Practice Questions and Answers

PHYSICS

For
Senior Secondary School

2

EDUBASE

QUESTIONS

TOPIC: CURVED MIRRORS

DIRECTION: Choose the correct answer from the lettered options.

1. Images of real objects formed by a convex mirror are always _____.

 A. inverted, real and diminished

 B. inverted, virtual and diminished

 C. erect, virtual and diminished

 D. erect, real and magnified

2. Light rays parallel to the principal axis are reflected by the curved mirror through the _____.

 A. center of curvature

 B. pole

 C. principal focus

 D. principal axis

3. An object is placed 32cm from a concave mirror of focal length 16cm. Find the magnification of the image produced.

 A. 11.06cm.

 B. 10.7cm.

 C. 12cm.

 D. 8.09cm.

 State whether the following statement is true or false.

4. A plane mirror is used as a rearview mirror.

 A. True

 B. False

5. A concave mirror can be used to produce a parallel beam of light if a lighted bulb is placed _____.

 A. between its focus and the pole

 B. at its focus

 C. at its Centre of curvature

 D. between its focus and Centre of curvature

6. The radius of curvature of a convex mirror is 30cm. Its focal length is _____ cm.

 A. 20

 B. 15

 C. 60

 D. 30

7. If a person has defective vision, he would use a shaving mirror which is a _____.

 A. plane mirror

 B. convex mirror

 C. concave mirror

 D. concave lens

8. If the object is at infinity in the case of a convex mirror, the image formed is _____.

 A. enlarged

 B. inverted

 C. real

 D. at the principal focus

 State whether the following statement is true or false.

9. A concave mirror is used as a shaving mirror.

A. True

B. False

10. Real images are _____.

A. inverted

B. erect

C. magnified

D. none of the above

11. A real image, equal in size to the object is obtained when the object is placed at the Centre of curvature in front of a _____.

A. plane mirror

B. concave mirror

C. convex mirror

D. either convex or concave mirror

12. The geometrical Centre of spherical mirror is called _____.

A. Centre of curvature

B. focus

C. pole

D. none of the above

13. In case of a concave mirror, when the object lies between the pole and the focus, the image formed is _____.

A. virtual

B. upright

C. magnified

D. all of the above

State whether the following statement is true or false.

14. Image formed by a convex mirror is always virtual.

A. True

B. False

15. Which of the following mirrors can be used to concentrate light on a spot?

A. Both concave and convex

B. Only convex

C. Only concave

D. Plane mirror

16. An object is placed at the Centre of curvature of a concave mirror, the image formed is at _____.

A. the focus

B. Centre of curvature

C. the pole of the mirror

D. the principal axis of the mirror

17. Plane travelling parallel to the principal axis are incident on a concave mirror. The are reflected

A. towards the Centre of curvature of the mirror.

B. as plane waves.

C. with the same wavelength.

D. as circular diverging from a point behind the mirror.

18. Images formed by a convex mirror are always _____.

A. diminished, virtual and erect

B. magnified, erect and real

C. erect, virtual and magnified

D. inverted, diminished and virtual

State whether the following statement is true or false.

19. The focal length of a spherical mirror is twice its radius of curvature.

A. True

B. False

20. Find the focal length of a lens that forms an inverted image the same size as the object when the object is located 20cm in front of the lens.

A. 10 cm.

B. 30 cm.

C. 40 cm.

D. 50 cm.

21. The focal length of a mirror is x. Find the radius of the mirror [x = 1cm].

A. 2cm.

B. 0.25cm.

C. 1.0cm.

D. 0.5cm.

Use the information to answer the question.

22. An image is two times the object distance. If the focal length of the lens is 5cm, find the kind of image formed.

A. Real image.

B. Virtual image.

C. Upright image and virtual.

D. None of the above.

23. What type of mirrors are capable of producing parallel beams of light such as those arising from the head lamps of a car?

A. Plane mirror

B. Spherical mirror

C. Parabolic mirrors

D. Cylindrical mirrors

24. Which of the following defines the center of curvature of a curved mirror?

A. The center of the hollow glass sphere of which the curved mirror was (previously) a part

B. The geometric center of the curved mirror

C. The radius of the hollow glass sphere of which the curved mirror was (previously) a part

D. The geometric radius of the curved mirror

25. A real image three times the size of an object is formed 24cm from a converging mirror, what is the focal length of the mirror?

A. 6cm

B. 8cm

C. 12cm

D. 16cm

26. The image formed by a concave mirror is of the same size as that of the object, if the object is placed _____.

A. at the focus

B. between pole and focus

C. at the Centre of curvature

D. at the pole

27. When an object is within the focal length of a concave mirror, the image formed is _____.

 A. real and inverted

 B. virtual and magnified

 C. virtual and same size

 D. real and magnified

28. Which of the following is not a method of determining focal length of a mirror?

 A. Use of mirror formular.

 B. By no-parallax method.

 C. From measurement of radius of curvature.

 D. All of the above.

29. If the object is placed between the principal focus and the center of curvature in front of a concave mirror, the image formed is _____.

 A. enlarged

 B. virtual

 C. erect

 D. at the pole

30. In order to get a virtual image of the same size as the object, it can be placed anywhere in front of a _____.

 A. concave mirror

 B. plane mirror

 C. convex mirror

 D. none of the above

31. The radius of curvature of a convex mirror is 40cm. Its focal length is _____.

 A. 40cm

 B. 30cm

 C. 20cm

 D. 10cm

32. An object of height 5cm is placed at 20cm from a concave mirror of focal length 10cm. The image height is _____.

 A. 20cm

 B. 15cm

 C. 10cm

 D. 5cm

33. The focal length of a concave mirror is 20cm. Its radius of curvature is _____cm.

 A. 10

 B. 20

 C. 40

 D. 15

34. Why do we use a convex mirror for driving?

 A. It produces reflection more than other types of mirror.

 B. The focus is conserved.

 C. It produces only red images.

 D. It produces images equal to the object.

 State whether the following statement is true or false.

35. A shaving mirror is convex in shape.

 A. True

B. False

36. An inverted image as seen in a convex mirror _____.

A. cannot be seen

B. when the object is very far from the mirror

C. when the object is at the center of curvature of the mirror

D. when the object is within the focal length of the mirror

37. A virtual image is one which _____.

A. can be got on a screen

B. cannot be got on a screen

C. is formed only by a plane mirror

D. is formed only by a convex mirror

38. The distance from the pole of a mirror to the Centre of curvature is _____.

A. principle focus

B. focal length

C. principle axis

D. radius of curvature

39. If an object is placed very close to the pole of a concave mirror, what will the image formed look like?

A. Virtual, diminished and upright.

B. Real, enlarged and inverted.

C. Real, enlarged, inverted and upright.

D. Virtual, enlarged and upright.

40. Find the focal length of a lens that produces an image four times an object placed 12cm from a converging lens.

A. 9.6cm.

B. 2.0cm.

C. 5.3cm.

D. 17.2cm.

TOPIC: EFFECT OF ELECTRIC CURRENT

DIRECTION: Choose the correct answer from the lettered options.

1. Which of the following is the main effect of electric currents?

 A. Chemical effect

 B. Heat effect

 C. Magnetic effect

 D. Electric effect

2. Find the power operating in a refrigerator when a current of 15A flows through the refrigerator at a resistance of 5Ω.

 A. 1125AΩ.

 B. 1125A/Ω.

 C. 1125J.

 D. 1125A.

3. An electric bulb is rated 60W for a 240V supply. Find the resistance of the bulb and the current it consumes.

 A. 960 ohms and 0.25A

 B. 340 ohms and 0.35A

 C. 0.25 ohms and 1.50A

 D. 1.50 ohms and 960A

4. Water in an electric kettle connected to a 240V supply took 6mins to reach its boiling point. How long would it have taken if the supply had been one of 210V?

 A. 5.25 mins

 B. 4 mins

 C. 3.75 mins

 D. 2.90 mins

5. A transformer which supplies 12V when connected to 240V mains takes 0.55A from the mains when used to light five 12V, 24W lamps in parallel, find its efficiency and the cost of using it for 12hr, at 60k per kWh.

A. 92.91%, 90.04k.

B. 91.91%, 95.04k.

C. 90.91%, 95.04k.

D. 90.91%, 95.10k.

6. The following options are applications of electrolysis EXCEPT _____.

 A. knowing mass of metals

 B. increasing the capacitance of an electrolytic capacitor

 C. extraction of metals

 D. calibration of ammeter

 [Specific latent heat of vaporization of water = 23 x 106JKg-1].

7. A heating coil rated at 1000W is used to boil off 0.5Kg of boiling water. The time taken to boil off the water is _____.

 A. 1.15 x 109s

 B. 1.15 x 107s

 C. 1.15 x 105s

 D. 1.15 x 103s

8. A filament lamp is rated 220V, 40W. What does this mean?

 A. Energy is supplied at 40W for 220V/m wire.

 B. P.d. is 220V only for every power delivered.

 C. A. p.d. of 220V actually needs to maintain power.

 D. Energy is supplied at 40W rate for every 220V applied across the filament lamp.

9. An electric heater of 420W is used to heat a 50kg mass of water from 25oC to boiling point, the time is _____.

 A. 10.4h

 B. 8.5h

 C. 6.0h

 D. 5.0h

10. Given that the specific heat capacity of water is 4180J/kg/K, how long will it take to heat 3kg of water at a temperature change 28oC – 88oC in a electric taking 6A from a 220volt supply?

 A. 10mins.

 B. 9.5mins.

 C. 2mins.

 D. 4620mins.

11. In the calibration of an ammeter using Faraday's laws of electrolysis, the ammeter reading is kept constant at 1.20A. If 0.990g of copper is deposited in 40 minutes, the correction to be applied to the ammeter is _____.

[e.c.e. of copper = 3.3 x 10–4gC–1].

 A. 0.05A

 B. 0.06A

 C. 0.03A

 D. 0.04A

12. The immediate products of decomposition of an electrolyte is the _____.

 A. element used

 B. the liquid used

 C. ion

 D. cathode

13. Electrical energy cost 5kobo per unit. What is the cost of running a 60W lamp for 24hrs?

A. 22kobo.

B. 14.4kobo.

C. 7.2kobo.

D. None of the above.

14. In electrolysis, a current I flows for 20mins and deposits a mass m of silver on the cathode. A current 2I flowing for 5mins will deposit a mass of silver of _____.

A. 8m

B. m/2

C. 2m

D. m

15. Which of the following laws states that "the electric force between two point charges separated by a distance is directly proportional to the product of the charges and inversely proportional to the square of the distance between the charges?

A. Coulomb's

B. Faraday's

C. Newton's

D. Ohm's

16. How many grams of copper would be deposited by the same number of coulombs that deposited 2grams of silver?

(Take the equivalent weight of silver = 107.8, and the equivalent weight of copper = 64)

A. 0.01g

B. 1.19g

C. 9.1g

D. 0.16g

17. 0.48 x 10-3kg mass was liberated by the passage of 1440Amp.sec quantity of electricity. Find the electrochemical equivalence of the system.

 A. 33.3 x 10-6kg/c.

 B. 3.33 x 10-6kg/c.

 C. 3.2 x 10-7kg/c.

 D. 33.0kg/c.

18. A with an input power of 2 kilowatts uses 80% of this power. If all the remaining energy appears as heat, and heats 40kg of iron, what will be the rise of temperature of this iron in 2min?

(Specific heat capacity of iron = 0.5 Jg K or 500 J/kg K).

 A. 9.6oC

 B. 2.4oC

 C. 24oC

 D. 12oC

19. Given that the electro-chemical equivalence is 0.126 x 10-6kg/C of a metal at a 5A current deposit for 1 hr. What is the mass of metal deposited?

 A. 2.268 x 10-3kg.

 B. 0.227 x 10-3kg.

 C. 0.039 x 10-3kg.

 D. 0.596 x 10-3kg.

20. A filament lamp is rated 220V, 40W. Find the resistance in the information given.

 A. 260Ω.

 B. 960Ω.

 C. 940Ω.

 D. 220Ω.

21. How much heat is generated when an electrical coil rated 200W is used to heat a given mass of water for 1hour?

A. 600KJ

B. 720KJ

C. 1200KJ

D. 1500KJ

22. An electric heater takes 4A when operated on a 200V supply, what is the cost of the electricity consumed at 10k per kwh, when it is used for 4 hours?

A. ₦0.10

B. ₦0.40

C. ₦4.00

D. ₦0.32

23. A charge of one coulomb liberates 0.0033g of copper in an electrolytic process. How long will it take a current of 2A to liberate 1.98g of copper in such a process?

A. 5 mins

B. 30 mins

C. 50 mins

D. 60 mins

24. What do you understand by the statement that the electrochemical equivalence of copper is 0.000333g/C?

A. It means copper has an electrochemical equivalence of 0.000333g/C.

B. It means 0.000333g of mass is liberated by passage of one quantity of charge.

C. It means 0.000333g of copper is deposited per one ampere of current flowing for one second at the cathode plate of copper.

D. All of the above is correct.

25. Determine the electrochemical equivalent of copper if a current of 0.8A passed through a copper voltmeter deposit 1.8g of copper after 60 mins.

 A. 0.0075g/c

 B. 0.0008g/c

 C. 0.000625g/c

 D. 0.024g/c

26. Calculate respectively the current it will take an electric kettle containing 960W heating unit and the time it will take an electric kettle to raise 2kg of water from 15oC to the boiling point, if 90% of the heat produced is used in raising the temperature of water and the cost of the charge is 3p for 1kwh.

(Take C = 4200J/kg/K for water and Voltage = 240V mains)

 A. 6A 826s 1.22p

 B. 4A 826s 0.66p

 C. 8A 826s 0.99p

 D. 9A 826s 3.66p

27. An electric heater rated 220V, 1000W is immersed into bucket full of water. If the temperature changes from 30oC to 100oC and the current flows for 300 seconds, the mass of water is _____.

[Specific heat capacity of water = 4200Jkg-1k-1]

 A. 4.28kg

 B. 4.86kg

 C. 1.02kg

 D. 7.14kg

28. An electric lamp is marked 100W, 250V. If the lamp is connected to a 250V mains, calculate the current and the cost of using the lamp for 100hr at 1p per KWh.

 A. 0.4A and 10p

 B. 0.6A and 1000p

 C. 0.4A and 100p

 D. 0.6A and 100p

29. An electrical drill rated 400W is used to drill a hole in copper of mass 400g in 20s. Calculate the rise in temperature if all the heat produced is absorbed by the copper.

[Specific heat capacity of copper = 400Jkg-1K-1].

 A. 100oC

 B. 75oC

 C. 50oC

 D. 45oC

30. An electric lamp is marked 12V, 36W. Calculate the energy in joules expended each minute after finding the resistance.

 A. 4016J

 B. 2160J

 C. 3164J

 D. 2005J

31. How long will it take to deposit 160g of copper on a zinc plate in a copper sulphate solution if the current through the cell is 2A?

[Take electrochemical equivalent of copper = 3.30 x 10-3 gc-1, mass of copper deposited (m) = 160g].

 A. 5.6hr

 B. 6.7hr

 C. 3.3hr

D. 4.2hr

32. A generator is on daily use and in the process, ten 60W and five 40W tungsten bulbs are on for the same time interval. The energy consumed daily is _____.

A. 0.96kWh

B. 1.92kWH

C. 9.60kWh

D. 9.20kWh

33. A 50W electric heater is used to heat a metal block of mass 5kg. If in 10 minutes a temperature rise of 12oC is achieved, the specific heat capacity of metal is _____.

A. 130J kg-1 K-1

B. 390J kg-1 K-1

C. 400J kg-1 K-1

D. 500J kg-1 K-1

34. An immersion heater is rated 100W. How long does it take the heater to raise the temperate of 2.5kg of water by 20oC?

[Assume heat lost to the surrounding is negligible and specific heat capacity of water = 4200J/kg/k].

A. 58.0 minutes

B. 70.0 minutes

C. 75.0 minutes

D. 35.0 minutes

35. An electric filament lamp is marked 6V and 0.4A. Find the rate at which energy is used by the lamp when it is connected to a 6V supply.

A. 0.07W

B. 1.00W

C. 2.40W

D. 15.00W

36. An electric heater rated 12 volts and 60 watts is used to boil 4000g of water, calculate the time required to raise the temperature of water from 30oC to 80oC. (Spectic heat capacity of water = 4.2J/g/k or 4200J/kg/k).

A. 388.9hrs

B. 3888.9hrs

C. 17.78hrs

D. 3.9hrs

37. What is the cost of running five 60W and four 100W lamps for 20hrs, given that electrical energy cost ₦10.00 per KWh?

A. ₦140.00.

B. ₦150.00

C. ₦120.00

D. ₦230.00.

38. Find the electrochemical equivalence of zinc if a current of 5A flowing for 40mins deposits 2.530g of copper at the cathode.

A. 2.11 x 10-3g/C.

B. 3.23 x 10-2g/C.

C. 4.25 x 10-3g/C.

D. 1.13 x 10-1g/C.

39. An electric generator has an e.m.f of 240V and an internal resistance of 1Ω. If the current supplied by the generator is 20A when the terminal voltage is 220V, find the ratio of the power supplied to the power

A. 11:1

B. 1:11

C. 12:11

D. 11:12

40. Two heating coils A and B dissipated heat at the rate of 60W and 90W respectively when connected in parallel to a 12V d.c. supply of negligible internal resistance. Find the resistances of A and B.

A. 2.4Ω, 0.63Ω

B. 2.4Ω, 1.6Ω

C. 0.42Ω, 0.63Ω

D. 0.42Ω, 1.6Ω

41. How long will it take an electric boiler of 450W to heat a 50kg mass of water from 25oC to boiling point?

A. 10.4h

B. 8.5h

C. 9.7h

D. 5.0h

42. The maximum power which a 100hms resistor 100R can absorb is 4W. The maximum voltage across the $P = I2 R$ resistor is _____.

A. 5V

B. 10V

C. 20V

D. 25V

43. Which of these states the faraday's 2nd law of electrolysis?

A. The mass of desposition at electrode during electrolysis is directly proportional to the quantity of electricity passing through the electrolyte

B. The quantity of electricity required to liberate one mole of a substance in electrolysis is approximately 96500 coulombs

C. The induce electromotive force in a circuit is directly proportional to the rate of change of magnetic flux linking the coil

D. The same quantity of electric passed through different electrolyte and ratio of the masses deposited at electrodes equal ratio of their chemical equivalent

44. All the heat generated in a 5 Ohm resistor by 2A flowing for 30 seconds is used to evaporate 5g of a liquid at its boiling point. Which of the following is the correct value of the specific latent heat of the liquid?

A. 120J

B. 60Jg-1

C. 120Jg-1

D. 1500J

45. Heat generated by a current of 4A passing through a 6Ω resistor for 24secs is used to evaporate 6g of a liquid at a boiling point. Find the specific latent heat of the liquid.

A. 384J/g.

B. 276J/g.

C. 164J/g.

D. 198J/g.

46. Two parallel plates at a distance of 9 x 10-3m apart are maintained at a potential difference of 700V. The electric field strength between them is _____.

A. 6.30 x 10^0Vm^{-1}

B. 1.26 x 10^1Vm^{-1}

C. 6.30 x 10^3Vm^{-1}

D. $7.78 \times 10^4 Vm^{-1}$

47. Which of the following best represents the statement Joule's laws of electrical heating (H) obtained. H = I2Rt

 A. Current [I], if the resistance [R] and time are constant

 B. Resistance [R], if heat [H] and time [t] are constant

 C. Resistance [R], if the current [I] and time are constant

 D. Time [t], if the resistance [R] and current [I] are constant

48. The value of two lengths of wire been compared are 2cm and 3cm. If the e.m.f. of 2cm wire is 5V. What is the e.m.f. of the 3cm wire?

 A. 3.3V.

 B. 7.5V.

 C. 2V.

 D. 6V.

49. If 100cm of wire was used in the heating element of a 12V, 60W heater, what length of wire of the same material having the double sectional area would be required for a 24V, 60W heating element, assuming the final temperature is the same?

 A. 200 cm

 B. 400 cm

 C. 50 cm

 D. 120cm

50. A block of aluminum is heated electrically by a 25W heater. If the temperature rises by 10oC in 5minutes, the heat capacity of the aluminum is _____.

 A. $850JK^{-1}$

 B. $750JK^{-1}$

 C. $650JK^{-1}$

D. 500JK^{-1}

51. A current of 3A is passed through a copper voltmeter for 10 minutes. If the electro chemical equivalent of copper is 3.27 x 10^{-7}kgc^{-1}. Determine the mass of copper deposited.

A. 58.86 x 10^{-4}kg

B. 5.886 x 10^{-4}kg

C. 588.6 x 10^{-4}kg

D. 5886 x 10^{-4}kg

TOPIC: ELECTROMAGNETIC SPECTRUM & DISPERSION OF LIGHT

DIRECTION: Choose the correct answer from the lettered options.

1. The complementary color of blue is _____.

A. violet

B. cyan

C. green

D. yellow

2. What is a diffraction grating?

A. A diffraction grating consists of a piece of opaque material on which a very large number of opaque (black) parallel lines are engraved

B. A diffraction grating consists of a piece of transparent material on which a very large number of transparent (black) parallel lines are engraved

C. A diffraction grating consists of a piece of transparent material on which a very large number of opaque (black) parallel lines are engraved

D. A diffraction grating consists of a piece of opaque material on which a very large number of transparent (black) parallel lines are engraved

3. When a sample of an element is heated until it glows, the color it gives off is _____.

A. a single frequency of light

B. a composite of lots of frequencies of light

C. a continuous band of color

D. monochromatic

4. Which region of the electromagnetic spectrum will travel with the fastest speed?

 A. Radio wave

 B. Infrared

 C. Ultra-violet

 D. All of the above

5. A piece of cloth appears green in sunlight. When held in red light, it will appear _____.

 A. green

 B. blue

 C. red

 D. black

6. In the formation of a pure spectrum which of the following apparatus is not necessary?

 A. The narrow slit.

 B. The screen.

 C. A converging lens with the slit at its focus.

 D. A second lens for collecting the parallel beams of different colours.

The correct answer is option [D].

7. Which of these combination will not produce a white light?
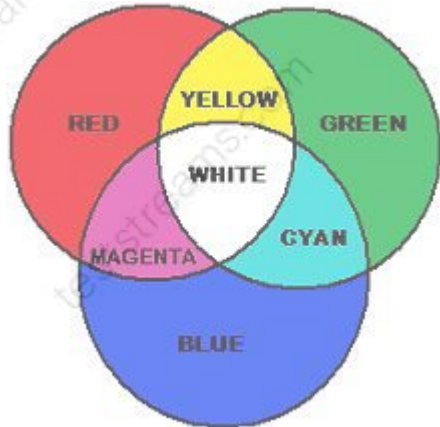
A. Yellow and Blue.

B. Green and Red.

C. Cyan and Red.

D. Magenta and Green.

8. Stars vary in colour. Which colour indicates the hottest surface temperature of a star?

A. Red

B. Orange

C. Yellow

D. Blue

9. The colour of light is determined by _____.

A. frequency

B. velocity of air

C. wavelength

D. distance

10. If the Nigerian flag (green, white, green) is viewed in pure yellow light, which of the following set of colours would be observed on the flag?

 A. Green, yellow, green

 B. Red, yellow, red

 C. Black, yellow, black

 D. Green, white, green

11. In the spectrum of white light which of the following pairs of light rays shows the widest separation?

 A. Red and Indigo.

 B. Black and White.

 C. Green and Orange.

 D. Yellow and Red.

12. Calculate the frequency of red light with a wavelength of 4.2×10^{-7}m.

 A. 7.14×10^{14} Hz

 B. 7.14×10^{-14} Hz

 C. 7.41×10^{14} Hz

 D. 6.14×10^{14} Hz

13. Which color of the visible light spectrum has the greatest frequency?

 A. Violet

 B. Red

 C. Infrared

 D. Radio

14. A student used a laser, as drawn, to demonstrate that light is a wave motion, Name the two phenomena that occur when the light passes through the pair of narrow slits.
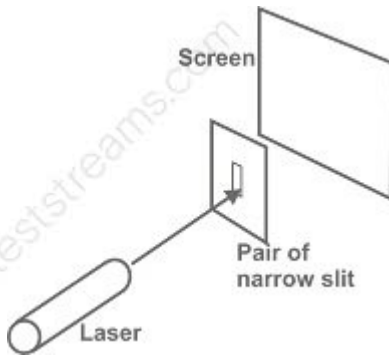
A. Polarization and Interference

B. Diffraction and Interference

C. Diffraction and Polarization

D. Absorption and Interference

15. The earth receives a significant amount of ultraviolet radiation from the sun. Luckily most of it doesn't reach the ground, because it is _____.

A. scattered by the upper atmosphere

B. absorbed by a protective layer of ozone gas in the upper atmosphere

C. absorbed by the large amount of air in the atmosphere

D. actually there isn't enough UV radiation coming from the sun to harm us

16. Which region of the electromagnetic spectrum has the highest frequency?

A. Ultra-violet radiation

B. Infrared radiation

C. X-ray

D. Gamma radiation

17. When red and green light shine on a white sheet, the resulting color is _____.

 A. blue

 B. cyan

 C. green

 D. yellow

18. When white light is diffracted, the least deviated colour is _____.

 A. violet

 B. orange

 C. red

 D. indigo

19. Clouds are white because water molecules _____.

 A. reflect white light

 B. absorb white light

 C. form clusters of different sizes and these clusters scatter different colors of light

 D. are white

20. The three primary colors of light addition are _____.

 A. red, yellow, and green

 B. red, yellow, and blue

 C. red, green, and blue

 D. yellow, green, and blue

21. The visible part of light consists of the following colours:

 A. Red, indigo, infra-red, violet, yellow, green and blue

 B. Red, green, blue, violet, indigo, orange, and yellow

 C. Blue, ultra-violet, infra-red, red, yellow, indigo, violet, green, and orange

D. Infra-red and ultra-violet

State whether the following statement is true or false.

22. The two colors of light that come together to form black light are called complementary colors.

A. True

B. False

23. Which colour is refracted more by the prism?

A. Red

B. Green

C. Blue

D. Yellow

State whether the following statement is true or false.

24. A spectroscope is an instrument that analyzes the colors in a light beam.

A. True

B. False

25. Which of the following has the shortest wavelength?

A. A microwave

B. An infrared ray

C. A ultra-violet ray

D. Visible light

26. Light of one colour is called _____ light

A. monochromatic

B. dispersed

C. diffused

D. chromatic

27. A burning candle is located 80 centimeters from the surface of a spherical concave mirror, and produces a focused image at 20 centimeters in front of the mirror. The radius of curvature for this mirror is _____.

A. 4 cm

B. 16 cm

C. 32 cm

D. 24 cm

28. Which one of these rays has the greatest penetrating power?

A. Ultra violet ray.

B. Gamma ray.

C. Beta ray.

D. Radio wave.

29. The combination of the colour white + cyan will produce _____.
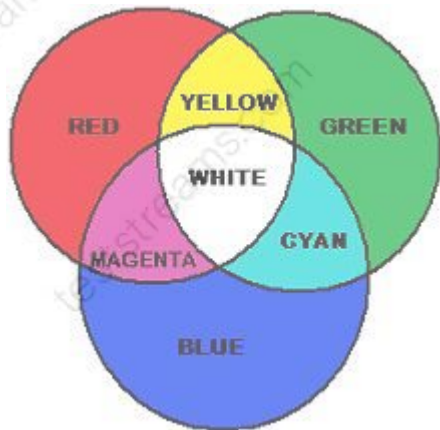
A. Blue

B. Red

C. Yellow

D. Green

30. On the moon, the daytime sky looks _____.

A. blue

B. yellow

C. white

D. black

31. Which of these are primary colours?

A. Green, Blue and Yellow.

B. Blue, Green and Red.

C. Orange, Red and Yellow.

D. Indigo, Violet and Cyan.

32. The reason the sky is blue is that air molecules _____.

A. scatter blue light in all directions

B. reflect blue light

C. absorb yellow light

D. absorb green light

TOPIC: GRAVITATIONAL FIELD

DIRECTION: Choose the correct answer from the lettered options.

1. Which of the following statement about intensity is/are correct?

I. It has the unit Nkg^{-1}

II. It is equal to acceleration of free fall due to gravity

III. It increases with altitude

A. I only

B. II only

C. I and II only

D. I, II and III.

2. If the earth's acceleration due to gravity on a mass of 4000kg on the earth surface is 10 m/s^2, what would be the acceleration due to gravity when it is at a point 4 times the radius of the earth?

A. 0.43 m/s^2

B. 0.63 m/s^2

C. 0.58 m/s^2

D. 0.87 m/s^2

3. If the gravitational constant is $8 \times 10^{-11} Nm^2/kg^2$. Calculate the force of attraction between 105kg mass of metal hanging one meter away from 104kg mass of Cu.

A. 8×10^{-2}N.

B. 12.1×10^{-4}N.

C. 10.03×10^{-3}N.

D. 2.14×10^{-1}N.

4. What is the acceleration due to gravity g on the moon if g is $10ms^{-2}$ on the earth?

A. $0.1ms^{-2}$

B. $0.74ms^{-2}$

C. $1.67ms^{-2}$

D. $10.00ms^{-2}$

5. The gravitational potential of a body at infinity is _____.

 A. less than that on the earth surface

 B. greater than that on the surface of the earth

 C. has no value

 D. proportional to the escape velocity

6. Which of the following is true about the law of universal gravitation?

 A. Any two bodies attract each other with a force that is proportional to the difference of their masses

 B. Any two bodies attract each other with a force that is inversely proportional to the square of the distance between them

 C. Any two bodies attract each other with a force, which is proportional to the product of their masses and inversely proportional to the square of the distance between them

 D. Any two bodies attract each other with a force that is proportional to the sum of their masses

7. A satellite is expected to circle round the earth in an orbit 40,000km from the earth's surface. What is the period? (Take radius of earth r = 6400km).

 A. 42hrs

 B. 27hrs

 C. 68hrs

 D. 48hrs

8. If the earth's acceleration due to gravity on a mass of 4000kg on the earth surface is 10m/s2 and the acceleration due to gravity is 4 times the radius of the earth, determine the gravitational force that acts on it.

A. 1650N

B. 1870N

C. 2520N

D. 3720N

9. Calculate the escape velocity for a rocket fired from the earth's surface at a point where the acceleration due to gravity is $10ms^2$ and the radius of the earth is 6×10^6m.

A. $7.8 \times 10^3 ms^{-1}$

B. $1.1 \times 10^4 ms^{-1}$

C. $3.5 \times 10^7 ms^{-1}$

D. $6.0 \times 10^7 ms^{-1}$

10. A 20kg mass (A) at a point, P, 50cm from a 500kg mass (B) is attracted towards B as a result of the force field produced by B. Determine the field intensity at P.

A. 1.34×10^{-7}N/kg

B. 6.7×10^{-8}N/kg

C. 2.68×10^{-9}N/kg

D. 1.34×10^{-8}N/kg

11. A mass of 2500kg is on the earth surface. What is the gravitational potential energy, when the mass is thrice as far away from the center of the earth? (Mass of Earth = 6.0×10^{24}kg).

A. 5.23×10^{13}J

B. 3.48×10^{14}J

C. 1.67×10^{12}J

D. 2.25×10^{15}J

12. Which of these is the formula for escape velocity of gravitation?

 A. $V = \sqrt{[2GM/r]}$

 B. $V = 2\pi R/T$

 C. $V = \sqrt{[GM/r]}$

 D. $V = \sqrt{[gr2/R]}$

13. The earth is four times the size of the moon and acceleration due to gravity on the earth is 80 times that of the moon. The ratio of the mass of the moon to that of the earth is _____.

 A. 1:4

 B. 1:80

 C. 1:320

 D. I: 1280

14. If an electron of mass is 9.11×10^{-31}kg and the radius of hydrogen is 0.32×10^{8}m. If the proton mass is 1.56×10^{-27}kg, the gravitational attraction between the charges is _____.

[Take $G = 6.67 \times 10^{-11}$Nm^2/kg^2]

 A. 12.1×10^{-26}N.

 B. 86.2×10^{-26}N.

 C. 9.26×10^{-83}N.

 D. 9.26×10^{-47}N.

15. A rocket of total mass 500kg on the earth surface is to be launched into space. Determine the escape velocity of the rocket and the kinetic energy required for the rocket to escape into space.

 A. 358m/s 3.2×10^{7}J

 B. 640m/s 6.4×10^{10}J

 C. 253m/s 6.6×10^{10}J

 D. 400m/s 4.0×10^{7}J

16. What is the gravitational potential due to a body of mass m at a distance r from it?

[G = Gravitational Constant]

A. Gm/r.

B. GMm/r^2.

C. Gm2/r^2.

D. m/Gr^2.

The correct answer is option [A].

Hint: Gm/r.

17. The force of attraction between two point masses is 10^{-4}N when the distance between them is 0.18m. If the distance is reduced to 0.06m, calculate the force.

A. 1.1 x 10^{-5}N

B. 3.3 x 10^{-5}N

C. 3.0 x 10^{-5}N

D. 9.0 x 10^{-4}N

18. What is the force of attraction between two masses 5kg and 8kg at a distance of 60cm apart?

A. 8.0 x 10^{-9}N

B. 7.4 x 10^{-9}N

C. 4.5 x 10^{-9}N

D. 5.6 x 10^{-9}N

19. Which of the following statements does not express the gravitational potential at a point on the earth's surface?

A. Usually expressed with +ve sign because the work done is towards infinity

B. At infinity is zero

C. Is a scalar quantity

D. Used to calculate energy changes in moving a given mass from one point to another

TOPIC: LENSES

1. If the image formed by an object lens at a distance from the eye lens is 4cm. What is the distance of the object from the lens, if the final image is at 26cm?

  A. 120cm

  B. 100cm

  C. 4.73cm

  D. 3.46cm

 Use the information to answer the question.

2. An image is two times the object distance. If the focal length of the lens is 5cm, find the object distance.

  A. 22.5cm.

  B. 15cm.

  C. 30cm.

  D. 7.5cm.

 Use the information to answer the question.

3. Given that the least distant of distinct vision for a normal eye is 25cm. What kind of lens is needed by the man whose near point is 38.5cm?

  A. Concave lens.

  B. Convex lens.

  C. Biconcave lens.

  D. Plano-concave lens.

4. The focal length of a lens is 2cm and is used to capture an image 4cm greater in distance from the lens compared to the object distance from the lens. Determine image distance of the object.

A. 6.83cm.

B. 4.83cm.

C. 3.38cm.

D. 2.83cm.

5. A converging lens of 6cm is used as a magnifying glass by a man whose near point is 36cm, the magnification given by the lens is _____.

A. 2.86

B. 9.0

C. 4.12

D. 5.0

6. A simple microscope forms an image 10cm from an eye close to the lens. If the object is 6cm from the eye, the focal length of the lens is _____.

A. 3.75cm

B. 4.00cm

C. 15.99cm

D. 16.00cm

7. In a ray diagram for a thin converging lens, a ray that is not parallel to the optic axis but passes through the optic center will _____.

A. pass through undeviated

B. pass through the center of curvature after

C. emerge parallel to the principal axis

D. pass through the principal focus after

8. Which of the following correctly describes the image of an object, 4cm from a diverging lens of focal length –12cm?

A. The image is virtual, 3cm in front of the lens

B. The image is real, 6cm behind the lens

C. The image is virtual, 6cm in front of the lens

D. The image is real, 3cm in front of the lens

9. A lens captures an image at 20cm distance. If the radius of curvature of the lens is 12.5. Find the object distance and the nature of the image formed.

A. 100cm but the image is real.

B. 100cm but the image is virtual.

C. –100cm but the image is real.

D. –100cm but the image is virtual.

10. If u is the object distance and v the image distance, which of the following expressions gives the linear magnification produced by a convex lens of focal length?

A. v + 1f

B. v – 1f

C. u – ff

D. u + fv

11. A converging [convex] lens has a focal length of 20cm. The lens forms a real inverted image of the same size as the object when the object distance from the lens is _____.

A. 40cm

B. 30cm

C. 20cm

D. 10cm

Use the information to answer the question.

12. An image is two times the object distance. If the focal length of the lens is 5cm, find the magnification of the lens.

A. Unknown.

B. 2.5cm.

C. 2cm.

D. 2

13. What is the focal length of the correcting lens required for a man to see distant objects if the man is suffering from short-sightedness and cannot see objects beyond 1.00m?

A. 50cm.

B. -50cm.

C. -100cm.

D. 180cm.

Use the information to answer the question.

14. Given that the least distant of distinct vision for a normal eye is 25cm. find the focal length of the lens needed by a man whose near point is 38.5cm.

A. 70.2cm.

B. 71.3cm.

C. -71.3cm

D. -65.1cm.

Use the information to answer the question.

15. An image is two times the object distance. If the focal length of the lens is 5cm, find the image distance of the object.

 A. 7.5cm.

 B. 15cm.

 C. 22.5cm.

 D. 0.013cm.

16. What is the focal length f of a converging lens if the real image formed is 90.0cm from the object placed 30.0cm from the lens?

 A. 20.0cm.

 B. 15cm.

 C. 60.0cm.

 D. 25.0cm.

17. The image of a pin formed by diverging lens of focal length 12cm is 6cm from the lens. Find the distance of the pin from the lens.

 A. 8cm.

 B. 2cm.

 C. 4cm.

 D. 9cm.

18. How far should an object be positioned from a converging lens of focal length 10.2m to obtain a magnification of 2.5?

 A. 0.50m.

 B. 0.25m.

 C. 0.13m.

 D. 0.28m.

19. The focal length of a converging lens is 6cm. If it is used as a magnifying glass by a man whose near point is 36cm, calculate the magnification given by the lens.

 A. 1.286.

 B. 128.4.

 C. 185.56.

 D. 259.18.

20. An object is placed 30cm from a lens if an image is formed on a screen 250cm away from the lens, calculate the magnification.

 A. 9.4.

 B. 8.33.

 C. 21.1.

 D. 18.4.

21. A convex lens of focal length 15cm is used to obtain a real image magnified 3/2. What is the distance of the image from the lens?

 A. 13.19cm.

 B. 37.5cm.

 C. 40.1cm.

 D. 28.1cm.

22. An object placed on the principal axes of a convex lens of focal length 10cm produces a real image of double magnification. The image distance from the lens is _____

 A. 30cm

 B. 25cm

 C. 20cm

 D. 15cm

TOPIC: LIGHT WAVES

DIRECTION: Choose the correct answer from the lettered options.

1. An astronomical telescope, having an objective of focal length 100cm and an eyepiece of focal length 10cm, is used in normal adjustment. Find the separation of the lenses.

A. 0.10m

B. 0.90m

C. 1.10m

D. 1.80m

2. In the diagram drawn, which of the angles θ_1, θ_2, θ_3, θ_4 is the angle of deviation of a ray of light passing through the glass prism XYZ?

A. θ_3

B. θ_2

C. θ_1

D. θ_4

3. An object of height 4cm is placed in front of a cuboid pinhole camera of size 6cm. If the image formed is 2cm high, how far is the object from the pinhole?

A. 3.0cm

B. 8.0cm

C. 12.0cm

D. 16.0cm

4. When a plane mirror at which a ray is incident is rotated through an angle q, the reflected ray will be rotated through _____.

A. $1/2\ \theta$

B. θ

C. 2 θ

D. 3 θ

5. Find the angle of minimum deviation for a ray which is refracted through an equiangular prism of refractive index 1.4.

A. 99°

B. 90°

C. 60°

D. 29°

6. Which of the following does not distinguish between regular and diffuse reflection of light?

A. Light beams are reflected in both smooth and rough reflecting surfaces

B. Light beams are reflected at different directions from the surface due to different angles of incident rays

C. Light beams are reflected in the same direction and so remain parallel

D. Light beams are reflected at different directions and so remain parallel

7. A lens that is thinner at the middle and thicker at the edge is a _____.

A. diverging lens

B. converging lens

C. Plano-convex lens

D. converging lens meniscus

8. Satellite communication network makes use of _____.

A. sound wave

B. micro

C. visible light

D. infra-red rays

9. The following is necessary for the production of interference with two wave trains EXCEPT _____.

 A. they must have the same wavelength

 B. they must have the same amplitude

 C. they must have the same frequency

 D. they must travel at a speed of light

10. Which of the following statement is not correct about long sight?

 A. A long-sighted person can see distant objects clearly

 B. Light from a nearby object is focused behind the retina

 C. The eyeball is too short

 D. The defect is corrected by using a diverging lens.

11. A magnifying glass of focal length 8.0cm gives 5 times enlarged image of an object. Determine the size of the object.

 A. 1.0cm

 B. 3.2cm

 C. 9.6cm

 D. 8.0cm

12. The objective and the eyepiece of an astronomical telescope have focal lengths of 60cm and 10cm respectively. Find the distance between the lenses, if the object and final image are both at infinity.

 A. 20cm

 B. 70cm

 C. 40cm

 D. 50cm

13. In the microscope, the eyepiece lens merely acts as _____.

A. an inverter

B. a refiner

C. a diminisher

D. a magnifier

14. A ray of light is incident on a plane mirror such that the angle of reflection is 25o. What is the angle of deviation of the ray after reflection from the mirror?

A. 25°

B. 50°

C. 65°

D. 130°

15. The basic difference between sound wave and light wave is that _____.

A. both are not electromagnetic

B. sound wave is heard while light wave is not heard

C. are longitudinal while are transverse

D. could be echoed while cannot

16. An object 4cm high is at right angles to the principal axis of a diverging lens of focal length 20cm, and 30cm from it. Determine the position of the image and its size.

A. 60cm, 4cm.

B. 60cm, 8cm.

C. 8cm, 30cm.

D. 60cm, 6cm.

17. When an object is placed at the principal focus of a concave mirror, the location of the image formed is _____.

A. beyond principal focus

B. between principal focus and center of curvature

C. at infinity

D. at center of curvature

18. A blue object viewed in yellow light appears to be _____.

A. black

B. green

C. orange

D. red

19. When white light passes through a triangular glass prism, there is dispersion because of _____.

A. diffraction of light

B. polarization of light

C. the difference in speed of the components of light

D. the interference of in glass

20. A lantern gives an image 3m square of a slide 7.62cm square on a screen. If the screen is 10m from the projection lens, calculate the focal length of the lens.

A. 40.3cm

B. 26.1cm

C. 0.7cm

D. 0.3cm

21. A thin converging lens has a power of 4.0 diopter. Determine its focal length.

 A. 0.03m

 B. 0.25m

 C. 2.50m

 D. 5.00m

22. The objective and the eyepiece of an astronomical telescope have focal lengths of 60cm and 10cm respectively. Find the distance between the lenses, if the object is at infinity and final image is formed 40cm from the eyepiece.

 A. 100cm

 B. 70cm

 C. 90cm

 D. 40cm

23. The phenomenon of producing transverse vibration which are only in one plane is called _____.

 A. plane-polarization

 B. polarization

 C. mechanical analogue of light

 D. Polaroid polarization

24. A lens of focal length 12.0cm forms an upright image four times the size of an object, the image distance is _____.

 A. 60cm

 B. 48cm

 C. 16cm

 D. 15cm

25. The sharpness of the boundary of the shadow of an object is determined by the _____.

 A. nature of the object

 B. opacity of the object

 C. intensity of light striking the object

 D. rays of light passing through the object

26. The focal lengths of the objective lens and the eye piece of an astronomical telescope are 40cm and 2.3cm respectively. What is the distance between the when it is at normal adjustment?

 A. 17.4cm

 B. 37.7cm

 C. 42.3cm

 D. 44.6cm

27. The number of times an image is bigger than an object is called _____.

 A. magnification of a lens

 B. magnification of a mirror

 C. magnification of an object

 D. magnification

28. Which of the following is true of light and sound waves?

 A. they both transmit energy

 B. they both need a medium for propagation

 C. they are both transverse

 D. their velocities in air are equal

29. If the speed of light in air is 3 x 108m/s. What is the frequency of yellow light of wavelength 6 x 10-7m in air?

 A. 6 x 10-6Hz.

 B. 8 x 10-14Hz.

 C. 5 x 1014Hz.

 D. 4 x 10-6Hz.

30. An object is placed 20cm from a lens. If an image is formed on a screen 260cm away from the lens, calculate the magnification of the image.

 A. 28

 B. 26

 C. 24

 D. 13

TOPIC: MACHINE

DIRECTION: Choose the correct answer from the lettered options.

1. Find the velocity ratio of a screw jack of pitch 0.3cm if the length of the tommy bar is 21cm.

 A. (1/140) p

 B. 14p

 C. 70p

 D. 140p

2. A block and tackle with a velocity ratio of 5 is used to raise a mass of 20kg through a vertical distance of 50cm at a steady rate. If the effort is equal to 50N, determine the distance moved by the effort and the work done by the effort in lifting the load.

 A. 240cm, 12560J.

 B. 200cm, 12400J.

 C. 250cm, 12500J.

 D. 250cm, 12000J.

3. Efficiency of a is always less than one because

I. work is done in moving the parts of the machine

II. of friction in the moving part of machine

III. The effort applied is always less than the load being overcome.

Which of the statements above is/are correct?

 A. I only

 B. II only

 C. III only

 D. I and II only

4. Mechanical advantage depends on all EXCEPT _____.

A. quality of the construction of the

B. friction Force

C. the geometry of the moving parts

D. load the is to carry

Use the information to answer the question.

5. An axle and wheel system lifts a man of 700N by an effort of 200N. If the radii of the wheel and axle are 400mm and 100mm respectively. Obtain the velocity ratio of the system.

A. 4.

B. 2.

C. 3.5.

D. 3.

Use the information to answer the question.

6. A system of hydraulic press was used to lift a load of 20N across a distance of 2m. If the area of the large piston is 5m2 while that of the small piston is 2m2. Find the velocity ratio, V.R. of the system.

A. 2.5.

B. 3.

C. 4.

D. 3.5.

7. An inclined plane is 6m long if the higher end is 2m above the ground. If the efficiency of the inclined plane used is 60%, the mechanical advantage of the machine is _____.

A. 2.5.

B. 1.8.

C. 2.3.

D. 5.

8. Which of the following is not an example of a machine?

 A. Pulley.

 B. Inclined plane.

 C. Horizontal plane.

 D. Screw.

9. Calculate the force parallel to the plane that is required to just push a load of 130N. If the plane is inclined at an angle of 30o with efficiency of 60%.

 A. 132.54N.

 B. 62.532N.

 C. 122.14N.

 D. 548.24N.

 Use the information to answer the question.

10. A with velocity ratio 5 needs 1000J of work to raise a weight of 500N via a vertical distance of 1.5m, the machine's efficiency is _____.

 A. 25%

 B. 75%

 C. 70%

 D. 85%

11. A pair of laboratory tongs is a good example of _____ order of lever.

 A. 1st

 B. 2nd

 C. 3rd

 D. 4th

Use the information to answer the question.

12. A system of hydraulic press was used to lift a load of 2ON across a distance of 2m. If the area of the large piston is 5m2 while that of the small piston is 2m2, the distance moved by effort is _____.

A. 1.25.

B. 0.80.

C. 1.20.

D. 5.00m.

13. A screw jack has a pitch 0.5cm, with the handle turning through a circle of 50cm radius. Obtain the mechanical advantage M.A. given that the efficiency of the machine is 25%.

A. 25π.

B. 50 π.

C. 50.

D. 65 π.

Use the information to answer the question.

14. A with velocity ratio 5 needs 1000J of work to raise a weight of 5OON via a vertical distance of 1.5m. What is the mechanical advantage of the machine?

A. 2.55.

B. 3.75.

C. 7.35.

D. 4.35.

Use the information to answer the question.

15. A system of consist of 5 pulleys and is used to raise a load of 400N through a height of 10m. If the work done against friction is 1000J, the work done by effort is _____.

A. 1KJ

B. 5KJ

C. 3KJ

D. 2KJ

Use the information to answer the question.

16. An axle and wheel system lifts a man of 700N by an effort of 200N. If the radii of the wheel and axle are 400mm and 100mm respectively. Determine the mechanical advantage.

A. 3.5.

B. 3.

C. 4.

D. 2.

17. What effort is needed to raise a load of 84.0N of a block system of five pulleys that have an efficiency of 70%?

A. 24.0N.

B. 60.0N.

C. 0.24N.

D. 58.8N.

18. An inclined plane has a mechanical advantage [M.A.] which depends on _____.

A. its height

B. its length

C. the point of the plank with the ground

D. the ratio of the length to the height

19. A screw jack has a pitch 0.5cm, with the handle turning through a circle of 50cm radius, the velocity ratio of the is _____.

A. 100π

B. 20 π

C. 10.50 π

D. 200 π

20. The efficiency of the pulley system shown is 80%. Find the effort E required to lift a load of 1200N.

A. 275N

B. 325N

C. 375N

D. 575N

Use the information to answer the question.

21. A system of consist of 5 pulleys and is used to raise a load of 400N through a height of 10m. If the work done against friction is 1000J, what is the value of the effort applied?

A. 50N.

B. 100N.

C. 150N.

D. 170N.

22. The fore arm of a human body is an example of _____ order lever.

A. 1st

B. 2nd

C. 3rd

D. only B and C

23. In an ideal wheel and axle system, R stands for the radius of wheel and r is the radius of the axle. The mechanical advantage is _____.

A. r/R

B. R/r

C. $(R/r)^2$

D. $(r/R)^2$

24. A is said to be a third class lever when the _____.

A. load is between the fulcrum and effort

B. fulcrum is between the effort and load

C. effort is between the fulcrum and load

D. fulcrum is directly below the load

25. A 20Kg mass is to be pulled up a slope inclined at 30o to the horizontal. If the efficiency of the plane is 75 %(0.75). The force required to pull the load up the plane is _____.

A. 13.3N

B. 73.5N

C. 133.3N

D. 533.2N

26. Mechanical advantage equals velocity ratio in any when _____.

A. effort = load

B. efficiency = 0

C. velocity ratio = 1

D. friction in the = 0

Use the information to answer the question.

27. An axle and wheel system lifts a man of 700N by an effort of 200N. If the radii of the wheel and axle are 400mm and 100mm respectively. If 15% is reduced from the true efficiency. What result is obtained?

 A. 85.7%.

 B. 87.5%.

 C. 72.5%.

 D. 71.5%.

28. _____ is not an example of a first order lever.

 A. Claw hammer

 B. Crow bar

 C. Pliers

 D. Nutcrackers

29. A good should have _____.

 A. friction reduction

 B. heat regulator

 C. non-heat reducers

 D. all of the above

30. A screw jack has a pitch 0.5cm, with the handle turning through a circle of 50cm radius. How will you rate such machine?

 A. Below average.

 B. Average.

 C. Above average.

 D. A little above average.

Use the information to answer the question.

31. A with velocity ratio 5 needs 1000J of work to raise a weight of 500N via a vertical distance of 1.5m. What is the effort needed to be applied?

A. 200N.

B. 130.0N.

C. 133.33N.

D. 76N.

32. If the velocity ratio of a machine is 2, what does this mean?

A. The effort and load are not the same.

B. The distance moved by effort is two times the distance moved by load.

C. The distance moved by load is two times the distance moved by effort.

D. Effort is two times greater than the load.

Use the information to answer the question.

33. A system of hydraulic press was used to lift a load of 20N across a distance of 2m. If the area of the large piston is $5m^2$ while that of the small piston is $2m^2$. Obtain the mechanical advantage of the system.

A. 3.

B. 2.5.

C. 4.

D. 3.5.

34. Determine the velocity ratio of a screw jack with pitch 0.5cm if the handle turns through a circle of diameter 20cm.

A. 4π.

B. 0.8 π.

C. 1.6 π.

D. 2 π.

35. An inclined plane is 6m long if the higher end is 2m above the ground. What is its velocity ratio?

A. 3.

B. 2.

C. 5/2.

D. 5.

Use the information to answer the question.

36. A system of hydraulic press was used to lift a load of 20N across a distance of 20cm. If the area of the large piston is 5m2 while that of the small piston is 2m2, excluding the lever, the efficiency of the press is _____.

[Given M.A. = 3]

A. 60.0%

B. 26.6%

C. 37.6%

D. 30.0%

Use the information to answer the question.

37. A system of consist of 5 pulleys and is used to raise a load of 400N through a height of 10m. If the work done against friction is 1000J. Find the mechanical advantage of the machine.

A. 2.

B. 3.

C. 4.

D. 5.

38. A whose efficiency is 60% has a velocity ratio of 5. If a force of 500N is applied to lift a load P, what is the magnitude of P?

A. 500N

B. 750N

C. 1500N

D. 166N

39. The mechanical advantage of a machine is 4. This means that

A. the effort is four less than the load.

B. the load is four greater than the effort.

C. the effort is four times the load.

D. the load is four times the effort.

40. If an 80% efficiency has velocity ratio of 5. What effort would be required to raise a load of 200N with the aid of this machine?

A. 250N.

B. 500N.

C. 1000N.

D. 450N.

41. The velocity ratio of any set of pulley system is _____.

A. the number of extension per load

B. the number of the ratio of the distance travelled by load to effort

C. is the number of the combined set of pulleys

D. the ratio of the load to effort

Use the information to answer the question.

42. A system of consist of 5 pulleys and is used to raise a load of 400N through a height of 10m. If the work done against friction is 1000J. What is the efficiency of the system?

A. 75%.

B. 65%.

C. 80%.

D. 85%.

43. Calculate the inclination to the horizontal when the velocity ratio is 5:1.

A. $\tan\theta = 1/5$.

B. $\cot\theta = 5$.

C. $\sin\theta = 1/5$.

D. $\cos\theta = 1/5$.

The correct answer is option [C].

44. If a heavy barrel is rolled up a plane inclined at 30o to the horizontal, its velocity ratio will be _____.

A. 3.0

B. 3.1

C. 3.2

D. 2.0

45. A 20Kg mass is to be pulled up a slope inclined at 30o to the horizontal. If the efficiency of the plane is 75%, the force required to pull the load up the plane is _____.

A. 13.3N

B. 73.5N

C. 133.3N

D. 533.2N

TOPIC: MOMENT, EQUILIBRIUM AND CENTRE OF GRAVITY

DIRECTION: Choose the correct answer from the lettered options.

1. _____ is a neutral equilibrium.

 A. A heavy weight table lamp

 B. A heavy weight suspended on a string

 C. A cone resting on its slant edge

 D. The beam of a balance in use

2. Which of the following is not an example of a couple system?

 A. Corkscrew.

 B. Turning a water tap.

 C. Only B is correct.

 D. Both A and B are correct.

3. An example of a neutral equilibrium body is _____.

 A. a cone resting on its slant height

 B. a ball or orange rolling on a horizontal plane

 C. a flying but unbalance insect

 D. none of the above

4. A uniform rod PQ of length 1m and mass 2kg is pivoted at the end P. If a load of 14N is placed at the center of the rod, find the force that should be applied vertically upwards at Q to maintain the rod in equilibrium horizontally.

A. 68N

B. 28N

C. 17N

D. 7N

5. The value of T in the diagram drawn is _____.

A. 10.0N

B. 11.8N

C. 20.0N

D. 40.0N

Use the information to answer the question.

6. A body 3kg is suspended by an inextensible thread from a nail O and is pulled by a horizontal force F, until the angle of inclination of the thread to the vertical is 30o [Take g = 10m/s^2, tan 30o = √3/3, cos 30° = √3/2].

The equation for the vertical equilibrium in fig. [n]. Find the value of the force, F.

fig.[n]
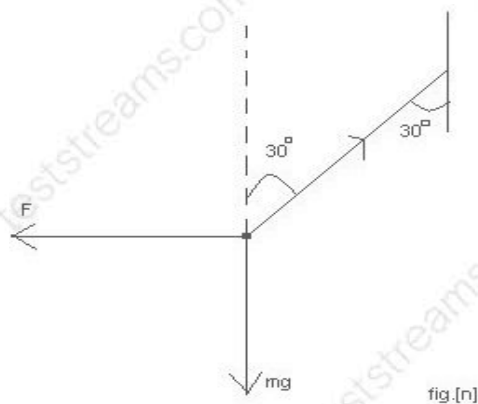
A. 3√10N.

B. √3N.

C. 10√3N.

D. 3√10N.

7. The stability of certain materials are guaranteed when the materials are constructed in such a way that they have _____.

 A. low center of gravity and wide base

 B. high center of gravity and small base

 C. big base and medium center of gravity

 D. maximum center of gravity and medium base

8. A force of 10N and that of 12N act at 60o to each other. What is the resultant force?

 A. 14.2N20°.

 B. 19.08N27°.

 C. 28.62N32°.

 D. 17.6N30°.

9. A uniform meter rule weighing 0.5N is to be pivoted on a knife-edge at the 30cm mark. Where will a force of 2N be placed from the knife-edge to balance the meter rule?

 A. 95.0cm

 B. 25.0cm

 C. 20.0cm

 D. 5.0cm

10. A handbag containing some load weighing 162N is carried by two students each holding the handle of the bag next to him. If each handle is pulled at 60o to the vertical, find the force on each student's arm.

A. 324N

B. 162N

C. 121N

D. 81N

11. The diagram shows a solid figure with base PQ and center of gravity G on an inclined plane. Which of the following statements is correct?
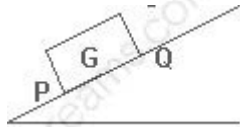
A. The solid will fall over if the vertical line through G lies outside the base.

B. The solid will fall over if the vertical line through G lies inside the base.

C. The solid will not fall over if the vertical line through G lies outside the base.

D. The solid will never fall.

12. If a man weighing 80kgf sits 2.6m from the fulcrum of a sea saw. Where should a man weighing 70kgf sit to balance the sea saw? Take acceleration due to gravity g = 10m/s2?

A. 2.97m.

B. 3.12m.

C. 11.2m.

D. 6.86m.

13. A uniform meter rule scale is balanced horizontally across a knife edge at the 20cm mark with a 300g mass hung by cotton from the 11cm mark. Calculate the mass of the meter rule.

A. 0.09kg.

B. 0.05kg.

C. 0.04kg.

D. 0.02kg.

14. Consider the system of equilibrium shown in fig. [mc] and obtain the value of y.

Fig. [mc]
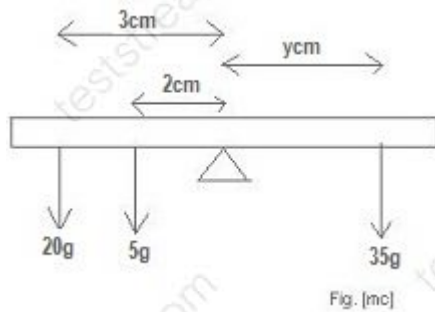
A. 4cm.

B. 3cm.

C. 2cm.

D. 1.5cm.

Use the information to answer the question.

15. A body 3kg is suspended by an inextensible thread from a nail O and is pulled by a horizontal force F, until the angle of inclination of the thread to the vertical is 30° [Take g = 10m/s^2, tan 30° = √3/3, cos 30° = √3/2].

The equation for the vertical equilibrium in fig. [n] Is

fig.[n]

A. Tsin30° = F.

B. Tcos30° = mg.

C. Ttan30° = mg.
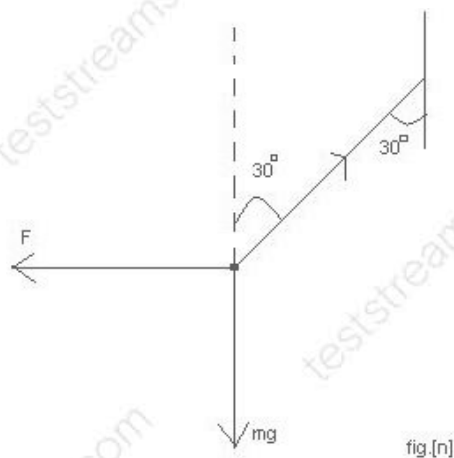
D. Ttan30° = F.

Use the information to answer the question.

16. The diagram drawn shows three forces at equilibrium at point O.

Find the value of Q.

A. 10√3N.

B. 2O√3N.

C. 4ON.
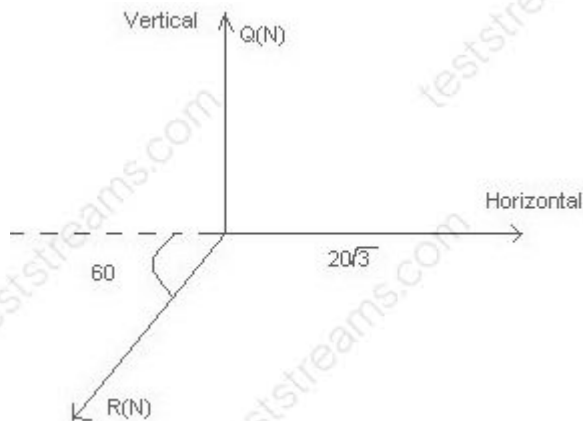
D. 2ON.

17. The value of F in the figure drawn when in equilibrium is _____.

A. 27N

B. 2ON

C. 12N

D. 10N

18. In the diagram drawn, which of the system is said to be stable?

[i]

[ii]

[iii]
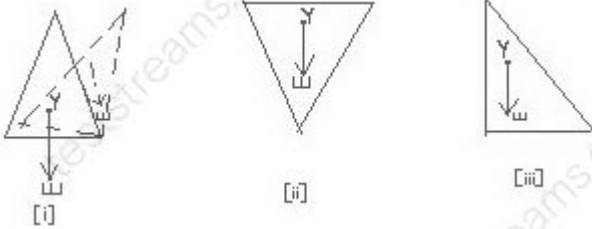
A. iii only.

B. iii and ii only.

C. ii and iii only.

D. i only.

19. Two forces act on a 20kg mass both from opposite direction. Find the acceleration of the body if the forces are 10N and 6N.

A. $1/2m/s^2$.

B. $1/5m/s^2$.

C. $1/10m/s^2$.

D. $5m/s^2$.

Use the information to answer the question.

20. A body 3kg is suspended by an inextensible thread from a nail O and is pulled by a horizontal force F, until the angle of inclination of the thread to the vertical is 30° [Take g = 10m/s², tan 30° = √3/3, cos 30° = √3/2].

The equation for the vertical equilibrium in fig. [n]. Find the tension T in the thread.
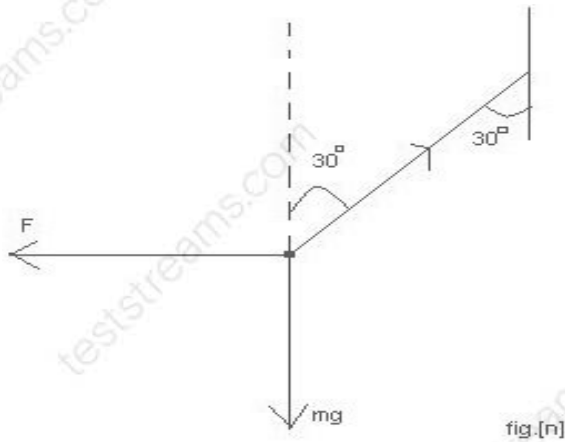
fig.[n]

A. 20√3N.

B. 20√2N.

C. 20√6N.

D. 20√5N.

21. Which of the following condition(s) will increase the stability of a body?

I. High center of gravity

II. Low center of gravity

III. Wide base

A. I only

B. II only

C. III only

D. II and III only

22. The moment of the force about B in the diagram drawn is _____.
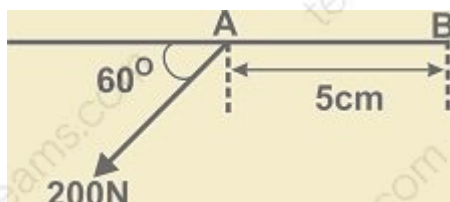
A. 5.00Nm

B. 8.66Nm

C. 10.00Nm

D. 86.60Nm

23. An example of a neutral equilibrium body is _____.

A. a cone resting on its slant height

B. a ball or orange rolling on a horizontal plane

C. a flying but unbalance insect

D. none of the above

24. A uniform light rod is kept in horizontal equilibrium under the influence of four forces as shown, which of the following equations correctly represents the condition of equilibrium for the rod?
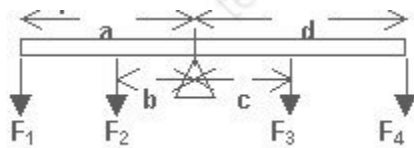
A. $F_1 + F_2 = F_3 + F_4$

B. $F_1 + F_2 - F_3 + F_4 = 0$

C. $(F_1 + F_2)\, ab = (F_3 + F_4)\, cd$

D. $F_1 a + F_2 b - F_3 c - F_4 d = 0$

25. The diagram shows a uniform wood of weight 200N and length 50m. It is pivoted at one end and suspended by a cord at the other end at angle of 30o to the wood, the tension in the cord if the wood is horizontal is _____.

A. 10N

B. 20N

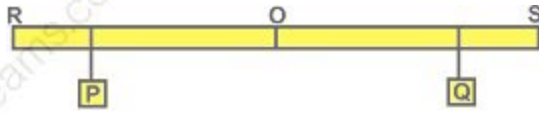C. 100N

D. 200N

Use the information to answer the question.

26. The diagram drawn shows three forces at equilibrium at point O. What is the value of R?
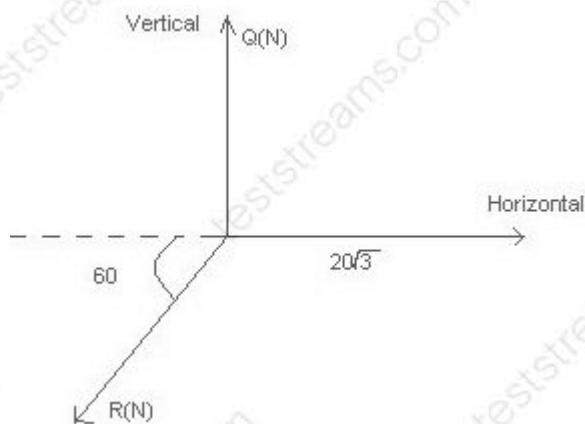
A. 20√3N.

B. 30√2N.

C. 40N.

D. 35√3N.

27. The diagram drawn shows a plank RS pivoted at its center of gravity O and is in equilibrium with the weights P and Q. If a weight 2P is added to P, the plank will be in equilibrium again by

A. moving Q nearer to P

B. moving P nearer to O

C. adding a weight Q to Q

D. moving P further away from O

28. Two bodies have masses in the ratio of 3:1. They experience forces which is impart to their accelerations in the ration of 2:9 respectively. Find the ratio of the forces experienced by the masses.

A. 1:4

B. 2:1

C. 2:3

D. 2:5

29. A meter rule AB is pivoted at its mid-point C. If a load of mass 2kg is hung at a point at which a load of 1.5kg will be hung, to balance the rule horizontally is _____.

A. 10.3cm away from C

B. 15.5cm away from A

C. 20.0cm away from B

D. 26.7cm away from C.

30. A 90cm uniform lever has a load of 30N suspended at 15cm from one of its ends. If the fulcrum is at the center of gravity, the force that must be applied at its other end to keep it in horizontal equilibrium is _____.

A. 60N

B. 30N

C. 15N

D. 20N

31. Which of the following statements about a moving particle is correct?

A. If the resultant force acting on the particle is zero, then it is in dynamic equilibrium.

B. If the result force acting on the particle is greater than zero, then it is moving with a uniform velocity.

C. The rate of change of its momentum with time takes place in a direction opposite to that of its motion.

D. The particle falling freely covers equal distances in equal time intervals.

The correct answer is option [A].

TOPIC: PROPAGATION OF LIGHT

DIRECTION: Choose the correct answer from the lettered options.

1. Calculate the speed of the wave.

 A. 36,000cm/s.

 B. 28,000m/s.

 C. 32,000m/s.

 D. 410,000cm/s

2. Stationary wave is produced in which of the following?

 A. The prongs of a tuning fork vibration in air.

 B. A vibrating tuning fork held near the end of a resonance tube closed at one end.

 C. A vibration in an aeroplane.

 D. Water wave.

 Use the information to answer the question.

3. A wave of amplitude A, angular velocity ω, frequency f, period T, wavelength λ, and displacement y is given by. $y = A\sin \omega t$------- [i].

If the equation of a wave is given by, $y = 5\sin 20\ pt$----- [ii].

What is the value of frequency ƒ of the wave?

 A. 5p/sec.

 B. 10p/sec.

 C. 10/sec.

 D. 5/sec.

Use the information to answer the question.

4. A wave of amplitude A, angular velocity ω, frequency ƒ, period T, wavelength λ, and displacement y is given by, y = Asin ωt-------[i].

If the equation of a wave is given by, y = 5sin2O pt----- [ii].

Find the amplitude A of the wave.

A. 5m.

B. 2Om.

C. 4m.

D. 3m.

5. The size of a pin-hole camera is increased. How will this affect the image produced?

A. The image is magnified.

B. The inverted image becomes upright.

C. The image becomes blurred.

D. The image size is brighten.

Use the information to answer the question.

If a plane progressive wave is represented by the equation Y = Asin [2OOOpt - px/18] where the symbol have their usual meaning.

6. Calculate the wavelength of the wave.

A. 36cm.

B. 2O.13cm.

C. 22cm.

D. 32.41cm.

7. A longitudinal wave is normally described by _____.

 A. crest and trough

 B. crest and compression

 C. rare fraction and compression

 D. compression and trough

8. What happens to rays in parallel beam of light?

 A. They meet at infinity

 B. They converge as they travel

 C. They diverge as they travel

 D. They intersect

9. What is the disadvantage of the pin-hole camera when in use?

 A. The object distance is definite and the hole must be small.

 B. The image distance is definite and the hole must be large.

 C. The object distance is definite and the hole must be large.

 D. None of the above.

10. The paths of light rays are reversible; this principle is called _____.

 A. principle of reflection

 B. principle of reversibility of light

 C. principle of rays and beams

 D. principle of

Use the information to answer the question.

11. A wave of amplitude A, angular velocity ω, frequency f, period T, wavelength λ, and displacement y is given by, $y = A\sin\omega t$-------[i].

If the equation of a wave is given by, $y = 5\sin 2O\ pt$----- [ii].

Find the angular velocity ω of the wave.

A. 2Orad/sec.

B. 2Oprad/sec.

C. 1Oprad/sec.

D. 1Orad/sec.

12. Which of the following option is not a property of longitudinal wave?

A. Reflection.

B. Diffraction.

C. Refraction.

D. Polarization.

Use the information to answer the question.

13. A wave of amplitude A, angular velocity ω, frequency f, period T, wavelength λ, and displacement y is given by, $y = A\sin\omega t$-------[i].

If the equation of a wave is given by, $y = 5\sin 2O\ pt.$ ----- [ii].

What is the period of the wave?

A. O.2secs.

B. O.1secs.

C. O.3secs.

D. O.4secs.

14. Which of the following can be propagated through vacuum?

A. Acoustic wave.

B. Infra-red wave.

C. X-ray.

D. Ultra sonic waves.

15. Given the progressive wave equation y = 5 sin (200 πt – 0.4x), calculate the wavelength.

A. 12.4m

B. 15.7m

C. 17.5m

D. 18.6m

Use the information to answer the question.

16. A wave of amplitude A, angular velocity ω, frequency f, period T, wavelength λ, and displacement y is given by, y = Asin ωt-------[i].

If the equation of a wave is given by, y = 5sin20 pt----- [ii].

If time t, in the equation [i] and [ii] is 1sec. Find wavelength λ if the wave covers a horizontal distance of 0.5m.

A. 0.5m.

B. 0.55m.

C. 0.05m.

D. 0.1m.

17. All which spread out continuously could be called _____.

A. stationary wave

B. congress wave

C. interference wave

D. progressive wave

18. A progressive plane wave has the equation Y = 2sin [2000pt – 0.6x] where the symbols have their usual meanings. Find the frequency.

 A. 2000Hz.

 B. 1100Hz.

 C. 1200Hz.

 D. 1000Hz.

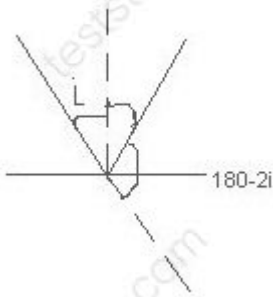19. The angle between the incidence ray and the normal is called _____.

 A. refractive angle

 B. normal angle

 C. phase angle

 D. incident angle

TOPIC: REFLECTION OF LIGHT

DIRECTION: Choose the correct answer from the lettered options.

1. Find in terms of I the angle of deviation of the ray after reflection from the mirror, if the light strikes a plane mirror at an angle of incidence i.

A. $2i^2$.

B. $90o - i^2$.

C. $270° + i$.

D. $180° - 2i$.

2. The center of the sphere of which the spherical mirror forms a part is called _____.

A. center of curvature

B. focus

C. pole

D. vertex

3. What is the amount of image formed by two mirrors inclined at an angle of 60o, if the object distance from each other is 1cm?

A. 4.

B. 5.

C. 3.

D. 6.

4. Which of the following is not a characteristics of a plane mirror image?

A. Upright and real.

B. Upright and virtual.

C. Laterally inverted.

D. Same size as the object.

5. An image formed by a convex mirror is always _____.

A. virtual, erect and diminished

B. virtual, real and magnified

C. real, inverted and diminished

D. real, erect and magnified

6. Butter paper is an example for _____ object.

A. a transparent

B. a translucent

C. an opaque

D. a luminous

7. The image formed by a plane mirror is always _____.

A. real and erect

B. virtual and erect

C. real and inverted

D. virtual and inverted

8. A ray of light passing through _____ retraces its path.

A. a focus

B. the center of curvature

C. a pole

D. a vertex

9. Which of the following statements is/are correct?

I. are transverse.

II. Need a material medium.

III. Light energy is propagated in a straight line.

A. I only.

B. II only.

C. III only

D. I & III only

10. A ray of light is incident on a plane mirror and the angle of incidence is 25o. What is the angle of reflection?

A. 0°

B. 50°

C. 90°

D. 25°

11. Which of the following properties make the convex mirror useful as a driving mirror?

I. The image is real.

II. The image is upright.

III. It has a wide field of view.

IV. The image is magnified.

A. I, II and IV only.

B. I, II and III only.

C. II and III only.

D. I and III only.

12. A ray of light strikes a plane mirror at an angle of incidence, i. Determine in terms of i, the angle of deviation of the ray after reflection from the mirror.

A. i.

B. 2i.

C. $90° - i$.

D. $180° - 2i$.

13. Determine the number of images formed if an object is placed between two plane mirrors facing each other and inclined at 120o to each other.

A. 5

B. 4

C. 3

D. 2

14. An object is placed 18 cm in front of a convex mirror. An image is formed 9 cm behind the mirror. Find the focal length of the mirror.

A. 0.0555555 cm

B. –0.0555555 cm

C. –0.555555 cm

D. 0.555555 cm

15. Which of the following statements is/are laws of reflection?

I. Incident ray, the reflected ray and the normal at the point of incidence, all lie in the same plane.

II. Angle of incidence is equal to the angle of reflection.

III. Ratio of the sine of the angle of incidence to the sine of the angle of is a constant for a pair of media.

A. III only.

B. I and II only.

C. II and III only.

D. I and III only.

16. Which of the options is the correct laws of reflection?

A. i = r

B. i > r

C. r > i

D. i < r

17. An incident ray is reflected normally by a plane mirror onto a screen where it forms a bright spot. The mirror and screen are parallel and 1m apart. If the mirror is rotated through 5o, calculate the displacement of the spot.

A. 8.7cm

B. 10.0cm

C. 15.4cm

D. 17.6cm

18. An example for non-luminous object is _____.

A. a candle

B. the sun

C. an electric bulb

D. the moon

19. A converging mirror is known as a _____.

 A. convex mirror

 B. plane mirror

 C. concave mirror

 D. cylindrical mirror

20. If the image formed by a concave mirror is virtual, erect and magnified, then the object is placed _____.

 A. between the pole of the mirror and the focus

 B. beyond the center of curvature

 C. at the center of curvature

 D. at the focus

21. Which mirror has a wider field of view?

 A. Convex mirror

 B. Concave mirror

 C. Plane mirror

 D. Cylindrical mirror

22. The focus of a concave mirror is _____.

 A. real

 B. virtual

 C. undefined

 D. at the pole

23. What is the angle between the incident and reflected rays when a ray of light is incident normally on a plane mirror?

 A. 90°

B. 45°

C. 180°

D. 0°

24. Dentists uses a _____ to focus light on the tooth of a patient.

 A. concave mirror

 B. convex mirror

 C. plane mirror

 D. cylindrical mirror

25. Which of the following is used to make a periscope?

 A. Concave mirror

 B. Convex mirror

 C. Plane mirror

 D. Lens

26. Which of the following is a type of mirror used in head lights of a car?

 A. Convex mirror

 B. Plane mirror

 C. Concave mirror

 D. None of the above

27. A ray of light makes an angle 35oC with a plane mirror, what is the angle of reflection?

 A. 70°C

 B. 65°C

 C. 55°C

 D. 35°C

28. The relation between the focal length and radius of curvature of a mirror is _____.

A. r – 2 = f

B. r + 2 = f

C. f = r/2

D. f = 2r

29. If an incident ray passes through the center of curvature of a spherical mirror, the reflected ray will _____.

A. pass through the focus

B. pass through the center of curvature

C. pass through the pole

D. retrace its path

30. The angle between a plane mirror and a fixed ray of light is 20o. The mirror rotates through 30o. How many degrees does the reflected ray rotates?

A. 40°.

B. 60°.

C. 30°.

D. 50°.

31. An object becomes invisible when it undergoes _____ reflection.

A. regular

B. irregular

C. diffused

D. normal

32. A ray of light is incident on a plane mirror and the angle of reflection is 50o. Calculate the angle between the incident ray and the reflected ray.

A. 50°

B. 25°

C. 90°

D. 100°

33. Radius of curvature of a concave mirror is always _____ to the mirror.

A. parallel

B. perpendicular

C. inclined at 60°

D. inclined at 45°

34. Light is a form of energy produced by a _____.

A. luminous object

B. transparent object

C. non-luminous object

D. opaque object

35. Which of the following is a type of image that can be obtained on a screen?

A. Virtual

B. Real

C. Diverging

D. Converging

36. The focal length of a concave mirror is 15cm. What is its radius of curvature?

A. 15 cm

B. 30 cm

C. 7.5 cm

D. 45 cm

37. Two mirrors of the same length are arranged as shown in the diagram. A ray of light NO strikes the system at O and emerges along PQ. The emergent ray has been deviated through _____.
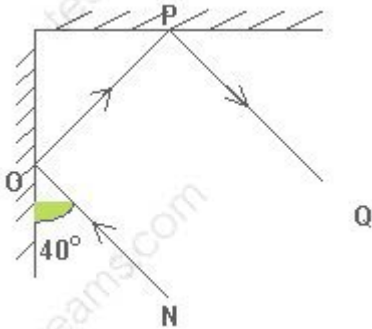
A. 220°

B. 200°

C. 210°

D. 180°

38. The magnification produced by a plane mirror is +1, what does this mean?

A. The positive sign means image formed by a plane mirror is virtual and erect.

B. The positive sign means image formed by a plane mirror is real and erect.

C. The positive sign means image formed by a plane mirror is virtual and magnified.

D. The positive sign means image formed by a plane mirror is real and magnified.

TOPIC: REFRACTION

1. A light ray incident at an angle of 30o on a glass prism of refractive index 1.6. What is the angle through which the ray slightly deviated in the prism?

 A. 13.86°.

 B. 18.14°.

 C. 11.79°.

 D. 18.21°.

2. A light ray passing through a rectangular glass prism which is surrounded by air _____.

 A. is reflected in the prism

 B. is deviated at the point of emergence

 C. suffers a displacement at the point of emergence

 D. emerges parallel to the incident ray

3. Given that SQ = 10cm and SP = 6cm, the refractive index of the block of glass shown in the figure is _____.
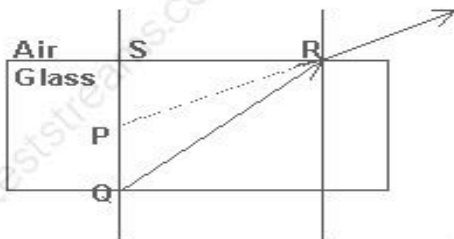
 A. 0.30

 B. 0.60

 C. 1.67

 D. 2.33

4. An instrument used to make appear stationary in a ripple tank, the experiment is called _____.

A. laser

B. refractive glass

C. stroboscope

D. mono-refractive lens

Use the information to answer the question.

5. The refractive index of a glass prism is 1.6 and the angle of the prism is 60o. Find the angle of incidence at minimum deviation.

A. 106.26°.

B. 73.74°.

C. 53.13°.

D. 30°.

6. The speed of light in vacuum is $3.0 \times 10^8 ms^{-1}$. If the refractive index of a transparent liquid is 4/3, then the speed of light in the liquid is _____.

A. $4.4 \times 10^7 ms^{-1}$

B. $2.25 \times 10^8 ms^{-1}$

C. $3.0 \times 10^8 ms^{-1}$

D. $4.0 \times 10^8 ms^{-1}$

7. The refractive of the medium M in the diagram below is _____.
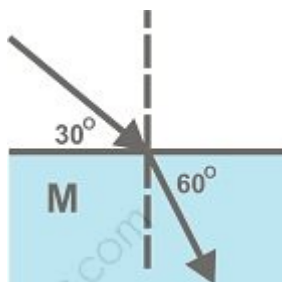
A. 2√3

B. √3

C. 2/√3

D. 1√3

8. An object placed at the bottom of a well full of clear water appears closer to surface due to _____.

A. diffraction

B. reflection

C. refraction

D. polarization

9. Just imagine a fish at a water depth of 8m and refractive index 4/3. What is the apparent depth of the fish below the surface of the pond?

A. 8.0m

B. 5.64m

C. 6.0m

D. 11.0m.

10. If the refractive index of a medium is √2, what is the critical angle?

A. 65°.

B. 45°.

C. 120°.

D. 60°.

11. The refractive index of a material glass block is 1.53. Find the velocity of light in a liquid.

[Given that velocity of light in space is 3.0×10^8m/s].

A. 1.96×10^8m/s.

B. 2.0×10^8 m/s.

C. 4.59×10^8 m/s.

D. 1.53×10^8 m/s.

12. A wave of frequency 300Hz travels in air with a velocity of 600m s⁻¹. If it enters a pool of water, calculate its wavelength in the water.

{Refractive index of water = 4/3}.

A. 0.5m

B. 1.0m

C. 1.5m

D. 2.5m

13. That particular angle of incident at which the angle of is 90o is called _____.

A. critical angle

B. angle of minimum deviation

C. normal angle

D. escape angle of light

14. Find the critical angle at the air-glass interface if the index of of glass = 1.5.

A. sin⁻¹0.5.

B. sin⁻¹0.6667.

C. sin⁻¹0.85.

D. sin⁻¹0.25.

15. What is the critical angle for light travelling from water to air [aηw = 4/3]?

A. 42°.

B. 48°36′.

C. 43°52′.

D. 46′38°.

TOPIC: SCALARS AND VECTORS

DIRECTION: Choose the correct answer from the lettered options.

1. The velocity of a car, A, relative to a car, B, is 15.0km/h in a direction of N45oE. If the velocity of car, B, is 30 km/h in the direction N60°W, determine the actual velocity of the car, A.

 A. 39.87m/s

 B. 28.97m/s

 C. 19.87m/s

 D. 29.87m/s

2. Which of the following is not used to find the resultant of two vectors?

 A. Trigonometric ratio

 B. Cosine and sine rule

 C. Scale drawing

 D. Pythagoras theorem

3. Which of the following is a scalar quantity?

 A. Electric field, E.

 B. Magnetic field, β.

 C. Gravitational potential.

 D. Gravitational field.

4. A man can row a boat in still water at 10kmh^{-1} and wants to cross a river to a position exactly opposite the starting point. If the river is 5km wide and is flowing at 6kmh^{-1} eastward, calculate the direction in which he must head the boat.

A. 48°

B. 36°

C. 26°

D. 31°

5. Which of these quantities are vectors?

[i] Electric potential

[ii] Torque

[iii] Kinetic energy

[iv] Momentum.

A. ii, i and iv.

B. ii, i and iii.

C. iii, i and iv.

D. ii, iii and iv.

6. Two forces whose resultant is 80N are perpendicular to each other. If one of them makes an angle of 60o with the resultant, its magnitude is _____.

A. 160.0N

B. 69.2N

C. 92.3N

D. 136.N

7. A force of 110N at 55° to the horizontal is to be resolved into the horizontal and vertical component. Find the resultant force.
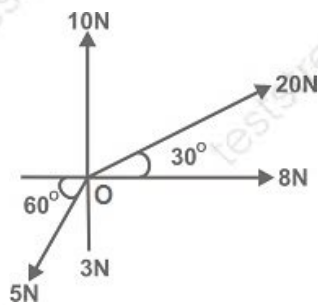
A. 109.998N.

B. 63.100N.

C. 90.100N.

D. 48.241N.

8. Determination of the resultant of two or more vector is known as _____.

 A. subtraction of vectors

 B. addition of vectors

 C. resolution of vector

 D. multiplication of vectors

9. Determine the resultant of the forces acting at a point O as drawn.

A. 25N

B. 26N

C. 28N

D. 29N

10. Find the resultant of a force of 10N acting at right angle to another force of 12N.

 A. 14.71N 47°

 B. 19.14N 40°

 C. 23.46N 50°

 D. 15.6N 44°

11. A man can row a boat in still water at 10kmh-1 and wants to cross a river to a position exactly opposite the starting point. If the river is 5km wide and is flowing at 6kmh-1 eastward, calculate how far from his destination he would land if he ignorantly steers due north?

A. 15km away

B. 10km away

C. 5km away

D. 2km away

12. An aircraft pilot flies through the air at 800km/h at a certain altitude, unfortunately he encounters a westerly wind at a speed of 300km/h. If the pilot wishes to arrive at a destination which is due north of his starting point, what would be his resultant velocity?

A. 500km/h

B. 650km/h

C. 742km/h

D. 854km/h

13. What is the magnitude of the resultant of the forces shown?

A. 50.0N

B. 75.0N

C. 80.0N

D. 156.2N

14. All of the following are scalar quantities EXCEPT _____.

A. distance

B. impulse

C. speed

D. potential

15. A car travels due east at a speed of 10km/h and then turn due west at a speed of 5km/h. Determine the resultant displacement after 30mins.

A. 11.0km

B. 8.0km

C. 2.5km

D. 5.5km

16. Which of the following pairs has each of its quantities measured in terms of the magnitude and direction?

A. Force and momentum

B. Length and weight

C. Mass and velocity

D. Temperature and acceleration

17. The pair of physical quantities consisting of vectors only are _____.

A. displacement and torque

B. momentum and power

C. acceleration and speed

D. velocity and distance

18. A man can row a boat in still water at 10kmh-1 and wants to cross a river to a position exactly opposite the starting point. If the river is 5km wide and is flowing at 6kmh-1 eastward, calculate the time taken to cross the river.

A. 27.5mins

B. 40.0mins

C. 25.7mins

D. 60.0mins

19. Which of the following is not an example of a vector quantity?

A. Electric Field.

B. Displacement.

C. Magnetic Flux.

D. Temperature.

20. Which of the following is a vector quantity?
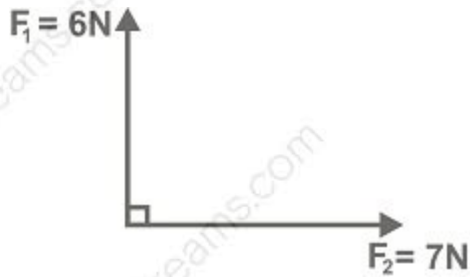
A. Displacement.

B. Energy.

C. Temperature.

D. Mass.

21. Which of the options is not a quantity with both magnitude and direction?

A. Momentum

B. Electric field

C. Magnetic field

D. Density

22. Which of the following is not an example of a scalar quantity?

A. Power.

B. Speed.

C. Velocity.

D. Work.

23. Find the resultant and direction of the force acting on a body as drawn.

$F_1 = 6N$

$F_2 = 7N$

A. 7.24N

B. 8.56N

C. 9.22N

D. 5.93N

24. If the angle between two vectors P and Q is $0°$, the vectors are said to _____.

A. be parallel

B. perpendicular

C. intersect at angle $45°$

D. intersect at angle of $60°$

25. The resultant force of two force is 10N. If one of the forces is 3N. Find the magnitude of the other force if the direction of the resultant force is $30°$ to the 3N force.
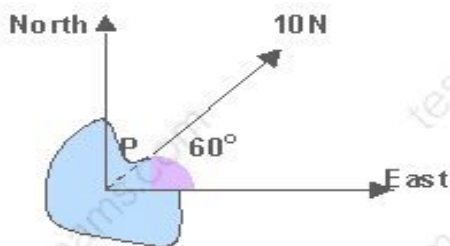
A. 7.0N

B. 7.6N

C. 8.9N

D. 9.5N

26. Which of the following is true of vectors shown in the diagram drawn?
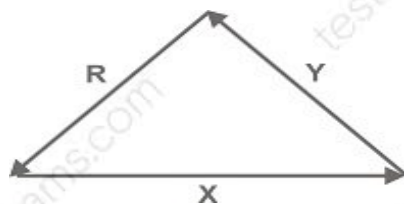
R   Y

X

A. The resultant of X, Y, and R is zero

B. R is the resultant of X and Y

C. X is the resultant of R and Y

D. X is the reuiltant of R and Y

27. A body on the ground is acted upon by a force of 10N at a point P as shown in the diagram drawn. What force is needed to stop the body from moving eastward?

A. 5N in the direction of east

B. 5N in the direction of west

C. 5Ö3N in the direction of west

D. 10N in the southwest direction

28. Which of the following is not a vector quantity?

A. Weight.

B. Pressure.

C. Altitude.

D. Displacement.

29. A car, A, moving at a velocity of 15m/s travels in opposite direction to another car, B, at a velocity of 30m/s. Determine the relative velocity of B to A.

A. 15m/s

B. 30m/s

C. 45m/s

D. 25m/s

30. Which of the following is NOT a vector quantity?

A. Force

B. Altitude

C. Weight

D. Displacement

31. A swimmer whose velocity in still water is 4km/h set out at right angles to the bank of a river which is flowing at 3km/h. Find his actual velocity through the water.

A. 5km/h

B. 12km/h

C. 1km/h

D. 7km/h
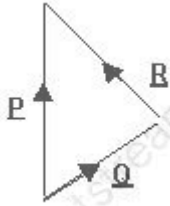
32. Determine the tensions in the spring acting on the metal weight (W = 50N) by applying the trigonometric ratio.
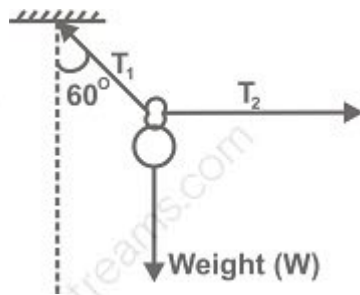
A. 69.4N100N

B. 86.6N100N

C. 69.4N200N

D. 86.6N200N

33. In the diagram shown, P, Q, and R are vectors which of the options gives the correct relationship between the vectors?

A. P = Q + R

B. P = Q – R

C. P = R – Q

D. P + Q + R = O

34. A man walks 10km east and then 20km south the displacement is _____.

A. 30km south

B. 27.6km north of east

C. 20km north

D. 22.36km, 63.4° south of east

TOPIC: SOUND WAVES

**DIRECTION: Choose the correct answer from the lettered options.**

1. State three ways in which two musical notes may differ from each other.

A. Loudness, Pitch, and Quality.

B. Timbre, Frequency, and Intensity.

C. Pitch, Frequency, and Quality.

D. Overtones, Timbre, and Loudness.

2. The factor, which enables the ear to distinguish between a notes played on different instruments, is _____.

A. pitch

B. speed

C. harmonics

D. loudness

3. The amplitude of a wave is the _____.

A. distance between two successive troughs of the wave

B. separation of two adjacent particles vibrating in phase

C. maximum displacement of the wave particle from the equilibrium position

D. distance travelled by a wave in a complete cycle of its motion

4. A man standing some distance from the foot of a tall cliff claps his hands and hears an echo 0.7s later. Find how far the man is from the cliff, if the speed of sound is 330m/s.

A. 115.5m.

B. 11.05m.

C. 3.32m.

D. 214.6m.

5. An ultrasonic vibrator sends out sound pulses down to the sea bed. If the echo is received after 8s, calculate the depth of the sea.

[Speed of sound in sea water = 1540ms]

A. 1.93×10^2m

B. 3.85×10^2m

C. 6.16×10^3m

D. 1.23×10^4m

6. In a resonance tube experiment which is illustrated in the fig. drawn, the velocity of sound in air is $327.68ms^{-1}$, the frequency of the tuning fork used is therefore _____.
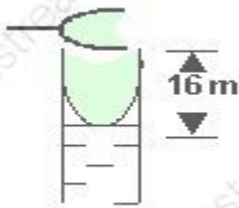
A. 128Hz

B. 256Hz

C. 512Hz

D. 768Hz

7. The speed of sound in air is $330ms^{-1.}$ How far from the center of a storm is an observer who hears thunder clap 2s after the lightning flash?

A. 1320m

B. 660m

C. 560m

D. 330m

8. A slight loading of a tuning fork has the effect of _____.

A. increasing its frequency

B. increasing its amplitude

C. decreasing its frequency

D. decreasing its amplitude

9. A hunter shot his gun and observed that the echo got to him 6s later. How far was he from the reflecting surface?

[Speed of sound in air = 330ms-1].

A. 27.5m

B. 55.0m

C. 990m

D. 1980m

10. Which of the following properties of wave is used in the measurement of oceanic depth?

A. Reflection.

B. diffraction.

C. Refraction.

D. Interference.

11. Calculate the wavelength of a note which is one octave lower than a note of 256Hz in a medium in which the speed of sound is 352ms-1.

A. 0.69m

B. 1.38m

C. 2.75m

D. 5.50m

12. Which of the following is not an example of a percussion instrument?

A. Clarint.

B. Bells.

C. Drums.

D. Tuning Forks

13. A sound wave of velocity $350ms^{-1}$ is directed towards the surface of water. If the ratio of the wavelength of sound in water to that in air is 425:100, calculate the velocity of the wave in water.

A. $82.4ms^{-1}$

B. $148.8ms^{-1}$

C. $350ms^{-1}$

D. $1487.5ms^{-1}$

14. How far from a wall should someone stand in order to hear is voice again after reflection at 0.9secs later?

A. 367m.

B. 320m.

C. 148.5m.

D. 36.7m.

15. The diagram drawn shows the motion of a progressive wave along a string. The particle motion of the medium is in the direction _____.
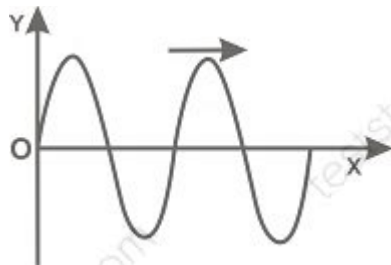
A. parallel to OX

B. parallel to OY

C. 60° to OX

D. 60° to OY

16. A wave produced by a source of sound has wavelength of 1.70m. What is the period of vibration in seconds, if the speed of sound is 330m/s?

A. 250.

B. 3.25 x 10^{-3}.

C. 1.14 x 10^{-4}.

D. 5.15 x 10^{-3}.

17. A string stretched firmly between two point 52cm apart at its center. What is the number of vibration made by the string if one of the wave produced is 280m/s?

A. 380Hz.

B. 269.2Hz.

C. 420Hz.

D. 180.23Hz.

18. A guitar string is 75cm long. The wavelength of its fundamental note is _____.

A. 75cm

B. 150cm

C. 37.5cm

D. 112.5cm

19. The relationship between the length, L and wave length λ in an open pipe is _____.

A. λ = 4L

B. λ = 3L

C. λ = 2L

D. λ = 2½L

20. Which of the following instrument produces sound by the vibration of air column?

A. Drum

B. Violin

C. Guitar

D. Flute

21. What will be the ratio of two mass of strings if they are under the same tension and have the same length given that the frequency notes is 4:1?

A. 2:1.

B. 1:4.

C. 1:16.

D. 1:2.

22. If the position of resonance in a resonance tube is 16.50cm from the open end of the tube, calculate the distance from the open end to the next position where resonance occurs.

[Neglect end-correction].

A. 24.75cm

B. 33.00cm

C. 41.25cm

D. 49.50cm

23. In order to obtain a sound note of a high pitch from a wire stretched by a constant tension, the wire must be _____.

A. short and thick

B. short and thin

C. long and thick

D. long and thin

24. A man hears his echo from a nearby hill 2s after he shouted. If the frequency of his voice is 260Hz and the wave length is 1.29m, how far away is the hill?

A. 330.0m

B. 335.4m

C. 660.0m

D. 670.8m

25. Given

[i] Air

[ii] Solids

[iii] Liquid,

Which of the following medium/media will allow the transmission of sound?

A. iii only.

B. ii and iii only.

C. i only.

D. iii, ii and i.

26. When vibration occurs in an air column, the distance between a node and an antinode is equal to _____.

A. one-quarter of the wavelength

B. one-half of the wavelength

C. the wavelength

D. twice the wavelength

27. A material medium is always compulsory to propagate sound wave.

A. False.

B. True.

C. Not in all condition.

D. All of the above.

28. The amplitude of sound wave determine its _____.

A. frequency

B. quality

C. loudness

D. pitch

29. A herdsman yelling out to a fellow herdsman heard his voice reflected by a cliff 4s later. What is the velocity of sound in air if the cliff is 680m away?

A. 170ms^{-1}

B. 136ms^{-1}

C. 340ms^{-1}

D. 680ms^{-1}

30. In a resonance tube, a turning fork of frequency 240Hz resonated when the water level was 20cm below the open end of the tube, if the next position of resonance was 90cm, the speed of sound in air is _____.

A. 245ms^{-1}

B. 320ms^{-1}

C. 330ms^{-1}

D. 336ms^{-1}

31. The following types of are all transverse EXCEPT _____.

A. volume wave

B. radio

C. sound wave

D. surface on water

32. The pitch of sound note depends on _____.

A. frequency

B. quality

C. timber

D. harmonics

33. Thunder is usually heard some seconds after lightning is observed because _____.

A. the human eye is more sensitive to light than the ear to sound

B. sound and light travel in different media

C. thunder occurs after lightning

D. light travels faster than sound

34. In which of the following media does sound travel fastest?

A. Water

B. Brass

C. Air

D. Wood

35. As the air column of length L in a pipe decreases, the frequency of the stationary wave emitted _____.

A. decrease

B. increase

C. varies as L^2C

D. varies as $\sqrt{L}$

36. Which of the following will NOT affect the velocity of sound in air?

A. Density of the air

B. Direction of the wind

C. Elasticity of the air

D. Temperature of the surrounding air

37. A sonometer under tension of 10N produces a frequency of 250Hz when plucked. Keeping the length of the wire constant, the tension is adjusted to produce a new frequency of 350Hz, the new tension is _____.

A. 39.2N

B. 19.6N

C. 14.2N

D. 7.4N

38. Sound after reflection is called _____.

A. sound reflection

B. vibration

C. echo

D. sound transmission

39. Metal cables are used as telephone wires because _____.

A. they are cheap

B. they are sourced locally

C. the speed of sound in them is very low

D. the speed of sound in them is very high

40. Which of the following is not a characteristics of sound?

A. Quality.

B. Loudness.

C. Noise.

D. Pitch.

41. A tuning fork of frequency 600Hz is sounded over a closed resonance tube. If the first and second resonant positions are 0.13m and 0.413m respectively, the speed of sound in air is _____.

A. 509.4ms^{-1}

B. 480.0ms^{-1}

C. 339.6ms^{-1}

D. 169.8ms^{-1}

42. Musical instruments playing the same note can be distinguished from one another owing to the difference in their _____.

A. quality

B. pitch

C. intensity

D. loudness

43. When the string is _____ a high frequency note is produced.

A. long, thick, and loose

B. long, thin, and loose

C. long, thin, and taut

D. short, thick and taut

44. Marching soldiers crossing a suspension bridge are usually advised to break their steps to avoid damaging the bridge owing to _____.

A. resonance

B. swinging

C. vibration

D. oscillation

45. How far away is a hill where a man receives his own echo 2secs after shouting, given that the frequency and wavelength of his voice is 260Hz and 1.29m?

A. 330m.

B. 660m.

C. 70.8m.

D. 335.4m.

46. In which of the following material media would sound travel fastest?

A. Gas

B. Water

C. Oil

D. Metal

47. If the source of sound is moving, a stationary listener will hear a sound of different frequency. This is called _____.

A. Doppler effect

B. resonance

C. ultrasound

D. diffraction of sound

48. The fastest sound wave transmission media is _____.

A. iron

B. vacuum

C. air

D. blood

TOPIC: SPEED, VELOCITY AND ACCELERATION

DIRECTION: Choose the correct answer from the lettered options.

1. A runner starts from rest and runs with a velocity of 10m/s for 10secs. What distance did he cover?

 A. 100m.

 B. 25m.

 C. -100m.

 D. 50m.

2. A small metal ball is thrown vertically upwards from the top of a tower with an initial velocity of 20ms-1. If the ball took a total of 6s to reach ground level. Determine the height of the tower.

 A. 60m

 B. 50m

 C. 38m

 D. 49m

3. A bus has a uniform velocity of 106km/h. How far does it travel in 1/4 minute?

 A. 0.441km.

 B. 0.421km.

 C. 0.86km.

 D. 2.062km.

4. A truck moves with an initial velocity of 37m/s and is brought to rest with acceleration of 3.17m/s^2. Calculate the time taken to come to rest.

A. 12.87secs.

B. 3.67secs.

C. 11.67secs.

D. 21.67secs.

5. A body is projected horizontally from the top of a cliff 45m above, if the body lands at a distance 30m from the cliff, what is the speed of projection? [g = 10ms^{-2}]

A. 10ms^{-1}

B. 15ms^{-1}

C. 20ms^{-1}

D. 6.1ms^{-1}

6. A vehicle travels at an average speed of 120km h^{-1}. What is the distance covered in 7 minutes?

A. 8.33km.

B. 14km.

C. 2.08km.

D. 31km.

7. The initial velocity of a car is 50m/s and an acceleration of 4m/s2. Find its velocity after 10 seconds.

A. 15m/s.

B. 24.03m/s.

C. 40.12m/s.

D. 10m/s.

8. When velocity is constant, the acceleration is _____.

A. constant

B. zero

C. varying

D. infinite

9. The velocity of a particle in a time t is given by the equation v = 10 + 2t2. Find the instantaneous acceleration after 5 seconds.

A. 10ms^{-2}

B. 15ms^{-2}

C. 20ms^{-2}

D. 60ms^{-2}

10. A car travels 300m in constant direction for 11secs. Find the average velocity of the car.

A. 11.48m/s.

B. 27.27m/s.

C. 30.12m/s.

D. 16.25m/s.

11. A hose of cross-sectional area 0.5m^2 is used to discharge water from a water tanker at a velocity of 60ms^{-1} in 20s into a container. If the container is filled completely, the volume of the container is _____

A. 2400m^3

B. 240m^3

C. 6000m^3

D. 600m^3

Use the information to answer the question.

12. A car breaks, and its velocity decreases from 30m/s to 20m/s in 5secs. What is the retardation of the car?

A. 4m/s^2.

B. 2m/s^2.

C. 6m/s^2.

D. –2m/s^2.

13. A 5kg block is accelerated from rest by a force of 20N at a time t = 2secs. Find the velocity of the block.

A. 8.5m/s.

B. 8.0m/s.

C. –8.0m/s.

D. 4m/s.

14. A ball of 0.075kg is shot against a goalkeeper with a 250N force for 0.05secs. Calculate the balls speed.

A. 165m/s.

B. 166.67m/s.

C. 176.67m/s.

D. 167.76m/s.

15. An electric train has an initial velocity of 58m/s and acceleration of –6m/s2. What is its velocity after 8seconds?

A. 12m/s.

B. 1.0m/s.

C. 10m/s.

D. 3.12m/s.

16. The diagram shows the velocity-time graph representing the motion of a car. Find the total distance covered during the motion.
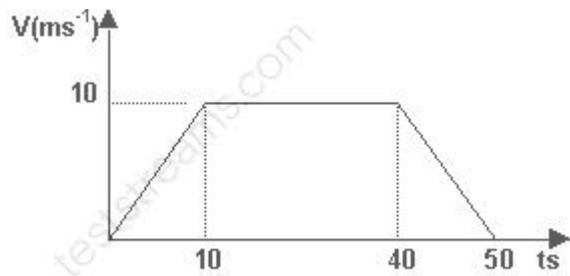
A. 375m

B. 150m

C. 300m

D. 400m

17. A car traveled a distance of 4.0km in 40s. What is the speed of the car in ms^{-1}?

A. 700

B. 400

C. 105

D. 100

18. An aeroplane accelerates along a runway at a velocity of 350m/s, the time it takes to ascend from the runway is 4secs. Find the distance the aeroplane covers at an acceleration of 3m/s2.

A. 1424m.

B. 1234m.

C. 2414m.

D. 1420m.

19. A motorcycle starting from rest moves with uniform acceleration until it attains a speed of 180km/h after 35s. Find the acceleration.

A. 2m/s^2

B. 1.4m/s^2

C. 3m/s^2

D. 2.5m/s^2

20. A velocity-time graph of a car that starts with an initial velocity of 15km/h and accelerates uniformly at 5m/s2 until it attains a maximum velocity of 30km/h. It then maintains this speed for the next 2 minutes.

Calculate the distance covered by the car.

A. 996 m

B. 762.5 m

C. 504 m

D. 750 m

21. A vehicle moving with a speed of 80km/h was brought uniformly to rest by the application of brakes in 18 secs. Find the distance travelled by the vehicle if the vehicle brake was applied.

A. 150m.

B. 170.2m.

C. 200.34m.

D. 299.4m.

22. Two cars x and y travelling in opposite direction along the same highway at uniform velocities $110kmh^{-1}$ and $90kmh^{-1}$ respectively pass each other at certain point. The velocity of x relative to y at the time they pass each other is _____.

A. $200kmh^{-1}$
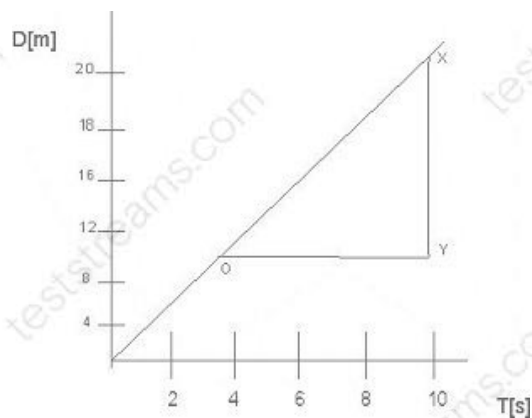
B. $100kmh^{-1}$

C. $40kmh^{-1}$

D. $20kmh^{-1}$

23. If a ball is released from a height of 30m. Find the time it takes to fall.

$[g = 10m/s^2]$

A. 30sec.

B. 2.44sec.

C. 1.89sec.

D. 20.03sec.

24. From a distance-time graph shown calculate the velocity of the car from the graph.

A. 2m/s.

B. 3.5m/s.

C. 1.54m/s.

D. 4.6m/s.

25. If a car has an initial velocity of 55m/s and an acceleration of -3m/s2, its velocity after 12secs will be _____.

A. 12.1m/s.

B. 2Om/s.

C. 1.12m/s.

D. 19m/s.

26. A mass of 6kg is operated by a force of 36N. Find the rate of change of velocity.

A. 6m/s.

B. O.2m/s.

C. 6m/s2.

D. O.2m/s2.

27. A body is said to move with uniform acceleration if its rate of increase of velocity with time is _____.

A. uniform

B. constant

C. directly proportional to the square of its distance apart

D. none of the above

28. A graph of velocity against time is called _____.

A. acceleration-time graph

B. acceleration graph

C. distance-time graph

D. displacement-time graph

29. Is acceleration, rate of change of speed or velocity?

A. It is rate of change of speed.

B. It is rate of change of velocity.

C. It is both options A and B.

D. It is rate of change of distance.

30. Gas expelled by a rocket is 0.5kg/s. Find the velocity of the gas if the average force of the gas is 140N.

A. 180m/s.

B. 280m/s.

C. 270m/s.

D. 320m/s.

31. An aircraft attempts to fly due north at $100Kmh^{-1}$. If the wind blows against it from east to west at $60kmh^{-1}$, its resultant velocity is _____.

A. $117Kmh^{-1}N31^{\circ}E$

B. $127kmh^{-1}N31^{\circ}E$

C. $117kmh^{-1}N31^{\circ}W$

D. $127kmh^{-1}N31^{\circ}W$

Use the information to answer the question.

32. A car breaks, and its velocity decreases from 30m/s to 20m/s in 5secs. The change in velocity with time of the car can be called all EXCEPT _____.

A. reverse velocity
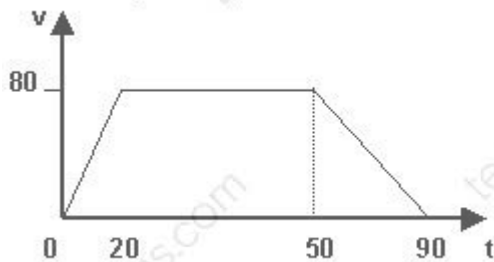
B. retardation

C. deceleration

D. negative acceleration

33. A car has a uniform velocity. What is the acceleration of the car?

 A. Unknown.

 B. Undefined.

 C. 0m/s^2.

 D. None of the above.

34. A lorry moves from rest with an acceleration of 0.4m/s^2. What is its velocity when it has moved a distance of 52m?

 A. 4.61m/s

 B. 6.44m/s

 C. 3.02m/s

 D. 8m/s

35. The diagram shows the velocity–time graph of a vehicle. Its acceleration and retardation respectively are _____.

 A. 8.0ms^{-2}, 4.0ms^{-2}

 B. 4.0ms^{-2}, 8.0ms^{-2}

 C. 4.0ms^{-2}, 2.0ms^{-2}

 D. 2.0ms^{-2}, 4.0ms^{-2}

36. A moving body of mass 25.0kg undergoes a uniform retardation of 20ms^{-2}, the magnitude of the retarding force is _____.

A. 1.25N

B. 8.00N

C. 45.00N

D. 500.00N

TOPIC: VAPOUR PRESSURE

DIRECTION: Choose the correct answer from the lettered options.

1. A dynamic equilibrium exists between the liquid molecules and the vapour molecules at a given temperature is called _____.

 A. atmospheric pressure

 B. saturated

 C. gas pressure

 D. vapour

2. The rate of evaporation of a liquid is affected by the _____.

 A. density of the liquid

 B. humidity of the atmosphere

 C. presence of impurities

 D. prevailing atmospheric pressure

3. Which of the following explains the variation of boiling point of water at 100°C with pressure?

 A. Atmospheric pressure varies at low altitude

 B. Atmospheric pressure varies at high altitude

 C. Atmospheric pressure is constant at low altitude

 D. Atmospheric pressure is constant at high altitude

4. The table below shows the saturation (s.v.p.) of a liquid in centimeters of mercury:

Temp	20°C	30°C	40°C	50°C	60°C	70°C	80°C
S.V.P	30	44	52	68	74	78	84

At standard (normal) atmospheric pressure the boiling point of the liquid is about
_____.

A. 35°C

B. 65°C

C. 40°C

D. 55°C

TOPIC: WAVES

DIRECTION: Choose the correct answer from the lettered options.

1. A parallel narrow wave became broadened and curved on passing through a narrow slit. Then _____ has occurred.

 A. sound wave

 B. interference

 C. diffraction

 D. dispersion

2. I. Wavelength

II. Medium of propagation

III. Wave velocity

IV. Frequency

V. Energy.

Which of the above are used for characterizing waves?

 A. I, III and IV

 B. I, II and V

 C. III, IV and V

 D. I and IV

3. If an object is placed 0.25m from the mirror whose radius of curvature is 0.20m? Find the distance of the image from the mirror.

 A. 0.17m.

 B. 19.17m.

 C. 18.21m.

 D. 20.03m.

4. The angular velocity of a wave is 5p rad/sec. What is the frequency and period of the wave?

 A. 2.5Hz, 2secs.

 B. 2.3Hz, O.4secs.

 C. 2.5Hz, O.4secs.

 D. 2.6Hz, O.4secs.

5. Infra-red rays are so called because _____.

 A. they are red in colour

 B. it is electromagnetically red and long

 C. they can be absorbed and re-absorbed

 D. their wavelength is much longer than the wavelength in visible light, which is red

6. The frequency of an electromagnetic wave of 5×10^{14}Hz is incident on the surface of water of refractive index 4/3. Calculate the wavelength of the wave in water if the speed of the wave in air is 3×10^8m/s.

 A. 4.5×10^{-7}.

 B. 13.2×10^{-7}.

 C. $3.8 \times 10^{-7.}$

 D. 21.6×10^{-7}.

7. A wave has a frequency of 2Hz. What is the period of the wave?

 A. O.5secs.

 B. 1sec.

 C. 2/3secs.

 D. 4secs.

8. The wavelength of water wave is 20cm and the frequency is 16Hz. Find the distance between successive crest of the wave.

A. 15cm.

 B. 10cm.

 C. 5cm.

 D. 20cm.

9. The maximum displacement of the wave from equilibrium position is known as _____.

 A. period

 B. amplitude

 C. frequency

 D. phase

10. Which of the following statement is wrong?

 A. An electron can behave as a wave.

 B. When the amplitude of a wave increases the wavelength increases.

 C. Kinetic energy is directly proportional to rise in temperature.

 D. Kinetic energy increase as pressure decreases.

11. Given that the wavelength of ultraviolet radiation is 400nm and electromagnetic speed being constant. What is the frequency?

 A. 1.4×10^{-15}Hz.

 B. 7.5×10^{14}Hz.

 C. 7.45×10^{5}Hz.

 D. 1.2×10^{11}Hz.

12. From the wave motion graph shown, find the wavelength of the graph.

A. O.1.

B. O.2.

C. O.3.
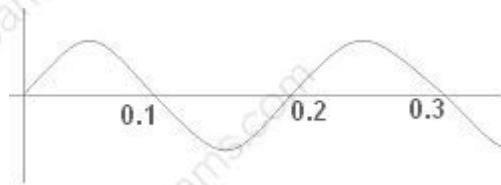
D. O.01.

13. In an electromagnetic spectrum, the wavelengths of visible spectrum is 400nm–700nm. The wavelength of γ-rays is _____.

A. 550nm

B. longer than 700nm

C. shorter than 400nm

D. infinite

14. A vibrating string has a tension of 400N and produces a note of 200Hz when plucked in the middle. When the length of the string is unaltered and the tension is increased to 729N, the frequency becomes _____.

A. 274Hz

B. 249Hz

C. 270Hz

D. 148Hz

15. What is the mean period of oscillation if 30 oscillations of a certain pendulum is repeated thrice to obtain 70secs, 72secs and 56secs?

A. 69.67secs.

B. 70secs.

C. 2.2secs.

D. 66secs.

16. A wave travel 55cm in 4.0s the distance between successive crest is 6cm. What is the frequency of the wave?

A. 13.75Hz.

B. 20.43Hz.

C. 2.29Hz.

D. 1000Hz.

17. When a body sets another body vibrating both at equal natural frequency, what has occurred?

A. Disturbance has occurred.

B. Resonance has occurred.

C. Reaction-conductance has occurred.

D. All of the above.

18. The phase difference between P and Q in the diagram drawn is _____.
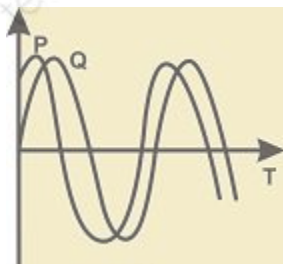

A. π/4

B. π/2

C. π

D. 2π

19. The wavelength of a wave is 0.5m and it travels a distance of 2m in 4secs. Calculate the period of the wave?

A. 5secs.

B. 4secs.

C. 1.5secs.

D. 1.0secs.

20. The frequency of the note emitted by a sonometer wire vibrating transversely is 120Hz. What will be the frequency of the note when the length of the wire is reduced by half without changing the tension?

A. 100Hz.

B. 450Hz.

C. 240Hz.

D. 60Hz.

21. If P represent an object distance measured 1/P and plotted against image distance 1/Q. Hence determine the focal length f from the graph.
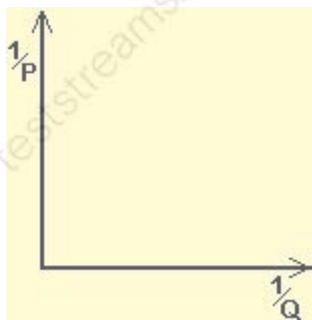
A. f = 1/v.

B. f = 1/u.

C. f is the reciprocal of the slope.

D. f is the reciprocal of the intercept on both sides.

22. Which of the in the following options cannot travel through space?

A. Infra-red wave.

B. Radio wave.

C. Sound wave.

D. Light wave.

23. The dual nature of light is when act as _____.

A. particle and wave

B. particle and matter

C. and wave

D. and particle

24. Soldiers marching are usually ordered to break steps while crossing a bridge to prevent _____.

A. the bridge from collapsing due to resonance

B. the bridge from collapsing due to their weights

C. them from colliding with one another on the bridge

D. them from crossing easily

25. Very tiny substances that acts as are best described in physics as _____.

A. atoms

B. molecules

C. particles

D. electrons

26. The equation given [sin I = sin (A + d)] is the equation of two prisms; one triangular and the other block. What is the angle of deviation given that I = 70° and A = 60°?

A. 42°.

B. 10°.

C. 21°.

D. 12°.

Use the information to answer the question.

27. At a television station the speed of the wave of frequency 200 KHz is 3 x 10⁸m/s. What is the wavelength of the wave?

A. 2×10^5m.

B. 3×10^3m.

C. 1.5×10^3m.

D. 10^3m.

28. The crest of a rocked boat is 120m apart and the velocity is 28m/s. Find the interval the wave crest reaches the boat.
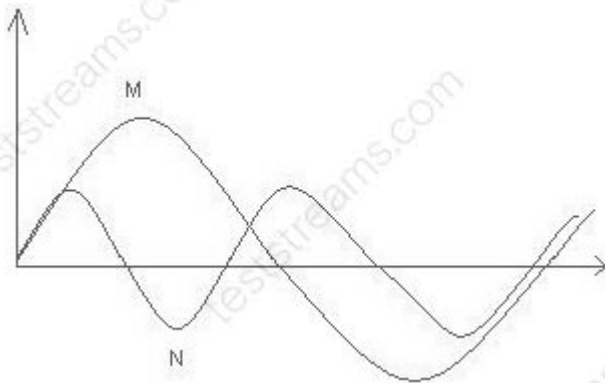
A. 3.16secs.

B. 13secs.

C. 4.28secs.

D. 42.01secs.

Use the information to answer the question.

29. At a television station the speed of the wave of frequency 200 KHz is 3×10^8m/s. The period of the wave is _____.

A. 10^{-5}secs

B. 0.5×10^{-5}secs

C. 2×10^5secs

D. none of the above

30. Given that the diagram drawn represent two wave form M and N. If the frequency of M is 40Hz, find that of N.

A. 100Hz.

B. 60Hz.

C. 25Hz.

D. 30Hz.

31. A ray of light in water operates as a wave with frequency 10^5Hz. What is the frequency of the wave in air?

[Refractive index of water = 1.33]

A. 1.33×10^5Hz.

B. 7.52×10^4Hz.

C. 10^4Hz.

D. 10^{-5}Hz.

32. A certain wave has a speed of 20ms-1. If the frequency of the wave is 0.25Hz, calculate the distance between successive crests of the wave.

A. 5.0m

B. 40.0m

C. 50.0m

D. 80.0m

33. What is the relationship between radius of curvature, r and focal length, f?

A. $v = f\lambda$.

B. $T = 1/f$.

C. $vr = f$.

D. $r = 2f$.

34. A progressive wave is represented by $y = 10\sin(1000\pi t - \alpha x/34)$. Two layers of the separated by 153cm have a phrase difference of _____.

A. 270°

B. 45°

C. 90°

D. 180°

35. The common circumference of all wave particles vibrating in phase is called _____.

A. phase distance

B. phase circumference

C. wave front

D. wave circumference

ANSWERS

TOPIC: CURVED MIRRORS

DIRECTION: Choose the correct answer from the lettered options.

1. Images of real objects formed by a convex mirror are always _____.

A. inverted, real and diminished

B. inverted, virtual and diminished

C. erect, virtual and diminished

D. erect, real and magnified

The correct answer is option [C]

2. Light rays parallel to the principal axis are reflected by the curved mirror through the _____.

A. center of curvature

B. pole

C. principal focus

D. principal axis

The correct answer is option [C]

3. An object is placed 32cm from a concave mirror of focal length 16cm. Find the magnification of the image produced.

A. 11.06cm.

B. 10.7cm.

C. 12cm.

D. 8.09cm.

The correct answer is option [B].

1/32 + 1/u = 1/16

1/u = 1/16 – 1/32

Therefore, u = 10.7cm.

State whether the following statement is true or false.

4. A plane mirror is used as a rearview mirror.

 A. True

 B. False

The correct answer is option [B]

5. A concave mirror can be used to produce a parallel beam of light if a lighted bulb is placed _____.

 A. between its focus and the pole

 B. at its focus

 C. at its Centre of curvature

 D. between its focus and Centre of curvature

The correct answer is option [B].

6. The radius of curvature of a convex mirror is 30cm. Its focal length is _____ cm.

 A. 20

 B. 15

 C. 60

 D. 30

The correct answer is option [B]

7. If a person has defective vision, he would use a shaving mirror which is a _____.

 A. plane mirror

 B. convex mirror

 C. concave mirror

 D. concave lens

The correct answer is option [C]

8. If the object is at infinity in the case of a convex mirror, the image formed is _____.

 A. enlarged

 B. inverted

 C. real

 D. at the principal focus

The correct answer is option [D]

 State whether the following statement is true or false.

9. A concave mirror is used as a shaving mirror.

 A. True

 B. False

The correct answer is option [A]

10. Real images are _____.

 A. inverted

 B. erect

 C. magnified

 D. none of the above

The correct answer is option [A]

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11. A real image, equal in size to the object is obtained when the object is placed at the Centre of curvature in front of a _____.

 A. plane mirror

 B. concave mirror

 C. convex mirror

 D. either convex or concave mirror

The correct answer is option [B]

12. The geometrical Centre of spherical mirror is called _____.

 A. Centre of curvature

 B. focus

 C. pole

 D. none of the above

The correct answer is option [A]

13. In case of a concave mirror, when the object lies between the pole and the focus, the image formed is _____.

 A. virtual

 B. upright

 C. magnified

 D. all of the above

The correct answer is option [D]

State whether the following statement is true or false.

14. Image formed by a convex mirror is always virtual.

 A. True

 B. False

The correct answer is option [A]

15. Which of the following mirrors can be used to concentrate light on a spot?

 A. Both concave and convex

 B. Only convex

 C. Only concave

 D. Plane mirror

The correct answer is option [C]

16. An object is placed at the Centre of curvature of a concave mirror, the image formed is at _____.

 A. the focus

 B. Centre of curvature

 C. the pole of the mirror

 D. the principal axis of the mirror

The correct answer is option [D].

17. Plane travelling parallel to the principal axis are incident on a concave mirror. The are reflected

 A. towards the Centre of curvature of the mirror.

 B. as plane waves.

 C. with the same wavelength.

 D. as circular diverging from a point behind the mirror.

The correct answer is option [C].

18. Images formed by a convex mirror are always _____.

 A. diminished, virtual and erect

 B. magnified, erect and real

 C. erect, virtual and magnified

 D. inverted, diminished and virtual

The correct answer is option [A].

 State whether the following statement is true or false.

19. The focal length of a spherical mirror is twice its radius of curvature.

 A. True

 B. False

The correct answer is option [B]

20. Find the focal length of a lens that forms an inverted image the same size as the object when the object is located 20cm in front of the lens.

 A. 10 cm.

 B. 30 cm.

 C. 40 cm.

 D. 50 cm.

The correct answer is option [A]

21. The focal length of a mirror is x. Find the radius of the mirror [x = 1cm].

 A. 2cm.

 B. 0.25cm.

 C. 1.0cm.

 D. 0.5cm.

The correct answer is option [A].

Hint: The radius, r = 2f,

Where f = focal length.

  Use the information to answer the question.

22. An image is two times the object distance. If the focal length of the lens is 5cm, find the kind of image formed.

 A. Real image.

 B. Virtual image.

 C. Upright image and virtual.

 D. None of the above.

The correct answer is option [A].

23. What type of mirrors are capable of producing parallel beams of light such as those arising from the head lamps of a car?

 A. Plane mirror

 B. Spherical mirror

 C. Parabolic mirrors

 D. Cylindrical mirrors

The correct answer is option [C].

24. Which of the following defines the center of curvature of a curved mirror?

 A. The center of the hollow glass sphere of which the curved mirror was (previously) a part

 B. The geometric center of the curved mirror

 C. The radius of the hollow glass sphere of which the curved mirror was (previously) a part

 D. The geometric radius of the curved mirror

The correct answer is option [A]

25. A real image three times the size of an object is formed 24cm from a converging mirror, what is the focal length of the mirror?

 A. 6cm

 B. 8cm

 C. 12cm

 D. 16cm

The correct answer is option [A].

v = 24cm, u = 8cm, f =?

1/v + 1/u = 1/f

1/24 + 1/8 = 1/f

1 + 3/24 = 1/f

4/24 = 1/f

f = 24/4 = 6cm

26. The image formed by a concave mirror is of the same size as that of the object, if the object is placed _____.

 A. at the focus

 B. between pole and focus

 C. at the Centre of curvature

 D. at the pole

The correct answer is option [C]

27. When an object is within the focal length of a concave mirror, the image formed is _____.

 A. real and inverted

 B. virtual and magnified

 C. virtual and same size

 D. real and magnified

The correct answer is option [B]

28. Which of the following is not a method of determining focal length of a mirror?

 A. Use of mirror formular.

 B. By no-parallax method.

 C. From measurement of radius of curvature.

 D. All of the above.

The correct answer is option [D].

29. If the object is placed between the principal focus and the center of curvature in front of a concave mirror, the image formed is _____.

 A. enlarged

 B. virtual

 C. erect

 D. at the pole

The correct answer is option [A]

30. In order to get a virtual image of the same size as the object, it can be placed anywhere in front of a _____.

 A. concave mirror

 B. plane mirror

 C. convex mirror

 D. none of the above

The correct answer is option [B]

31. The radius of curvature of a convex mirror is 40cm. Its focal length is _____.

 A. 40cm

 B. 30cm

 C. 20cm

 D. 10cm

The correct answer is option [C]

32. An object of height 5cm is placed at 20cm from a concave mirror of focal length 10cm. The image height is _____.

 A. 20cm

 B. 15cm

 C. 10cm

 D. 5cm

The correct answer is option [D].

Using the formula:

$1/f = 1/u + 1/v$

33. The focal length of a concave mirror is 20cm. Its radius of curvature is _____cm.

 A. 10

 B. 20

 C. 40

 D. 15

The correct answer is option [C]

34. Why do we use a convex mirror for driving?

 A. It produces reflection more than other types of mirror.

 B. The focus is conserved.

 C. It produces only red images.

 D. It produces images equal to the object.

The correct answer is option [A].

State whether the following statement is true or false.

35. A shaving mirror is convex in shape.

 A. True

 B. False

The correct answer is option [B]

36. An inverted image as seen in a convex mirror _____.

 A. cannot be seen

 B. when the object is very far from the mirror

 C. when the object is at the centre of curvature of the mirror

 D. when the object is within the focal length of the mirror

 The correct answer is option [A]

37. A virtual image is one which _____.

 A. can be got on a screen

 B. cannot be got on a screen

 C. is formed only by a plane mirror

 D. is formed only by a convex mirror

The correct answer is option [B]

38. The distance from the pole of a mirror to the Centre of curvature is _____.

 A. principle focus

 B. focal length

 C. principle axis

 D. radius of curvature

The correct answer is option [C].

39. If an object is placed very close to the pole of a concave mirror, what will the image formed look like?

 A. Virtual, diminished and upright.

 B. Real, enlarged and inverted.

 C. Real, enlarged, inverted and upright.

 D. Virtual, enlarged and upright.

The correct answer is option [D].

40. Find the focal length of a lens that produces an image four times an object placed 12cm from a converging lens.

 A. 9.6cm.

 B. 2.0cm.

 C. 5.3cm.

 D. 17.2cm.

The correct answer is option [A].

Hint: Use the lens formular $1/f = 1/v + 1/u$ and put $v = 4u$.

TOPIC: EFFECT OF ELECTRIC CURRENT

DIRECTION: Choose the correct answer from the lettered options.

1. Which of the following is the main effect of electric currents?

 A. Chemical effect

 B. Heat effect

 C. Magnetic effect

 D. Electric effect

The correct answer is option [D].

2. Find the power operating in a refrigerator when a current of 15A flows through the refrigerator at a resistance of 5Ω.

 A. 1125AΩ.

 B. 1125A/Ω.

 C. 1125J.

 D. 1125A.

The correct answer is option [A].

Reason: Power, P = I2R and the unit follows.

3. An electric bulb is rated 60W for a 240V supply. Find the resistance of the bulb and the current it consumes.

 A. 960 ohms and 0.25A

 B. 340 ohms and 0.35A

 C. 0.25 ohms and 1.50A

 D. 1.50 ohms and 960A

The correct answer is option [A].

Power w = 60W,

Voltage supplied V = 240V

Power = V 2/R,

60 = (240) 2/R

R = (240) 2/60

R = 960 and 0.25A

4. Water in an electric kettle connected to a 240V supply took 6mins to reach its boiling point. How long would it have taken if the supply had been one of 210V?

 A. 5.25 mins

 B. 4 mins

 C. 3.75 mins

 D. 2.90 mins

The correct answer is option [A].

240->360s, 210->360 x 210/240 = 630/2 = 315/60 = 5.25m

5. A transformer which supplies 12V when connected to 240V mains takes 0.55A from the mains when used to light five 12V, 24W lamps in parallel, find its efficiency and the cost of using it for 12hr, at 60k per kWh.

A. 92.91%, 90.04k.

B. 91.91%, 95.04k.

C. 90.91%, 95.04k.

D. 90.91%, 95.10k.

The correct answer is option [C].

Hint: Use the equation Efficiency = [power output] x 100/ [power input],

Where power output = 5 x 24W = 120W and power input = IV = 0.55 x 240 = 132W.

Therefore, efficiency = [120 x 100]/132 = 90.91%. The cost of using it is power input x number of hours x cost = 132W = 132/1000 = 0.132kW x 12 x 60k = 95.04k.

6. The following options are applications of electrolysis EXCEPT _____.

 A. knowing mass of metals

B. increasing the capacitance of an electrolytic capacitor

C. extraction of metals

D. calibration of ammeter

The correct answer is option [A].

[Specific latent heat of vaporization of water = 23 x 106JKg-1].

7. A heating coil rated at 1000W is used to boil off 0.5Kg of boiling water. The time taken to boil off the water is _____.

A. 1.15 x 109s

B. 1.15 x 107s

C. 1.15 x 105s

D. 1.15 x 103s

The correct answer is option [D].

$P = 1000W$, $m = 0.5Kg$, $L_v = 2.3 \times 10^6 JKg^{-1}$

$$Pt = mL_v \Rightarrow t = \frac{mL_v}{P} = \frac{0.5 \times 2.3 \times 10^6}{1000} = 1150s$$

8. A filament lamp is rated 220V, 40W. What does this mean?

A. Energy is supplied at 40W for 220V/m wire.

B. P.d. is 220V only for every power delivered.

C. A. p.d. of 220V actually needs to maintain power.

D. Energy is supplied at 40W rate for every 220V applied across the filament lamp.

The correct answer is option [D].

9. An electric heater of 420W is used to heat a 50kg mass of water from 25oC to boiling point, the time is _____.

A. 10.4h

B. 8.5h

C. 6.0h

D. 5.0h

The correct answer is option [A].

Electric heat produced = Ivt

Heat gained by metal block = mcθ

10. Given that the specific heat capacity of water is 4180J/kg/K, how long will it take to heat 3kg of water at a temperature change 28oC – 88oC in a electric taking 6A from a 220volt supply?

A. 10mins.

B. 9.5mins.

C. 2mins.

D. 4620mins.

The correct answer is option [B].

Hint: IVt = mcθ

Where m = mass of substance, c = specific heat capacity of substance, I = current flowing, V = Voltage supply, and θ = [88 – 28] oC = 60oC.

11. In the calibration of an ammeter using Faraday's laws of electrolysis, the ammeter reading is kept constant at 1.20A. If 0.990g of copper is deposited in 40 minutes, the correction to be applied to the ammeter is _____.

[e.c.e. of copper = 3.3 x 10-4gC-1].

 A. 0.05A

 B. 0.06A

 C. 0.03A

 D. 0.04A

The correct answer is option [A].

Using the formula:

m = Izt

12. The immediate products of decomposition of an electrolyte is the _____.

 A. element used

 B. the liquid used

 C. ion

 D. cathode

The correct answer is option [C].

13. Electrical energy cost 5kobo per unit. What is the cost of running a 60W lamp for 24hrs?

 A. 22kobo.

 B. 14.4kobo.

 C. 7.2kobo.

 D. None of the above.

The correct answer is option [C].

14. In electrolysis, a current I flows for 20mins and deposits a mass m of silver on the cathode. A current 2I flowing for 5mins will deposit a mass of silver of _____.

A. 8m

B. m/2

C. 2m

D. m

The correct answer is option [B].

15. Which of the following laws states that "the electric force between two point charges separated by a distance is directly proportional to the product of the charges and inversely proportional to the square of the distance between the charges?

A. Coulomb's

B. Faraday's

C. Newton's

D. Ohm's

The correct answer is option [A].

16. How many grams of copper would be deposited by the same number of coulombs that deposited 2grams of silver?

(Take the equivalent weight of silver = 107.8, and the equivalent weight of copper = 64)

A. 0.01g

B. 1.19g

C. 9.1g

D. 0.16g

The correct answer is option [B].

107.88-> 2grams, Then 64g = 2 x 64/107.88g

17. 0.48 x 10-3kg mass was liberated by the passage of 1440Amp.sec quantity of electricity. Find the electrochemical equivalence of the system.

 A. 33.3 x 10-6kg/c.

 B. 3.33 x 10-6kg/c.

 C. 3.2 x 10-7kg/c.

 D. 33.0kg/c.

The correct answer is option [A].

Hint: m = zQ, where z = electrochemical equivalence, Q = quantity of electricity.

18. A with an input power of 2 kilowatts uses 80% of this power. If all the remaining energy appears as heat, and heats 40kg of iron, what will be the rise of temperature of this iron in 2min?

(Specific heat capacity of iron = 0.5 Jg K or 500 J/kg K).

 A. 9.6oC

 B. 2.4oC

 C. 24oC

 D. 12oC

The correct answer is option [B].

19. Given that the electro-chemical equivalence is 0.126 x 10-6kg/C of a metal at a 5A current deposit for 1 hr. What is the mass of metal deposited?

 A. 2.268 x 10-3kg.

 B. 0.227 x 10-3kg.

 C. 0.039 x 10-3kg.

 D. 0.596 x 10-3kg.

The correct answer is option [A].

Hint: Use the equation m = zIt; where m = mass, z = electro-chemical equivalence, I = current and t = time taken.

20. A filament lamp is rated 220V, 40W. Find the resistance in the information given.

 A. 260Ω.

 B. 960Ω.

 C. 940Ω.

 D. 220Ω.

The correct answer is option [B].

Hint: Power, P = IV and I = V/R → R = V2/P.

21. How much heat is generated when an electrical coil rated 200W is used to heat a given mass of water for 1hour?

 A. 600KJ

 B. 720KJ

 C. 1200KJ

 D. 1500KJ

The correct answer is option [B].

22. An electric heater takes 4A when operated on a 200V supply, what is the cost of the electricity consumed at 10k per kwh, when it is used for 4 hours?

 A. ₦0.10

 B. ₦0.40

 C. ₦4.00

 D. ₦0.32

The correct answer is option [D].

The power = IVt

Where V = 200V, I = 4A, t = 4hrs

P = 200 x 4 x 4 = 3200 Whr

P in KWhr = 3200/1000KWhr = 3.2 KWhr

10 k = 1 KWhr, then cost of 3.2 KWhr = 32k equivalent to N0.32.

23. A charge of one coulomb liberates 0.0033g of copper in an electrolytic process. How long will it take a current of 2A to liberate 1.98g of copper in such a process?

A. 5 mins

B. 30 mins

C. 50 mins

D. 60 mins

The correct answer is Option [C]

$M = Zq$

$M = mass = 3.3 \times 10^{-6}kg$, $q = charge = 1$, $Z = electrochemical\ equivalent$.

$Z = M$ since $q = 1$

$Z = 3.3 \times 10^{-6}kgC\text{-}1$

$M = ZIt$

$M = 1.98 \times 10^{-3}kg$, $I = 2A$

$$t = {^M/_{ZI}} = \frac{1.98 \times 10^{-3}}{2 \times 3.3 \times 10^{-6}} = 300\,sec = 5\,min$$

24. What do you understand by the statement that the electrochemical equivalence of copper is 0.000333g/C?

A. It means copper has an electrochemical equivalence of 0.000333g/C.

B. It means 0.000333g of mass is liberated by passage of one quantity of charge.

C. It means 0.000333g of copper is deposited per one ampere of current flowing for one second at the cathode plate of copper.

D. All of the above is correct.

The correct answer is option [C].

25. Determine the electrochemical equivalent of copper if a current of 0.8A passed through a copper voltmeter deposit 1.8g of copper after 60 mins.

A. 0.0075g/c

B. 0.0008g/c

C. 0.000625g/c

D. 0.024g/c

The correct answer is option [C].

26. Calculate respectively the current it will take an electric kettle containing 960W heating unit and the time it will take an electric kettle to raise 2kg of water from 15oC to the boiling point, if 90% of the heat produced is used in raising the temperature of water and the cost of the charge is 3p for 1kwh.

(Take C = 4200J/kg/K for water and Voltage = 240V mains)

 A. 6A 826s 1.22p

 B. 4A 826s 0.66p

 C. 8A 826s 0.99p

 D. 9A 826s 3.66p

The correct answer is option [B].

From P= IV

960 = I x 240: I = 960/240 = 4A

Heat to raise water to boiling pt = 2 x 4200 x (100 –15) = 714000

Heat to raise water to boiling pt 90% of 960t = 864t

864t =714000, t = 714000/864 = 826s

Energy used = 960W x 826s = 0.96kW x (826/3600)h = 0.22kWh cost = 0.22 x 3p = 0.66p

27. An electric heater rated 220V, 1000W is immersed into bucket full of water. If the temperature changes from 30oC to 100oC and the current flows for 300 seconds, the mass of water is _____.

[Specific heat capacity of water = 4200Jkg–1k–1]

 A. 4.28kg

 B. 4.86kg

 C. 1.02kg

 D. 7.14kg

The correct answer is option [C].

IVt = mcθ

1000 x 300 = m x 4200 x (100 – 30) oC

1000 x 300 = m x 4200 x 70

m = 1000 x 30/4200 x 70 = 1.02kg

28. An electric lamp is marked 100W, 250V. If the lamp is connected to a 250V mains, calculate the current and the cost of using the lamp for 100hr at 1p per KWh.

 A. 0.4A and 10p

 B. 0.6A and 1000p

 C. 0.4A and 100p

 D. 0.6A and 100p

The correct answer is option [A].

P= VI = 100W

100W = 250I

I = 100/250 = 0.4A

1p = 1KWh

Power rating for 100 hrs. = 100 x 100 = 10 000W which is equivalent to 10KWh

The cost for 100 hr = 10 x 1p = 10p

29. An electrical drill rated 400W is used to drill a hole in copper of mass 400g in 20s. Calculate the rise in temperature if all the heat produced is absorbed by the copper.

[Specific heat capacity of copper = 400Jkg–1K–1].

 A. 100oC

 B. 75oC

 C. 50oC

 D. 45oC

The correct answer is option [C].

30. An electric lamp is marked 12V, 36W. Calculate the energy in joules expended each minute after finding the resistance.

 A. 4016J

 B. 2160J

 C. 3164J

 D. 2005J

The correct answer is option [B].

V = IR, P = IV = V2/R

Energy in Joules = IVt = Pt = 36(60) = 2160J

31. How long will it take to deposit 160g of copper on a zinc plate in a copper sulphate solution if the current through the cell is 2A?

[Take electrochemical equivalent of copper = 3.30 x 10-3 gc-1, mass of copper deposited (m) = 160g].

 A. 5.6hr

 B. 6.7hr

 C. 3.3hr

 D. 4.2hr

The correct answer is option [B].

Mass of copper deposited (m) = 160g current (I) = 2A according to faraday's first law m = zIt

160 = 3.3 x 10 –3 x 2 x t i.e. t = 160/3.33 x 10 –3 x 2 = 6.73hr

32. A generator is on daily use and in the process, ten 60W and five 40W tungsten bulbs are on for the same time interval. The energy consumed daily is _____.

 A. 0.96kWh

 B. 1.92kWH

 C. 9.60kWh

 D. 9.20kWh

The correct answer is option [D].

33. A 50W electric heater is used to heat a metal block of mass 5kg. If in 10 minutes a temperature rise of 12oC is achieved, the specific heat capacity of metal is _____.

 A. 130J kg-1 K-1

 B. 390J kg-1 K-1

 C. 400J kg-1 K-1

 D. 500J kg-1 K-1

The correct answer is option [C].

P x t = mcΔθ

50 x (10 x 60) = 5 x C x 12

50 x 600 = 60 x C

C = 50x600/60

C = 500J kg-1 K-1

34. An immersion heater is rated 100W. How long does it take the heater to raise the temperate of 2.5kg of water by 20oC?

[Assume heat lost to the surrounding is negligible and specific heat capacity of water = 4200J/kg/k].

 A. 58.0 minutes

 B. 70.0 minutes

 C. 75.0 minutes

 D. 35.0 minutes

The correct answer is option [D].

I 2RT = θ (mc + H)

Heat lost negligible = 100Wt = 20 x (2.5 x 4200)

t = 210000/100 = 2100 since 1m ->60s, 2100/60 = 35.0m

35. An electric filament lamp is marked 6V and 0.4A. Find the rate at which energy is used by the lamp when it is connected to a 6V supply.

 A. 0.07W

 B. 1.00W

 C. 2.40W

 D. 15.00W

The correct answer is option [C].

36. An electric heater rated 12 volts and 60 watts is used to boil 4000g of water, calculate the time required to raise the temperature of water from 30oC to 80oC. (Spectic heat capacity of water = 4.2J/g/k or 4200J/kg/k).

 A. 388.9hrs

 B. 3888.9hrs

 C. 17.78hrs

 D. 3.9hrs

The correct answer is option [D].

P = IV

I = P/V, I = 60/12 = 5A IVt = mcθ

5 x 12 x t = 4000 x 4.2 x (80 – 30)

60t = 504000

t = 840000/60 = 14000secs

14000/3600hrs

37. What is the cost of running five 60W and four 100W lamps for 20hrs, given that electrical energy cost ₦10.00 per KWh?

 A. ₦140.00.

 B. ₦150.00

 C. ₦120.00

 D. ₦230.00.

The correct answer is option [A].

Hint: Total power = [[(5 x 60) + (4 x 100)] x 20]/1000 = 14KWh. Total cost = 14 x 10 = N140.

38. Find the electrochemical equivalence of zinc if a current of 5A flowing for 40mins deposits 2.530g of copper at the cathode.

 A. 2.11 x 10-3g/C.

 B. 3.23 x 10-2g/C.

 C. 4.25 x 10-3g/C.

 D. 1.13 x 10-1g/C.

The correct answer is option [A].

Hint: z = m/It.

39. An electric generator has an e.m.f of 240V and an internal resistance of 1Ω. If the current supplied by the generator is 20A when the terminal voltage is 220V, find the ratio of the power supplied to the power

 A. 11:1

 B. 1:11

 C. 12:11

 D. 11:12

The correct answer is option [C].

E = I(R + r)

240 = 20(R + 1)

240 = 20R + 20

R = 220/20 = 11Ω

Power supplied = IV = 20 x 240 = 4800W

Power dissipated = I2R = 20 x 20 x 11 = 4400W

The ratio of power supplied to power dissipated

4800: 4400

12: 11

40. Two heating coils A and B dissipated heat at the rate of 60W and 90W respectively when connected in parallel to a 12V d.c. supply of negligible internal resistance. Find the resistances of A and B.

 A. 2.4Ω, 0.63Ω

 B. 2.4Ω, 1.6Ω

 C. 0.42Ω, 0.63Ω

 D. 0.42Ω, 1.6Ω

The correct answer is option [B].

Hints: P = IV = V2/R.

41. How long will it take an electric boiler of 450W to heat a 50kg mass of water from 25oC to boiling point?

 A. 10.4h

 B. 8.5h

 C. 9.7h

 D. 5.0h

The correct answer is option [C].

Electric heat produced = Ivt

Heat gained by metal block = mcθ

42. The maximum power which a 100Ohms resistor 100R can absorb is 4W. The maximum voltage across the P = I2 R resistor is _____.

 A. 5V

 B. 10V

 C. 20V

 D. 25V

The correct answer is option [C].

4 = I2 (100), 4 = 100I2, I2 = 4/100 =

Ö

0.04

P = VI

4 = V (0.2)

V = 4/0.2 = 20V

43. Which of these states the faraday's 2nd law of electrolysis?

 A. The mass of desposition at electrode during electrolysis is directly proportional to the quantity of electricity passing through the electrolyte

 B. The quantity of electricity required to liberate one mole of a substance in electrolysis is approximately 96500 coulombs

C. The induce electromotive force in a circuit is directly proportional to the rate of change of magnetic flux linking the coil

D. The same quantity of electric passed through different electrolyte and ratio of the masses deposited at electrodes equal ratio of their chemical equivalent

The correct answer is option [D].

44. All the heat generated in a 5 Ohm resistor by 2A flowing for 30 seconds is used to evaporate 5g of a liquid at its boiling point. Which of the following is the correct value of the specific latent heat of the liquid?

 A. 120J

 B. 60Jg-1

 C. 120Jg-1

 D. 1500J

The correct answer is option [C].

$IVt = mL_v = I^2Rt$

$$\Rightarrow L_v = \frac{I^2Rt}{m} = \frac{2^2 \times 5 \times 30}{5} = 120Jg^{-1}$$

45. Heat generated by a current of 4A passing through a 6Ω resistor for 24secs is used to evaporate 6g of a liquid at a boiling point. Find the specific latent heat of the liquid.

A. 384J/g.

B. 276J/g.

C. 164J/g.

D. 198J/g.

The correct answer is option [A].

Heat supplied $I^2Rt = mL$

4^2 x 6 x 24 = 6 x L

2304 = 6L,

Therefore, L = 2304/6 → S.L.H of liquid [L] = 384J/g.

46. Two parallel plates at a distance of 9 x 10-3m apart are maintained at a potential difference of 700V. The electric field strength between them is _____.

A. 6.30 x 10^0Vm^{-1}

B. 1.26 x 10^1Vm^{-1}

C. 6.30 x 10^3Vm^{-1}

D. 7.78 x 10^4Vm^{-1}

The correct answer is option [D].

47. Which of the following best represents the statement Joule's laws of electrical heating (H) obtained. H = I2Rt

A. Current [I], if the resistance [R] and time are constant

B. Resistance [R], if heat [H] and time [t] are constant

C. Resistance [R], if the current [I] and time are constant

D. Time [t], if the resistance [R] and current [I] are constant

The correct answer is option [B].

48. The value of two lengths of wire been compared are 2cm and 3cm. If the e.m.f. of 2cm wire is 5V. What is the e.m.f. of the 3cm wire?

A. 3.3V.

B. 7.5V.

C. 2V.

D. 6V.

The correct answer is option [B].

Hint: If the length of two wires are being compared, the e.m.fs are also compared, thus we have E1/E2 = L1/L2.

49. If 100cm of wire was used in the heating element of a 12V, 60W heater, what length of wire of the same material having the double sectional area would be required for a 24V, 60W heating element, assuming the final temperature is the same?

A. 200 cm

B. 400 cm

C. 50 cm

D. 120cm

The correct answer is option [B].

$P = IV = V^2/R$, when V = 12V

$R1 = 12^2/60 = 2.4\Omega$

To get the resistance when V = 24V

$R_2 = 242/60 = 9.6\Omega$

R_1 used 100 cm of wire, R_2 used? Of wire

$R_1/R_2 = 100/?$

2.4/9.6 = 100/?

50. A block of aluminum is heated electrically by a 25W heater. If the temperature rises by 10oC in 5minutes, the heat capacity of the aluminum is _____.

 A. 850JK^{-1}

 B. 750JK^{-1}

 C. 650JK^{-1}

 D. 500JK^{-1}

The correct answer is option [B].

Heat given out by heater = Heat absorbed by aluminum

Ivt = mcθ

Pt = mcθ

Where; P = 25W, t = (5 x 60) s = 300s, θ = 10°C

Heat capacity = mc = H

25 x 300/10 = 750JK^{-1}

51. A current of 3A is passed through a copper voltmeter for 10 minutes. If the electro chemical equivalent of copper is 3.27 x 10^{-7}kgc^{-1}. Determine the mass of copper deposited.

 A. 58.86 x 10^{-4}kg

 B. 5.886 x 10^{-4}kg

 C. 588.6 x 10^{-4}kg

 D. 5886 x 10^{-4}kg

The correct answer is option [B].

Using the formula m = zIt

Where z = 3.27 x 10–7kgc^{-1}, I = 3 A and t = 10 mins = 600 secs.

TOPIC: ELECTROMAGNETIC SPECTRUM & DISPERSION OF LIGHT

DIRECTION: Choose the correct answer from the lettered options.

1. The complementary color of blue is _____.

 A. violet

 B. cyan

 C. green

 D. yellow

The correct answer is option [D]

2. What is a diffraction grating?

 A. A diffraction grating consists of a piece of opaque material on which a very large number of opaque (black) parallel lines are engraved

 B. A diffraction grating consists of a piece of transparent material on which a very large number of transparent (black) parallel lines are engraved

 C. A diffraction grating consists of a piece of transparent material on which a very large number of opaque (black) parallel lines are engraved

 D. A diffraction grating consists of a piece of opaque material on which a very large number of transparent (black) parallel lines are engraved

The correct answer is option [C]

3. When a sample of an element is heated until it glows, the color it gives off is _____.

 A. a single frequency of light

 B. a composite of lots of frequencies of light

 C. a continuous band of color

 D. monochromatic

The correct answer is option [B]

4. Which region of the electromagnetic spectrum will travel with the fastest speed?

 A. Radio wave

 B. Infrared

 C. Ultra-violet

 D. All of the above

The correct answer is option [D]

5. A piece of cloth appears green in sunlight. When held in red light, it will appear _____.

 A. green

 B. blue

 C. red

 D. black

The correct answer is option [B]

6. In the formation of a pure spectrum which of the following apparatus is not necessary?

 A. The narrow slit.

 B. The screen.

 C. A converging lens with the slit at its focus.

 D. A second lens for collecting the parallel beams of different colours.

The correct answer is option [D].

7. Which of these combination will not produce a white light?
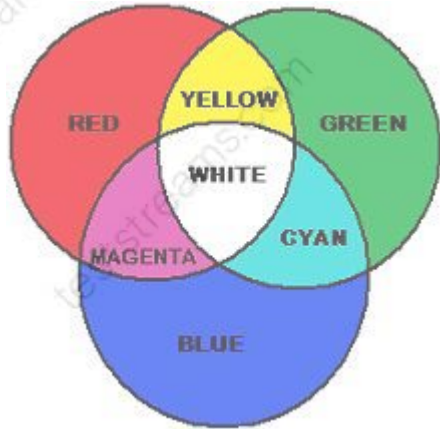
 A. Yellow and Blue.

 B. Green and Red.

 C. Cyan and Red.

 D. Magenta and Green.

The correct answer is option [B].

8. Stars vary in colour. Which colour indicates the hottest surface temperature of a star?

 A. Red

 B. Orange

 C. Yellow

 D. Blue

The correct answer is option [D]

9. The colour of light is determined by _____.

 A. frequency

 B. velocity of air

 C. wavelength

 D. distance

The correct answer is option [C]

10. If the Nigerian flag (green, white, green) is viewed in pure yellow light, which of the following set of colours would be observed on the flag?

 A. Green, yellow, green

 B. Red, yellow, red

 C. Black, yellow, black

 D. Green, white, green

The correct answer is option [B].

N/B if you try remembering colour mixing as

Red + green = yellow or yellow – green = red it would probably save you all the headaches.

11. In the spectrum of white light which of the following pairs of light rays shows the widest separation?

 A. Red and Indigo.

 B. Black and White.

 C. Green and Orange.

 D. Yellow and Red.

The correct answer is option [A].

12. Calculate the frequency of red light with a wavelength of 4.2×10^{-7}m.

 A. 7.14×10^{14} Hz

 B. 7.14×10^{-14} Hz

 C. 7.41×10^{14} Hz

 D. 6.14×10^{14} Hz

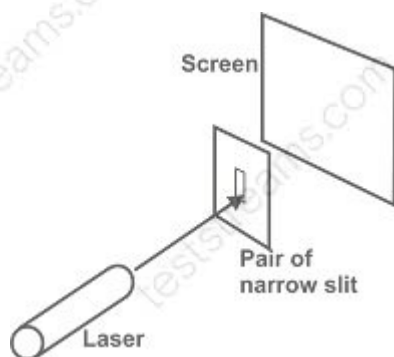The correct answer is option [A].

Using the formula

$c = \lambda f$

13. Which color of the visible light spectrum has the greatest frequency?

 A. Violet

 B. Red

 C. Infrared

 D. Radio

The correct answer is option [A]

14. A student used a laser, as drawn, to demonstrate that light is a wave motion,

Name the two phenomena that occur when the light passes through the pair of narrow slits.

 A. Polarization and Interference

 B. Diffraction and Interference

 C. Diffraction and Polarization

 D. Absorption and Interference

The correct answer is option [B]

15. The earth receives a significant amount of ultraviolet radiation from the sun. Luckily most of it doesn't reach the ground, because it is _____.

 A. scattered by the upper atmosphere

 B. absorbed by a protective layer of ozone gas in the upper atmosphere

 C. absorbed by the large amount of air in the atmosphere

 D. actually there isn't enough UV radiation coming from the sun to harm us

The correct answer is option [B]

16. Which region of the electromagnetic spectrum has the highest frequency?

 A. Ultra-violet radiation

 B. Infrared radiation

 C. X-ray

 D. Gamma radiation

The correct answer is option [D]

17. When red and green light shine on a white sheet, the resulting color is _____.

 A. blue

 B. cyan

 C. green

 D. yellow

The correct answer is option [D]

18. When white light is diffracted, the least deviated colour is _____.

 A. violet

 B. orange

 C. red

 D. indigo

The correct answer is option [C].

19. Clouds are white because water molecules _____.

 A. reflect white light

 B. absorb white light

 C. form clusters of different sizes and these clusters scatter different colors of light

 D. are white

The correct answer is option [C]

20. The three primary colors of light addition are _____.

 A. red, yellow, and green

 B. red, yellow, and blue

 C. red, green, and blue

 D. yellow, green, and blue

The correct answer is option [C]

21. The visible part of light consists of the following colours:

 A. Red, indigo, infra-red, violet, yellow, green and blue

 B. Red, green, blue, violet, indigo, orange, and yellow

 C. Blue, ultra-violet, infra-red, red, yellow, indigo, violet, green, and orange

 D. Infra-red and ultra-violet

The correct answer is option [B].

The visible components of light are evident in the 7 colours of the RAINBOW (ROYGBIV).

 State whether the following statement is true or false.

22. The two colors of light that come together to form black light are called complementary colors.

 A. True

B. False

The correct answer is option [B]

23. Which colour is refracted more by the prism?

 A. Red

 B. Green

 C. Blue

 D. Yellow

The correct answer is option [C]

State whether the following statement is true or false.

24. A spectroscope is an instrument that analyzes the colors in a light beam.

 A. True

 B. False

The correct answer is option [A]

25. Which of the following has the shortest wavelength?

 A. A microwave

 B. An infrared ray

 C. A ultra-violet ray

 D. Visible light

The correct answer is option [C]

26. Light of one colour is called _____ light

 A. monochromatic

 B. dispersed

 C. diffused

 D. chromatic

The correct answer is option [A]

27. A burning candle is located 80 centimeters from the surface of a spherical concave mirror, and produces a focused image at 20 centimeters in front of the mirror. The radius of curvature for this mirror is _____.

 A. 4 cm

 B. 16 cm
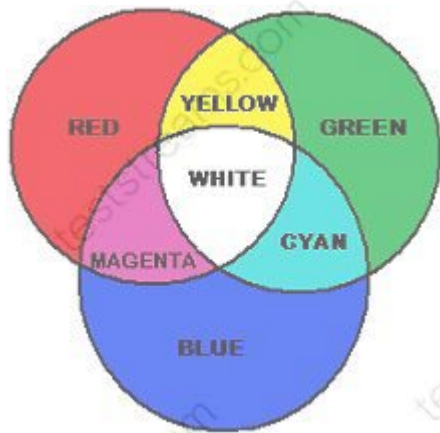
 C. 32 cm

 D. 24 cm

The correct answer is option [C]

28. Which one of these rays has the greatest penetrating power?

 A. Ultra violet ray.

 B. Gamma ray.

 C. Beta ray.

 D. Radio wave.

The correct answer is option [B].

Hint: They are not even deflected in magnetic and electromagnetic fields.

29. The combination of the colour white + cyan will produce _____.

A. Blue

B. Red

C. Yellow

D. Green

The correct answer is option [B].

Hint: Because red is a primary colour and can be obtained when white and a secondary colour not having red is mixed.

30. On the moon, the daytime sky looks _____.

A. blue

B. yellow

C. white

D. black

The correct answer is option [D]

31. Which of these are primary colours?

A. Green, Blue and Yellow.

B. Blue, Green and Red.

C. Orange, Red and Yellow.

D. Indigo, Violet and Cyan.

The correct answer is option [B].

32. The reason the sky is blue is that air molecules _____.

A. scatter blue light in all directions

B. reflect blue light

C. absorb yellow light

D. absorb green light

The correct answer is option [A]

TOPIC: GRAVITATIONAL FIELD

DIRECTION: Choose the correct answer from the lettered options.

1. Which of the following statement about intensity is/are correct?

I. It has the unit Nkg-1

II. It is equal to acceleration of free fall due to gravity

III. It increases with altitude

A. I only

B. II only

C. I and II only

D. I, II and III.

The correct answer is option [D].

2. If the earth's acceleration due to gravity on a mass of 4000kg on the earth surface is 10 m/s^2, what would be the acceleration due to gravity when it is at a point 4 times the radius of the earth?

A. 0.43 m/s^2

B. 0.63 m/s^2

C. 0.58 m/s^2

D. 0.87 m/s^2

The correct answer is option [B].

g" = r^2 × g/R^2

g" = r^2 × g/4^{2}r^2

g" = g/4^2 = 10/16 = 0.63m/s^2

3. If the gravitational constant is 8 × 10^{-11}Nm^2/kg^2. Calculate the force of attraction between 105kg mass of metal hanging one meter away from 104kg mass of Cu.

A. 8 × 10^{-2}N.

B. 12.1×10^{-4}N.

C. 10.03×10^{-3}N.

D. 2.14×10^{-1}N.

The correct answer is option [A].

Hint: Use the equation $F = [GM_1M_2]/r^2 = [8\times10^{-11} \times 10^5 \times 10^4]/1^2 = 0.08$ or 8×10^{-2}.

4. What is the acceleration due to gravity g on the moon if g is $10ms^{-2}$ on the earth?

A. $0.1ms^{-2}$

B. $0.74ms^{-2}$

C. $1.67ms^{-2}$

D. $10.00ms^{-2}$

The correct answer is option [C]

Solution: On the moon the acceleration due to gravity is one-sixth that of the earth, since the mass of the moon is much less than that of the earth.

5. The gravitational potential of a body at infinity is _____.

A. less than that on the earth surface

B. greater than that on the surface of the earth

C. has no value

D. proportional to the escape velocity

The correct answer is option [C].

6. Which of the following is true about the law of universal gravitation?

A. Any two bodies attract each other with a force that is proportional to the difference of their masses

B. Any two bodies attract each other with a force that is inversely proportional to the square of the distance between them

C. Any two bodies attract each other with a force, which is proportional to the product of their masses and inversely proportional to the square of the distance between them

D. Any two bodies attract each other with a force that is proportional to the sum of their masses

The correct answer is option [C].

7. A satellite is expected to circle round the earth in an orbit 40,000km from the earth's surface. What is the period? (Take radius of earth r = 6400km).

A. 42hrs

B. 27hrs

C. 68hrs

D. 48hrs

The correct answer is option [B].

The Period T = $2\pi R/V = 2\pi \times 4.6 \times 10^{-7}/2.97 \times 10^3 = 9.82 \times 10^4/3600$

approx. 27hours

8. If the earth's acceleration due to gravity on a mass of 4000kg on the earth surface is 10m/s2 and the acceleration due to gravity is 4 times the radius of the earth, determine the gravitational force that acts on it.

A. 1650N

B. 1870N

C. 2520N

D. 3720N

The correct answer is option [C].

mg" = 4000 x 0.63 = 2520N

9. Calculate the escape velocity for a rocket fired from the earth's surface at a point where the acceleration due to gravity is $10ms^2$ and the radius of the earth is $6 \times 10^6 m$.

A. $7.8 \times 10^3 ms^{-1}$

B. $1.1 \times 10^4 ms^{-1}$

C. $3.5 \times 10^7 ms^{-1}$

D. $6.0 \times 10^7 ms^{-1}$

The correct answer is option [B].

Velocity of escape $v = \sqrt{2gR}$

$$v = \sqrt{2 \times 10 \times 6 \times 10^6} = 1.1 \times 10^4\, ms^{-1}$$

10. A 20kg mass (A) at a point, P, 50cm from a 500kg mass (B) is attracted towards B as a result of the force field produced by B. Determine the field intensity at P.

A. $1.34 \times 10^{-7} N/kg$

B. $6.7 \times 10^{-8} N/kg$

C. $2.68 \times 10^{-9} N/kg$

D. $1.34 \times 10^{-8} N/kg$

The correct answer is option [A].

Field intensity = Force/mass at point P

$F = GMm/r = 1.34 \times 10^{-6}$

Field intensity = $1.34 \times 10^{-6}/20 = 6.7 \times 10^{-8} N/kg$

11. A mass of 2500kg is on the earth surface. What is the gravitational potential energy, when the mass is thrice as far away from the center of the earth? (Mass of Earth = $6.0 \times 10^{24} kg$).

A. $5.23 \times 10^{13} J$

B. $3.48 \times 10^{14} J$

C. $1.67 \times 10^{12} J$

D. $2.25 \times 10^{15} J$

The correct answer is option [A].

The gravitational potential = –GMm/r

Where G = 6.7 x 10^{-11}, M = 6.0 x 10^{24}kg, m = 2500kg, r = thrice the radius of the earth = 3 x 6400 = 19200 km

12. Which of these is the formula for escape velocity of gravitation?

 A. V = √ [2GM/r]

 B. V = 2πR/T

 C. V = √ [GM/r]

 D. V = √ [gr2/R]

The correct answer is option [A].

13. The earth is four times the size of the moon and acceleration due to gravity on the earth is 80 times that of the moon. The ratio of the mass of the moon to that of the earth is _____.

 A. 1:4

 B. 1:80

 C. 1:320

 D. I: 1280

The correct answer is option [C].

(mg) moon = (mg) earth

mearth = 4mmoon

gmoon = 80gearth

(mg) moon = 4mmoon x 80gearth = 320(mg)

14. If an electron of mass is 9.11 × 10^{-31}kg and the radius of hydrogen is 0.32×10^{8}m. If the proton mass is 1.56 × 10^{-27}kg, the gravitational attraction between the charges is _____.

[Take G = 6.67 × 10^{-11}Nm^2/kg^2]

 A. 12.1 × 10^{-26}N.

B. 86.2×10^{-26}N.

C. 9.26×10^{-83}N.

D. 9.26×10^{-47}N.

The correct answer is option [C].

Solution GMm/r^2. Substitute the values into the equation.

15. A rocket of total mass 500kg on the earth surface is to be launched into space. Determine the escape velocity of the rocket and the kinetic energy required for the rocket to escape into space.

A. 358m/s 3.2×10^7J

B. 640m/s 6.4×10^{10}J

C. 253m/s 6.6×10^{10}J

D. 400m/s 4.0×10^7J

The correct answer is option [A].

16. What is the gravitational potential due to a body of mass m at a distance r from it?

[G = Gravitational Constant]

A. Gm/r.

B. GMm/r^2.

C. $Gm2/r^2$.

D. m/Gr^2.

The correct answer is option [A].

Hint: Gm/r.

17. The force of attraction between two point masses is 10^{-4}N when the distance between them is 0.18m. If the distance is reduced to 0.06m, calculate the force.

A. 1.1×10^{-5}N

B. 3.3×10^{-5}N

C. 3.0×10^{-5}N

D. 9.0×10^{-4}N

The correct answer is option [D].

$F = 10^{-4}$N when $x = 0.18$m

$$F = \frac{Gm_1 m_2}{r^2} \Rightarrow Gm_1 m_2 = Fr^2 = 10^{-4} \times 0.18^2 = 3.24 \times 10^{-6}$$

when $x = 0.06$m $\therefore F = \frac{Gm_1 m_2}{0.06^2} = \frac{3.24 \times 10^{-6}}{0.06^2} = 9 \times 10^{-4} N$ masses 5kg and 8kg at a distance of 60cm apart?

A. 8.0×10^{-9}N

B. 7.4×10^{-9}N

C. 4.5×10^{-9}N

D. 5.6×10^{-9}N

The correct answer is option [C].

Taking $G = 6.7 \times^{-11}$Nm²kg)

$F = 6.7 \times^{-11} (5)(8)/0.6 = 2.68 \times 10^{-9}/0.6 = 4.467 \times 10^{-9}$N

19. Which of the following statements does not express the gravitational potential at a point on the earth's surface?

A. Usually expressed with +ve sign because the work done is towards infinity

B. At infinity is zero

C. Is a scalar quantity

D. Used to calculate energy changes in moving a given mass from one point to another

The correct answer is option [A].

TOPIC: LENSES

1. If the image formed by an object lens at a distance from the eye lens is 4cm. What is the distance of the object from the lens, if the final image is at 26cm?

 A. 120cm

 B. 100cm

 C. 4.73cm

 D. 3.46cm

The correct answer is option [C].

1/f = 1/u – 1/v

1/u = 1/4 – 1/26

Therefore, u = 3.46cm.

 Use the information to answer the question.

2. An image is two times the object distance. If the focal length of the lens is 5cm, find the object distance.

 A. 22.5cm.

 B. 15cm.

 C. 30cm.

 D. 7.5cm.

The correct answer is option [D]. 1/f = 1/v + 1/u,

Where f = focal length = 5cm, u = object distance = u, v = image distance = 2u. Substitute the value into the equation to solve the object distance.

Use the information to answer the question.

3. Given that the least distant of distinct vision for a normal eye is 25cm. What kind of lens is needed by the man whose near point is 38.5cm?

A. Concave lens.

B. Convex lens.

C. Biconcave lens.

D. Plano-concave lens.

The correct answer is option [B].

Hint: A converging lens is needed to make the rays converge.

4. The focal length of a lens is 2cm and is used to capture an image 4cm greater in distance from the lens compared to the object distance from the lens. Determine image distance of the object.

A. 6.83cm.

B. 4.83cm.

C. 3.38cm.

D. 2.83cm.

The correct answer is option [A].

Hint: $1/f = 1/v + 1/u$ and $v = u + 4 \rightarrow 1/f = 1/u + 1/[u + 4]$. Solve quadratically.

5. A converging lens of 6cm is used as a magnifying glass by a man whose near point is 36cm, the magnification given by the lens is _____.

A. 2.86

B. 9.0

C. 4.12

D. 5.0

The correct answer is option [D].

$1/u = 1/6 – 1/36 = [6 – 1]/36 = 5/36$

$u = 7.2cm \approx 7.0cm$. Magnification, $m = v/u = 36/7.0 = 5.14 \approx 5$.

6. A simple microscope forms an image 10cm from an eye close to the lens. If the object is 6cm from the eye, the focal length of the lens is _____.

 A. 3.75cm

 B. 4.00cm

 C. 15.99cm

 D. 16.00cm

The correct answer is option [A].

1/f = 1/u + 1/v = 1/f = 1/6 + 1/10 = 8/30

f = 3.75cm

7. In a ray diagram for a thin converging lens, a ray that is not parallel to the optic axis but passes through the optic center will _____.

 A. pass through undeviated

 B. pass through the center of curvature after

 C. emerge parallel to the principal axis

 D. pass through the principal focus after

The correct answer is option [A].

8. Which of the following correctly describes the image of an object, 4cm from a diverging lens of focal length –12cm?

 A. The image is virtual, 3cm in front of the lens

 B. The image is real, 6cm behind the lens

 C. The image is virtual, 6cm in front of the lens

 D. The image is real, 3cm in front of the lens

9. A lens captures an image at 20cm distance. If the radius of curvature of the lens is 12.5. Find the object distance and the nature of the image formed.

 A. 100cm but the image is real.

 B. 100cm but the image is virtual.

 C. –100cm but the image is real.

 D. –100cm but the image is virtual.

The correct answer is option [D].

Hint: First find focal length then use the mirror formular to find object distance, u.

10. If u is the object distance and v the image distance, which of the following expressions gives the linear magnification produced by a convex lens of focal length?

 A. v + 1f

 B. v – 1f

 C. u – ff

 D. u + fv

The correct answer is option [B].

11. A converging [convex] lens has a focal length of 20cm. The lens forms a real inverted image of the same size as the object when the object distance from the lens is _____.

 A. 40cm

 B. 30cm

 C. 20cm

 D. 10cm

The correct answer is option [A].

Hint: Use the formula, $1/f = 1/u + 1/v$. Where v = image distance u = object distance f = focal length since the image size is the same as the object size v = u. Therefore $1/20 = 1/u + 1/u$ → $1/20 = 2/u$, then u = 2 x 20 = 40cm.

Use the information to answer the question.

12. An image is two times the object distance. If the focal length of the lens is 5cm, find the magnification of the lens.

 A. Unknown.

 B. 2.5cm.

 C. 2cm.

 D. 2

The correct answer is option [D].

Hint: Magnification = [Image distance]/ [Object distance].

13. What is the focal length of the correcting lens required for a man to see distant objects if the man is suffering from short-sightedness and cannot see objects beyond 1.00m?

 A. 50cm.

 B. -50cm.

 C. -100cm.

 D. 180cm.

The correct answer is option [C].

Hint: Take image distance to be -100cm and object distance to be at infinity ∞, then use the lens formular.

Use the information to answer the question.

14. Given that the least distant of distinct vision for a normal eye is 25cm. find the focal length of the lens needed by a man whose near point is 38.5cm.

A. 70.2cm.

B. 71.3cm.

C. -71.3cm

D. -65.1cm.

The correct answer is option [B].

Hint: Image must be formed at 38.5cm on the same side of the lens at his near point also the final image is therefore virtual. 1/f = 1/ [-38.5] + 1/25 or 1/f = 1/[-v] + 1/u.

Use the information to answer the question.

15. An image is two times the object distance. If the focal length of the lens is 5cm, find the image distance of the object.

A. 7.5cm.

B. 15cm.

C. 22.5cm.

D. 0.013cm.

The correct answer is option [B].

Hint: Use the lens formular 1/f = 1/v + 1/u.

16. What is the focal length f of a converging lens if the real image formed is 90.0cm from the object placed 30.0cm from the lens?

 A. 20.0cm.

 B. 15cm.

 C. 60.0cm.

 D. 25.0cm.

The correct answer is option [A].

Hint: Use the lens formular; 1/f = 1/u + 1/v.

17. The image of a pin formed by diverging lens of focal length 12cm is 6cm from the lens. Find the distance of the pin from the lens.

 A. 8cm.

 B. 2cm.

 C. 4cm.

 D. 9cm.

The correct answer is option [C].

1/f = 1/u + 1/ [−v] = 1/u − 1/v

v is minus because the image is divergent.

Therefore, 1/u = 1/f + 1/v = 1/12 + 1/6 = 3/12

3u = 12, u = 12/3 = 4cm.

18. How far should an object be positioned from a converging lens of focal length 10.2m to obtain a magnification of 2.5?

 A. 0.50m.

 B. 0.25m.

 C. 0.13m.

 D. 0.28m.

The correct answer is option [D].

Hint: Use the mirror/lens formular.

19. The focal length of a converging lens is 6cm. If it is used as a magnifying glass by a man whose near point is 36cm, calculate the magnification given by the lens.

  A. 1.286.

  B. 128.4.

  C. 185.56.

  D. 259.18.

The correct answer is option [D].

$1/f = 1/u + 1/v$

$1/u = 1/6 – 1/36 = [36 – 6]/216 = 30/216 = 0.1389,$

Therefore, the magnification, $m = v/u = 36/0.1389$

20. An object is placed 30cm from a lens if an image is formed on a screen 250cm away from the lens, calculate the magnification.

  A. 9.4.

  B. 8.33.

  C. 21.1.

  D. 18.4.

The correct answer is option [B].

Hint: using the equation $m = v/u = 250/30 = 8.33$

21. A convex lens of focal length 15cm is used to obtain a real image magnified 3/2. What is the distance of the image from the lens?

 A. 13.19cm.

 B. 37.5cm.

 C. 40.1cm.

 D. 28.1cm.

The correct answer is option [B].

$1/f = 1/2x + 1/3x = 5/6x$

Therefore, $x = [5 × 15]/6 = 12.5cm$. Then $v = 3 × 12.5 = 37.5cm$.

22. An object placed on the principal axes of a convex lens of focal length 10cm produces a real image of double magnification. The image distance from the lens is _____

 A. 30cm

 B. 25cm

 C. 20cm

 D. 15cm

The correct answer is option [A].

$1/v + 1/u = 1/f$

$1 + m = v/f$

$1 + 2 = v/10$

$v = 30cm$

TOPIC: LIGHT WAVES

DIRECTION: Choose the correct answer from the lettered options.

1. An astronomical telescope, having an objective of focal length 100cm and an eyepiece of focal length 10cm, is used in normal adjustment. Find the separation of the lenses.

 A. 0.10m

 B. 0.90m

 C. 1.10m

 D. 1.80m

The correct answer is option [C].

For the telescope in normal adjustment, the separation of the is

$f_1 + f_2 = 100 + 10 = 110cm = 1.10m$

2. In the diagram drawn, which of the angles θ_1, θ_2, θ_3, θ_4 is the angle of deviation of a ray of light passing through the glass prism XYZ?

 A. θ_3

 B. θ_2

 C. θ_1

 D. θ_4

The correct answer is option [A].

3. An object of height 4cm is placed in front of a cuboid pinhole camera of size 6cm. If the image formed is 2cm high, how far is the object from the pinhole?

 A. 3.0cm

 B. 8.0cm

 C. 12.0cm

 D. 16.0cm

The correct answer is option [C].

Using the formula:

Magnification (m) = image distance/object distance = image height/object height

4. When a plane mirror at which a ray is incident is rotated through an angle q, the reflected ray will be rotated through _____.

 A. $1/2\ \theta$

 B. θ

 C. $2\ \theta$

 D. $3\ \theta$

The correct answer is option [C].

5. Find the angle of minimum deviation for a ray which is refracted through an equiangular prism of refractive index 1.4.

 A. 99°

 B. 90°

 C. 60°

 D. 29°

The correct answer is option [D].

n = 1.4

A = 60°

n = sin (A + Dmin/2)/sin (A/2)

1.4 = sin (60 + Dmin/2)/ sin (60/2)

1.4 = sin (6O + Dmin/2)/sin (3O)

1.4 = sin (6O + Dmin/6.5)

1.4 = sin (6O + Dmin/2) = 1.4 x 0.5 = 0.7

6O + Dmin/2 = sin $^{-1}$(0.7)

6O + Dmin = 2 x 44.4 = 88.8

: .Dmin = 88.8° – 6O° = 28.8° ≈ 29°

6. Which of the following does not distinguish between regular and diffuse reflection of light?

 A. Light beams are reflected in both smooth and rough reflecting surfaces

 B. Light beams are reflected at different directions from the surface due to different angles of incident rays

 C. Light beams are reflected in the same direction and so remain parallel

 D. Light beams are reflected at different directions and so remain parallel

The correct answer is option [D].

7. A lens that is thinner at the middle and thicker at the edge is a _____.

 A. diverging lens

 B. converging lens

 C. Plano–convex lens

 D. converging lens meniscus

The correct answer is option [A].

8. Satellite communication network makes use of _____.

 A. sound wave

 B. micro

C. visible light

D. infra-red rays

The correct answer is option [B].

9. The following is necessary for the production of interference with two wave trains EXCEPT _____.

A. they must have the same wavelength

B. they must have the same amplitude

C. they must have the same frequency

D. they must travel at a speed of light

The correct answer is option [D].

10. Which of the following statement is not correct about long sight?

A. A long-sighted person can see distant objects clearly

B. Light from a nearby object is focused behind the retina

C. The eyeball is too short

D. The defect is corrected by using a diverging lens.

The correct answer is option [C].

11. A magnifying glass of focal length 8.0cm gives 5 times enlarged image of an object. Determine the size of the object.

A. 1.0cm

B. 3.2cm

C. 9.6cm

D. 8.0cm

The correct answer is option [C].

12. The objective and the eyepiece of an astronomical telescope have focal lengths of 60cm and 10cm respectively. Find the distance between the lenses, if the object and final image are both at infinity.

A. 20cm

B. 70cm

C. 40cm

D. 50cm

The correct answer is option [B].

13. In the microscope, the eyepiece lens merely acts as _____.

A. an inverter

B. a refiner

C. a diminisher

D. a magnifier

The correct answer is option [D].

14. A ray of light is incident on a plane mirror such that the angle of reflection is 25o. What is the angle of deviation of the ray after reflection from the mirror?

 A. 25°

 B. 50°

 C. 65°

 D. 130°

The correct answer is option [D].

Hints: Angle of deviation = 2α

Where α = 90 – I

15. The basic difference between sound wave and light wave is that _____.

 A. both are not electromagnetic

 B. sound wave is heard while light wave is not heard

 C. are longitudinal while are transverse

 D. could be echoed while cannot

The correct answer is option [C].

16. An object 4cm high is at right angles to the principal axis of a diverging lens of focal length 20cm, and 30cm from it. Determine the position of the image and its size.

 A. 60cm, 4cm.

 B. 60cm, 8cm.

 C. 8cm, 30cm.

 D. 60cm, 6cm.

The correct answer is option [B].

Hint: Use the equation $1/f = 1/v + 1/u$, where u = 30cm, f = 20cm and v =? Therefore, $1/20 = 1/30 + 1/v$, $1/v = 1/20 – 1/30$, $1/v = [3 – 2]/60 = 1/60$. Then, v = 60cm. The size of the image is image distance/object distance = image size/object size, where image distance = 60cm, object distance = 30cm, image size =? and object size =

4cm. Therefore, image size = [image distance x object size]/object distance = [60 x 4]/30 = 2 x 4 = 8cm.

17. When an object is placed at the principal focus of a concave mirror, the location of the image formed is _____.

 A. beyond principal focus

 B. between principal focus and center of curvature

 C. at infinity

 D. at center of curvature

The correct answer is option [C].

18. A blue object viewed in yellow light appears to be _____.

 A. black

 B. green

 C. orange

 D. red

The correct answer is option [B].

19. When white light passes through a triangular glass prism, there is dispersion because of _____.

 A. diffraction of light

 B. polarization of light

 C. the difference in speed of the components of light

 D. the interference of in glass

The correct answer is option [C].

20. A lantern gives an image 3m square of a slide 7.62cm square on a screen. If the screen is 10m from the projection lens, calculate the focal length of the lens.

A. 40.3cm

B. 26.1cm

C. 0.7cm

D. 0.3cm

The correct answer is option [D].

M = image size/object size = 30000cm sq./7.62cm sq. = 3937

v = 10m

V/f = 1 + M

=> f = v/ (1 + M) = 10/ (1 + 3937) = 2.539 x 10-3m

f = 0.3cm

21. A thin converging lens has a power of 4.0 diopter. Determine its focal length.

A. 0.03m

B. 0.25m

C. 2.50m

D. 5.00m

The correct answer is option [B].

P = 1/f = 1/4 = 0.25Diopter

22. The objective and the eyepiece of an astronomical telescope have focal lengths of 60cm and 10cm respectively. Find the distance between the lenses, if the object is at infinity and final image is formed 40cm from the eyepiece.

A. 100cm

B. 70cm

C. 90cm

D. 40cm

The correct answer is option [A].

23. The phenomenon of producing transverse vibration which are only in one plane is called _____.

A. plane-polarization

B. polarization

C. mechanical analogue of light

D. Polaroid polarization

The correct answer is option [B].

24. A lens of focal length 12.0cm forms an upright image four times the size of an object, the image distance is _____.

A. 60cm

B. 48cm

C. 16cm

D. 15cm

The correct answer is option [D].

Using the equation:

$1/f = 1/v + 1/u$

Where $v = 4u$.

25. The sharpness of the boundary of the shadow of an object is determined by the _____.

 A. nature of the object

 B. opacity of the object

 C. intensity of light striking the object

 D. rays of light passing through the object

The correct answer is option [C].

26. The focal lengths of the objective lens and the eye piece of an astronomical telescope are 40cm and 2.3cm respectively. What is the distance between the when it is at normal adjustment?

 A. 17.4cm

 B. 37.7cm

 C. 42.3cm

 D. 44.6cm

The correct answer is option [C].

Using the equation:

Distance between the = f_o + f_e

Where f_o = focal length of objective lens, f_e = focal length of eye piece.

27. The number of times an image is bigger than an object is called _____.

 A. magnification of a lens

 B. magnification of a mirror

 C. magnification of an object

 D. magnification

The correct answer is option [B].

28. Which of the following is true of light and sound waves?

A. they both transmit energy

B. they both need a medium for propagation

C. they are both transverse

D. their velocities in air are equal

The correct answer is option [A].

29. If the speed of light in air is 3 x 108m/s. What is the frequency of yellow light of wavelength 6 x 10-7m in air?

A. 6 x 10-6Hz.

B. 8 x 10-14Hz.

C. 5 x 1014Hz.

D. 4 x 10-6Hz.

The correct answer is option [C].

Hint: Use the equation $f = c/\lambda = 3 \times 108/6 \times 10-7 = 5 \times 1014$Hz.

30. An object is placed 20cm from a lens. If an image is formed on a screen 260cm away from the lens, calculate the magnification of the image.

A. 28

B. 26

C. 24

D. 13

The correct answer is option [D].

m = image height/object height = image distance/object distance

m = 260/20 = 13

TOPIC: MACHINE

DIRECTION: Choose the correct answer from the lettered options.

1. Find the velocity ratio of a screw jack of pitch 0.3cm if the length of the tommy bar is 21cm.

  A. (1/140) p

  B. 14p

  C. 70p

  D. 140p

The correct answer is option [D].

V.R = 2pa/P where a = 21cm and P = 0.3cm.

Hence V.R = 2(21) p/0.3 = 140p

2. A block and tackle with a velocity ratio of 5 is used to raise a mass of 20kg through a vertical distance of 50cm at a steady rate. If the effort is equal to 50N, determine the distance moved by the effort and the work done by the effort in lifting the load.

  A. 240cm, 12560J.

  B. 200cm, 12400J.

  C. 250cm, 12500J.

  D. 250cm, 12000J.

The correct answer is option [C].

Hint: Using the equation V.R. = distance moved by effort/distance moved by load. The velocity ratio, V.R. = 5, distance moved by load = 50cm, and distance moved by the effort =?

Therefore, distance moved by the effort = V.R.x distance moved by the load = 5 x 50cm = 250cm.

The work done by the effort = Force x distance moved by the effort = 50N x 250cm = 12500J.

3. Efficiency of a is always less than one because

I. work is done in moving the parts of the machine

II. of friction in the moving part of machine

III. The effort applied is always less than the load being overcome.

Which of the statements above is/are correct?

A. I only

B. II only

C. III only

D. I and II only

The correct answer is option [D].

4. Mechanical advantage depends on all EXCEPT _____.

A. quality of the construction of the

B. friction Force

C. the geometry of the moving parts

D. load the is to carry

The correct answer is option [C].

Use the information to answer the question.

5. An axle and wheel system lifts a man of 700N by an effort of 200N. If the radii of the wheel and axle are 400mm and 100mm respectively. Obtain the velocity ratio of the system.

A. 4.

B. 2.

C. 3.5.

D. 3.

The correct answer is option [A].

Hint: V.R. = 400/100 = 4.

Use the information to answer the question.

6. A system of hydraulic press was used to lift a load of 20N across a distance of 2m. If the area of the large piston is 5m2 while that of the small piston is 2m2. Find the velocity ratio, V.R. of the system.

A. 2.5.

B. 3.

C. 4.

D. 3.5.

The correct answer is option [A].

Hint: V.R. = A2/A1 or V.R. = x/y.

7. An inclined plane is 6m long if the higher end is 2m above the ground. If the efficiency of the inclined plane used is 60%, the mechanical advantage of the machine is _____.

A. 2.5.

B. 1.8.

C. 2.3.

D. 5.

The correct answer is option [B].

8. Which of the following is not an example of a machine?

A. Pulley.

B. Inclined plane.

C. Horizontal plane.

D. Screw.

The correct answer is option [C].

9. Calculate the force parallel to the plane that is required to just push a load of 130N. If the plane is inclined at an angle of 30o with efficiency of 60%.

 A. 132.54N.

 B. 62.532N.

 C. 122.14N.

 D. 548.24N.

The correct answer is option [A].

Hint: Use the equation m = F/R = [mgsinθ]/ [mgcosθ] = [130sin30°]/ [130cos30°] but m = 60/100 = 0.6, then frictional force, F = mR = 130cos30° x 0.6 = 67.54N. Weight up the plane = mgsinθ = 130sin30° = 65N. Force parallel to the plane required to just push up the load = 67.54 + 65 = 132.54N.

 Use the information to answer the question.

10. A with velocity ratio 5 needs 1000J of work to raise a weight of 500N via a vertical distance of 1.5m, the machine's efficiency is _____.

 A. 25%

 B. 75%

 C. 70%

 D. 85%

The correct answer is option [B].

Hint: Efficiency = [Work output/Work Input] × 100%,

Where work output = 500N × 1.5m = 750J, work input = 1000J.

11. A pair of laboratory tongs is a good example of _____ order of lever.

 A. 1st

 B. 2nd

 C. 3rd

 D. 4th

The correct answer is option [C].

 Use the information to answer the question.

12. A system of hydraulic press was used to lift a load of 20N across a distance of 2m. If the area of the large piston is 5m2 while that of the small piston is 2m2, the distance moved by effort is _____.

 A. 1.25.

 B. 0.80.

 C. 1.20.

 D. 5.00m.

The correct answer is option [D].

Hint: $x/y = A_2/A_1$, where x = distance moved by effort, y = distance moved by load, A_1 = area of small piston, A_2 = area of large piston.

13. A screw jack has a pitch 0.5cm, with the handle turning through a circle of 50cm radius. Obtain the mechanical advantage M.A. given that the efficiency of the machine is 25%.

 A. 25π.

 B. 50 π.

 C. 50.

 D. 65 π.

The correct answer is option [B].

Use the information to answer the question.

14. A with velocity ratio 5 needs 1000J of work to raise a weight of 500N via a vertical distance of 1.5m. What is the mechanical advantage of the machine?

A. 2.55.

B. 3.75.

C. 7.35.

D. 4.35.

The correct answer is option [B].

Hint: Efficiency = [Mechanical Advantage/Velocity Ratio] × 100%.

Use the information to answer the question.

15. A system of consist of 5 pulleys and is used to raise a load of 400N through a height of 10m. If the work done against friction is 1000J, the work done by effort is _____.

A. 1KJ

B. 5KJ

C. 3KJ

D. 2KJ

The correct answer is option [B].

Hint: Work done by effort = Work done in raising the load + work done against friction.

Use the information to answer the question.

16. An axle and wheel system lifts a man of 700N by an effort of 200N. If the radii of the wheel and axle are 400mm and 100mm respectively. Determine the mechanical advantage.

A. 3.5.

B. 3.

C. 4.

D. 2.

The correct answer is option [A].

Hint: M.A. = Load/Effort = 700/200 = 3.5.

17. What effort is needed to raise a load of 84.0N of a block system of five pulleys that have an efficiency of 70%?

A. 24.0N.

B. 60.0N.

C. 0.24N.

D. 58.8N.

The correct answer is option [A].

Hint: Use the relation Efficiency = [Mechanical Advantage/Velocity Ratio] × 100%.

18. An inclined plane has a mechanical advantage [M.A.] which depends on _____.

A. its height

B. its length

C. the point of the plank with the ground

D. the ratio of the length to the height

The correct answer is option [D].

19. A screw jack has a pitch 0.5cm, with the handle turning through a circle of 50cm radius, the velocity ratio of the is _____.

 A. 100π

 B. 20 π

 C. 10.50 π

 D. 200 π

The correct answer is option [D].

Hint: V.R. = 2 π a/p, a = radius, p = pitch.

20. The efficiency of the pulley system shown is 80%. Find the effort E required to lift a load of 1200N.

 A. 275N

 B. 325N

 C. 375N

 D. 575N

The correct answer is option [C].

e = MA/VR x 100/1

VR = 4, which is the no of pulley.

80 = 1200/E/4 x 100/1

320 = 1200 x 100/E

E = 1200 x 100/320 = 375N

Use the information to answer the question.

21. A system of consist of 5 pulleys and is used to raise a load of 400N through a height of 10m. If the work done against friction is 1000J, what is the value of the effort applied?

A. 50N.

B. 100N.

C. 150N.

D. 170N.

The correct answer is option [B].

Hint: Use the relation M.A. = L/E, where L = load, E = effort.

22. The fore arm of a human body is an example of _____ order lever.

A. 1st

B. 2nd

C. 3rd

D. only B and C

The correct answer is option [C].

23. In an ideal wheel and axle system, R stands for the radius of wheel and r is the radius of the axle. The mechanical advantage is _____.

A. r/R

B. R/r

C. $(R/r)^2$

D. $(r/R)^2$

The correct answer is option [B].

24. A is said to be a third class lever when the _____.

A. load is between the fulcrum and effort

B. fulcrum is between the effort and load

C. effort is between the fulcrum and load

D. fulcrum is directly below the load

The correct answer is option [C].

[Take g = 10ms-2]

25. A 20Kg mass is to be pulled up a slope inclined at 30o to the horizontal. If the efficiency of the plane is 75 %(0.75). The force required to pull the load up the plane is _____.

 A. 13.3N

 B. 73.5N

 C. 133.3N

 D. 533.2N

The correct answer is option [C].

For an inclined plane, V.R = 1/sinq = 1/sin30o = 2

But Eff = M.A/V.R => M.A = eff x V.R = 0.75 x 2 = 1.5

Also M.A = L/E thus E = L/M.A, but L = 20Kg = 200N

Therefore E = 200/1.5 = 133.3N

26. Mechanical advantage equals velocity ratio in any when _____.

 A. effort = load

 B. efficiency = 0

 C. velocity ratio = 1

 D. friction in the = 0

The correct answer is option [D].

Use the information to answer the question.

27. An axle and wheel system lifts a man of 700N by an effort of 200N. If the radii of the wheel and axle are 400mm and 100mm respectively. If 15% is reduced from the true efficiency. What result is obtained?

A. 85.7%.

B. 87.5%.

C. 72.5%.

D. 71.5%.

The correct answer is option [C].

Hint: Efficiency = [M.A. /V.R.] × 100% – 15%.

28. _____ is not an example of a first order lever.

A. Claw hammer

B. Crow bar

C. Pliers

D. Nutcrackers

The correct answer is option [D].

Hint: Nutcracker is an example of a second order lever and not first order lever which have the fulcrum between load and effort.

29. A good should have _____.

A. friction reduction

B. heat regulator

C. non-heat reducers

D. all of the above

The correct answer is option [C].

30. A screw jack has a pitch 0.5cm, with the handle turning through a circle of 50cm radius. How will you rate such machine?

 A. Below average.

 B. Average.

 C. Above average.

 D. A little above average.

The correct answer is option [A].

Hint: Since efficiency is 25% the machine is below average.

 Use the information to answer the question.

31. A with velocity ratio 5 needs 1000J of work to raise a weight of 500N via a vertical distance of 1.5m. What is the effort needed to be applied?

 A. 200N.

 B. 130.0N.

 C. 133.33N.

 D. 76N.

The correct answer is option [C].

Hint: Mechanical Advantage = Load/Effort.

32. If the velocity ratio of a machine is 2, what does this mean?

 A. The effort and load are not the same.

 B. The distance moved by effort is two times the distance moved by load.

 C. The distance moved by load is two times the distance moved by effort.

 D. Effort is two times greater than the load.

The correct answer is option [B].

Use the information to answer the question.

33. A system of hydraulic press was used to lift a load of 20N across a distance of 2m. If the area of the large piston is 5m^2 while that of the small piston is 2m^2. Obtain the mechanical advantage of the system.

 A. 3.

 B. 2.5.

 C. 4.

 D. 3.5.

The correct answer is option [B].

Hint: In this case V.R. = M.A.

34. Determine the velocity ratio of a screw jack with pitch 0.5cm if the handle turns through a circle of diameter 20cm.

 A. 4π.

 B. 0.8 π.

 C. 1.6 π.

 D. 2 π.

The correct answer is option [B].

Hint: V.R. = 2 π a/p, and a = diameter/2.

35. An inclined plane is 6m long if the higher end is 2m above the ground. What is its velocity ratio?

 A. 3.

 B. 2.

 C. 5/2.

 D. 5.

The correct answer is option [A].

Hint: V.R. of an inclined plane = 1/sin θ

Where sin θ = Opp. /Hypotenuse = 2/6 = 0.333333333333

Therefore, V.R. = 1/0.33333333333 = 3.

Use the information to answer the question.

36. A system of hydraulic press was used to lift a load of 20N across a distance of 20cm. If the area of the large piston is 5m2 while that of the small piston is 2m2, excluding the lever, the efficiency of the press is _____.

[Given M.A. = 3]

 A. 60.0%

 B. 26.6%

 C. 37.6%

 D. 30.0%

The correct answer is option [A].

Hint: Efficiency = [work output × 100]/work input

Where work output = 20 x 0, 2 = 4J, and work input = 6.66J. Therefore, efficiency = [4 × 100]/6.66 = 60%.

Use the information to answer the question.

37. A system of consist of 5 pulleys and is used to raise a load of 400N through a height of 10m. If the work done against friction is 1000J. Find the mechanical advantage of the machine.

 A. 2.

 B. 3.

 C. 4.

 D. 5.

The correct answer is option [C].

Hint: Efficiency = [Mechanical advantage/Velocity ratio] × 100%. Therefore, M.A. = V.R. × Efficiency.

38. A whose efficiency is 60% has a velocity ratio of 5. If a force of 500N is applied to lift a load P, what is the magnitude of P?

 A. 500N

 B. 750N

 C. 1500N

 D. 166N

The correct answer is option [C].

n = 60% = 0.6, V.R. = 5

F = 500N, P =?

n = M.A. /V.R.

0.6 = P/500/5 = P/500 x 5

0.6 = P/2500

P = 2500 x 0.6 = 1500N

39. The mechanical advantage of a machine is 4. This means that

 A. the effort is four less than the load.

 B. the load is four greater than the effort.

 C. the effort is four times the load.

 D. the load is four times the effort.

The correct answer is option [D].

40. If an 80% efficiency has velocity ratio of 5. What effort would be required to raise a load of 200N with the aid of this machine?

 A. 250N.

 B. 500N.

 C. 1000N.

 D. 450N.

The correct answer is option [B].

Hint: Efficiency = [Mechanical advantage/Velocity ratio] × 100%,

Where velocity ratio = 5, mechanical advantage =? Efficiency = 80%.

Therefore, mechanical advantage = load/effort.

41. The velocity ratio of any set of pulley system is _____.

 A. the number of extension per load

 B. the number of the ratio of the distance travelled by load to effort

 C. is the number of the combined set of pulleys

 D. the ratio of the load to effort

The correct answer is option [C].

 Use the information to answer the question.

42. A system of consist of 5 pulleys and is used to raise a load of 400N through a height of 10m. If the work done against friction is 1000J. What is the efficiency of the system?

 A. 75%.

 B. 65%.

 C. 80%.

 D. 85%.

The correct answer is option [C].

Hint: Efficiency = [work output/work input] × 100%, where work output = work done in raising the load, work input = work done by effort.

43. Calculate the inclination to the horizontal when the velocity ratio is 5:1.

 A. $\tan\theta = 1/5$.

 B. $\cot\theta = 5$.

 C. $\sin\theta = 1/5$.

 D. $\cos\theta = 1/5$.

The correct answer is option [C].

Hint: V.R. $= 1/\sin\theta$.

44. If a heavy barrel is rolled up a plane inclined at 30° to the horizontal, its velocity ratio will be _____.

 A. 3.0

 B. 3.1

 C. 3.2

 D. 2.0

The correct answer is option [D].

Velocity ratio $= 1/\sin\theta = 1/\sin 30^{\circ}$

Sin $30^{\circ} = 1/1/2 = 2.0$

$(g = 10ms{-2})$

45. A 20Kg mass is to be pulled up a slope inclined at 30° to the horizontal. If the efficiency of the plane is 75%, the force required to pull the load up the plane is _____.

 A. 13.3N

 B. 73.5N

 C. 133.3N

 D. 533.2N

The correct answer is option [C]

V.R $= 1/\sin q = 1/\sin 30^{\circ} = 2$

L = 200N, e = 0.75

Efficiency e = MA/V.R = L/ (e x V.R)

F = L/ (Efficiency x V.R)

F = 2OO/ (O.75 x 2) = 133.3N

There is a tendency for confusion to set in when handling inclined planes. However, to distinguish between the inclined planes in machines and in friction, efficiency will be given or demanded for in machines and coefficient of friction, for friction related problems.

TOPIC: MOMENT, EQUILIBRIUM AND CENTRE OF GRAVITY

DIRECTION: Choose the correct answer from the lettered options.

1. _____ is a neutral equilibrium.

 A. A heavy weight table lamp

 B. A heavy weight suspended on a string

 C. A cone resting on its slant edge

 D. The beam of a balance in use

The correct answer is option [B].

2. Which of the following is not an example of a couple system?

 A. Corkscrew.

 B. Turning a water tap.

 C. Only B is correct.

 D. Both A and B are correct.

The correct answer is option [C].

Hint: Options B is correct.

3. An example of a neutral equilibrium body is _____.

 A. a cone resting on its slant height

 B. a ball or orange rolling on a horizontal plane

 C. a flying but unbalance insect

 D. none of the above

The correct answer is option [B].

 [g = 10ms–2]

4. A uniform rod PQ of length 1m and mass 2kg is pivoted at the end P. If a load of 14N is placed at the center of the rod, find the force that should be applied vertically upwards at Q to maintain the rod in equilibrium horizontally.

A. 68N

B. 28N

C. 17N

D. 7N

The correct answer is option [C]
Taking moments about

point P,
we have (20 +14)(0.5) = F
hence, F = 34 x 0.5 = 17 N
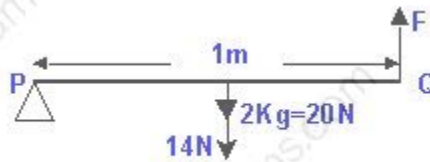
5. The value of T in the diagram drawn is _____.

A. 10.0N

B. 11.8N

C. 20.0N

D. 40.0N

The correct answer is option [C].

From the figure, resolving vertically, we have

Tcos60o + Tcos60o = 20N,

=> 0.5T + 0.5T = 20N,

Thus T = 20N

Use the information to answer the question.

6. A body 3kg is suspended by an inextensible thread from a nail O and is pulled by a horizontal force F, until the angle of inclination of the thread to the vertical is 30o

[Take g = 10m/s^2, tan 30o = √3/3, cos 30° = √3/2].

The equation for the vertical equilibrium in fig. [n]. Find the value of the force, F.

fig.[n]
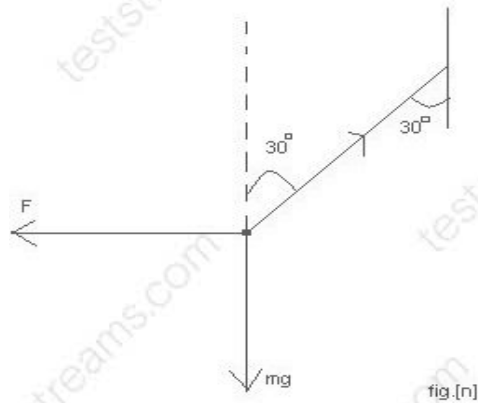
A. 3√10N.

B. √3N.

C. 10√3N.

D. 3√10N.

The correct answer is option [C].

Hint: F = mgtan30o.

7. The stability of certain materials are guaranteed when the materials are constructed in such a way that they have _____.

A. low center of gravity and wide base

B. high center of gravity and small base

C. big base and medium center of gravity

D. maximum center of gravity and medium base

The correct answer is option [A].

8. A force of 10N and that of 12N act at 60o to each other. What is the resultant force?

A. 14.2N2O°.

B. 19.O8N27°.

C. 28.62N32°.

D. 17.6N3O°.

The correct answer is option [B].

From Δ DCE, since 60° = EC/DC = EC/10, EC = 10sin60° = 8.66N

cos60o = DE/DC = DE/10, DE = 10cos60° = 5N.

Then, AE = AD + DE = [12 + 5] N = 17N but AC = √AE^2 + EC^2 = √172 + 8.662 = 19.O8N.

Considering Δ CAE, tan A = EC/AE = 8.66/17 = 0.5094 <A = 27°.

9. A uniform meter rule weighing 0.5N is to be pivoted on a knife-edge at the 30cm mark. Where will a force of 2N be placed from the knife-edge to balance the meter rule?

A. 95.Ocm

B. 25.Ocm

C. 2O.Ocm

D. 5.Ocm

The correct answer is option [D].

taking moments about the pivot, we have 2(x) = 20 x 0.5

∴ x = $\frac{10}{2}$ = 5 cm

10. A handbag containing some load weighing 162N is carried by two students each holding the handle of the bag next to him. If each handle is pulled at 60o to the vertical, find the force on each student's arm.

A. 324N

B. 162N

C. 121N

D. 81N

The correct answer is option [B].
$T_1 = T_2$
Resolving vertically, $2T\cos60° = 162N$
$\therefore T\cos60° = 81N \Rightarrow T = \dfrac{81}{\cos60^0} = 162N$
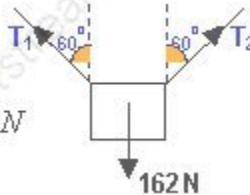
162 N

11. The diagram shows a solid figure with base PQ and center of gravity G on an inclined plane. Which of the following statements is correct?
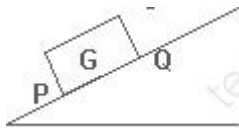
A. The solid will fall over if the vertical line through G lies outside the base.

B. The solid will fall over if the vertical line through G lies inside the base.

C. The solid will not fall over if the vertical line through G lies outside the base.

D. The solid will never fall.

The correct answer is option [A].

12. If a man weighing 80kgf sits 2.6m from the fulcrum of a sea saw. Where should a man weighing 70kgf sit to balance the sea saw? Take acceleration due to gravity g = 10m/s2?

A. 2.97m.

B. 3.12m.

C. 11.2m.

D. 6.86m.

The correct answer is option [A].

Hint: Use the equation F = ma = 80 x 10 = 800N

70kgf = 700N. From principle of moments 800 x 2.6 = 700 x a,

Therefore, a = [800 x 2.6]/700 = 2.97m.

13. A uniform meter rule scale is balanced horizontally across a knife edge at the 20cm mark with a 300g mass hung by cotton from the 11cm mark. Calculate the mass of the meter rule.

A. 0.09kg.

B. 0.05kg.

C. 0.04kg.

D. 0.02kg.

The correct answer is option [A].

Hint: Using the equation of moment = Force x perpendicular distance from the point of force.

14. Consider the system of equilibrium shown in fig. [mc] and obtain the value of y.

Fig. [mc]
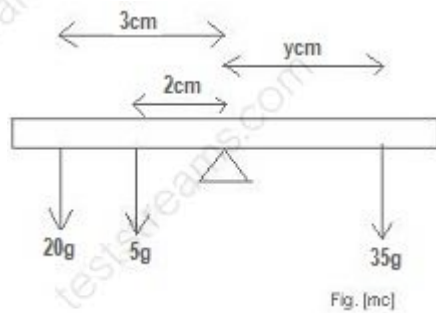
A. 4cm.

B. 3cm.

C. 2cm.

D. 1.5cm.

The correct answer is option [C].

Hint: Clockwise moment = 35 × y = 35ycm and anti – clockwise moment = [3 × 20] + [2 × 5] = 70cmg i.e. CW = ACW → y = 2cm.

   Use the information to answer the question.

15. A body 3kg is suspended by an inextensible thread from a nail O and is pulled by a horizontal force F, until the angle of inclination of the thread to the vertical is 30° [Take g = 10m/s^2, tan 30° = √3/3, cos 30° = √3/2].

The equation for the vertical equilibrium in fig. [n] Is

fig.[n]

A. Tsin30° = F.

B. Tcos30° = mg.

C. Ttan30° = mg.
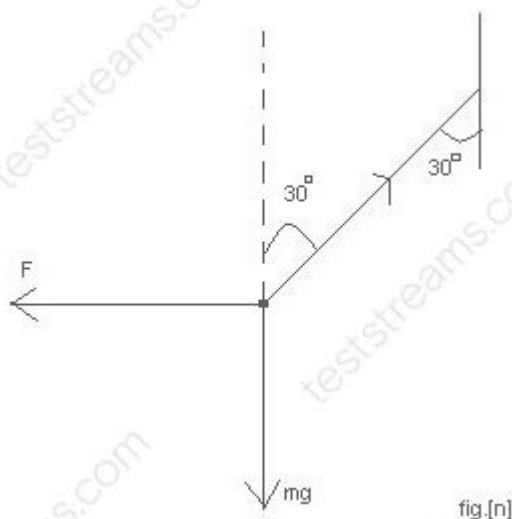
D. Ttan30° = F.

The correct answer is option [B].

Use the information to answer the question.

16. The diagram drawn shows three forces at equilibrium at point O.

Find the value of Q.

A. 10√3N.

B. 20√3N.

C. 40N.

D. 20N.

The correct answer is option [D].

Hint: Q = Rsin60°.

17. The value of F in the figure drawn when in equilibrium is _____.

A. 27N

B. 2ON

C. 12N

D. 1ON
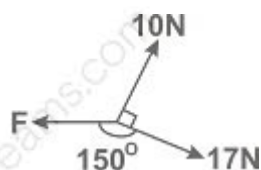
The correct answer is option [B].

$10/\sin150^o = F/\sin90^o$

$10/\sin30^o = F$

$\therefore F = 10/0.5 = 2ON$

18. In the diagram drawn, which of the system is said to be stable?

[i]   [ii]   [iii]
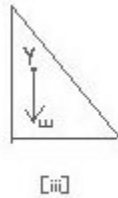
A. iii only.

B. iii and ii only.

C. ii and iii only.

D. i only.

The correct answer is option [D].

Note: A necessary condition for stability is that the center of gravity is at its lowest position.

19. Two forces act on a 2Okg mass both from opposite direction. Find the acceleration of the body if the forces are 1ON and 6N.

A. $1/2m/s^2$.

B. $1/5m/s^2$.

C. $1/10m/s^2$.

D. $5m/s^2$.

The correct answer is option [B].

Hint: Find the difference in the force and then use the equation F = ma.

Use the information to answer the question.

20. A body 3kg is suspended by an inextensible thread from a nail O and is pulled by a horizontal force F, until the angle of inclination of the thread to the vertical is 30° [Take g = $10m/s^2$, tan 30° = √3/3, cos 30° = √3/2].

The equation for the vertical equilibrium in fig. [n]. Find the tension T in the thread.

fig.[n]
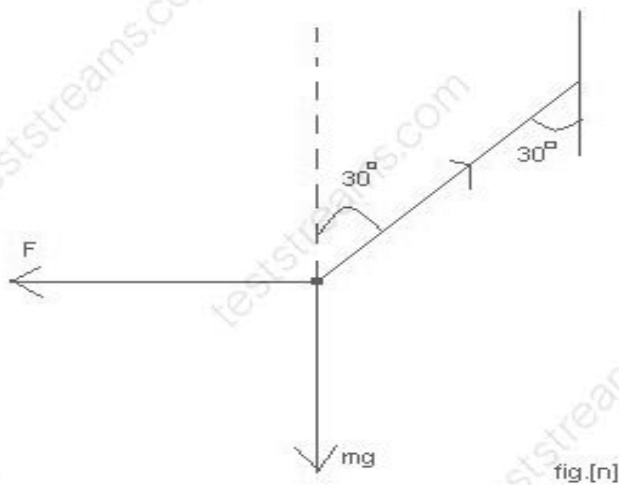
A. 20√3N.

B. 20√2N.

C. 20√6N.

D. 20√5N.

The correct answer is option [A].

Hint: Tension, T = mg/cos30°.

21. Which of the following condition(s) will increase the stability of a body?

I. High center of gravity

II. Low center of gravity

III. Wide base

A. I only

B. II only

C. III only

D. II and III only

The correct answer is option [D].

22. The moment of the force about B in the diagram drawn is _____.
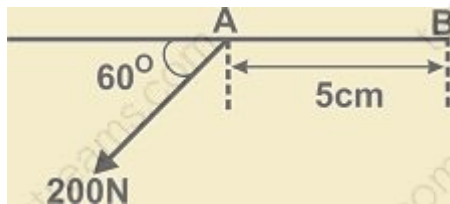
A. 5.00Nm

B. 8.66Nm

C. 10.00Nm

D. 86.60Nm

The correct answer is option [B].

Using the equation:

$200 × \cos 30° × 0.05 = 8.66Nm$

23. An example of a neutral equilibrium body is _____.

A. a cone resting on its slant height

B. a ball or orange rolling on a horizontal plane

C. a flying but unbalance insect

D. none of the above

The correct answer is option [B].

24. A uniform light rod is kept in horizontal equilibrium under the influence of four forces as shown, which of the following equations correctly represents the condition of equilibrium for the rod?
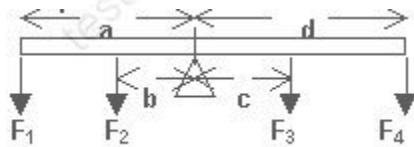
A. $F_1 + F_2 = F_3 + F_4$

B. $F_1 + F_2 - F_3 + F_4 = 0$

C. $(F_1 + F_2)\ ab = (F_3 + F_4)\ cd$

D. $F_1a + F_2b - F_3c - F_4d = 0$

The correct answer is option [D].

From the diagram, taking moments from the pivot gives

$F_1a + F_2b\ F3c\ F4d = 0$

25. The diagram shows a uniform wood of weight 200N and length 50m. It is pivoted at one end and suspended by a cord at the other end at angle of 30o to the wood, the tension in the cord if the wood is horizontal is _____.
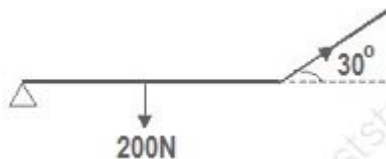
A. 10N

B. 20N

C. 100N

D. 200N

The correct answer is option [D].

Resolving the tension in the cord vertically, we have

Tv = Tsin30o = T/2. Taking moments about the fulcrum, we have (200 x 25) = ½T x 50

=> T = (200 x 25 x 2)/50 = 200N

Use the information to answer the question.

26. The diagram drawn shows three forces at equilibrium at point O. What is the value of R?
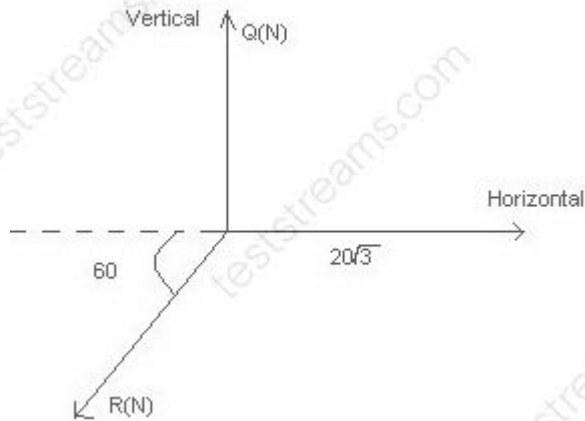
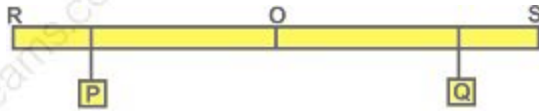A. 20√3N.

B. 30√2N.

C. 40N.

D. 35√3N.

The correct answer is option [C].

Hint: Rcos60° = 20√3N.

27. The diagram drawn shows a plank RS pivoted at its center of gravity O and is in equilibrium with the weights P and Q. If a weight 2P is added to P, the plank will be in equilibrium again by

A. moving Q nearer to P

B. moving P nearer to O

C. adding a weight Q to Q

D. moving P further away from O

The correct answer is option [D].

28. Two bodies have masses in the ratio of 3:1. They experience forces which is impart to their accelerations in the ration of 2:9 respectively. Find the ratio of the forces experienced by the masses.

A. 1:4

B. 2:1

C. 2:3

D. 2:5

The correct answer is option [C].

$m_1: m_2 = 3: 1$ and $a_1: a_2 = 2: 9$

=> $F_1: F_2 = m_1a_1: m2a2 = 3(2): 9(1) = 6: 9 = 2: 3$

29. A meter rule AB is pivoted at its mid-point C. If a load of mass 2kg is hung at a point at which a load of 1.5kg will be hung, to balance the rule horizontally is _____.

A. 10.3cm away from C

B. 15.5cm away from A

C. 20.0cm away from B

D. 26.7cm away from C.

The correct answer is option [D].

30. A 90cm uniform lever has a load of 3ON suspended at 15cm from one of its ends. If the fulcrum is at the center of gravity, the force that must be applied at its other end to keep it in horizontal equilibrium is _____.

A. 6ON
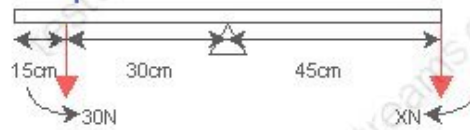
B. 3ON

C. 15N

D. 2ON

The correct answer is option [D].
From the principles of moments of forces, for a body in equilibrium,
Sum of clockwise moments, must be equal to sum of anticlockwise moments.

∴ XN x 45cm = 30N x 30cm

∴ $\Rightarrow X = \dfrac{30 \times 30}{45} = 20N$

31. Which of the following statements about a moving particle is correct?

A. If the resultant force acting on the particle is zero, then it is in dynamic equilibrium.

B. If the result force acting on the particle is greater than zero, then it is moving with a uniform velocity.

C. The rate of change of its momentum with time takes place in a direction opposite to that of its motion.

D. The particle falling freely covers equal distances in equal time intervals.

The correct answer is option [A].

TOPIC: PROPAGATION OF LIGHT

DIRECTION: Choose the correct answer from the lettered options.

1. Calculate the speed of the wave.

 A. 36,000cm/s.

 B. 28,000m/s.

 C. 32,000m/s.

 D. 410,000cm/s

The correct answer is option [A]. $2\pi v/\lambda = 2000\pi$,

Therefore, $v = 2000\pi\lambda/2\pi = 1000 \times 36 = 36000$cm/s.

2. Stationary wave is produced in which of the following?

 A. The prongs of a tuning fork vibration in air.

 B. A vibrating tuning fork held near the end of a resonance tube closed at one end.

 C. A vibration in an aeroplane.

 D. Water wave.

The correct answer is option [A].

 Use the information to answer the question.

3. A wave of amplitude A, angular velocity ω, frequency f, period T, wavelength λ, and displacement y is given by. $y = A\sin \omega t$------- [i].

If the equation of a wave is given by, $y = 5\sin 2O\ pt$----- [ii].

What is the value of frequency ƒ of the wave?

 A. 5p/sec.

 B. 10p/sec.

 C. 10/sec.

 D. 5/sec.

The correct answer is option [C].

Hint: Use the equation $\omega = 2\pi f$. Since $\omega = 20\pi$.

Use the information to answer the question.

4. A wave of amplitude A, angular velocity ω, frequency f, period T, wavelength λ, and displacement y is given by, $y = A\sin \omega t$-------[i].

If the equation of a wave is given by, $y = 5\sin 20 pt$----- [ii].

Find the amplitude A of the wave.

 A. 5m.

 B. 20m.

 C. 4m.

 D. 3m.

The correct answer is option [A].

Hint: Simply compare equations.

5. The size of a pin-hole camera is increased. How will this affect the image produced?

 A. The image is magnified.

 B. The inverted image becomes upright.

 C. The image becomes blurred.

 D. The image size is brighten.

The correct answer is option [C].

Use the information to answer the question.

If a plane progressive wave is represented by the equation Y = Asin [2000pt – px/18] where the symbol have their usual meaning.

6. Calculate the wavelength of the wave.

 A. 36cm.

 B. 20.13cm.

 C. 22cm.

 D. 32.41cm.

The correct answer is option [A].

From Y = Asin [2000πt – (πx)/18] but Y = Asin (2π/λ) [vt – x].

Therefore, 2πv/λ = 2000π and 2π/λ = π/18

λ = [2π x 18]/π = 2 x 18 = 36cm.

7. A longitudinal wave is normally described by _____.

 A. crest and trough

 B. crest and compression

 C. rare fraction and compression

 D. compression and trough

The correct answer is option [C].

8. What happens to rays in parallel beam of light?

 A. They meet at infinity

 B. They converge as they travel

 C. They diverge as they travel

 D. They intersect

The correct answer is option [A].

9. What is the disadvantage of the pin-hole camera when in use?

 A. The object distance is definite and the hole must be small.

 B. The image distance is definite and the hole must be large.

 C. The object distance is definite and the hole must be large.

 D. None of the above.

The correct answer is option [A].

10. The paths of light rays are reversible; this principle is called _____.

 A. principle of reflection

 B. principle of reversibility of light

 C. principle of rays and beams

 D. principle of

The correct answer is option [B].

 Use the information to answer the question.

11. A wave of amplitude A, angular velocity ω, frequency f, period T, wavelength λ, and displacement y is given by, y = Asin ωt-------[i].

If the equation of a wave is given by, y = 5sin2O pt----- [ii].

Find the angular velocity ω of the wave.

 A. 2Orad/sec.

 B. 2Oprad/sec.

 C. 1Oprad/sec.

 D. 1Orad/sec.

The correct answer is option [B].

Hint: ω = 2πf.

Obtain ω from the equation given; ω = 2Oπ

12. Which of the following option is not a property of longitudinal wave?

 A. Reflection.

 B. Diffraction.

 C. Refraction.

 D. Polarization.

The correct answer is option [D]

 Use the information to answer the question.

13. A wave of amplitude A, angular velocity ω, frequency f, period T, wavelength λ, and displacement y is given by, y = Asin ωt-------[i].

If the equation of a wave is given by, y = 5sin2O pt----- [ii].

What is the period of the wave?

 A. O.2secs.

 B. O.1secs.

 C. O.3secs.

 D. O.4secs.

The correct answer is option [B].

14. Which of the following can be propagated through vacuum?

 A. Acoustic wave.

 B. Infra-red wave.

 C. X-ray.

 D. Ultra sonic waves.

The correct answer is option [B].

15. Given the progressive wave equation y = 5 sin (200 πt – 0.4x), calculate the wavelength.

 A. 12.4m

 B. 15.7m

 C. 17.5m

 D. 18.6m

The correct answer is option [B].

Using the formula:

y = A sin (2πt/T – 2πx/λ)

 Use the information to answer the question.

16. A wave of amplitude A, angular velocity ω, frequency ƒ, period T, wavelength λ, and displacement y is given by, y = Asin ωt-------[i].

If the equation of a wave is given by, y = 5sin20 pt----- [ii].

If time t, in the equation [i] and [ii] is 1sec. Find wavelength λ if the wave covers a horizontal distance of 0.5m.

 A. 0.5m.

 B. 0.55m.

 C. 0.05m.

 D. 0.1m.

The correct answer is option [C].

17. All which spread out continuously could be called _____.

 A. stationary wave

 B. congress wave

 C. interference wave

 D. progressive wave

The correct answer is option [D].

18. A progressive plane wave has the equation Y = 2sin [2000pt – 0.6x] where the symbols have their usual meanings. Find the frequency.

  A. 2000Hz.

  B. 1100Hz.

  C. 1200Hz.

  D. 1000Hz.

The correct answer is option [D].

Comparing Y = 2sin [2000πt – 0.6x] with Y = Asin [(2πvt/λ) – (2πx/λ)].

Then, 2πv/λ = 2000π and 2π/λ = 0.6.

λ = 6.284/0.6 = 10.47m,

Therefore, v = 2000πλ/2π = 1000λ = 1000 x 10.47m/s.

The frequency, f = v/λ = 1000Hz.

19. The angle between the incidence ray and the normal is called _____.

  A. refractive angle

  B. normal angle

  C. phase angle

  D. incident angle

The correct answer is option [D].

TOPIC: REFLECTION OF LIGHT

DIRECTION: Choose the correct answer from the lettered options.

1. Find in terms of I the angle of deviation of the ray after reflection from the mirror, if the light strikes a plane mirror at an angle of incidence i.
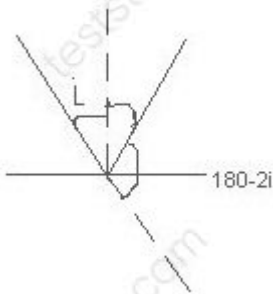
A. $2i^2$.

B. $90o - i^2$.

C. $270° + i$.

D. $180° - 2i$.

The correct answer is option [D].

2. The center of the sphere of which the spherical mirror forms a part is called _____.

A. center of curvature

B. focus

C. pole

D. vertex

The correct answer is option [A]

3. What is the amount of image formed by two mirrors inclined at an angle of 60o, if the object distance from each other is 1cm?

 A. 4.

 B. 5.

 C. 3.

 D. 6.

The correct answer is option [B].

N = [360/θ] – 1.

Therefore, N = [360/60] – 1.

Number of image formed [N] = 5.

4. Which of the following is not a characteristics of a plane mirror image?

 A. Upright and real.

 B. Upright and virtual.

 C. Laterally inverted.

 D. Same size as the object.

The correct answer is option [A].

5. An image formed by a convex mirror is always _____.

 A. virtual, erect and diminished

 B. virtual, real and magnified

 C. real, inverted and diminished

 D. real, erect and magnified

The correct answer is option [A]

6. Butter paper is an example for _____ object.

 A. a transparent

 B. a translucent

 C. an opaque

 D. a luminous

The correct answer is option [B]

7. The image formed by a plane mirror is always _____.

 A. real and erect

 B. virtual and erect

 C. real and inverted

 D. virtual and inverted

The correct answer is option [B]

8. A ray of light passing through _____ retraces its path.

 A. a focus

 B. the center of curvature

 C. a pole

 D. a vertex

The correct answer is option [B]

9. Which of the following statements is/are correct?

I. are transverse.

II. need a material medium.

III. Light energy is propagated in a straight line.

 A. I only.

 B. II only.

 C. III only

 D. I & III only

The correct answer is option [D]

10. A ray of light is incident on a plane mirror and the angle of incidence is 25o. What is the angle of reflection?

 A. $0°$

 B. $50°$

 C. $90°$

 D. $25°$

The correct answer is option [D]

11. Which of the following properties make the convex mirror useful as a driving mirror?

I. The image is real.

II. The image is upright.

III. It has a wide field of view.

IV. The image is magnified.

A. I, II and IV only.

B. I, II and III only.

C. II and III only.

D. I and III only.

The correct answer is option [C]

12. A ray of light strikes a plane mirror at an angle of incidence, i. Determine in terms of i, the angle of deviation of the ray after reflection from the mirror.

A. i.

B. 2i.

C. $90° - i$.

D. $180° - 2i$.

The correct answer is option [D]

13. Determine the number of images formed if an object is placed between two plane mirrors facing each other and inclined at 120o to each other.

A. 5

B. 4

C. 3

D. 2

The correct answer is option [D]

14. An object is placed 18 cm in front of a convex mirror. An image is formed 9 cm behind the mirror. Find the focal length of the mirror.

A. 0.0555555 cm

B. −0.0555555 cm

C. −0.555555 cm

D. 0.555555 cm

The correct answer is option [B]

15. Which of the following statements is/are laws of reflection?

I. Incident ray, the reflected ray and the normal at the point of incidence, all lie in the same plane.

II. Angle of incidence is equal to the angle of reflection.

III. Ratio of the sine of the angle of incidence to the sine of the angle of is a constant for a pair of media.

 A. III only.

 B. I and II only.

 C. II and III only.

 D. I and III only.

The correct answer is option [B]

16. Which of the options is the correct laws of reflection?

 A. i = r

 B. i > r

 C. r > i

 D. i < r

The correct answer is option [A]

17. An incident ray is reflected normally by a plane mirror onto a screen where it forms a bright spot. The mirror and screen are parallel and 1m apart. If the mirror is rotated through 5o, calculate the displacement of the spot.

 A. 8.7cm

 B. 10.0cm

 C. 15.4cm

 D. 17.6cm

The correct answer is option [D].
Since angle if rotation of reflected ray = 2 x angle of rotation of mirror,
r = 2 x 5 = 10°
Tan θ = image displacement/1m
Image displacement = Tan θ x 1m
= tan 10° = 17.6cm
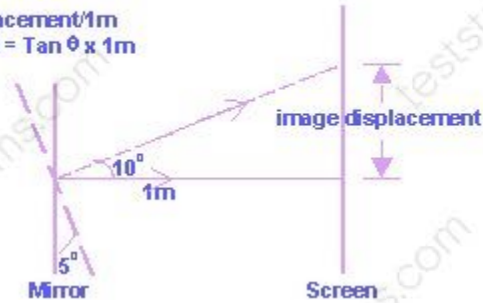
18. An example for non-luminous object is _____.

 A. a candle

 B. the sun

 C. an electric bulb

 D. the moon

The correct answer is option [D]

19. A converging mirror is known as a _____.

 A. convex mirror

 B. plane mirror

 C. concave mirror

 D. cylindrical mirror

The correct answer is option [C]

20. If the image formed by a concave mirror is virtual, erect and magnified, then the object is placed _____.

 A. between the pole of the mirror and the focus

 B. beyond the center of curvature

 C. at the center of curvature

 D. at the focus

The correct answer is option [A]

21. Which mirror has a wider field of view?

 A. Convex mirror

 B. Concave mirror

 C. Plane mirror

 D. Cylindrical mirror

The correct answer is option [A]

22. The focus of a concave mirror is _____.

 A. real

 B. virtual

 C. undefined

 D. at the pole

The correct answer is option [B]

23. What is the angle between the incident and reflected rays when a ray of light is incident normally on a plane mirror?

 A. 90°

 B. 45°

 C. 180°

 D. 0°

The correct answer is option [D]

24. Dentists uses a _____ to focus light on the tooth of a patient.

 A. concave mirror

 B. convex mirror

 C. plane mirror

 D. cylindrical mirror

The correct answer is option [A]

25. Which of the following is used to make a periscope?

A. Concave mirror

B. Convex mirror

C. Plane mirror

D. Lens

The correct answer is option [C]

26. Which of the following is a type of mirror used in head lights of a car?

A. Convex mirror

B. Plane mirror

C. Concave mirror

D. None of the above

The correct answer is option [C]

27. A ray of light makes an angle 35oC with a plane mirror, what is the angle of reflection?

A. 70°C

B. 65°C

C. 55°C

D. 35°C

The correct answer is option [D].

28. The relation between the focal length and radius of curvature of a mirror is _____.

A. r – 2 = f

B. r + 2 = f

C. f = r/2

D. f = 2r

The correct answer is option [C]

29. If an incident ray passes through the center of curvature of a spherical mirror, the reflected ray will _____.

 A. pass through the focus

 B. pass through the center of curvature

 C. pass through the pole

 D. retrace its path

The correct answer is option [D]

30. The angle between a plane mirror and a fixed ray of light is 20o. The mirror rotates through 30o. How many degrees does the reflected ray rotates?

 A. 40°.

 B. 60°.

 C. 30°.

 D. 50°.

The correct answer is option [B].

Hint: The reflected ray must rotate twice.

31. An object becomes invisible when it undergoes _____ reflection.

 A. regular

 B. irregular

 C. diffused

 D. normal

The correct answer is option [A]

32. A ray of light is incident on a plane mirror and the angle of reflection is 50o. Calculate the angle between the incident ray and the reflected ray.

A. 50°

B. 25°

C. 90°

D. 100°

The correct answer is option [D]

33. Radius of curvature of a concave mirror is always _____ to the mirror.

A. parallel

B. perpendicular

C. inclined at 60°

D. inclined at 45°

The correct answer is option [B]

34. Light is a form of energy produced by a _____.

A. luminous object

B. transparent object

C. non-luminous object

D. opaque object

The correct answer is option [A]

35. Which of the following is a type of image that can be obtained on a screen?

A. Virtual

B. Real

C. Diverging

D. Converging

The correct answer is option [B]

36. The focal length of a concave mirror is 15cm. What is its radius of curvature?

A. 15 cm

B. 30 cm

C. 7.5 cm

D. 45 cm

The correct answer is option [B]

37. Two mirrors of the same length are arranged as shown in the diagram. A ray of light NO strikes the system at O and emerges along PQ. The emergent ray has been deviated through _____.
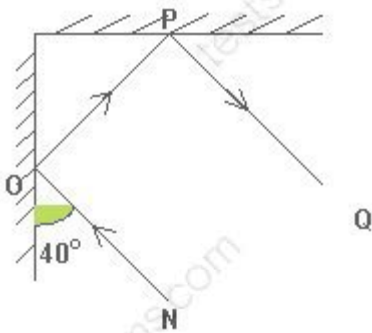
A. 220°

B. 200°

C. 210°

D. 180°

The correct answer is option [D].
For plane mirrors, $i = r$
Angle of incidence $i_1 = 90 - 40 = 50°$

$\alpha = r$ (adjacent angles)
$\therefore \alpha = 50°$
$i_1 = 90 - 50 = 40°$
the total angle of deviation will
then be $i_1 + r_1 + i_2 + r_2$
$= 50 + 50 + 40 + 40 = 180°$
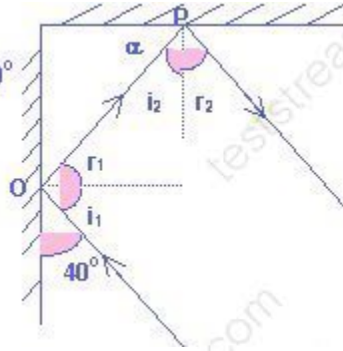
38. The magnification produced by a plane mirror is +1, what does this mean?

 A. The positive sign means image formed by a plane mirror is virtual and erect.

 B. The positive sign means image formed by a plane mirror is real and erect.

C. The positive sign means image formed by a plane mirror is virtual and magnified.

 D. The positive sign means image formed by a plane mirror is real and magnified.

The correct answer is option [A]

TOPIC: REFRACTION

> **DIRECTION: Choose the correct answer from the lettered options.**

1. A light ray incident at an angle of 30o on a glass prism of refractive index 1.6. What is the angle through which the ray slightly deviated in the prism?

A. 13.86°.

B. 18.14°.

C. 11.79°.

D. 18.21°.

The correct answer is option [C].

Hint: using the equation η = sin i/sin r, then sin r = sin30°/η = 0.5/1.6 = 0.3125, therefore, r = sin−1[0.3125] = 18.21O; deviation = 30° − 18.21° = 11.79°.

2. A light ray passing through a rectangular glass prism which is surrounded by air _____.

A. is reflected in the prism

B. is deviated at the point of emergence

C. suffers a displacement at the point of emergence

D. emerges parallel to the incident ray

The correct answer is option [C].

3. Given that SQ = 10cm and SP = 6cm, the refractive index of the block of glass shown in the figure is _____.
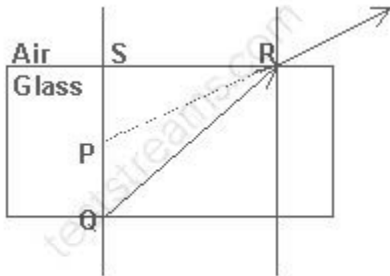
A. 0.30

B. 0.60

C. 1.67

D. 2.33

The correct answer is option [B].

gha = apparent height/ real height = 6cm/10cm = 0.60

4. An instrument used to make appear stationary in a ripple tank, the experiment is called _____.

A. laser

B. refractive glass

C. stroboscope

D. mono-refractive lens

The correct answer is option [C].

Use the information to answer the question.

5. The refractive index of a glass prism is 1.6 and the angle of the prism is 60o. Find the angle of incidence at minimum deviation.

A. 106.26°.

B. 73.74°.

C. 53.13°.

D. 30°.

The correct answer is option [C].

Hint: The angle of incidence is given by the equation 2i = dm + A,

Where A = 60°, dm = 46.26°.

6. The speed of light in vacuum is $3.0 \times 10^8 ms^{-1}$. If the refractive index of a transparent liquid is 4/3, then the speed of light in the liquid is _____.

A. $4.4 \times 10^7 ms^{-1}$

B. $2.25 \times 10^8 ms^{-1}$

C. $3.0 \times 10^8 ms^{-1}$

D. $4.0 \times 10^8 ms^{-1}$

The correct answer is option [B].

vhl = speed of light in vacuum/speed of light in medium

= v/m

m = v/h = 3 x v/4 = 3 x 3 x 108/4

= $2.25 \times 10^8 ms^{-1}$

7. The refractive of the medium M in the diagram below is _____.
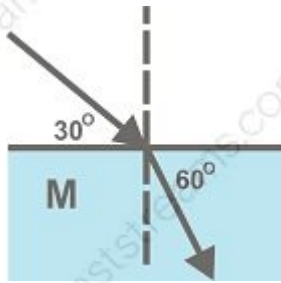
A. 2√3

B. √3

C. 2/√3

D. 1√3

The correct answer is option [B].

I = 90° – 30° = 60°

r = 90° – 60° = 30°

n = sin i/sin r = sin60o/sin30o = √3/2/1/2 = √3/2 x 2/1 = √3

8. An object placed at the bottom of a well full of clear water appears closer to surface due to _____.

A. diffraction

B. reflection

C. refraction

D. polarization

The correct answer is option [C].

9. Just imagine a fish at a water depth of 8m and refractive index 4/3. What is the apparent depth of the fish below the surface of the pond?

 A. 8.0m

 B. 5.64m

 C. 6.0m

 D. 11.0m.

The correct answer is option [C].

Hint: Refractive index, η = Real Depth/Apparent Depth.

10. If the refractive index of a medium is √2, what is the critical angle?

 A. 65°.

 B. 45°.

 C. 120°.

 D. 60°.

The correct answer is option [B].

η = 1/sin C; √2 = 1/sin C, then sin C = 1/√2 = 0.70711, therefore, C = sin⁻¹[0.70711] = 45°.

11. The refractive index of a material glass block is 1.53. Find the velocity of light in a liquid.

[Given that velocity of light in space is 3.0 x 10⁸m/s].

 A. 1.96 x 10⁸m/s.

 B. 2.0 x 10⁸m/s.

 C. 4.59 x 10⁸m/s.

 D. 1.53 x 10⁸m/s.

The correct answer is option [A].

Hint: Refractive index, η = [Velocity of light in vacuum/space]/[Velocity of light in liquid].

12. A wave of frequency 300Hz travels in air with a velocity of 600m s^{-1}. If it enters a pool of water, calculate its wavelength in the water.

{Refractive index of water = 4/3}.

 A. 0.5m

 B. 1.0m

 C. 1.5m

 D. 2.5m

The correct answer is option [C].

13. That particular angle of incident at which the angle of is 90o is called _____.

 A. critical angle

 B. angle of minimum deviation

 C. normal angle

 D. escape angle of light

The correct answer is option [A].

Hint: At critical angle, angle of = 90°.

14. Find the critical angle at the air-glass interface if the index of of glass = 1.5.

 A. sin^{-1}0.5.

 B. sin^{-1}0.6667.

 C. sin^{-1}0.85.

 D. sin^{-1}0.25.

The correct answer is option [B].

Hint: Equate finally refractive index 3/2 to sin i/sin C, where; i = 90° and C is the critical angle required.

15. What is the critical angle for light travelling from water to air [$_a\eta_w = 4/3$]?

 A. 42°.

 B. 48°36′.

 C. 43°52′.

 D. 46′38°.

The correct answer is option [B].

Hint: Use $_w\eta_a = 1/_a\eta_w = [3/4]^{-1} = \sin C/\sin 90°$.

TOPIC: SCALARS AND VECTORS

DIRECTION: Choose the correct answer from the lettered options.

1. The velocity of a car, A, relative to a car, B, is 15.0km/h in a direction of N45oE. If the velocity of car, B, is 30 km/h in the direction N60°W, determine the actual velocity of the car, A.

 A. 39.87m/s

 B. 28.97m/s

 C. 19.87m/s

 D. 29.87m/s

The correct answer is option [D].

2. Which of the following is not used to find the resultant of two vectors?

 A. Trigonometric ratio

 B. Cosine and sine rule

 C. Scale drawing

 D. Pythagoras theorem

The correct answer is option [D].

3. Which of the following is a scalar quantity?

 A. Electric field, E.

 B. Magnetic field, β.

 C. Gravitational potential.

 D. Gravitational field.

The correct answer is option [C].

4. A man can row a boat in still water at 10kmh^{-1} and wants to cross a river to a position exactly opposite the starting point. If the river is 5km wide and is flowing at 6kmh^{-1} eastward, calculate the direction in which he must head the boat.

A. 48°

B. 36°

C. 26°

D. 31°

The correct answer is option [D].

Hints: tan-1 = 6/10 = 30.9° ≈ 31o

5. Which of these quantities are vectors?

[i] Electric potential

[ii] Torque

[iii] Kinetic energy

[iv] Momentum.

A. ii, i and iv.

B. ii, i and iii.

C. iii, i and iv.

D. ii, iii and iv.

The correct answer is option [D].

6. Two forces whose resultant is 80N are perpendicular to each other. If one of them makes an angle of 60o with the resultant, its magnitude is _____.

A. 160.0N

B. 69.2N

C. 92.3N

D. 136.N

The correct answer is option [B].

7. A force of 110N at 55° to the horizontal is to be resolved into the horizontal and vertical component. Find the resultant force.

A. 109.998N.

B. 63.100N.

C. 90.100N.

D. 48.241N.

The correct answer is option [A].

Horizontal component F_x = 110cos55° = 63.1N

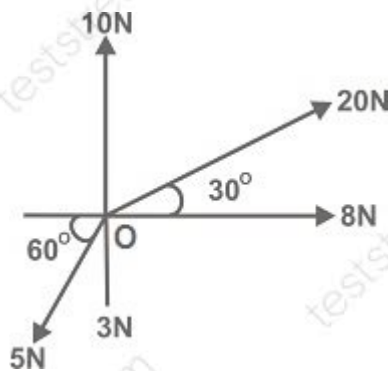Vertical component F_y = 110sin55° = 90.10N.

8. Determination of the resultant of two or more vector is known as _____.

A. subtraction of vectors

B. addition of vectors

C. resolution of vector

D. multiplication of vectors

The correct answer is option [C].

9. Determine the resultant of the forces acting at a point O as drawn.

A. 25N

B. 26N

C. 28N

D. 29N

The correct answer is option [B].

10. Find the resultant of a force of 10N acting at right angle to another force of 12N.

 A. 14.71N 47°

 B. 19.14N 40°

 C. 23.46N 50°

 D. 15.6N 44°

The correct answer is option [D].

Resultant force AC $= \sqrt{+ BC^2} = \sqrt{10^2 + 12^2} = 15.6N$

Tan θ = CD/AD, since BC = AD, then tan θ = 10/12 = 0.833,

Therefore, θ = $\tan^{-1}[0.833]$ = 44°.

11. A man can row a boat in still water at 10kmh-1 and wants to cross a river to a position exactly opposite the starting point. If the river is 5km wide and is flowing at 6kmh-1 eastward, calculate how far from his destination he would land if he ignorantly steers due north?

 A. 15km away

 B. 10km away

 C. 5km away

 D. 2km away

The correct answer is option [C].

12. An aircraft pilot flies through the air at 800km/h at a certain altitude, unfortunately he encounters a westerly wind at a speed of 300km/h. If the pilot wishes to arrive at a destination which is due north of his starting point, what would be his resultant velocity?

 A. 500km/h

 B. 650km/h

C. 742km/h

D. 854km/h

The correct answer is option [C].

13. What is the magnitude of the resultant of the forces shown?

A. 50.0N

B. 75.0N

C. 80.0N

D. 156.2N

The correct answer is option [D].

Using the cosine rule equation:

$c = \sqrt{[a^2 + b^2 - (2 \times a \times b \times \cos \theta)]}$

14. All of the following are scalar quantities EXCEPT _____.

A. distance

B. impulse

C. speed

D. potential

The correct answer is option [B].

15. A car travels due east at a speed of 10km/h and then turn due west at a speed of 5km/h. Determine the resultant displacement after 30mins.

A. 11.0km

B. 8.0km

C. 2.5km

D. 5.5km

The correct answer is option [C].

The resultant R = 10 - 5 = 5 km/h

The resultant displacement is = Average speed R × time = 5 × 1/2 = 2.5 km.

16. Which of the following pairs has each of its quantities measured in terms of the magnitude and direction?

 A. Force and momentum

 B. Length and weight

 C. Mass and velocity

 D. Temperature and acceleration

The correct answer is option [A].

17. The pair of physical quantities consisting of vectors only are _____.

 A. displacement and torque

 B. momentum and power

 C. acceleration and speed

 D. velocity and distance

The correct answer is option [A]

18. A man can row a boat in still water at 10kmh-1 and wants to cross a river to a position exactly opposite the starting point. If the river is 5km wide and is flowing at 6kmh-1 eastward, calculate the time taken to cross the river.

 A. 27.5mins

 B. 40.0mins

 C. 25.7mins

 D. 60.0mins

The correct answer is option [C].

Hint: Find the resultant speed at which the man rows the boat.

The time = distance/Average speed x 60 mins

19. Which of the following is not an example of a vector quantity?

 A. Electric Field.

 B. Displacement.

 C. Magnetic Flux.

 D. Temperature.

The correct answer is option [D].

Reason: Because it is a scalar quantity which has size but no direction.

20. Which of the following is a vector quantity?

 A. Displacement.

 B. Energy.

 C. Temperature.

 D. Mass.

The correct answer is option [A].

21. Which of the options is not a quantity with both magnitude and direction?

 A. Momentum

 B. Electric field

 C. Magnetic field

 D. Density

The correct answer is option [D].

22. Which of the following is not an example of a scalar quantity?

 A. Power.

 B. Speed.

 C. Velocity.

 D. Work.

The correct answer is option [C].

Reason: Because it is a vector quantity which has both magnitude and direction.

23. Find the resultant and direction of the force acting on a body as drawn.

$F_1 = 6N$ (vertical arrow), $F_2 = 7N$ (horizontal arrow)

A. 7.24N

B. 8.56N

C. 9.22N

D. 5.93N

The correct answer is option [C].

$R_2 = F^2_1 + F^2_2$

$R = \sqrt{[F^2_1 + F^2_2]}$

24. If the angle between two vectors P and Q is $0°$, the vectors are said to _____.

A. be parallel

B. perpendicular

C. intersect at angle $45°$

D. intersect at angle of $60°$

The correct answer is option [A].

$P.Q = |P| |Q|$

$\cos\theta$ if two vectors are parallel, $\theta = 0°$, $\cos\theta = 0$

Hence $P.Q = 0$

25. The resultant force of two force is 10N. If one of the forces is 3N. Find the magnitude of the other force if the direction of the resultant force is 30° to the 3N force.

A. 7.0N

B. 7.6N

C. 8.9N

D. 9.5N

The correct answer is option [B].

Using cosine rule: $a^2 = b^2 + c^2 - 2ab \times \cos \theta$

26. Which of the following is true of vectors shown in the diagram drawn?
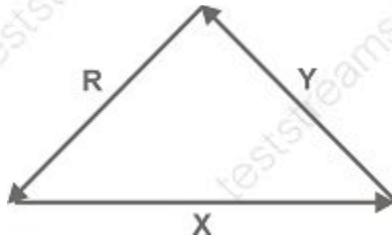
A. The resultant of X, Y, and R is zero

B. R is the resultant of X and Y

C. X is the resultant of R and Y

D. X is the reuiltant of R and Y

The correct answer is option [B].

27. A body on the ground is acted upon by a force of 10N at a point P as shown in the diagram drawn. What force is needed to stop the body from moving eastward?
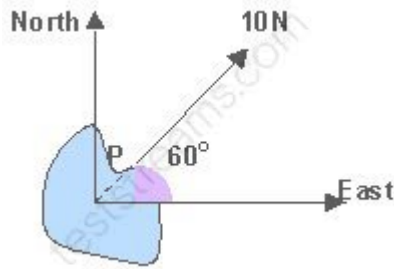
A. 5N in the direction of east

B. 5N in the direction of west

C. 5Ö3N in the direction of west

D. 10N in the southwest direction

The correct answer is option [B].

The component in the eastern (horizontal) direction

F = 10cos60o = 5N and in the western direction.

28. Which of the following is not a vector quantity?

A. Weight.

B. Pressure.

C. Altitude.

D. Displacement.

The correct answer is option [C].

Reason Altitude has no direction but only magnitude.

29. A car, A, moving at a velocity of 15m/s travels in opposite direction to another car, B, at a velocity of 30m/s. Determine the relative velocity of B to A.

A. 15m/s

B. 30m/s

C. 45m/s

D. 25m/s

The correct answer is option [C].

30. Which of the following is NOT a vector quantity?

A. Force

B. Altitude

C. Weight

D. Displacement

The correct answer is option [B].

Vector quantities are quantities that have both magnitude and direction. Altitude has magnitude, but no direction hence it is not a vector quantity.

Scalar quantities on the other hand, have only magnitudes but no direction. Altitude is a scalar quantity.

31. A swimmer whose velocity in still water is 4km/h set out at right angles to the bank of a river which is flowing at 3km/h. Find his actual velocity through the water.

A. 5km/h

B. 12km/h

C. 1km/h

D. 7km/h

The correct answer is option [A].

32. Determine the tensions in the spring acting on the metal weight (W = 50N) by applying the trigonometric ratio.

A. 69.4N1OON

B. 86.6N1OON

C. 69.4N2OON

D. 86.6N2OON
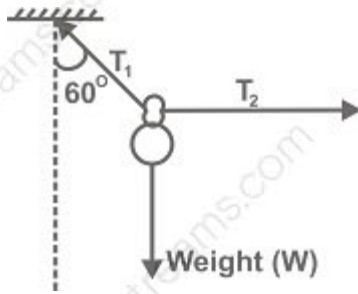
The correct answer is option [B].

$T_2/W = \tan 60°$
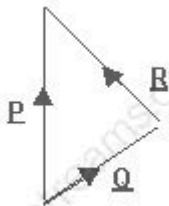
$T_2 = W \tan 60°$

$W/T_1 = \cos 60°$

$T_1 = W/\cos 60°$

33. In the diagram shown, P, Q, and R are vectors which of the options gives the correct relationship between the vectors?

A. P = Q + R

B. P = Q – R

C. P = R – Q

D. P + Q + R = O

The correct answer is option [A].
Following the directions of the arrow heads, it can be seen that
P = Q + R
NB: the other deductions could have been
P – R = Q or P – Q = R

34. A man walks 10km east and then 20km south the displacement is _____.

A. 30km south

B. 27.6km north of east

C. 20km north

D. 22.36km, 63.4° south of east

The correct answer is option [D].

TOPIC: SOUND WAVES

DIRECTION: Choose the correct answer from the lettered options.

1. State three ways in which two musical notes may differ from each other.

 A. Loudness, Pitch, and Quality.

 B. Timbre, Frequency, and Intensity.

 C. Pitch, Frequency, and Quality.

 D. Overtones, Timbre, and Loudness.

The correct answer is option [A].

Hint: Sound is produced by a vibrating object, loudness which depends on the amplitude, pitch which depends on the frequency, and quality depends on the overtones are characteristics of sound.

2. The factor, which enables the ear to distinguish between a notes played on different instruments, is _____.

 A. pitch

 B. speed

 C. harmonics

 D. loudness

The correct answer is option [A].

3. The amplitude of a wave is the _____.

 A. distance between two successive troughs of the wave

 B. separation of two adjacent particles vibrating in phase

 C. maximum displacement of the wave particle from the equilibrium position

 D. distance travelled by a wave in a complete cycle of its motion

The correct answer is option [C].

4. A man standing some distance from the foot of a tall cliff claps his hands and hears an echo 0.7s later. Find how far the man is from the cliff, if the speed of sound is 330m/s.

A. 115.5m.

B. 11.05m.

C. 3.32m.

D. 214.6m.

The correct answer is option [A].

Hint: Using the equation x = [vt]/2 = [330 x 0.7]/2 = 115.5m.

5. An ultrasonic vibrator sends out sound pulses down to the sea bed. If the echo is received after 8s, calculate the depth of the sea.
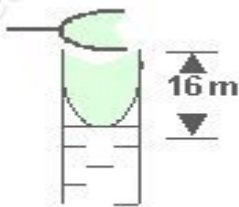
[Speed of sound in sea water = 1540ms]

A. 1.93×10^2m

B. 3.85×10^2m

C. 6.16×10^3m

D. 1.23×10^4m

The correct answer is option [D].

Hints: x = vt/2

6. In a resonance tube experiment which is illustrated in the fig. drawn, the velocity of sound in air is 327.68ms^{-1}, the frequency of the tuning fork used is therefore _____.

A. 128Hz

B. 256Hz

C. 512Hz

D. 768Hz

The correct answer is option [C]

L = ¼p

p = 4L = 4 x 16 = 64cm.

V = ƒp

F = v/p = 327.68 x 100/64 = 512Hz

  [Neglect the time taken by light to travel to the observer].

7. The speed of sound in air is $330ms^{-1}$. How far from the center of a storm is an observer who hears thunder clap 2s after the lightning flash?

 A. 1320m

 B. 660m

 C. 560m

 D. 330m

The correct answer is option [D].

Distance S = velocity v x time t.

S = (v x t)/2 = (330 x 2)/2 = 330m.

8. A slight loading of a tuning fork has the effect of _____.

 A. increasing its frequency

 B. increasing its amplitude

 C. decreasing its frequency

 D. decreasing its amplitude

The correct answer is option [B].

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9. A hunter shot his gun and observed that the echo got to him 6s later. How far was he from the reflecting surface?

[Speed of sound in air = 330ms-1].

 A. 27.5m

 B. 55.0m

 C. 990m

 D. 1980m

The correct answer is option [C].

Hint: x = vt/2

Where v = speed of sound in air, t = time

10. Which of the following properties of wave is used in the measurement of oceanic depth?

 A. Reflection.

 B. diffraction.

 C. Refraction.

 D. Interference.

The correct answer is option [A].

11. Calculate the wavelength of a note which is one octave lower than a note of 256Hz in a medium in which the speed of sound is 352ms-1.

 A. 0.69m

 B. 1.38m

 C. 2.75m

 D. 5.50m

The correct answer is option [C].

Since it is one octave lower, its frequency will be half of the 256Hz note.

If = 256/2 = 128Hz

l = v/f = 352/128 = 2.75m.

12. Which of the following is not an example of a percussion instrument?

A. Clarint.

B. Bells.

C. Drums.

D. Tuning Forks

The correct answer is option [A].

Hint: Clarint is an example of a wind instrument.

13. A sound wave of velocity $350ms^{-1}$ is directed towards the surface of water. If the ratio of the wavelength of sound in water to that in air is 425:100, calculate the velocity of the wave in water.

A. $82.4ms^{-1}$

B. $148.8ms^{-1}$

C. $350ms^{-1}$

D. $1487.5ms^{-1}$

The correct answer is option [D].
The ratio of the velocity of sound in air to that in water should be equal to the ratio of the wavelength in air to that in water,

hence; $\dfrac{v_a}{v_w} = \dfrac{\lambda_a}{\lambda_w} \Rightarrow v_w = v_a \times \dfrac{\lambda_w}{\lambda_a} = 350 \times \dfrac{425}{100} = 1487.5ms^{-1}$
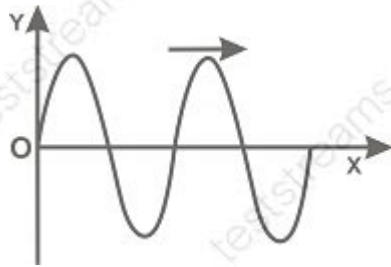
14. How far from a wall should someone stand in order to hear is voice again after reflection at 0.9secs later?

A. 367m.

B. 320m.

C. 148.5m.

D. 36.7m.

The correct answer is option [C].

Hint: x = vt/2, where v = velocity = 330m/s, t = time = 0.9secs.

15. The diagram drawn shows the motion of a progressive wave along a string. The particle motion of the medium is in the direction _____.

A. parallel to OX

B. parallel to OY

C. 60° to OX

D. 60° to OY

The correct answer is option [B].

16. A wave produced by a source of sound has wavelength of 1.70m. What is the period of vibration in seconds, if the speed of sound is 330m/s?

A. 250.

B. 3.25 x 10^{-3}.

C. 1.14 x 10^{-4}.

D. 5.15 x 10^{-3}.

The correct answer is option [D].

Hint: Using the equation T = λ/v = 1.70/330 = 5.15 x 10⁻³.

17. A string stretched firmly between two point 52cm apart at its center. What is the number of vibration made by the string if one of the wave produced is 280m/s?

 A. 380Hz.

 B. 269.2Hz.

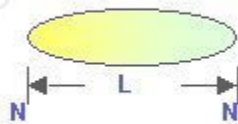 C. 420Hz.

 D. 180.23Hz.

The correct answer is option [B].

Hint: λ = 2 x 52 = 104cm = 1.04m,

Therefore, f = v/λ = 280/1.04 = 269.2Hz.

18. A guitar string is 75cm long. The wavelength of its fundamental note is _____.

 A. 75cm

 B. 150cm

 C. 37.5cm

 D. 112.5cm

The correct answer is option [B]
The fundamental note is the note just before the string is plucked and is drawn thus:

NN = λ/2 = L
λ = 2L = 2 x 75 = 150cm

19. The relationship between the length, L and wave length λ in an open pipe is _____.

 A. λ = 4L

 B. λ = 3L

 C. λ = 2L

 D. λ = 2½L

The correct answer is option [C].

20. Which of the following instrument produces sound by the vibration of air column?

 A. Drum

 B. Violin

 C. Guitar

 D. Flute

The correct answer is option [D].

21. What will be the ratio of two mass of strings if they are under the same tension and have the same length given that the frequency notes is 4:1?

 A. 2:1.

 B. 1:4.

 C. 1:16.

 D. 1:2.

The correct answer is option [B].

22. If the position of resonance in a resonance tube is 16.50cm from the open end of the tube, calculate the distance from the open end to the next position where resonance occurs.

[Neglect end–correction].

 A. 24.75cm

 B. 33.00cm

 C. 41.25cm

 D. 49.50cm

The correct answer is option [B].

The position of the next resonant sound will be twice the position of the first since this is the first harmonic

=> l2 = 2 x 16.50 = 33.00cm

23. In order to obtain a sound note of a high pitch from a wire stretched by a constant tension, the wire must be _____.

 A. short and thick

 B. short and thin

 C. long and thick

 D. long and thin

The correct answer is option [B].

24. A man hears his echo from a nearby hill 2s after he shouted. If the frequency of his voice is 260Hz and the wave length is 1.29m, how far away is the hill?

 A. 330.0m

 B. 335.4m

 C. 660.0m

 D. 670.8m

The correct answer is option [B].

The echo equation is given as $v = \dfrac{2x}{t}$ but $v = f\lambda$

$\Rightarrow \dfrac{2x}{2} = 260 \times 1.29 \Rightarrow x = 335.4m$

25. Given

[i] Air

[ii] Solids

[iii] Liquid,

Which of the following medium/media will allow the transmission of sound?

A. iii only.

B. ii and iii only.

C. i only.

D. iii, ii and i.

The correct answer is option [D].

26. When vibration occurs in an air column, the distance between a node and an antinode is equal to _____.

A. one-quarter of the wavelength

B. one-half of the wavelength

C. the wavelength

D. twice the wavelength

The correct answer is option [A].

27. A material medium is always compulsory to propagate sound wave.

 A. False.

 B. True.

 C. Not in all condition.

 D. All of the above.

The correct answer is option [B].

28. The amplitude of sound wave determine its _____.

 A. frequency

 B. quality

 C. loudness

 D. pitch

The correct answer is option [C].

29. A herdsman yelling out to a fellow herdsman heard his voice reflected by a cliff 4s later. What is the velocity of sound in air if the cliff is 680m away?

 A. 170ms^{-1}

 B. 136ms^{-1}

 C. 340ms^{-1}

 D. 680ms^{-1}

The correct answer is option [C].

Velocity = distance/time

Here, the sound travels and returns thus making a distance equal to twice the distance of the cliff from the herdsman

v = 680 x 2/4= 340ms-1

30. In a resonance tube, a turning fork of frequency 240Hz resonated when the water level was 20cm below the open end of the tube, if the next position of resonance was 90cm, the speed of sound in air is _____.

A. 245ms^{-1}

B. 320ms^{-1}

C. 330ms^{-1}

D. 336ms^{-1}

The correct answer is option [D].

Using the equation:

v = 2f (L$_2$ – L$_1$)

Where L$_2$ = 90cm or 0.9m

L$_1$ = 20cm or 0.2m

31. The following types of are all transverse EXCEPT _____.

A. volume wave

B. radio

C.

D. surface on water

The correct answer is option [C].

The main distinguishing feature between transverse and longitudinal is polarization. Sound is the only one among the options that cannot be polarized

32. The pitch of sound note depends on _____.

A. frequency

B. quality

C. timber

D. harmonics

The correct answer is option [A].

33. Thunder is usually heard some seconds after lightning is observed because _____.

 A. the human eye is more sensitive to light than the ear to sound

 B. sound and light travel in different media

 C. thunder occurs after lightning

 D. light travels faster than sound

The correct answer is option [D].

34. In which of the following media does sound travel fastest?

 A. Water

 B. Brass

 C. Air

 D. Wood

The correct answer is option [B].

35. As the air column of length L in a pipe decreases, the frequency of the stationary wave emitted _____.

 A. decrease

 B. increase

 C. varies as L^2C

 D. varies as $\sqrt{L}$

The correct answer is option [D].

36. Which of the following will NOT affect the velocity of sound in air?

 A. Density of the air

 B. Direction of the wind

 C. Elasticity of the air

 D. Temperature of the surrounding air

The correct answer is option [C].

37. A sonometer under tension of 10N produces a frequency of 250Hz when plucked. Keeping the length of the wire constant, the tension is adjusted to produce a new frequency of 350Hz, the new tension is _____.

 A. 39.2N

 B. 19.6N

 C. 14.2N

 D. 7.4N

The correct answer is option [B].

The frequency f of a sonometer is related to the length l, the mass/unit length m, and the tension T by the equation

F = (1/2l) √ (T/m):

F a√T where l and m are constant

$F_1 = k\sqrt{T_1}$

=> $k = F_1/\sqrt{T_1}$

Therefore $T_2 = (f_2/k)^2 = (350/250)^2 \times 10 = 19.6N$

38. Sound after reflection is called _____.

 A. sound reflection

 B. vibration

 C. echo

 D. sound transmission

The correct answer is option [C].

39. Metal cables are used as telephone wires because _____.

 A. they are cheap

 B. they are sourced locally

 C. the speed of sound in them is very low

 D. the speed of sound in them is very high

The correct answer is option [D].

40. Which of the following is not a characteristics of sound?

 A. Quality.

 B. Loudness.

 C. Noise.

 D. Pitch.

The correct answer is option [C].

41. A tuning fork of frequency 600Hz is sounded over a closed resonance tube. If the first and second resonant positions are 0.13m and 0.413m respectively, the speed of sound in air is _____.

 A. 509.4ms^{-1}

 B. 480.0ms^{-1}

 C. 339.6ms^{-1}

 D. 169.8ms^{-1}

The correct answer is option [C].

For the first resonant position for a closed pipe, $l_1 = l/4$.

For the second resonant position for a closed pipe, $l_2 = 3l/4$

=> $(l_2 - l_1) = 3l/4 - l/4 => l = 2(l_2 - l_1)$

$v = f_l = 2f (l_2 - l_1) = 2 \times 600 \times (0.413 - 0.13) = 339.6ms^{-1}$

42. Musical instruments playing the same note can be distinguished from one another owing to the difference in their _____.

 A. quality

 B. pitch

 C. intensity

 D. loudness

The correct answer is option [A].

43. When the string is _____ a high frequency note is produced.

 A. long, thick, and loose

 B. long, thin, and loose

 C. long, thin, and taut

 D. short, thick and taut

The correct answer is option [D].

44. Marching soldiers crossing a suspension bridge are usually advised to break their steps to avoid damaging the bridge owing to _____.

 A. resonance

 B. swinging

 C. vibration

 D. oscillation

The correct answer is option [A].

45. How far away is a hill where a man receives his own echo 2secs after shouting, given that the frequency and wavelength of his voice is 260Hz and 1.29m?

 A. 330m.

 B. 660m.

 C. 70.8m.

 D. 335.4m.

The correct answer is option [D].

Hint: Distance x = [vt]/2, where v = fλ.

46. In which of the following material media would sound travel fastest?

 A. Gas

 B. Water

 C. Oil

 D. Metal

The correct answer is option [D].

47. If the source of sound is moving, a stationary listener will hear a sound of different frequency. This is called _____.

A. Doppler effect

B. resonance

C. ultrasound

D. diffraction of sound

The correct answer is Option [A].

48. The fastest sound wave transmission media is _____.

A. iron

B. vacuum

C. air

D. blood

The correct answer is option [A].

TOPIC: SPEED, VELOCITY AND ACCELERATION

DIRECTION: Choose the correct answer from the lettered options.

1. A runner starts from rest and runs with a velocity of 10m/s for 10secs. What distance did he cover?

A. 100m.

B. 25m.

C. -100m.

D. 50m.

The correct answer is option [D].

Hint: Use the equation s = [(u + v)/2] × t,

Where s = distance, u = initial velocity = 0m/s, v = final velocity = 10m/s and t = time taken = 10secs.

2. A small metal ball is thrown vertically upwards from the top of a tower with an initial velocity of 20ms-1. If the ball took a total of 6s to reach ground level. Determine the height of the tower.

A. 60m

B. 50m

C. 38m

D. 49m

The correct answer is option [A].
For the upward motion, $u = 20ms-1$, $g = -10ms^{-2}$, $v = 0$
Hence $t = \frac{(v-u)}{g} = \frac{-20}{-10} = 2s$.
Also $S = ut + \frac{1}{2}gt^2$
$S = 20(2) + 0.5(-10)(4) = 20m$
Hence the downward motion took 4s (i.e. 6s – 2s).
But for this motion,
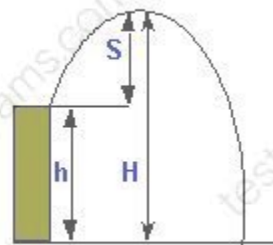$U = 0$, $v = ?$, $x = ?$, $t = 4s$, $g = 10ms^{-2}$,
using $H = ut + \frac{1}{2}at^2$
We have $H = 0.5 \times 10 \times 4 \times 4 = 80m$
Hence $h = H – S = 80 – 20 = 60m$

3. A bus has a uniform velocity of 106km/h. How far does it travel in 1/4 minute?

A. 0.441km.

B. 0.421km.

C. 0.86km.

D. 2.062km.

The correct answer is option [A].

106km/h = [106 x 1000]/ [60 x 60] = 106000/3600 = 29.4m/s, then, 1/4mins = 1/4 x 60 = 15secs.

Therefore, using the equation s = vt = 29.4 x 15 = 441m = 0.441km.

4. A truck moves with an initial velocity of 37m/s and is brought to rest with acceleration of $3.17m/s^2$. Calculate the time taken to come to rest.

A. 12.87secs.

B. 3.67secs.

C. 11.67secs.

D. 21.67secs.

The correct answer is option [C].

Hint: Use the equation v = u + at, where v = 0m/s, u = 37m/s and a = $-3.17m/s^2$, then, v = u + (–3.17) t, therefore, t = [u – v]/a = [37 – 0]/3.17 = 11.67secs.

5. A body is projected horizontally from the top of a cliff 45m above, if the body lands at a distance 30m from the cliff, what is the speed of projection? [g = $10ms^{-2}$]

A. $10ms^{-1}$

B. $15ms^{-1}$

C. $20ms^{-1}$

D. $6.1ms^{-1}$

The correct answer is option [D].

6. A vehicle travels at an average speed of 120km h^{-1}. What is the distance covered in 7 minutes?

 A. 8.33km.

 B. 14km.

 C. 2.08km.

 D. 31km.

The correct answer is option [B].

Hint: Use the equation Average Speed = Distance/Time, where Time = 7minutes = 7/60hr, Average Speed = 120km/hr.

Therefore, the Distance = Average Speed x Time = 120 x 7/60 = 14km.

7. The initial velocity of a car is 50m/s and an acceleration of 4m/s2. Find its velocity after 10 seconds.

 A. 15m/s.

 B. 24.03m/s.

 C. 40.12m/s.

 D. 10m/s.

The correct answer is option [D].

Hint: Use the equation v = u + at = 50 + [–4] x 10 = 10m/s.

8. When velocity is constant, the acceleration is _____.

 A. constant

 B. zero

 C. varying

 D. infinite

The correct answer is option [B].

9. The velocity of a particle in a time t is given by the equation v = 10 + 2t2. Find the instantaneous acceleration after 5 seconds.

 A. 10ms^{-2}

 B. 15ms^{-2}

 C. 20ms^{-2}

 D. 60ms^{-2}

The correct answer is Option [C]

Given v =10 + 2t^2

a = dv/dt = 4t

at t = 5s,

a = 4 x 5^2 = 20ms^{-2}

10. A car travels 300m in constant direction for 11secs. Find the average velocity of the car.

 A. 11.48m/s.

 B. 27.27m/s.

 C. 30.12m/s.

 D. 16.25m/s.

The correct answer is option [B].

Average Velocity = Displacement/Time = 300/11 = 27.27m/s.

11. A hose of cross-sectional area 0.5m^2 is used to discharge water from a water tanker at a velocity of 60ms^{-1} in 20s into a container. If the container is filled completely, the volume of the container is _____

 A. 2400m^3

 B. 240m^3

 C. 6000m^3

 D. 600m^3

The correct answer is option [D].

The volume of the container will be given as the product of area of the hose, the velocity of the water and the time.

Volume = area x rate x time

Volume = 0.5 x 60 x 20 = 600m^3

Use the information to answer the question.

12. A car breaks, and its velocity decreases from 30m/s to 20m/s in 5secs. What is the retardation of the car?

 A. 4m/s^2.

 B. 2m/s^2.

 C. 6m/s^2.

 D. –2m/s^2.

The correct answer is option [D].

Hint: Thus it is called deceleration or negative acceleration.

13. A 5kg block is accelerated from rest by a force of 20N at a time t = 2secs. Find the velocity of the block.

 A. 8.5m/s.

 B. 8.0m/s.

 C. –8.0m/s.

 D. 4m/s.

The correct answer is option [B].

Hint: F = m [v – u]/t, u = 0m/s.

14. A ball of 0.075kg is shot against a goalkeeper with a 250N force for 0.05secs. Calculate the balls speed.

A. 165m/s.

B. 166.67m/s.

C. 176.67m/s.

D. 167.76m/s.

The correct answer is option [B].

Use F = mdv/t where dv = Change in velocity at a negligible instant.

15. An electric train has an initial velocity of 58m/s and acceleration of −6m/s2. What is its velocity after 8seconds?

A. 12m/s.

B. 1.0m/s.

C. 10m/s.

D. 3.12m/s.

The correct answer is option [C].

Using the equation v = u +at, where u = 58m/s, t = 8secs, and a = −6m/s^2, therefore, v = 58 + [(−6) x 8] = 10m/s.

16. The diagram shows the velocity-time graph representing the motion of a car. Find the total distance covered during the motion.
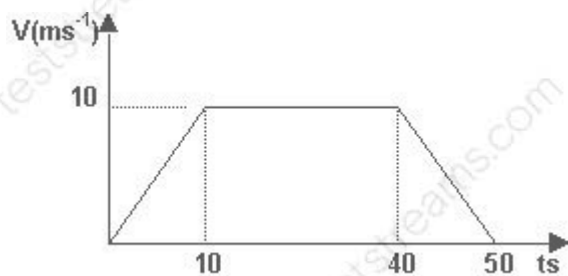
A. 375m

B. 150m

C. 300m

D. 400m

17. A car traveled a distance of 4.0km in 40s. What is the speed of the car in ms⁻¹?

A. 700

B. 400

C. 105

D. 100

The correct answer is option [D].

Using the equation:

Speed = distance/time

18. An aeroplane accelerates along a runway at a velocity of 350m/s, the time it takes to ascend from the runway is 4secs. Find the distance the aeroplane covers at an acceleration of 3m/s2.

A. 1424m.

B. 1234m.

C. 2414m.

D. 1420m.

The correct answer is option [A].

Hint: Use the equation $s = ut + 1/2at^2$. Therefore, $s = [350 \times 4] + [1/2 \times 3 \times 4^2] = 1400 + 24 = 1424m$.

19. A motorcycle starting from rest moves with uniform acceleration until it attains a speed of 180km/h after 35s. Find the acceleration.

A. 2m/s^2

B. 1.4m/s^2

C. 3m/s^2

D. 2.5m/s^2

The correct answer is option [B].

180km/h = (180 x 1000)/ (60 x 60) = 50m/s

Therefore, initial velocity, u = 0m/s final velocity (speed), V = 50m/s change in velocity = v –u = 50 – 0 = 50

Time since acceleration a = 50/35 = 1.4m/s^2

A velocity–time graph of a car that starts with an initial velocity of 15km/h and accelerates uniformly at 5m/s2 until it attains a maximum velocity of 30km/h. It then maintains this speed for the next 2 minutes.

20. Calculate the distance covered by the car.

A. 996 m

B. 762.5 m

C. 504 m

D. 750 m

The correct answer is option [B].

The distance s = (u + v) t/2

Where u = initial velocity, v = final velocity and t = time.

21. A vehicle moving with a speed of 80km/h was brought uniformly to rest by the application of brakes in 18 secs. Find the distance travelled by the vehicle if the vehicle brake was applied.

A. 150m.

B. 170.2m.

C. 200.34m.

D. 299.4m.

The correct answer is option [C].

80km/h = [80 x 1000m]/[60 x 60] = 22.2m/s. Deceleration, a = v/t = 22.2/18 = –1.23m/s²;s = ut + 1/2at² = 22.2 x 18 + [1/2 x (–1.23) x 182 = 399.6 + [–199.26] = 399.6 – 199.26 = 200.34m.

22. Two cars x and y travelling in opposite direction along the same highway at uniform velocities 110kmh⁻¹ and 90kmh⁻¹ respectively pass each other at certain point. The velocity of x relative to y at the time the they pass each other is _____.

A. 200kmh⁻¹

B. 100kmh⁻¹

C. 40kmh⁻¹

D. 20kmh⁻¹

The correct answer is option [D].

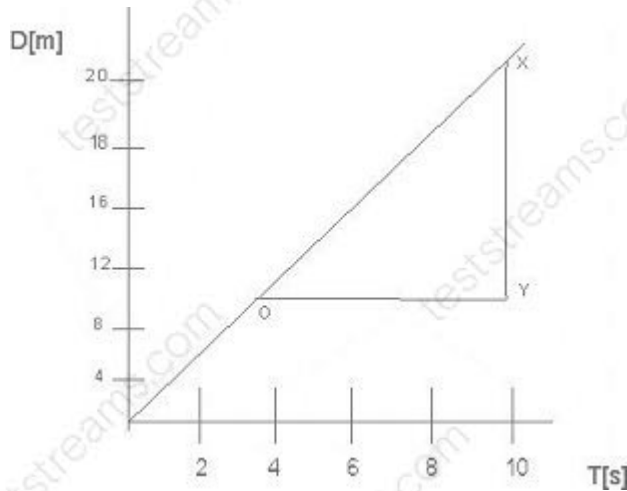23. If a ball is released from a height of 30m. Find the time it takes to fall.

[g = 10m/s²]

A. 30sec.

B. 2.44sec.

C. 1.89sec.

D. 20.03sec.

The correct answer is option [B].

Hint: Use the equation s = ut + [1/2gt²] → 30 = 0 + [1/2 x 10 x t²] → 30 = 5t², therefore, t² = 30/5 = 6s, then, t = √6 = 2.44secs.

24. From a distance–time graph shown calculate the velocity of the car from the graph.

A. 2m/s.

B. 3.5m/s.

C. 1.54m/s.

D. 4.6m/s.

The correct answer is option [C].

Velocity = Slope OX = [XY]/ [OY] = [20 – 10]/[10 – 3.5] = 1.54m/s.

25. If a car has an initial velocity of 55m/s and an acceleration of –3m/s2, its velocity after 12secs will be _____.

A. 12.1m/s.

B. 20m/s.

C. 1.12m/s.

D. 19m/s.

The correct answer is option [D].

Hint: Use the equation v = u + at = 55 + [–3 x 12] + 19m/s.

26. A mass of 6kg is operated by a force of 36N. Find the rate of change of velocity.

 A. 6m/s.

 B. 0.2m/s.

 C. 6m/s2.

 D. 0.2m/s2.

The correct answer is option [C].

Hint: $F = mdv/dt \rightarrow dv/dt = F/m$

Where dv/dt is the rate of change of velocity.

27. A body is said to move with uniform acceleration if its rate of increase of velocity with time is _____.

 A. uniform

 B. constant

 C. directly proportional to the square of its distance apart

 D. none of the above

The correct answer is option [B].

Reason: Because $[v_2 - v_1]/ [t_2 - t_1]$ = Constant or $\delta v/\delta u$ = constant.

28. A graph of velocity against time is called _____.

 A. acceleration-time graph

 B. acceleration graph

 C. distance-time graph

 D. displacement-time graph

The correct answer is option [B].

29. Is acceleration, rate of change of speed or velocity?

 A. It is rate of change of speed.

 B. It is rate of change of velocity.

C. It is both options A and B.

D. It is rate of change of distance.

The correct answer is option [B].

30. Gas expelled by a rocket is 0.5kg/s. Find the velocity of the gas if the average force of the gas is 140N.

A. 180m/s.

B. 280m/s.

C. 270m/s.

D. 320m/s.

The correct answer is option [B].

Hint: Use the equation F = mv = 0.5v = 140, therefore, v = 140/0.5 = 280m/s.

31. An aircraft attempts to fly due north at 100Kmh^{-1}. If the wind blows against it from east to west at 60kmh^{-1}, its resultant velocity is _____.

A. 117Kmh^{-1}N31°E

B. 127kmh^{-1}N31°E

C. 117kmh^{-1}N31°W

D. 127kmh^{-1}N31°W

The correct answer is option [C].

By Pythagoras theorem $R^2 = 100^2 + 60^2$

$R^2 = 10,000 + 3600$

$R = \sqrt{13600}$

$R = 116.62 = 117$kmh^{-1}

N31°W

Use the information to answer the question.

32. A car breaks, and its velocity decreases from 30m/s to 20m/s in 5secs. The change in velocity with time of the car can be called all EXCEPT _____.

A. reverse velocity

B. retardation

C. deceleration

D. negative acceleration

The correct answer is option [A].

33. A car has a uniform velocity. What is the acceleration of the car?

A. Unknown.

B. Undefined.

C. $0m/s^2$.

D. None of the above.

The correct answer is option [C].

Hint: Acceleration = Rate of change of velocity. Therefore, if the velocity is uniform, acceleration must be zero.
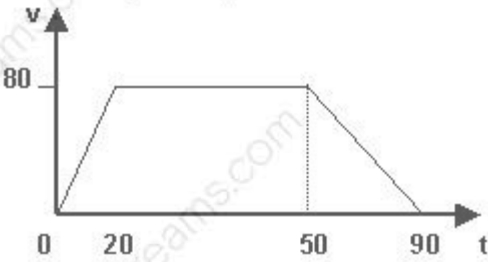
34. A lorry moves from rest with an acceleration of $0.4m/s^2$. What is its velocity when it has moved a distance of 52m?

A. 4.61m/s

B. 6.44m/s

C. 3.02m/s

D. 8m/s

The correct answer is option [B].

Hint: use the equation $v = \sqrt{[u^2 + 2as]} = \sqrt{[0 + (2 \times 0.4 \times 52)]}$ = 6.44m/s.

35. The diagram shows the velocity–time graph of a vehicle. Its acceleration and retardation respectively are _____.

A. 8.0ms⁻², 4.0ms⁻²

B. 4.0ms⁻², 8.0ms⁻²

C. 4.0ms⁻², 2.0ms⁻²

D. 2.0ms⁻², 4.0ms⁻²

The correct answer is option [C].

Acceleration = 80/20 = 4ms²

Deceleration = (0 80)/ 40 = 2ms⁻²

36. A moving body of mass 25.0kg undergoes a uniform retardation of 20ms⁻², the magnitude of the retarding force is _____.

A. 1.25N

B. 8.00N

C. 45.00N

D. 500.00N

The correct answer is option [D].

TOPIC: VAPOUR PRESSURE

DIRECTION: Choose the correct answer from the lettered options.

1. A dynamic equilibrium exists between the liquid molecules and the vapour molecules at a given temperature is called _____.

 A. atmospheric pressure

 B. saturated

 C. gas pressure

 D. vapour

The correct answer is option [B].

N/B: whenever saturation is mentioned, the first thing that should come to a student's mind should be equilibrium.

2. The rate of evaporation of a liquid is affected by the _____.

 A. density of the liquid

 B. humidity of the atmosphere

 C. presence of impurities

 D. prevailing atmospheric pressure

The correct answer is option [B].

3. Which of the following explains the variation of boiling point of water at 100°C with pressure?

 A. Atmospheric pressure varies at low altitude

 B. Atmospheric pressure varies at high altitude

 C. Atmospheric pressure is constant at low altitude

 D. Atmospheric pressure is constant at high altitude

The correct answer is option [A].

4. The table below shows the saturation (s.v.p.) of a liquid in centimeters of mercury:

Temp	20°C	30°C	40°C	50°C	60°C	70°C	80°C
S.V.P	30	44	52	68	74	78	84

At standard (normal) atmospheric pressure the boiling point of the liquid is about _____.

A. 35°C

B. 65°C

C. 40°C

D. 55°C

The correct answer is option [B].

TOPIC: WAVES

DIRECTION: Choose the correct answer from the lettered options.

1. A parallel narrow wave became broadened and curved on passing through a narrow slit. Then _____ has occurred.

 A. sound wave

 B. interference

 C. diffraction

 D. dispersion

The correct answer is option [C].

2. I. Wavelength

II. Medium of propagation

III. Wave velocity

IV. Frequency

V. Energy.

Which of the above are used for characterizing waves?

 A. I, III and IV

 B. I, II and V

 C. III, IV and V

 D. I and IV

The correct answer is option [A].

3. If an object is placed 0.25m from the mirror whose radius of curvature is 0.20m? Find the distance of the image from the mirror.

 A. 0.17m.

 B. 19.17m.

 C. 18.21m.

 D. 20.03m.

The correct answer is option [A].

U = 0.25m x 100 = 25cm

r = 0.20m x 100 = 20cm.

Then ƒ = r/2 = 20/2 = 10cm

1/v = 1/10 – 1/25,

Therefore, v = 0.17m or 16.7cm.

4. The angular velocity of a wave is 5p rad/sec. What is the frequency and period of the wave?

 A. 2.5Hz, 2secs.

 B. 2.3Hz, 0.4secs.

 C. 2.5Hz, 0.4secs.

 D. 2.6Hz, 0.4secs.

The correct answer is option [C].

Hint: $\omega = 2\pi f$ and $f = 1/T$

Where ω = angular velocity, ƒ = frequency measured in Hertz or per seconds, T = Period measured in seconds.

5. Infra-red rays are so called because _____.

 A. they are red in colour

 B. it is electromagnetically red and long

 C. they can be absorbed and re-absorbed

 D. their wavelength is much longer than the wavelength in visible light, which is red

The correct answer is option [D].

6. The frequency of an electromagnetic wave of 5×10^{14}Hz is incident on the surface of water of refractive index 4/3. Calculate the wavelength of the wave in water if the speed of the wave in air is 3×10^8m/s.

 A. 4.5×10^{-7}.

 B. 13.2×10^{-7}.

 C. $3.8 \times 10^{-7.}$

 D. 21.6×10^{-7}.

The correct answer is option [A].

$a\eta w = \lambda a/\lambda w = [v/f]/\lambda w$

$4/3 = [v/f]/\lambda w$,

Therefore, $\lambda w = 3/4[v/f] = 3/4 \times 0.6 \times 10{-6} = 4.5 \times 10^{-7}$.

7. A wave has a frequency of 2Hz. What is the period of the wave?

 A. 0.5secs.

 B. 1sec.

 C. 2/3secs.

 D. 4secs.

The correct answer is option [A].

Hint: $f = 1/T$,

Where T= Period and f = Frequency.

8. The wavelength of water wave is 20cm and the frequency is 16Hz. Find the distance between successive crest of the wave.

 A. 15cm.

 B. 10cm.

 C. 5cm.

 D. 20cm.

The correct answer is option [D].

The distance between successive crests of the wave is the wavelength = 20cm.

9. The maximum displacement of the wave from equilibrium position is known as _____.

 A. period

 B. amplitude

 C. frequency

 D. phase

The correct answer is option [B].

10. Which of the following statement is wrong?

 A. An electron can behave as a wave.

 B. When the amplitude of a wave increases the wavelength increases.

 C. Kinetic energy is directly proportional to rise in temperature.

 D. Kinetic energy increase as pressure decreases.

The correct answer is option [D].

Hint: $1/2[mv^2] = PV \rightarrow P = [mv^2]/2V$

Where v = velocity, V = volume, m = mass and P = Pressure. This shows that pressure increase as kinetic energy increases.
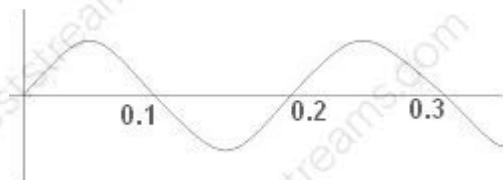
11. Given that the wavelength of ultraviolet radiation is 400nm and electromagnetic speed being constant. What is the frequency?

A. 1.4×10^{-15} Hz.

B. 7.5×10^{14} Hz.

C. 7.45×10^{5} Hz.

D. 1.2×10^{11} Hz.

The correct answer is option [B].

Hint: Take electromagnetic speed to be equal to the speed of light in space and then use $f = c/\lambda$.

12. From the wave motion graph shown, find the wavelength of the graph.

A. 0.1.

B. 0.2.

C. 0.3.

D. 0.01.

The correct answer is option [B].

13. In an electromagnetic spectrum, the wavelengths of visible spectrum is 400nm-700nm. The wavelength of γ-rays is _____.

A. 550nm

B. longer than 700nm

C. shorter than 400nm

D. infinite

The correct answer is option [C].

Reason: Because its frequency is higher than visible light frequency.

14. A vibrating string has a tension of 400N and produces a note of 200Hz when plucked in the middle. When the length of the string is unaltered and the tension is increased to 729N, the frequency becomes _____.

 A. 274Hz

 B. 249Hz

 C. 270Hz

 D. 148Hz

The correct answer is option [C].

15. What is the mean period of oscillation if 30 oscillations of a certain pendulum is repeated thrice to obtain 70secs, 72secs and 56secs?

 A. 69.67secs.

 B. 70secs.

 C. 2.2secs.

 D. 66secs.

The correct answer is option [C].

Hint: Take the mean of the times then divide the result by the number of oscillations.

16. A wave travel 55cm in 4.0s the distance between successive crest is 6cm. What is the frequency of the wave?

 A. 13.75Hz.

 B. 20.43Hz.

 C. 2.29Hz.

 D. 1000Hz.

The correct answer is option [C].

V = d/t = 55/4 = 13.75cm/s. Frequency, $f = v/\lambda$ = 13.75/6 = 2.29Hz.

17. When a body sets another body vibrating both at equal natural frequency, what has occurred?

 A. Disturbance has occurred.

 B. Resonance has occurred.

 C. Reaction-conductance has occurred.

 D. All of the above.

The correct answer is option [B].

18. The phase difference between P and Q in the diagram drawn is _____.

 A. $\pi/4$

 B. $\pi/2$

 C. π

 D. 2π
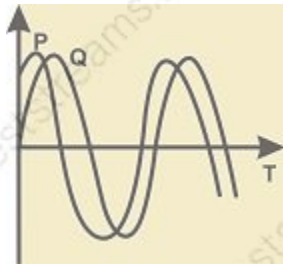
The correct answer is option [D].

$\varphi = 2\pi/\lambda$

$\lambda = 1$

$\varphi = 2\pi$

19. The wavelength of a wave is 0.5m and it travels a distance of 2m in 4secs. Calculate the period of the wave?

A. 5secs.

B. 4secs.

C. 1.5secs.

D. 1.0secs.

The correct answer is option [D].

Hint: Wave speed v = x/t = 2/4 = 0.5m/s.

Frequency, f = v/λ = 0.5/0.5 = 1Hz.

Period, T = 1/f = 1secs.

20. The frequency of the note emitted by a sonometer wire vibrating transversely is 120Hz. What will be the frequency of the note when the length of the wire is reduced by half without changing the tension?
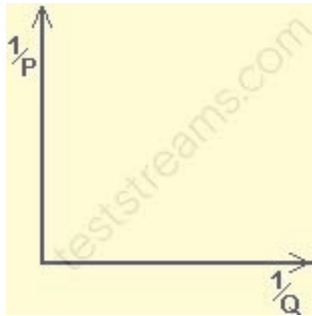
A. 100Hz.

B. 450Hz.

C. 240Hz.

D. 60Hz.

The correct answer is option [C].

Hint: f α1/L or f = 1/L,

Where L = length of wire, and f = frequency.

21. If P represent an object distance measured 1/P and plotted against image distance 1/Q. Hence determine the focal length f from the graph.

A. f = 1/v.

B. f = 1/u.

C. f is the reciprocal of the slope.

D. f is the reciprocal of the intercept on both sides.

The correct answer is option [D].

22. Which of the in the following options cannot travel through space?

A. Infra-red wave.

B. Radio wave.

C. Sound wave.

D. Light wave.

The correct answer is option [C].

23. The dual nature of light is when act as _____.

A. particle and wave

B. particle and matter

C. and wave

D. and particle

The correct answer is option [A].

24. Soldiers marching are usually ordered to break steps while crossing a bridge to prevent _____.

 A. the bridge from collapsing due to resonance

 B. the bridge from collapsing due to their weights

 C. them from colliding with one another on the bridge

 D. them from crossing easily

The correct answer is option [A].

25. Very tiny substances that acts as are best described in physics as _____.

 A. atoms

 B. molecules

 C. particles

 D. electrons

The correct answer is option [C].

26. The equation given [sin I = sin (A + d)] is the equation of two prisms; one triangular and the other block. What is the angle of deviation given that I = 70° and A = 60°?

 A. 42°.

 B. 10°.

 C. 21°.

 D. 12°.

The correct answer is option [B].

Sin I = Sin (A + d)

Use the information to answer the question.

27. At a television station the speed of the wave of frequency 200 KHz is 3×10^8 m/s. What is the wavelength of the wave?

A. 2×10^5 m.

B. 3×10^3 m.

C. 1.5×10^3 m.

D. 10^3 m.

The correct answer is option [C].

28. The crest of a rocked boat is 120m apart and the velocity is 28m/s. Find the interval the wave crest reaches the boat.

A. 3.16secs.

B. 13secs.

C. 4.28secs.

D. 42.01secs.

The correct answer is option [C].

Velocity = d/t

t = d/v = 120/28 = 4.28secs.
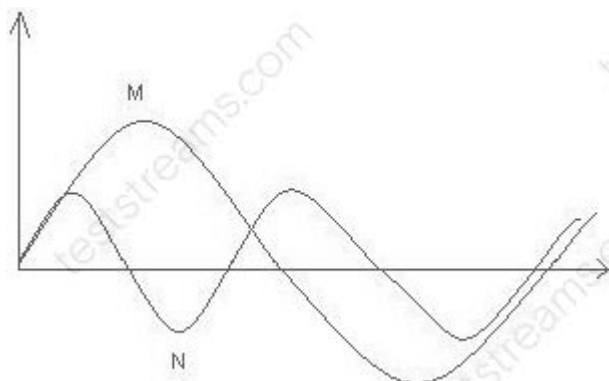
Use the information to answer the question.

29. At a television station the speed of the wave of frequency 200 KHz is 3×10^8 m/s. The period of the wave is _____.

A. 10^{-5} secs

B. 0.5×10^{-5} secs

C. 2×10^5 secs

D. none of the above

The correct answer is option [B].

30. Given that the diagram drawn represent two wave form M and N. If the frequency of M is 40Hz, find that of N.

 A. 100Hz.

 B. 60Hz.

 C. 25Hz.

 D. 30Hz.

The correct answer is option [A].

Hint: From the diagram the frequency of N is 2.5 times that of M.

31. A ray of light in water operates as a wave with frequency 10^5Hz. What is the frequency of the wave in air?

[Refractive index of water = 1.33]

 A. 1.33×10^5Hz.

 B. 7.52×10^4Hz.

 C. 10^4Hz.

 D. 10^{-5}Hz.

The correct answer is option [A].

Hint: Refractive index, η = frequency in air/frequency in medium.

32. A certain wave has a speed of 20ms-1. If the frequency of the wave is 0.25Hz, calculate the distance between successive crests of the wave.

A. 5.0m

B. 40.0m

C. 50.0m

D. 80.0m

The correct answer is option [D].

Using the formula: v = λf

33. What is the relationship between radius of curvature, r and focal length, f?

A. v = fλ.

B. T = 1/f.

C. vr = f.

D. r = 2f.

The correct answer is option [D]. R = 2f or f = r/2

Where r = radius of curvature and f = focal length.

34. A progressive wave is represented by y = 10sin (1000πt – αx/34). Two layers of the separated by 153cm have a phrase difference of _____.

A. 270°

B. 45°

C. 90°

D. 180°

The correct answer is option [D].

35. The common circumference of all wave particles vibrating in phase is called _____.

A. phase distance

B. phase circumference

C. wave front

D. wave circumference

The correct answer is option [C].