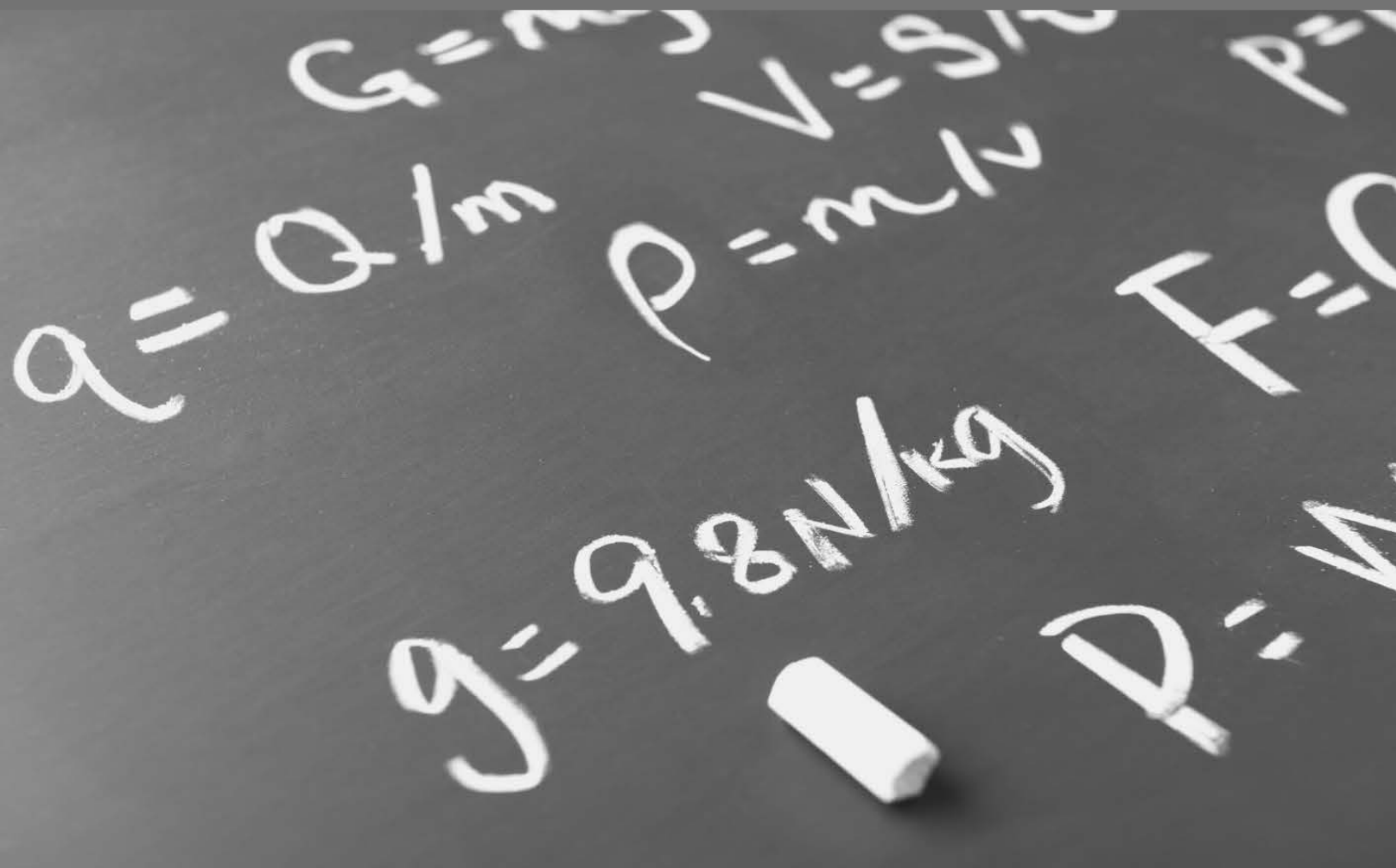


Practice Questions and Answers

PHYSICS

For
Senior Secondary School

3



EDUBASE

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QUESTIONS

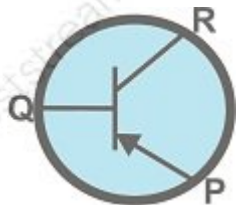
TOPIC: ALTERNATING CURRENT

DIRECTION: Choose the correct answer from the lettered options.

1. The peak voltage in an r.m.s. circuit is 2.0V and the resistance of the circuit is 3.0Ω . Find the peak current flowing.

- A. 0.666A.
- B. 1.5A.
- C. 2.43A.
- D. 1.333A.

2. In the circuit transistor diagram shown, the terminals P, Q and R represent _____.



- A. BASE, EMITTER, COLLECTOR
- B. BASE, COLLECTOR, EMITTER
- C. EMITTER, BASE, COLLECTOR
- D. COLLECTOR, EMITTER, BASE

3. The resistance in a series R-C circuit is 5Ω . If the impedance of the circuit is 13Ω , calculate the reactance of the capacitor.

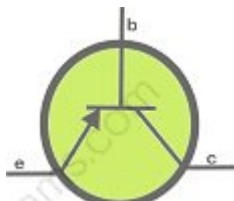
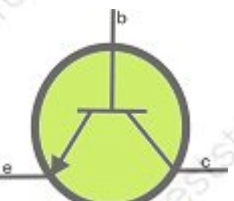

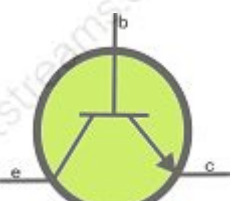
- A. 18Ω
- B. 16Ω
- C. 14Ω
- D. 12Ω

Use the information to answer the question.

4. An RLC circuit with $R = 60\Omega$, $L = 0.2\text{H}$, $C = 40\text{mF}$ and $f = 392.86\text{Hz}$ experiences the passage of an a.c. with peak value 0.1A . Obtain the value of the current vector, V_C .

- A. 10.0V .
- B. 15.0V .
- C. 18.4V .
- D. 12.0V .

5. Which of the following diagram represents correctly an n-p-n transistor?

- A. 
- B. 
- C. 
- D. 

6. At what frequency would a capacitor of $2.5\mu\text{F}$ be used in a radio circuit having a reactance of 250 ohms ?

- A. $80/\text{pHz}$
- B. $800/\text{pHz}$
- C. $1600/\text{pHz}$

D. $3200/\rho\text{Hz}$

7. In a tuned radio receiver R, L, C series circuit for resonance, the inductive and capacitive reactance X_L and X_C respectively are related as _____.

- A. $X_L = 2X_C$
- B. $X_L = X_C$
- C. $X_L = X_C/2$
- D. $X_L = 1/X_C$

Use the information to answer the question.

8. An alternating e.m.f. of 12V and frequency 50Hz is flowing across a capacitor of 2 nanofarad and resistor of 1000Ω . Obtain the current flowing in the circuit.

- A. $7.5 \times 10^{-6}\text{A}$.
- B. $2.5 \times 10^{-5}\text{A}$.
- C. $7.5 \times 10^{-3}\text{A}$.
- D. $7.0 \times 10^{-4}\text{A}$.

9. An inductor of inductance 0.5H stores 6.25J of energy. The current passing through it is _____.

- A. 0.25A
- B. 0.50A
- C. 3.31A
- D. 5.00A

Use the information to answer the question.

10. An RLC circuit with $R = 60\Omega$, $L = 0.2\text{H}$, $C = 40\text{mF}$ and $f = 392.86\text{Hz}$ experiences the passage of an a.c. with peak value 0.1A. Determine the phase current between the current and the applied voltage.

- A. -39.8° .
- B. 23.4° .
- C. -23.4° .

D. 40.9° .

11. Given that a sinusoidal alternating wave have a voltage of 60.0V and the angle sinusoidal wave being constant 30° . Obtain the amplitude voltage of the system.

A. 15.0V .

B. 25.2V .

C. 45.0V .

D. 60.0V .

12. When impurities are added to semi-conductor, the conductivity of the semi-conductor _____.

A. increases

B. decreases

C. remains constant

D. increases then decreases

13. The capacitive reactance is 15Ω and the resistance is 25Ω . Obtain the phase angle of the circuit.

A. $\sin^{-1} 5/3$.

B. $\tan^{-1} 3/5$.

C. $\tan^{-1} 5/3$.

D. $\cos 3/5$.

Use the information to answer the question.

14. An alternating e.m.f. of 12V and frequency 50Hz is flowing across a capacitor of 2 nanofarad and resistor of 1000Ω . Obtain the voltage across the capacitor.

A. 2.5V .

B. 10.2V .

C. 11.94V .

D. 11.02V .

15. A radio station delivers at a frequency of 500Hz and current used is 0.5mA. If a capacitor 3 μ F is used, the reactance of the capacitor is _____.

- A. 159 Ω
- B. 238.5 Ω
- C. 325.5 Ω
- D. 23.85 Ω

16. The effective voltage recorded in an effective is 230V. What is the peak voltage?

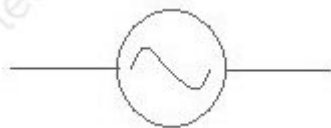
- A. 325.250V.
- B. 215.150V.
- C. 322.120V.
- D. 125.325V.

Use the information to answer the question.

17. A capacitor of known capacitance and a 230V power supply at 50Hz are connected in series to a lamp rated 0.8A current. If the capacitor is replaced by an inductor of 0.9H, what will be the value of the current in the circuit?

- A. 3.0000A.
- B. 2.5232A.
- C. 3.8125A.
- D. 1.6250A.

18. What kind of symbol is drawn?



- A. Direct e.m.f.
- B. Direct current.
- C. Alternating e.m.f.
- D. Alternating inductance.

19. The battery connection that permits current to flow across a p-n junction is called _____.

- A. amplification
- B. rectification
- C. forward biased
- D. reverse biased

Use the information to answer the question.

20. An alternating e.m.f. of 12V and frequency 50Hz is flowing across a capacitor of 2 nanofarad and resistor of 1000Ω. Obtain the result of the phase angle.

- A. $\sin^{-1} 45$.
- B. $\tan^{-1} 19$.
- C. $\tan^{-1} 25$.
- D. $\sin^{-1} 19$.

Use the information to answer the question.

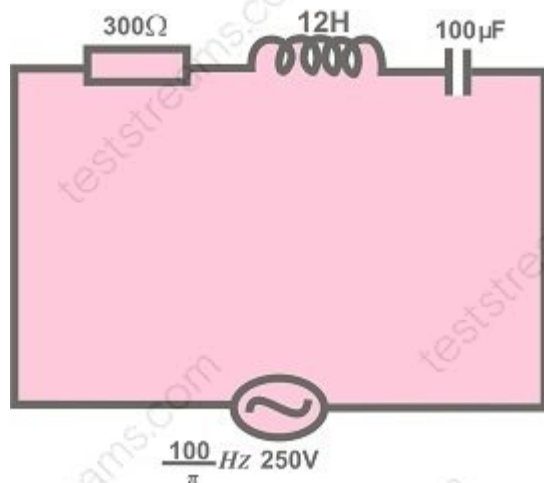
21. An RLC circuit with $R = 60\Omega$, $L = 0.2\text{H}$, $C = 40\mu\text{F}$ and $f = 392.86\text{Hz}$ experiences the passage of an a.c. with peak value 0.1A. Guess the instantaneous value of the reactive capacitance?

- A. 20Ω .
- B. 50Ω .
- C. 70Ω .
- D. 100Ω .

22. A p-n junction diode is used as _____.

- A. a rectifier in a d.c circuit
- B. an amplifier in an a.c circuit
- C. a rectifier in an a.c circuit
- D. an amplifier in an d.c in circuit

23. Using the circuit diagram drawn, calculate the inductive reactance.



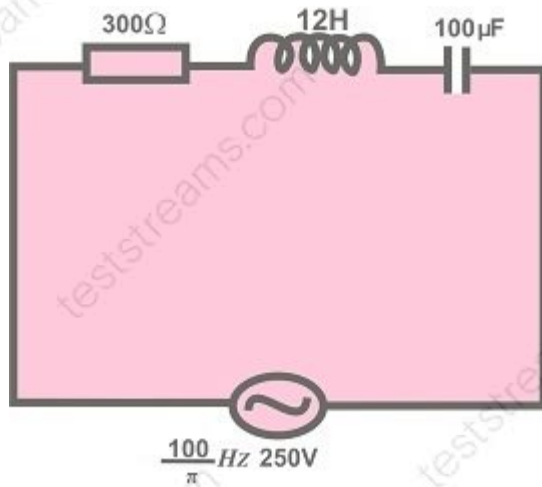
- A. 3000Ω
- B. 4500Ω
- C. 2400Ω
- D. 1250Ω

Use the information to answer the question.

24. A capacitor of known capacitance and a 230V power supply at 50Hz are connected in series to a lamp rated 0.8A current. If this current is the minimum current needed to light up the lamp, then what is the value of the effective current and voltage?

- A. 0.8A and 230V.
- B. 0.6A and 210V.
- C. 2.0A and 2.3V.
- D. 0.6A and 220V.

25. Using the circuit diagram drawn, find the impedance of the circuit.



- A. 2418.2Ω
- B. 2369.1Ω
- C. 304.1Ω
- D. 340.1Ω

Use the information to answer the question.

26. An RLC circuit with $R = 60\Omega$, $L = 0.2\text{H}$, $C = 40\text{mF}$ and $f = 392.86\text{Hz}$ experiences the passage of an a.c. with peak value 0.1A . Measure by calculation the result of the voltage vector, V_L .

- A. 5.0volt .
- B. 21.1volt .
- C. 3.5volt .
- D. 4.25volt .

27. The energy stored in an inductor of inductance 5mH when a current of 6A flows through it is _____.

- A. $1.4 \times 10^{-2}\text{J}$
- B. $1.8 \times 10^{-2}\text{J}$
- C. $9.0 \times 10^{-2}\text{J}$
- D. $9.0 \times 10^{-3}\text{J}$

Use the information to answer the question.

28. An RLC circuit with $R = 60\Omega$, $L = 0.2\text{H}$, $C = 40\text{mF}$ and $f = 392.86\text{Hz}$ experiences the passage of an a.c. with peak value 0.1A . What is the square difference of V_C and V_L ?

- A. 27.8V .
- B. 70V^2 .
- C. 75V^2 .
- D. 57V^2 .

Use the information to answer the question.

29. An alternating e.m.f. of 12V and frequency 50Hz is flowing across a capacitor of 2 nanofarad and resistor of 1000Ω . Find the impedance of the circuit.

- A. $10^3\sqrt{3}\Omega$.
- B. $10^6\sqrt{2.53}\Omega$.
- C. $10^2\sqrt{2.50}\Omega$.
- D. 105 .

30. When the base current of a common-emitter transistor is kept at zero, it operates in the _____.

- A. active-on region
- B. break down region
- C. saturation region
- D. cut-off region

31. For semiconductors to have negative temperature coefficient of resistance implies that _____.

- A. their resistance increases with temperature
- B. their resistance decreases with temperature
- C. they have electrons and holes at high
- D. their resistance is constantly changing with temperature

32. At a certain measurement, the amplitude voltage was 9.33V across a capacitor and an inductor. The current value recorded at this point was 3.0A. Find the reactance of the system.

- A. 27.99A.V.
- B. 27.99V/A.
- C. 3.11A/V.
- D. 3.11V/A.

33. Which of the following equation is correct for the energy 'E' stored in an inductor of inductance 'L' when current 'I' passes through it?

- A. $E = LI^2/2$
- B. $E = LI^2$
- C. $E = LI/2$
- D. $E = L^2I/2$

34. When an given by $I = 10\sin(120\omega)t$ passes through a 12Ω resistor, the power dissipated in the resistor is _____.

- A. 120W
- B. 30W
- C. 600W
- D. 1200W

35. Find the peak voltage of a 240V r.m.s main supply.

- A. 77.1V
- B. 120.0V
- C. 169.7V
- D. 339.4V

Use the information to answer the question.

36. An RLC circuit with $R = 60\Omega$, $L = 0.2H$, $C = 40mF$ and $f = 392.86Hz$ experiences the passage of an a.c. with peak value 0.1A. What is the reference voltage?

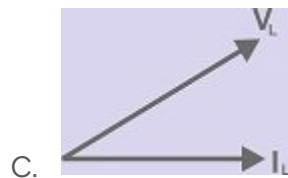
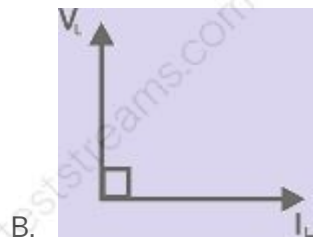
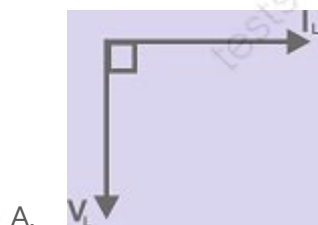
- A. 43V.
- B. $\sqrt{43}$ V.
- C. $\sqrt{20}$ V.
- D. 25V.

Use the information to answer the question.

37. An RLC circuit with $R = 60\Omega$, $L = 0.2\text{H}$, $C = 40\text{mF}$ and $f = 392.86\text{Hz}$ experiences the passage of an a.c. with peak value 0.1A . Visualise the result of the voltage at maximum.

- A. 20.1volt.
- B. 7.81volt.
- C. 2.01volt.
- D. 30.7volt.

38. Which of the following diagrams illustrates the phase difference between the voltage and current of an inductor in a circuit?



39. When an given by $I = 10 \sin(120\pi)t$ passes through a 12Ω resistor, the power dissipated in the resistor is _____.

- A. 120W
- B. 30W
- C. 600W
- D. 1200W

40. In an a.c. circuit that contains only a capacitor, the current voltage lags behind by _____.

- A. 30°
- B. 60°
- C. 90°
- D. 180°

Use the information to answer the question.

41. An RLC circuit with $R = 60\Omega$, $L = 0.2\text{H}$, $C = 40\text{mF}$ and $f = 392.86\text{Hz}$ experiences the passage of an a.c. with peak value 0.1A , calculate the reference voltage V_R .

- A. 0.2A .
- B. 0.0707A .
- C. 4.24V .
- D. 0.03V .

42. If a current of 17A pass through a coil such that the magnetic flux set up is 40Weber , determine the self-inductance in the coil.

- A. 3.45 H
- B. 1.73 H
- C. 2.35 H
- D. 6.35 H

Use the information to answer the question.

43. An RLC circuit with $R = 60\Omega$, $L = 0.2\text{H}$, $C = 40\mu\text{F}$ and $f = 392.86\text{Hz}$ experiences the passage of an a.c. with peak value 0.1A . Obtain the impedance of the circuit.

- A. 40Ω .
- B. 20Ω .
- C. 78.1Ω .
- D. 50Ω .

44. The ratio of the effective voltage to effective current is known as _____.

- A. impedance
- B. reactance of capacitor
- C. resistance
- D. phase resistance

45. Find the reactance of a capacitor $500/\rho\text{Hz}$ frequency if in a circuit a capacitor has a reactance = 5mF .

- A. 200Ω
- B. 200.5Ω
- C. 80.7Ω
- D. 190.1Ω

46. The overall resistance of a circuit containing a resistor and either a capacitor or an inductor is called _____.

- A. capacitance
- B. impedance
- C. inductance
- D. reactance

47. Maximum current is obtained in a series RLC circuit when the

- I. total reactance is zero

II. impedance is equal to the resistance

III. capacitive reactance is equal to the inductive reactance

IV. circuit is in resonance

Which of the statements above is /are correct?

- A. I only
- B. III only
- C. I and II only
- D. I, II, III and IV

48. The charge carriers in gases are _____.

- A. electrons only
- B. ions only
- C. electrons and ions
- D. electrons and holes

49. A radio station delivers at a frequency of 500Hz and current used is 0.5mA. If a capacitor 3 μ F is used, obtain the voltage value across the capacitor.

- A. 0.6V.
- B. 0.1193V.
- C. 0.1250V.
- D. 0.5321V.

TOPIC: ELECTRIC FIELDS

DIRECTION: Choose the correct answer from the lettered options.

Use the information to answer the question.

1. Two plates capacitors are separated by a distance of 0.5m in a field at 10^7N/C .

[Take $1/4\pi\epsilon_0 = 9.05 \times 10^9\text{m/f}$].

Determine the power generated by the circuit.

- A. $1.25 \times 10^6\text{W}$.
- B. $26.73 \times 10^4\text{W}$.
- C. $39.22 \times 10^7\text{W}$.
- D. $1.38 \times 10^8\text{W}$.

Use the information to answer the question.

2. Two plates capacitors are separated by a distance of 0.5m in a field at 10^7N/C .

[Take $1/4\pi\epsilon_0 = 9.05 \times 10^9\text{m/f}$].

What is the current that could be generated if the system of circuit is left over a period of 10^{-5}sec ?

- A. 10^{-3}A .
- B. $2.5 \times 10^{-2}\text{A}$.
- C. 27.62A .
- D. 3.52A .

3. A current of 21A is passed through a 20m length of two conducting wire placed 125cm apart. Determine the force of attraction between the wires assuming the current is flowing in the direction.

[TAKE the force constant to be 2×10^{-7}].

- A. $1.33 \times 10^{-5} \text{N}$
- B. $4.5 \times 10^{-5} \text{N}$
- C. $7.1 \times 10^{-4} \text{N}$
- D. $6.4 \times 10^{-4} \text{N}$

Use the information to answer the question.

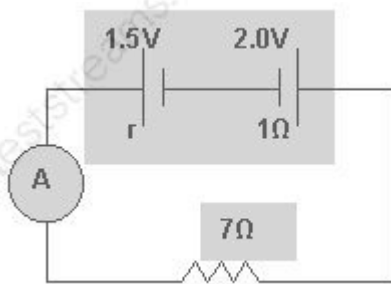
4. Two plates capacitors are separated by a distance of 0.5m in a field at 10^7N/C .

[Take $1/4\pi\epsilon_0 = 9.05 \times 10^9 \text{m/f}$].

Obtain the possible resistance that could be applied across the capacitors.

- A. 320.056K Ω .
- B. 22.056K Ω .
- C. 520K Ω .
- D. 362.056K Ω .

5. In the given circuit shown, the cell P has an e.m.f of 1.5V and an unknown internal resistance, r while the cell Q has an e.m.f. 2.0V and an internal resistance 1. If the ammeter reads 50mA, then R equals _____.



- A. 3.0W
- B. 4.0W
- C. 5.5W
- D. 2.0W

6. The force of repulsion between two particles of equal charges of $1.7 \times 10^{-18} \text{C}$ is _____, if the distance between them is $5.2 \times 10^{-10} \text{m}$.

$$[1/4\pi\epsilon_0 = 9 \times 10^9 \text{Nm}^2/\text{C}^2]$$

- A. $26.7 \times 10^{-8} \text{N}$.
- B. $10.11 \times 10^{-8} \text{N}$.
- C. $7 \times 10^{-8} \text{N}$.
- D. $9.62 \times 10^{-8} \text{N}$.

7. Which of the following is NOT an effect that can be produced by an electric current?

- A. Heat
- B. Light
- C. Sound
- D. Water

8. If the distance between two point charges is increased by a factor of four, the magnitude of the electrostatic force between them will be _____.

- A. 4 times its former value
- B. $1/2$ of its former value
- C. $1/4$ of its former value
- D. $1/16$ of its former value

9. Two charged particles are projected into a region where there is a perpendicular to their velocities. If the charges are deflected in opposite directions, which of the following statement is true of charges?

- A. The charges are electrically neutral
- B. The charges must be of opposite sign
- C. The charges are of the same sign
- D. Positive charges are more in number

10. If the force on a charge of 0.2C in an electric field is 4N, then the electric field intensity of the field is _____.

- A. 0.8 C/N
- B. 0.8 N/C
- C. 20.0 N/C
- D. 4.2 N/C

11. Given three capacitors 0.3 μ F, 0.5 μ F and 0.2 μ F, the joint capacitance when arranged to give minimum capacitance is _____.

- A. 1.0 μ F
- B. 0.5 μ F
- C. 0.3 μ F
- D. 0.1 μ F

12. Capacitors are used in the following devices, EXCEPT _____.

- A. water pumping
- B. ceiling fans
- C. electric irons
- D. television set

13. Calculate the peak voltage of a mains supply of r.m.s. value 220V.

- A. 112V
- B. 150V
- C. 240V
- D. 311V

14. Which of the following is a pure semiconductor?

- A. Silicon
- B. Phosphorus
- C. Transistor

D. Carbon

15. The force acting on an electron of charge $1.6 \times 10^{-19}\text{C}$ placed in an electric field of intensity 108Vm^{-1} is _____.

A. $1.6 \times 10^{-11}\text{N}$

B. $1.6 \times 10^{-14}\text{N}$

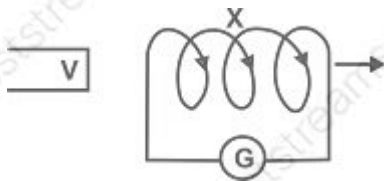
C. $1.6 \times 10^{-16}\text{N}$

D. $1.0 \times 10^{-16}\text{N}$

TOPIC: ELECTROMAGNETIC INDUCTION

DIRECTION: Choose the correct answer from the lettered options.

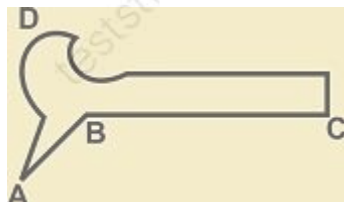
- Which of the options is not a use of soft-iron core being laminated?
 - To reduce loss of energy in the form of heat
 - Ensuring that the core is made of hard magnetic material for easy magnetic reversal
 - Eliminate the effect of eddy current which occurs due to lenz"s law
 - Increase the efficiency of the transformer
- In the diagram drawn, a coil X is moved quickly away from the end V of a stationary metal bar and a current then flows in X as shown. Which of the following option best explains the diagram drawn?



- The bar is not a magnet
 - V is a north pole
 - The current in X is constant
 - V is a south pole
- In an iron-cored transformer, the number of secondary turns is 100 and of primary turns is 2000. When 240V a.c. is connected from the mains, the output is _____.
 - 240V
 - 12V
 - 100V
 - 4800V
 - A dry battery of 6V is joined to the primary of a commercial transformer. The secondary has twice the number of turns of the primary. The primary resistance is 2 ohms. The voltage obtained at the secondary is _____.
 - 0V

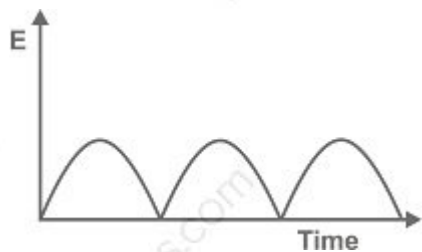
- B. 1.5V
- C. 12V
- D. 3V

5. Which part of the conductor drawn labelled A-D will have the greatest charge density?



- A. D
- B. A
- C. C
- D. B

6. When a coil rotates in a magnetic field, the induced e.m.f E at the brushes varies as shown in the diagram drawn, then _____.



- A. the speed of rotation varies
 - B. the has damaged easily
 - C. the becomes zero twice per revolution
 - D. the ends of the coil are connected to a split-ring commutator
7. All of the options are relevant terms in magnetic flux EXCEPT _____.
- A. magnetic lines of force
 - B. unit weber (Wb)
 - C. telsa unit per unit area

D. electromotive force

8. All of the following are effects of soft-wires as iron-core EXCEPT _____.

- A. to reduce eddy current thereby increasing the secondary emf
- B. to ensure that it is easily magnetised during make and demagnetised during break
- C. provide limited sparks when in use to ignite petrol air mixture in a car cylinder
- D. reduce loss of energy in form of heat

9. A transformer connected to 350V supply has 3000 turns of primary coil. Calculate the number of turns in the secondary coil if the voltage is 60V.

- A. 625 turns
- B. 114 turns
- C. 514 turns
- D. 240 turns

10. The instrument used for securing a large number of similar charges by induction is called _____.

- A. electroscope
- B. proofplane
- C. capacitors
- D. electrophorus

11. What is the power wasted, when 10kilowatts at 200V is supplied through a cable of total resistance 0.5 ohms?

- A. 1345W
- B. 1250W
- C. 1470W
- D. 1730W

12. What would be the effect on the amount of power wasted if the applied voltage was increased and the power was transmitted through the same cable?

- A. Decreased
- B. Increased
- C. The same
- D. Zero

13. A generator used in converting a mechanical energy to electrical energy is called _____.

- A. a moving-coil galvanometer
- B. a moving-iron ammeter
- C. a moving-coil loud speaker
- D. simple dynamo

14. A positive charge moving with a velocity of $3.68 \times 10^{-15} \text{ m/s}$ enters a uniform magnetic field, B of 10^{-7} Telsa. Determine the force on the charge and mass of the positive charge. [Take a positive charge $(+q) = 1.6 \times 10^{-19}$ when radius is 3.78m].

- A. $5.89 \times 10^{-41} \text{ N}$ and $1.3 \times 10^{-2} \text{ kg}$
- B. $5.89 \times 10^{-41} \text{ N}$ and $8.3 \times 10^{-9} \text{ kg}$
- C. $5.89 \times 10^{-41} \text{ N}$ and $1.64 \times 10^{-11} \text{ kg}$
- D. $5.89 \times 10^{-41} \text{ N}$ and $2.4 \times 10^{-17} \text{ kg}$

15. Another name for galvanometer is _____.

- A. ammeter
- B. multimeter
- C. avometer
- D. milliammeter

16. Which of the following does not happen when force acts perpendicular to the deflection path?

- A. Work is done on charge by force
- B. Speed (average velocity) is constant
- C. Energy possessed by remains constant

D. The radius of the circular path can be deduced from the force that tends to keep the charge in circular path

17. Eddy currents can be reduced by _____.

- A. using coil of high resistance
- B. winding the coil on a soft iron core
- C. creating holes in the metal plates
- D. using coil of low resistance

18. Force experienced can be expressed by mathematical induction $F = BIL\sin \theta$. This deduce that L in the relation denote _____.

- A. density
- B. current density
- C. length of conductor
- D. angle of the field

19. Which of the following does not have the application of an electromagnet?

- A. Steel girders handling in industries.
- B. Electric bell.
- C. Microphone.
- D. Telephone earpiece.

20. All of the following is to minimize energy loss in a transformer EXCEPT _____.

- A. use of low resistance copper coil so as to minimize energy loss in the coil winding
- B. laminating soft iron core
- C. ensure that the core is made up of hard material for easy magnetic reversal
- D. ensuring that the primary flux links completely with the secondary

21. An ideal transformer has a primary coil with 500 turns and a secondary coil with 2500 turns. When the input voltage to the primary is 120V, the output secondary voltage is _____.

- A. 12V
- B. 24V
- C. 300V
- D. 600V

22. Which of the following statement does not state Fleming's left hand rule?

- A. It is also called motor rule
- B. The little finger point to the direction of the
- C. The thumb point the direction of the force
- D. The thumb point to the direction of the magnetic fields

23. Lenz's law of is essentially a statement of the _____.

- A. inverse-square law of gravitation
- B. inverse-square law of magnetism
- C. inverse-square law of electrostatics
- D. law of conservation of energy

24. Which of the following is not a factor that affects the magnitude of the induced e.m.f. or current?

- A. The strength of the magnet
- B. Speed of the coil when magnet is steady
- C. Speed of the magnet when coil is steady
- D. Number of turns of the coil

25. Which of the following is an instrument of multiple functions?

- A. Voltmeter
- B. Ammeter
- C. galvanometer
- D. Avometer

26. If two inductors of inductances 3H and 6H are arranged in series, the total inductance is _____.

- A. 0.5H
- B. 2.0H
- C. 9.0H
- D. 18.0H

27. Which of the following is an advantage of the capacitor in an induction coil?

- A. The presence of the capacitor is to slow down the fall of current in the primary coil at the instant of break
- B. To produce low voltage from a high voltage for use
- C. To provide sparks required to ignite the petrol air mixture in car cylinder
- D. This is to prevent the induced emf in the primary coil from rising as to cause unwanted spark

28. Which of the following is a cause of not achieving maximum efficiency?

- A. Low amount of current
- B. Loss of energy arising from work-done against friction in the bearing and commutator of the motor
- C. Low number of coils
- D. Reduced amount of wind air springs

29. A direct current of 2 amps in a coil of 400 turns causes a flux of 10^{-4} weber to link the turns of the coil. Compute the average counter emf induced in the coil if the current is interrupted in 0.008secs.

- A. 0.5 volts
- B. 5 volts
- C. 50 volts
- D. 0.05 volts

30. When an induced current is produced in one coil, the currents direction in another is changed this is called _____.

- A. back emf
- B. mutual induction
- C. self induction
- D. Lenz law

31. The force in a current carrying conductor in a acts at an _____.

- A. right angle to the plane
- B. angle 60° to the plane
- C. angle 45° to the plane
- D. zero angle

32. Which of the following does not happen in a moving-coil galvanometer?

- A. Presence of soft iron cylinder in between the magnet is to ensure that the magnetic flux is concentrated radially
- B. Rotation of coil is due to the force set up in accordance with Fleming's left hand rule
- C. The force set up acts on the two parallel side of the coil
- D. The force set up a deflecting couple which causes the coil to rotate until it balances the control couple set by the air spring

33. All these are uses of electromagnet EXCEPT _____.

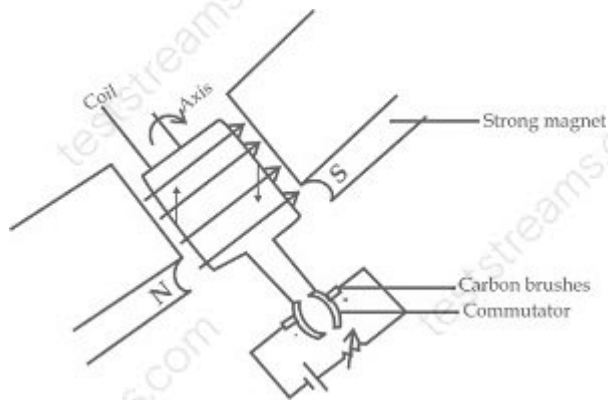
- A. door bell
- B. audiotapes
- C. electric iron
- D. speakers

34. A transformer is rated 240V. If the primary coil is 4000 turns and secondary voilage is 12V, determine the number of turns in the secondary coil.

- A. 100
- B. 150
- C. 200

D. 250

35. The diagram drawn is a simple electric motor that consist of the following parts EXCEPT _____.



- A. a power in which the coil turns
- B. weak hair springs so as to give a small rotational control
- C. a commutator which consist of split copper ring with their two halves insulated from each other
- D. rectangular coil of wire known as the armature about an axis

36. Which of the following best defines eddy current?

- A. The induced emf in a circuit is directly proportional to the rate of change of magnetic flux linking the coil.
- B. The induced current flows in such a direction to oppose the change producing it.
- C. An electric current induced within the body of a conductor when that conductor either moves through a non-uniform or is in a region where there is a change in magnetic flux.
- D. The induced emf in a circuit as a result of the change in the current through the circuit.

37. Soft iron is used in making the armature of an electric bell because it _____.

- A. retains its magnetism for a long time
- B. loses its magnetism readily
- C. produces permanent magnets
- D. is not easily magnetized

38. Which of the following connections is required to convert a millimeter into a voltmeter?

- A. A low resistance in series
- B. A low resistance in parallel
- C. A high resistance in series
- D. A high resistance in parallel

39. The current in the primary coil of a transformer is 2.5A. If the coil has 50 turns and the secondary 250 turns, calculate the current in the secondary coil.

[Neglect energy losses in the transformer]

- A. 0.2A
- B. 0.5A
- C. 2.5A
- D. 5.0A

40. The following options are uses of eddy current EXCEPT _____.

- A. speedometer
- B. induction furnace
- C. inducting a galvanometer
- D. detecting visible cracks on railroads

41. The unit of inductance is _____.

- A. Henrys
- B. Tesla
- C. Ohms
- D. mho

42. The force and magnitude of a current carrying conductor in a depends on the following EXCEPT _____.

- A. the direction and strength of the by the magnet
- B. the direction and amount of the current flowing through the conductor
- C. the current direction and direction are at right angle to each other
- D. the type of magnet and conductors

43. Which of the following defines self-inductance?

- A. Magnetic flux linking the coil per current
- B. Magnetic flux linking the coil per time
- C. Magnetic flux around the coil per current
- D. Change of magnetic flux in a coil per current

44. Which of these type of galvanometer converts electrical energy to sound?

- A. Avometer
- B. Mirror-galvanometer
- C. Moving-coil loud speaker
- D. Moving-coil galvanometer

45. Which of the following is not a use of an induction coil?

- A. To produce low voltage from high voltage for use
- B. For studying the discharge of electricity through gases
- C. For x-ray tubes to produce to the voltage required for accelerating the electron towards the metal target
- D. To provide sparks required to ignite the petrol air mixture in a car cylinder

46. All these are devices that uses electro magnet in its mode of operation EXCEPT _____.

- A. telephones
- B. transformers

- C. microphone
- D. induction coil

47. A force F , experience in a field of magnetic induction β , particle of charge q , moving with a velocity v , with angle θ , between the magnetic induction is given by _____.

- A. $q = F \sin \theta / v \beta$.
- B. $F = qv\beta \sin \theta$.
- C. $F = qv\beta \cos \theta$.
- D. $q = F \cos \theta / \beta$.

48. The e.m.f. is opposing the motion producing it. This law is similar to _____.

- A. Faraday's law
- B. Ampere's law
- C. Electro-induction law
- D. Lenz's law

49. All these are types of moving-coil instruments EXCEPT _____.

- A. moving-coil galvanometer
- B. moving-coil loud speaker
- C. mirror-galvanometer
- D. avometer

50. The direction of induced current in a straight wire placed in a is determined using _____.

- A. Fleming left hand rule.
- B. Fleming right hand rule.
- C. Lenz's law.
- D. Faraday's law.

51. To convert an dynamo into a direct current dynamo, the _____.

- A. number of turns in the coil is increased

- B. strength of the field magnets is increased
- C. slip rings are replaced with split ring commutators
- D. number of turns in the coil is decreased

52. What is the unit of magnetic induction β ?

- A. Force/meter².
- B. Coulomb/meter.
- C. m².
- D. Tesla.

53. All of the options are functions of a mirror galvanometer EXCEPT _____.

- A. it can measure current of about 10^{-6} of an ampere
- B. it can measure resistances
- C. it uses torsion as its weak control spring
- D. it uses light beam as its power

54. Lines of force

- I. are continuous in any region with charges
- II. cross each other
- III. indicate the direction of the field
- IV. start and end on negative charge only.

Which of the statements above are NOT correct?

- A. I and II only
- B. I and III only
- C. I and IV only
- D. II and IV only

55. If current of 4A passing through a coil sets up a magnetic effect of 15H after 12minutes, what is the energy stored in the coil?

- A. 5.0J

- B. 120.0J
- C. 36.0J
- D. 4.0J

56. A wire carrying a current tend to move when it is placed in a which is not parallel to the wire in accordance with _____.

- A. Fleming"s left hand rule
- B. Fleming"s right hand rule
- C. Maxwell"s corkscrew rule
- D. Newton"s principle

57. An instrument used in detection of current calibrated in milliammeter is called _____.

- A. moving-iron ammeter
- B. moving-coil ammeter
- C. rheostat
- D. hot-wire ammeter

58. A galvanometer of resistance 100 ohms has its maximum deflection as 10mA. If it's to be converted to read 0.1A, what would be the magnitude and position of the shunt required?

- A. 11.1ohm shunt in series
- B. 11.1ohm shunt in parallel
- C. 0.09ohms shunt in parallel
- D. 0.09ohms shunt in series

59. The magnitude of the induced e.m.f in lenz"s law does NOT depend on the _____.

- A. distance between the magnet and the galvanometer
- B. lines of force linking the circuit
- C. numbers of turns of the coil
- D. surface area of the coil

Use the information to answer the question.

60. (i) The presence of a strong radical makes it not to be affected by stray or the earth"s magnetic field

(ii) It has a uniform scale

(iii) It is robust and portable

(iv) The instrument can be used along with shunt to measure large current or potential difference

Which of the following options are the advantages of a strong moving coil instrument?

- A. (i), (ii), (iii) and (iv)
- B. (i) and (iii) only
- C. (iv) only

D. (i), (ii) and (iii)

61. To reduce heat loss in a transformer

- A. the number of turns should be increased.
- B. the soft iron core should be laminated.
- C. the area of the coils in the soft iron core should be increased.
- D. all of the above.

62. A coil of inductance 0.48 henry carries a current of 5A. Compute the energy of its magnetic field.

- A. 6J
- B. 40J
- C. 36J
- D. 8J

63. A coil of 50 turns is pulled in 0.02 secs from between the poles of a magnet where its area includes 31×10^{-5} weber to a place where its area includes 1×10^{-5} weber. Determine the average emf induced in the coil.

- A. 0.75V
- B. 0.075V
- C. 75V
- D. 7.5V

64. Which of the options is not true about transformers?

- A. To increase the output voltage which is achieved by reduction in the number of turns of coils
- B. Sheets of soft-iron insulated from one another with film of the number
- C. The induce emf in a coil is directly proportional to the number of turns ie E_N
- D. $E_p = I_p =$

$n_s = \text{turns ratio}$

$E_s = E_p$

np

65. A disadvantage of a moving-iron ammeter is _____.

- A. a non-uniform scale
- B. a uniform scale
- C. there is no scale
- D. that the scale is too small

66. All of the following is to improve the efficiency of an electric motor EXCEPT _____.

- A. increase the current flowing through with the aid of rheostat
- B. increase the number of turns of rectangle coil
- C. the weak air springs so as to give a small rotational control
- D. wind the coil on a soft-iron armature so as to increase the magnetic strength

67. An induction core consist of all the following EXCEPT _____.

- A. primary coil of few turns of wire wound on a laminated soft iron core connected to a power source
- B. a secondary coil wound on the primary coil in the opposite direction and connected to an adjustable spark gap
- C. an iron core in between the two coil consist of a ring around the soft-iron amature
- D. a weak air spring so as to give a small rotational control

68. A transformer has 800 turns in the primary winding and 40 turns in the secondary winding. The alternating emf connected to the primary is replaced by a steady emf of 240V and the current flowing is 0.2A. Find the secondary emf.

- A. 36V
- B. 24V
- C. 12V
- D. 6V

69. A transformer supplies 12V when connected to 240V mains. If this transformer 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 10h at 6p per kWh.

- A. 91% 7.2p
- B. 84% 5.5p
- C. 76% 8.1p
- D. 65% 4.6p

70. A step-down transformer has a power output of 500W and efficiency is 80%. If the mains supply voltage is 200V, the primary current of the transformer is _____.

- A. 0.31A
- B. 3.20A
- C. 3.40A
- D. 5.00A

71. Which of the following is an advantage of an AC?

- A. It can easily be changed from one voltage to another with little loss of energy
- B. It is suitable in charging an accumulator
- C. It cannot be directed into different sources
- D. It can be used directly without conversion

72. Electric power is transmitted by the following EXCEPT _____.

- A. low transmission
- B. low voltage transmission
- C. high transmission
- D. high tension transmission

73. A multimeter has all these functions EXCEPT _____.

- A. it consists of multiplier and shunts
- B. it provides different measurements of current and p.d

- C. it also measures D.C. and A.C.
- D. it can also measure resistances

74. A transformer is required to give 200V from a 240V mains supply. If the primary coil has 600 turns, how many turns is in the secondary?

- A. 250 turns
- B. 720 turns
- C. 300 turns
- D. 500 turns

75. If a current carrying coil is mounted on a metal frame, the back e.m.f induced in the coil causes _____.

- A. inductance
- B. eddy currents
- C. electromagnetism
- D. dipole moment

TOPIC: ELEMENTARY MODERN PHYSICS

DIRECTION: Choose the correct answer from the lettered options.

1. Find the half-life of radio-isotope which has a decay constant 0.000456.
 - A. 1520 days.
 - B. 1248 days.
 - C. 2560 days.
 - D. 1452 days.

2. Which of the following is the correct definition of half-life?
 - A. The average life-time of a radioactive material
 - B. The time it takes a radioactive material to decay to half of its original quantity
 - C. Half the period of a radioactive material decays completely
 - D. Half of the decay constant

3. In the equation of the Heisenberg uncertainty principle $\Delta X \times \Delta V \geq h/m$ where h = plank constant, m = mass of the particle, X = particle positron, V = particle velocity.

ΔX means what?

 - A. Displacement.
 - B. Particle positron.
 - C. Particle constancy.
 - D. Particle uncertainty.

4. What is the decay constant of a radioactive element whose half-life is 3seconds?
 - A. $0.132s^{-1}$
 - B. $0.231s^{-1}$
 - C. $0.347s^{-1}$
 - D. $0.693s^{-1}$

5. Uranium isotopes have the same _____.

- A. nucleon number
- B. number of neutrons
- C. decay rate
- D. proton number

6. The work function of sodium is 2eV. Calculate the incident photon energy when sodium is illuminated by a radiation of 1.5×10^{-10} m wavelength.

[$h = 6.63 \times 10^{-34}$ Js, $1\text{eV} = 1.6 \times 10^{-19}$ C, $m_e = 9.1 \times 10^{-31}$ kg, $c = 3 \times 10^8$ m/s].

- A. 13×10^{-18} J.
- B. 13.2×10^{-19} J.
- C. $13.2 \times 10\text{eV}$.
- D. 4.3×10^{-33} J.

7. I. The number of neutrons released exceeds the number that caused the fission.

II. There is loss of mass

III. Energy is produced

IV. Smaller nuclei merge to form larger nuclei

Which of the statements above are correct about nuclear fission?

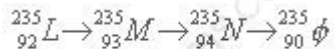
- A. I, II and IV only
- B. I, II and III only
- C. I, III and IV only
- D. II, III and IV

8. Which of the following is not a cathode ray property?

- A. They carry considerable energy as they heat objects which stop them.
- B. They have mass but no momentum.
- C. They cause glass and other materials to fluoresce.

D. They throw a shadow at the anode end of a tube.

9. Given the radioactive series, what is emitted?



- A. β , β , α particles
- B. α , γ , β particles
- C. γ , α , β particles
- D. None of the above

10. The wavelength at minimum energy needed just to liberate an electron from a metallic surface is called _____.

- A. minimum wavelength
- B. threshold wavelength
- C. work function
- D. threshold energy

11. The following are advantages of radioscotopes EXCEPT _____.

- A. they emit radiation like alpha & beta along with gamma ray
- B. they emitted gamma rays from cobalt-60 are used
- C. isotopes of radioactive substances have other use apart from its original state
- D. they have unstable nuclei

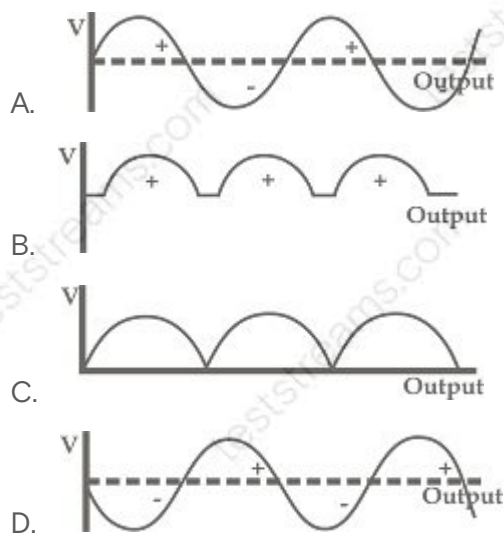
12. The mass number of an atom P is 11 and the atomic number is 5. How many neutrons are there in an atom of P?

- A. 6.
- B. 7.
- C. 8.
- D. 10.

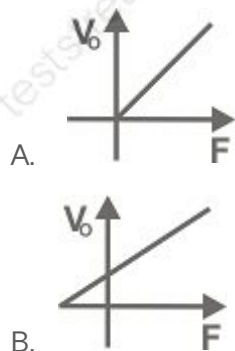
13. The following is a method of producing spectra of a hot substance by _____.

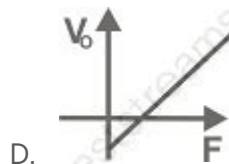
- A. use of discharge tube
- B. direct application of a bunsen flame
- C. use of two metal electrodes connected to the secondary of an induction coil
- D. use of two non-metal rods connected to a dc voltage

14. Which of the following diode valve as a rectifier can attain full-wave rectification as shown on a cathode ray oscilloscope screen?



15. In photoelectric effect, which of the following graphs correctly represents the graph of stopping potential V_0 against frequency f of incident light?





16. ${}^9_4\text{K}$ represent a berryllium atom. What does the number 9 and 4 represent?

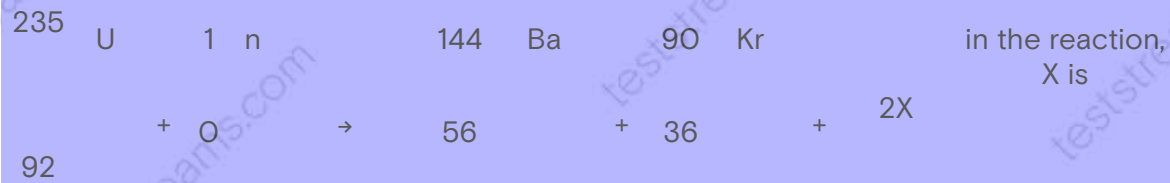
- A. Proton and Neutron.
- B. Electron and Atomic Number.
- C. Mass Number and Atomic Mass.
- D. Mass Number and Atomic Number.

17. An electron makes a transition from a certain energy level E_k to the ground state E_0 . If the frequency of emission is $8.0 \times 10^{14}\text{Hz}$, the energy emitted is _____.

$[h = 6.6 \times 10^{-34}\text{Js}]$

- A. $5.28 \times 10^{19}\text{J}$
- B. $8.25 \times 10^{-19}\text{J}$
- C. $8.25 \times 10^{19}\text{J}$
- D. $5.28 \times 10^{-19}\text{J}$

18.



- A. proton
- B. neutron
- C. electron
- D. neutrino

19. Which of the following is not a unit for measuring the plank constant, h?

- A. Joules.second
- B. Electron-Volt per frequency
- C. Joules per second
- D. Electron-Volt second

20. An electron accelerated from rest through a potential difference of 80KV collides with a metal target. If the whole of its kinetic energy is converted to the energy of a photon. Then the wavelength of the photon is _____.

[TAKE $h = 6.6 \times 10^{-34}$ Js, $c = 3 \times 10^8$ m/s, $e = 1.6 \times 10^{-19}$].

- A. 1.55×10^{-10}
- B. 8.25×10^{-10}
- C. 1.55×10^{-12}
- D. 1.55×10^{-11}

21. Which of the following best defines nuclear fusion?

- A. The splitting of heavy nuclei of an element to form a part with roughly the same mass.
- B. The fusion of heavy nuclei of an element to form a light atom.
- C. The splitting of heavy nuclei of an element to form two parts with roughly different mass.

D. The fusion of light nuclei of an element to form heavy atom.

22. Which of these phenomena demonstrate the fact that matter is made of particles?

I. Diffraction

II. Compton effect

III. Photoelectric effect

IV. Emission and absorption of light

A. I and II only

B. II and III only

C. I, II and III only

D. II,III,and IV only

23. Which of the following is NOT correct about Bohr's model of the atom?

A. As electrons radiate energy they are drawn closer to the nucleus until the atom collapses

B. As an electron changes orbit, it either absorbs or emits a photon of energy

C. The model combines classical physics with quantum physics

D. The model is applicable to an atom with one electron only

24. Which of the following is usually used to capture excess neutrons produced in a nuclear reactor?

A. Boron rods

B. Steel rods

C. Graphite rods

D. X-rays

25. The process through which free electrons leave the surface of hot metals is known as _____.

A. thermionic emission

- B. photo emission
- C. photon emission
- D. electron emission

26. Which one of the list below is not strongly deflected by a magnetic field?

- A. X-rays
- B. Gamma rays
- C. Alpha rays
- D. Beta rays

27. Similarities in the properties of radioactive substance include all EXCEPT _____.

- A. penetrating power
- B. type of charge
- C. type of trail it leaves
- D. can both be absorb

28. Which of the following does the properties of emitted electrons not depend on?

- A. Incident light emitted
- B. Frequency of elected
- C. Velocity of electron
- D. Mass of metallic surface

29. A uranium isotope $^{235}_{92}\text{U}$ emits four alpha particles and three beta-particle. The mass and atomic number of the product formed are _____

- A. 223 and 87.
- B. 219 and 81.
- C. 223 and 84.
- D. 219 and 87.

30. The time it will take a certain radioactive material with a half-life of 50days to reduce to $1/32$ of its original number is _____.

- A. 150days
- B. 200days
- C. 250days
- D. 300days

31. When two or more light nuclei are fused together to form a heavy nucleus with liberation of energy, it is called _____.

- A. nuclear fusion
- B. nuclear fission
- C. nuclear reactor
- D. nuclear reaction

32. The energy associated with the photon of a radio transmission at 3×10^5 Hz is _____.

($h = 6.63 \times 10^{-34}$ Js).

- A. 2.00×10^{-28}
- B. 1.30×10^{-28}
- C. 2.00×10^{-29}
- D. 1.30×10^{-29}

34. Absorption line spectra exhibited by atom is due to _____.

- A. excitation of an electron in the atom
- B. transition of an electron from a higher to lower energy level
- C. instability of the nucleons
- D. change in the kinetic energy

35. Find the quantum energy carried by a radiation of wavelength 3×10^{-6} m.

[$h = 6.63 \times 10^{-34}$ Js]

- A. 10^{-14} Hz.

- B. 10^2 Hz.
- C. 10^{-2} Hz.
- D. 10^{14} Hz.

36. All these are properties of electrons shown by tetron tube EXCEPT _____.

- A. electrons travels in straight line, a shadow of a metal maltese cross is seen on the flourescent screen
- B. electrons have momentum they exert force when incident on light metals
- C. electrons make certain material fluoresce
- D. electrons do not have energy to make metals glow when they strike on them

37. The scientist that showed α -particles is _____.

- A. Rutherford and Royds
- B. Avogadro
- C. Sir Isaac Newton
- D. Albert Einstein

38. Which of the following options best defines nuclear fission?

- A. The fusion of heavy nuclei of an element to form heavy atom.
- B. The splitting of heavy nuclei of an element to form two parts with roughly the same mass.
- C. The splitting of heavy nuclei of an element to form two parts with roughly different mass.
- D. The fusion of light nuclei of an element to form heavy atom.

39. Electrons can be best produced through thermionic emission by _____.

- A. hot cathode
- B. tungsten lamp
- C. electrolyte plate
- D. electron lens camera

40. Uncertainty principle equation can be written in all these forms EXCEPT _____.

- A. $X \times \Delta V \geq h/m$
- B. $\Delta X \times \Delta V \leq h/m$
- C. $\Delta E \times \Delta t \geq h$
- D. $\Delta X \times \Delta V \times m \geq h$

41. Which of the following gives the best definition of atomic mass number?

- A. Number of particles in the nucleus
- B. Number of protons in the nucleus
- C. Number of neutrons inside the nucleus
- D. Number of electrons in the orbit

42. ${}^{27}_{13}\text{Al} + {}^1_0\text{n} \rightarrow {}^{24}_{11}\text{Ra} + X$

- A. Electron
- B. Proton
- C. Beta-particle
- D. Alpha-particle

43. An atom's energy is increased via an elastic collision with the electron, this process is known as _____.

- A. inelastic collision
- B. excitation
- C. ionisation
- D. energy maximization

44. The decay constant is assumed to be 0.5 for a radioactive substance. What is the half-life of the substance?

- A. 0.642secs.
- B. 1.025secs.
- C. 1.382secs.

D. 2.0435secs.

45. Nuclear fission occurs where?

- A. The water molecule
- B. Sun and moon
- C. In the bombardment of krypton
- D. In the fission of most nuclei

46. Isotopes are nuclei with _____.

- A. equal number of protons and electrons
- B. the same number of neutrons and electrons
- C. equal number of total particles
- D. equal atomic number but different number of neutrons

47. Fluorescent tubes produce light by the _____.

- A. thermal agitation of electron in the tube
- B. refraction of light by gas molecules
- C. excitation of gas molecules
- D. conduction of solar energy

48. In nuclear fission, the most likely particles that bombard the nucleus are the _____.

- A. neutrons
- B. protons
- C. electrons
- D. α - particles

49. Find the momentum of a particle with wavelength $6.6 \times 10^{-11}\text{m}$ given that plank constant , $h = 6.6 \times 10^{-34}\text{Js}$.

- A. 10^{-22}kgm/s .
- B. 10^{-23}kgm/s .

- C. 1.5×10^{-23} kgm/s.
- D. 2.0×10^{-22} kgm/s.

50. Which of the following is not a use of emitted electrons obtained by incident light?

- A. Graphic display on a TV and system monitors
- B. Making sound tracks on films by converting light energy to electrical
- C. Setting of burglary alarms
- D. Light meters in camera

51. The work function of sodium is 2eV, when sodium is illuminated by a radiation of 1.5×10^{-10} m wavelength.

[$h = 6.63 \times 10^{-34}$ J.s, $1\text{eV} = 1.6 \times 10^{-19}$ C, $m_e = 9.1 \times 10^{-31}$ kg, $c = 3 \times 10^8$ m/s].

What is the speed of the emitted electron in the information given?

- A. 1.0×10^7 m/s.
- B. 1.5×10^6 m/s.
- C. 2×10^6 m/s.
- D. 10^{-6} m/s

52. The maximum kinetic energy of the photoelectron emitted from a metal surface is 0.55eV. If the work function of the metal surface is 2.66eV the stopping potential will be _____.

- A. 0.44V
- B. 2.11V
- C. 0.55V
- D. 3.21V

53. The following are precautions of x-rays EXCEPT _____.

- A. users of x-ray machines should wear radiation sensing badges to ensure they are not exposed to x-ray
- B. to put on the light in a dark room to reduce intensity
- C. the radiation dose for medical examination must be administered by experts

D. the surrounding walls of the radiograph room are made of concrete walls so as to minimise radiation effect on the surrounding

54. How long would it take to disintegrate 3.5g of a material. If 4g of a radioactive material of half-life of 20 days is spilled on a laboratory floor?

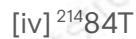
- A. 1.927 days.
- B. 2.0 days.
- C. 3.70 days.
- D. 3.854 days.

55. What is the number of neutrons in the Uranium isotope?



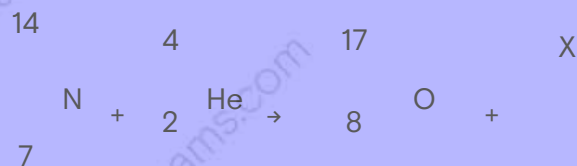
- A. 92
- B. 141
- C. 238
- D. 146

56. Which of the atoms are isotopes?



- A. ii and iii.
- B. iii and i.
- C. iv and i.
- D. ii and iv.

57



In the above equation, the particle X is _____.

- A. a proton
- B. a neutron
- C. an α -particle
- D. a β -particle

58. The mass number of two isotopes of chlorine is 35 and 37. If the isotope has a ratio of 3:1. Find the relative atomic mass of chlorine if the lighter isotopes being the more abundant.

- A. 86.4.
- B. 35.5.
- C. 26.4.
- D. 13.9.

59. Emitted energy from a radiation is in what form?

- A. Continuous energy.
- B. Discrete packets of energy.
- C. Scattered form of energy.
- D. None of the above.

60. The commonest natural condition where nuclear fusion can take place is in the _____.

- A. uranium bombardment
- B. mercury bombardment
- C. sun
- D. earth's earthquake

61. α -particles are simply _____.

- A. hydrogen nuclei
- B. uranium nuclei
- C. fast accelerating electrons
- D. helium nuclei

62. X-rays can be used in the study of crystal structure because they _____.

- A. are visible
- B. are fast
- C. have an extremely short wavelength
- D. have a very long-reaching wavelength

63. Which of the following phenomena is called photoelectric effect?

- A. High-energy electrons impinging on a metallic anode which then emits photons
- B. A high energy photon emits photons as it is slowed down
- C. A metal absorbs quanta of light and then emits electrons
- D. Two electrons are created from a quanta of light

64.

$\begin{matrix} 4 & & \\ & \text{He} & \\ 2 & & \end{matrix}$
 represents a helium atom. This means that

- A. atomic mass number is 4.
- B. the electron number is 4.
- C. proton has a mass of 2.
- D. atomic number is 4.

65. The following are types of radiation in electromagnetic spectrum EXCEPT _____.

- A. infrared radiations
- B. microwaves
- C. radio waves
- D. sound waves

66. Which of the following is not correct?

- A. Fission reaction involves splitting atomic nucleus.
- B. Fusion reaction involves fusing of atomic nuclei.
- C. The energy required in fission reaction is greater than the energy required in nuclear fusion.
- D. The energy required in fusion reaction is greater than the energy required in fission reaction.

The correct answer is option [C].

Reason: Fusion reaction requires greater energy than fission reaction because nuclei are combined.

67. If the half-life of a radioactive material is 4 days. What is the decay constant assuming that the mass of the original sample of the material is 5g?

- A. 0.124
- B. 0.143
- C. 0.173
- D. 0.693

68. Which of these is an advantage of nuclear reactors?

- A. It is used in generating heat energy required to generate electricity
- B. The plant set-up is capital intensive
- C. Principal raw-material (uranium) is not easily available
- D. Exposure to raw-material affects the cell tissues due to radiation

69. Which of the following electromagnetic waves has the longest wavelength?

- A. Radio waves
- B. Gamma rays
- C. Infrared waves
- D. Ultraviolet rays

70. Which of the following features is NOT a characteristic of natural radioactivity?

- A. Radioactivity is a nuclear phenomenon
- B. Radioactivity is exhibited only by elements of mass number greater than 206
- C. The radioactivity of an element is affected by electric and magnetic fields in the surroundings
- D. Radioactive substances emit three types of radiation: α - rays, β - rays and γ - rays

71. What is the effect of the emission of a β - particle from an atom of radioactive phosphorus of atomic number 15, and mass number 32?

- A. There is an increase in both the atomic number and mass number of phosphorus.
- B. There is a decrease only in the mass number of phosphorus.
- C. There is an increase only in the atomic number of phosphorus.
- D. There is a decrease only in the atomic number of phosphorus.

72. All these are substances emitted by radioactive substance EXCEPT _____.

- A. Alpha rays
- B. Beta rays
- C. X-rays
- D. Gamma rays

73. An instrument used in measuring varying current in an experiment in electron deflected in electric and magnetic fields in Tetrode tube is called _____.

- A. ammeter
- B. rheostat

- C. galvanometer
- D. resistor

74. When a green glow at a very low pressure of 0.01mmhg is observed, what is deflected when a strong magnet is brought at right angle to the tube?

- A. Anodes rays
- B. Cathode rays
- C. Anionic rays
- D. Cathion rays

75. Which of the following statements are true of isotopes?

- i. Isotopes of an element have the same chemical properties because they have the same number of electrons
- ii. Isotopes of elements are normally separated using physical properties.
- iii. Isotopes of an element have the same number of protons in their nuclei.

- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III only

76. The relative atomic masses of elements that are not whole numbers are _____.

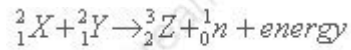
- A. magnets
- B. isotopes
- C. metals
- D. poly-atoms

77. The uncertainty principle shows that at any point in time the position and the momentum of a particle can be simultaneously known is _____.

- A. true
- B. false

- C. both particles can be measured
- D. only the momentum of the particles can be measured

78. What type of reaction is represented by the following scheme?



- A. Fusion reaction
- B. Fission reaction
- C. Chain reaction
- D. Radioactive decay

79. A light of energy 5eV falls on a metal and the electrons with a maximum kinetic energy of 2eV are ejected. The work function of the metal is _____.

- A. 0.4eV
- B. 2.5eV
- C. 3.0eV
- D. 7.0eV

80. Supposing a light of photon energy 2.0eV is incident suitably on the surface of a metal with work function 3.5eV, then _____

- A. most electron will be emitted.
- B. the electron emitted will have 3.5eV K.E.
- C. few electrons will be liberated.
- D. no electron will be liberated.

81. In a model of the hydrogen the energy levels W_n are expressed in terms of a constant P and integer n as $-P/n^2$. What will be the energy released in the transition from $n = 2$ to $n = 1$?

- A. $3P/4$
- B. $P/2$
- C. P
- D. $-2P/3$

82. The ray which causes gas molecules to glow is known as _____.

- A. gamma rays
- B. molecular ray
- C. cathode ray
- D. anode ray

83. Beta particles are _____.

- A. decelerating electrons
- B. electrons moving at high speeds
- C. helium particles
- D. non-radioactive electromagnetic particles

84. The work function of sodium is 2eV, when sodium is illuminated by a radiation of 1.5×10^{-10} m wavelength

[$h = 6.63 \times 10^{-34}$ Js, $1\text{eV} = 1.6 \times 10^{-19}$ C, $m_e = 9.1 \times 10^{-31}$ kg, $c = 3 \times 10^8$ m/s].

Calculate the maximum energy of the emitted electron.

- A. 10^{-18} J.
- B. 8.9×10^{-19} J.
- C. 10^{-19} J.
- D. 1.2×10^{-18} J.

85. The equations in the options represents Einstein photoelectric equation EXCEPT _____.

- A. $E_{\text{max}} = hf - W_0$.
- B. $hf = E_{\text{max}} + W_0$.
- C. $\frac{1}{2}m_e v_{\text{max}}^2 = hf - W_0$.
- D. $E_{\text{max}} = hf + W_0$.

86. The major difference between a direct heated cathode to indirect heated cathode is _____.

- A. amount of heated applied
- B. an emitter of electron is called the cathode
- C. a collected of nickel plates is called anode
- D. electrodes are placed inside and evacuated glass

87. An instrument which reacts to the radiation from radioactive sources is called _____.

- A. x-ray tube
- B. Geiger-Muller tube
- C. cathode discharge tube
- D. photoelectric

88. When a beam of light falls on metallic surface the maximum kinetic energy of electron that may be emitted from the surface depends on _____.

- A. the surface area of the metal surface
- B. the intensity of the light
- C. the colour of the light
- D. the distance of surface from light

89. The work function of sodium is 3.2×10^{-19} J. Calculate the threshold frequency.

[$h = 6.63 \times 10^{-34}$ J \cdot s, $c =$ speed of light]

- A. 4.8×10^{14} Hz.
- B. 3.8×10^{14} Hz.
- C. 5.1×10^{14} Hz.
- D. 2.01×10^{-15} Hz.

90. The following are emission spectra of light with a definite amount of energy with more than one wavelength in form of electromagnetic radiation EXCEPT _____.

- A. line spectra
- B. band spectra

- C. incontinous spectra
- D. absorption spectra

91. The half -life of a radioactive element is 8 days, in what time will the activity of the specimen decay to $1/64$ of it original volume?

- A. 15 days
- B. 25 days
- C. 64 days
- D. 48 days

92. A radioactive source has a half-life of 6days. How long will it take for the count-rate to fall from 180 per minute to 45 per minute?

- A. 18days.
- B. 15days.
- C. 10days.
- D. 12days.

93. Which of the options is the definition of atomic number?

- A. Atomic number is the number of proton in an atom.
- B. Atomic number is the number of electron in an atom.
- C. Atomic number is the number of neutron and proton in an atom.
- D. Atomic number is the number of proton and electron in an atom.

94. What is the wavelength of an electron of mass $9 \times 10^{-31}\text{kg}$ moving with an electromagnetic speed?

[$h = 6.626 \times 10^{-34}\text{Jsec}$]

- A. $3.68 \times 10^{-10}\text{m}$.
- B. $2 \times 10^{-11}\text{m}$.
- C. $5.32 \times 10^{-10}\text{m}$.
- D. $4.48 \times 10^{-11}\text{m}$.

95. Which is the correct statement from A to D?

- A. At low temperature light elements can produce nuclear fission.
- B. An α -particle can produce nuclear fission.
- C. A neutron can produce nuclear fission.
- D. A neutron can produce nuclear fusion.

96. One of the properties of gamma rays is that they are _____.

- A. negatively charged
- B. massive
- C. neutral
- D. positively charged

97. The kinetic energy of a photoelectron dislodge from the surface of a metal depends on _____.

- A. temperature of the incident radiation
- B. frequency of the incident radiation
- C. intensity of the incident radiation
- D. time duration of the incident liberation

Use the information to answer the question.

98. Lithium has a threshold frequency of 5.5×10^{14} Hz, the work function of lithium is _____.

- A. 2.27eV
- B. 2.34eV
- C. 21.2eV
- D. 3.0eV

99. A radioisotope has a decay constant of 10^{-7} s⁻¹. The average life of the radioisotope is _____.

- A. 1.00×10^{-7} s

- B. $1.00 \times 10^7 \text{s}$
- C. $6.93 \times 10^6 \text{s}$
- D. $6.93 \times 10^8 \text{s}$

100. The energy needed to separate all the nucleus apart completely in an atomic nucleus is called _____.

- A. work function
- B. binding energy
- C. photo electric effect
- D. none of the above

101. Free electrons _____.

- A. can be studied more easily
- B. are free in vacuum/space
- C. are deposited on the surface of a non-conductor as static charge
- D. are detached from atoms but are not carried in conductors

102. The count rate of a radioactive material is 800 count/min. If the half-life of the material is 4 days what would the count rate be 16 days later?

- A. 50 count/min
- B. 25 count/min
- C. 200 count/min
- D. 100 count/min

103. The intensity of a light photon in an area of 0.2m^2 is 30J/m^2 . Find the energy of the photon.

- A. 5.0J.
- B. 0.3J.
- C. 0.4J.
- D. 6.0J.

104. Cathode rays are _____

- A. atoms.
- B. electrons.
- C. neutrons.
- D. ions.

TOPIC: FORCE ON A CURRENT-CARRYING CONDUCTOR IN A MAGNETIC FIELD

DIRECTION: Choose the correct answer from the lettered options.

1. Which of the following has a disadvantage of measuring only d.c current?
 - A. Hot-wire ammeter
 - B. Moving-iron ammeter
 - C. Rheostat
 - D. Moving-coil galvanometer
2. The reading of a galvanometer is so close to the true value of the current under measurement, the galvanometer is therefore said to be _____.
 - A. sensitive
 - B. accurate
 - C. detective
 - D. precise
3. Which of the following device can be used to measure d.c to a.c and the scale reading is not uniform?
 - A. A telephone earpiece
 - B. Hot-wire ammeter
 - C. Thermopile
 - D. Moving-coil loudspeaker
4. The moving coil galvanometer is used to measure _____.
 - A. small values of current
 - B. large values of current
 - C. current of about 100A
 - D. only A and C

5. In an electric motor, the rotation can be reversed by _____.

- A. reversing both the current and the
- B. reversing the current
- C. decreasing the current
- D. increasing the current

6. in a force only acts on a conductor carrying current _____

- A. across at parallel.
- B. across at right angles.
- C. across at opposite sides.
- D. across at adjacent.

7. A galvanometer detects small currents, it is therefore said to be _____.

- A. accurate
- B. sensitive
- C. precise
- D. detective

8. When a right handed corkscrew is turned to travel in the direction of the current, then the direction of the is called the maxwell's _____.

- A. electric line of force rule
- B. compass needle rule
- C. magnetic rule
- D. corkscrew rule

9. To make a highly sensitive galvanometer _____.

- A. the should be made stronger
- B. the number of turns of coil should be large

- C. the coil should have a small area
- D. should be suspended so it can turn easily

10. The rule that states that when the first three fingers of the right hand are held at right angles to each other with the fore finger pointing in the direction of the field and the thumb in the direction of the motion of the conductor, then the second finger will point in the direction of the induced current, this explains _____.

- A. Maxwell corkscrew
- B. Fleming's right hand rule
- C. Fleming's left hand rule
- D. Mutual induction rule

11. To convert a galvanometer to an ammeter, we connect _____.

- A. a high resistance in parallel to the galvanometer
- B. a low resistance in series to the galvanometer
- C. a high resistance in series to the galvanometer
- D. a low resistance in parallel to the galvanometer

12. Fleming's left hand rule describes three fingers one in the direction of the conventional current i.e. The second finger, the fore-finger in the direction of the field while the thumb in the direction of the _____.

- A. motion
- B. action force
- C. opposing field
- D. repelling field

13. The main function of the mouth piece of a telephone is to convert sound energy to _____ energy.

- A. chemical
- B. electrical
- C. kinetic
- D. mechanical

14. All of the options are apparatus needed to investigate EXCEPT _____.

- A. Solenoid or coil of many turns
- B. Center scale zero galvanometer
- C. A bar magnet
- D. Ammeter

15. Which of the following is not a part of an electric motor?

- A. Armature.
- B. Field magnet.
- C. Commutator.
- D. Transformer.

16. A d.c. motor transforms _____.

- A. mechanical energy to electrical energy
- B. electrical energy to mechanical energy
- C. heat energy to sound energy
- D. heat energy to mechanical energy

17. If a d.c. motor is to be used as a dynamo then _____.

- A. the armature should be rotated
- B. use slip-rings instead of carbon brushes
- C. increase the
- D. increase the area of the coils and magnet

18. A moving-coil galvanometer has a full-scale deflection of 3A equivalent to 30o deflection. The sensitivity of the instrument is _____.

- A. 0.1
- B. 10.0
- C. 33.0

D. 90.0

19. Which of the following is not an advantage of a galvanometer?

A. It has a uniform linear scale.

B. Can control the effects of external magnetic field.

C. It can be made to read different ranges of currents, p.d. and resistance by appropriate resistance connection.

D. A and B only.

20. A coil is wound round a soft iron core, and a current is made to flow round the coil, the product obtained is _____.

A. a magnet

B. an electromagnet

C. a bar magnet

D. an electric bell

21. A generator-manufacturing company was contracted to produce an a.c. dynamo but inadvertently produced a d.c. dynamo. To correct this error, the _____.

A. armature coil should be made of aluminium

B. armature coils should be made of silver

C. commutator should be replaced with slip rings

D. commutator should be replaced with rings

22. The following consist of a moving-iron ammeter EXCEPT _____.

A. a solenoid in between

B. a Fixed soft iron piece

C. a uniform scale

D. a spring to control angular deflection

23. In a moving coil loud speaker current enters it at the coil through _____.
- A. the soft iron core
 - B. soft iron core plates
 - C. the leads
 - D. the paper cone
24. To convert a galvanometer to a voltmeter, we connect _____ in _____ to the galvanometer.
- A. high resistance, parallel.
 - B. low resistance, parallel.
 - C. high resistance, series.
 - D. low resistance, series.
25. The resistance of a galvanometer is 60Ω and requires 0.02A for a full scale deflection. How will a scientist connect it to a voltmeter to read 45V at a full scale?
- A. 4950Ω .
 - B. 200Ω .
 - C. 350Ω .
 - D. 2190Ω .
26. Two parallel wires have current flowing through them, by ampere's law they should _____.
- A. attract each other
 - B. repel each other
 - C. remain as they are
 - D. interferes with each other if they have very small separation of about 5cm
27. The Maxwell's corkscrew rule can be represented by all of the following EXCEPT _____.
- A. a small heavy circle
 - B. large concentric single light circle for lines
 - C. straight lines magnet field lines

D. a cross (x) in the centre of the wire

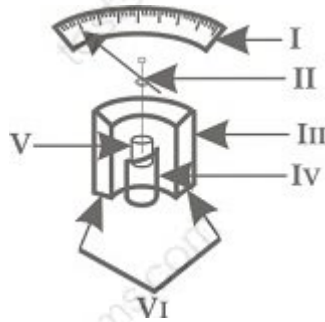
28. Calculate the force acting on a charge, $q = 1.6 \times 10^{-19} \text{C}$ moving with a velocity $2.5 \times 10^7 \text{m/s}$ in a of flux density 2.0Wb/m^2 at an angle 30° with the field.

- A. 10^{-12}N .
- B. $4 \times 10^{-11} \text{N}$.
- C. $4 \times 10^{-12} \text{N}$.
- D. $3 \times 10^{-12} \text{N}$.

TOPIC: MAGNETIC FIELD

DIRECTION: Choose the correct answer from the lettered options.

1. From the diagram drawn I and IV are _____.



- A. solenoid and spring to contact angle of deflected
- B. scale and current in and out
- C. moveable soft iron and fixed soft iron
- D. scale and moveable soft iron

2. Which of the following diagrams shows the correct directions of both the magnetic line of force and current for a vertical wire JK?

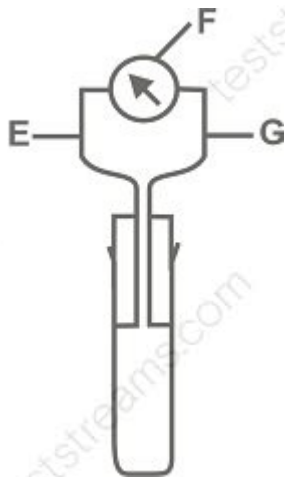




3. The point where the earth's imaginary axis of rotation would emerge from the surface in the northern hemisphere is known as _____.

- A. geographical North Pole
- B. geographical South Pole
- C. magnetic north pole
- D. magnetic South Pole

4. E in the diagram drawn is the _____.



- A. Constantine wire
- B. copper wire
- C. silk thread spring
- D. resistance wire

5. A magnet is placed inside a solenoid through which an flows, what happens to the magnet?

- A. The magnet will become magnetic.
- B. The magnet will be demagnetized.
- C. The magnet will change its poles.
- D. The magnet will become electrically magnetic.

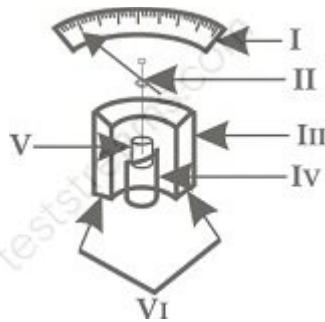
6. The difference in magnetic properties of iron and steel is that _____.

- A. iron is more easily magnetized than steel
- B. iron is more easily demagnetized than steel
- C. iron keeps its magnetism much longer than steel
- D. steel keeps its magnetism much longer than iron

7. The thermocouple of a thermopile can consist of _____.

- A. copper and glass
- B. copper and iron
- C. brass and carbon
- D. bismuth and chalk

8. From the diagram drawn, the moveable soft iron and fixed soft iron are _____.



- A. II and IV
- B. VI and V
- C. V and III
- D. I and IV

9. The strength of a magnetic flux acting in a horizontal direction is called _____.

- A. magnetic meridian
- B. angle of dip
- C. the horizontal component of the earth's field
- D. the magnetic flux density at maximum

10. To protect a material from the influence of an external magnetic field, the material should be kept in a _____.

- A. soft iron ring
- B. square steel ring
- C. loop of copper wire
- D. triangular zinc ring

11. Angle of dip can be defined as the ratio of the earth's vertical component to the earth's horizontal component.

- A. True.
- B. False.
- C. It is not a ratio.
- D. Only B and C.

12. The space around a magnet where a magnetic force is experienced is known as _____.

- A. magnetic field
- B. magnetic space
- C. electro
- D. magnetization potential field

13. In electrical method of magnetization, what does the polarity of a magnet depend on?

- A. Magnetic material orientation in space.
- B. Magnetic material size.
- C. Amount of current passed.
- D. Direction of current.

The correct answer is option [D].

14. Which one of the following is true of magnetism?

- A. Like poles attract.
- B. Lodestone is a non-magnetic oxide.
- C. The freely suspended magnet comes to rest in the geographical north-south direction.
- D. Iron fillings cling mainly round the ends of a bar magnet.

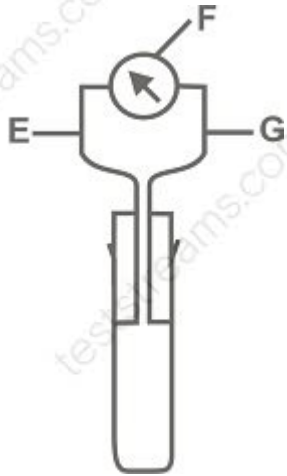
15. The field around a permanent bar magnet is similar to that around the _____.

- A. north pole
- B. point charge
- C. solenoid carrying current
- D. two parallel wires carrying current

16. Which one of these is not a magnetic material?

- A. Cobalt.
- B. Nickel.
- C. Copper.
- D. Steel.

17. What is the label G in the diagram drawn?



- A. Resistance wire
- B. Copper wire
- C. Constantine wire
- D. Silk thread

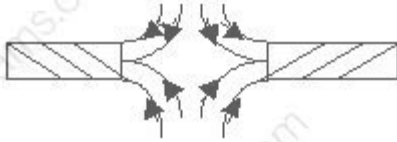
18. The angle between the earth's magnetic flux and the horizontal is known as _____.

- A. declination angle
- B. angle of dip
- C. angle of inclination
- D. vertical component of the earth's angle

19. What happens when a current flows in along solenoid P?

- A. Both end of P are south poles
- B. Both ends of P are North poles
- C. There is only a at the end of P
- D. P settles in a north -south direction if freely suspended

20. The diagram represents the field pattern obtained by bringing the poles of two magnets near each other. The poles must be _____.



- A. N - N poles
- B. S - S poles
- C. S - N poles
- D. N - S poles

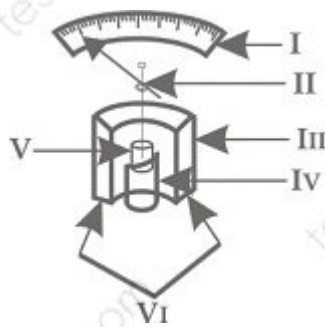
21. When the resultant magnetic flux density equals zero, it is said to be _____.

- A. zero point
- B. normal point
- C. neutral point
- D. flux density maximum

22. Which one of these is a method of making a temporary magnet and also demagnetising a magnet in the laboratory?

- A. Single touch method
- B. Divided touch method
- C. Hammering method
- D. Electrical method

23. From the diagram drawn, III and II are _____.



- A. solenoid and spring to contact angle of deflection
- B. solenoid and scale

- C. moveable soft iron and fixed soft iron
- D. spring to contact angle of deflection and fixed soft iron

24. In order to prevent bar magnets from losing their strength, they are stored with keepers such that the two bars are placed with _____.

- A. like poles facing each other and the keeper placed across their ends
- B. unlike poles adjacent to each other and the keeper placed across their ends
- C. unlike poles facing each other and the keeper placed at their ends
- D. unlike poles facing each other and the keepers placed between them

25. Anywhere on the earth surface, a compass needle always points in the north-south direction, this suggests that _____.

- A. the earth is a magnet
- B. the earth is spherical
- C. the earth is gravitational
- D. the earth is surrounded by a

26. The path or curve in which a magnetic material traces in a is called all EXCEPT _____.

- A. magnetic wave
- B. lines
- C. magnetic lines of force
- D. magnetic flux

27. In the electrical method of magnetisation, the polarity of the magnet depends on the _____.

- A. amount of current passed
- B. direction of current
- C. magnetic material used
- D. size of the magnetic material

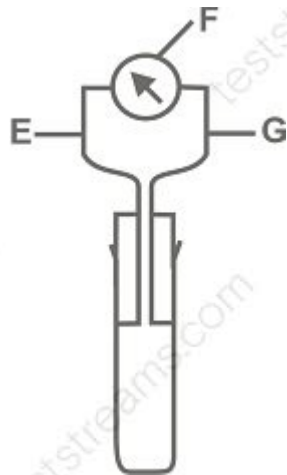
28. The d.c generator has essentially the same components as the a.c generator except the presence of _____.

- A. slip-ring
- B. carbon-brushes
- C. split ring
- D. armature

29. Which of the following sets comprises magnetic substances only?

- A. Cobalt, Iron, Nickel and Manganese
- B. Cobalt, Steel, Iron and Copper
- C. Copper, Iron, Manganese and steel
- D. Iron, Nickel, Manganese and Copper

30. What is F in the diagram of a thermopile drawn?



- A. Galvanometer
- B. Ammeter
- C. voltmeter
- D. Avometer

31. Which of the following statement is correct about the earth's magnetic field?

- A. The angle of dip is the angle which a freely suspended needle makes with the vertical

B. The angle of declination is the angle between the magnetic meridian and the geographic meridian

C. The angle of declination is the angle which a magnet compass makes with the magnetic meridian

D. The angle of inclination is the difference between the angle of dip and the angle of declination

32. The direction of the force on a north pole placed at the point is _____.

A. magnetic flux direction

B. magnetic flux potential

C. magnetic direction

D. electromagnetic direction

33. Which of the options is not an effect of current?

A. A is formed

B. A force between conductors

C. The direction of lines is known

D. It can destroy the conductor

34. The magnetic element of any given place include all EXCEPT _____.

A. angle of inclination

B. angle of dip

C. angle of declination

D. the horizontal component of the earth's

35. Which of the following will NOT be effective in order to increase the e.m.f. obtained from a simple dynamo?

A. Increasing the number of turns in its coil

B. Increasing the resistance of its coil

C. Increasing the speed of its rotation

D. Increase the strength of the

36. Magnetization can be done by all EXCEPT _____.

- A. method of double touch
- B. electrical method
- C. method of single touch
- D. method of putting the magnet in line with the earth

37. A proton moving with a speed of $1.0 \times 10^6 \text{ms}^{-1}$ through a of 1.0T experiences a magnetic force of magnitude $8.0 \times 10^{-14} \text{N}$. The angle between the proton's velocity and the field is _____.

[proton charge = $1.6 \times 10^{-19} \text{C}$].

- A. 90°
- B. 60°
- C. 45°
- D. 30°

38. Which one of these is NOT a way by which energy is lost in an electric motor?

- A. Eddy current
- B. Hysteresis
- C. Reducing the number of turns
- D. Unlaminated soft iron core

39. Which of the following option would NOT alter the strength of the between the poles of an electromagnet?

- A. Reversing the current in the coils
- B. Halving the number of turns
- C. Doubling the current and change
- D. moving the poles nearer each other

40. The north pole of a magnet can never be separated from the south pole because of a property known as _____.

- A. magnetic monopole
- B. magnetic dipoles
- C. magnetic quadrupole
- D. magnetic octopole

41. The process of magnetizing an object of magnetic material simply by bringing a magnet near is called _____.

- A. magnetic field
- B. ionic magnetization
- C. electrolytic magnetization
- D. induced magnetism

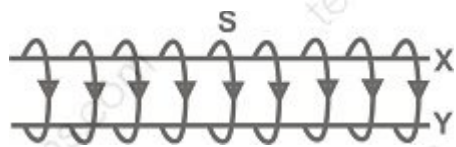
42. The region around a magnet in which the magnetic influence is experienced is called _____.

- A. magnetic flux
- B. magnetic field
- C. magnetic meridian
- D. magnetic declination

43. Which of the following is not the property of a magnet?

- A. They have ends called poles.
- B. They always come to rest with their axis pointing north-south.
- C. Like poles attract while unlike poles repel.
- D. Their attraction power is at the end.

44. In the diagram drawn X and Y are two parallel soft iron rods inside a solenoid S. When a high current flows in S then X and Y _____.



- A. stay still

- B. attract each other
- C. move to right and left
- D. repel each other

45. Which combination makes iron preferable to steel in making of electromagnets?

- i. It retains its magnetism much longer than steel.
- ii. It is more easily magnetized than steel.
- iii. It is more easily demagnetized than steel.
- iv. It produces a stronger magnet than steel.

- A. II and III only.
- B. I and II only.
- C. II, III and IV only.
- D. I, III and IV only.

ANSWERS

TOPIC: ALTERNATING CURRENT

DIRECTION: Choose the correct answer from the lettered options.

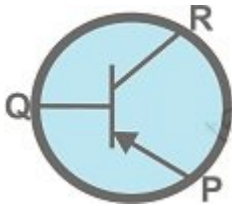
1. The peak voltage in an r.m.s. circuit is 2.0V and the resistance of the circuit is 3.0Ω. Find the peak current flowing.

- A. 0.666A.
- B. 1.5A.
- C. 2.43A.
- D. 1.333A.

The correct answer is option [A].

Hint: $I_0 = V_0/R$.

2. In the circuit transistor diagram shown, the terminals P, Q and R represent _____.



- A. BASE, EMITTER, COLLECTOR
- B. BASE, COLLECTOR, EMITTER
- C. EMITTER, BASE, COLLECTOR
- D. COLLECTOR, EMITTER, BASE

The correct answer is option [C].

3. The resistance in a series R-C circuit is 5W. If the impedance of the circuit is 13 Ω, calculate the reactance of the capacitor.

- A. 18Ω
- B. 16 Ω
- C. 14 Ω

D. $12\ \Omega$

The correct answer is option [D].

The impedance is given as

$$Z = \sqrt{(X_c^2 + R^2)} \Rightarrow 13 = \sqrt{(X_c^2 + 5^2)}$$

$$\therefore X_c = \sqrt{(13^2 - 5^2)} = \sqrt{144} = 12\ \Omega$$

ALTERNATING CURRENT

Use the information to answer the question.

4. An RLC circuit with $R = 60\ \Omega$, $L = 0.2\text{H}$, $C = 40\text{mF}$ and $f = 392.86\text{Hz}$ experiences the passage of an a.c. with peak value 0.1A . Obtain the value of the current vector, V_c .

A. 10.0V .

B. 15.0V .

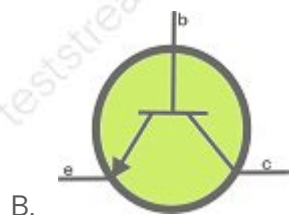
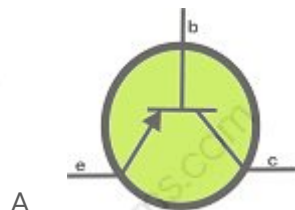
C. 18.4V .

D. 12.0V .

The correct answer is option [A].

Hint: $V_c = I_o \times X_c = 0.1 \times 100 = 10.0\text{V}$.

5. Which of the following diagram represents correctly an n-p-n transistor?





D.

The correct answer is option [B].

6. At what frequency would a capacitor of $2.5\mu\text{F}$ be used in a radio circuit having a reactance of 250 ohms?

- A. 80/pHz
- B. 800/pHz
- C. 1600/pHz
- D. 3200/pHz

The correct answer is option [B].

$$X_c = 1/(2\pi fC)$$

$$\Rightarrow f = 1/(2\pi X_c C) = 1/(2\pi \times 250 \times 2.5 \times 10^{-6})$$

$$= 800/\pi \text{ Hz}$$

7. In a tuned radio receiver R, L, C series circuit for resonance, the inductive and capacitive reactance X_L and X_C respectively are related as _____.

- A. $X_L = 2X_C$
- B. $X_L = X_C$
- C. $X_L = X_C/2$
- D. $X_L = 1/X_C$

The correct answer is option [B].

Use the information to answer the question.

8. An alternating e.m.f. of 12V and frequency 50Hz is flowing across a capacitor of 2 nanofarad and resistor of 1000Ω . Obtain the current flowing in the circuit.

- A. $7.5 \times 10^{-6}\text{A}$.

- B. $2.5 \times 10^{-5}\text{A}$.
- C. $7.5 \times 10^{-3}\text{A}$.
- D. $7.0 \times 10^{-4}\text{A}$.

The correct answer is option [A].

Hint: Current, $I = V/Z$.

9. An inductor of inductance 0.5H stores 6.25J of energy. The current passing through it is _____.

- A. 0.25A
- B. 0.50A
- C. 3.31A
- D. 5.00A

The correct answer is option [D].

Use the information to answer the question.

10. An RLC circuit with $R = 60\Omega$, $L = 0.2\text{H}$, $C = 40\text{mF}$ and $f = 392.86\text{Hz}$ experiences the passage of an a.c. with peak value 0.1A . Determine the phase current between the current and the applied voltage.

- A. -39.8° .
- B. 23.4° .
- C. -23.4° .
- D. 40.9° .

The correct answer is option [A].

Hint: Phase angle = $\tan \phi = [XL - XC]/R$.

11. Given that a sinusoidal alternating wave have a voltage of 60.0V and the angle sinusoidal wave being constant 30° . Obtain the amplitude voltage of the system.

- A. 15.0V .
- B. 25.2V .
- C. 45.0V .

D. 60.0V.

The correct answer is option [D].

Hint: $V = V_0 \sin \omega t$

where $\omega t = \theta$

V_0 = Amplitude voltage and V = Voltage applied.

12. When impurities are added to semi-conductor, the conductivity of the semi-conductor _____.

A. increases

B. decreases

C. remains constant

D. increases then decreases

The correct answer is option [B].

13. The capacitive reactance is 15Ω and the resistance is 25Ω . Obtain the phase angle of the circuit.

A. $\sin^{-1} 5/3$.

B. $\tan^{-1} 3/5$.

C. $\tan^{-1} 5/3$.

D. $\cos 3/5$.

The correct answer is option [B].

Hint: Phase angle, $\phi = \tan^{-1} \phi = XC/R$.

Use the information to answer the question.

14. An alternating e.m.f. of 12V and frequency 50Hz is flowing across a capacitor of 2 nanofarad and resistor of 1000Ω . Obtain the voltage across the capacitor.

A. 2.5V.

B. 10.2V.

C. 11.94V.

D. 11.02V.

The correct answer is option [C].

Hint: Voltage across the capacitor is given by the equation $V_C = I \times X_C$.

15. A radio station delivers at a frequency of 500Hz and current used is 0.5mA. If a capacitor $3\mu\text{F}$ is used, the reactance of the capacitor is _____.

- A. 159Ω
- B. 238.5Ω
- C. 325.5Ω
- D. 23.85Ω

The correct answer is option [B].

Hint: Reactance of capacitor $X_C = 1/[2\pi fC]$

16. The effective voltage recorded in an effective is 230V. What is the peak voltage?

- A. 325.250V.
- B. 215.150V.
- C. 322.120V.
- D. 125.325V.

The correct answer is option [A].

Hint: $V_o = V_{r.m.s.} \times \sqrt{2}$

where $V_{r.m.s.}$ = Effective Voltage.

Use the information to answer the question.

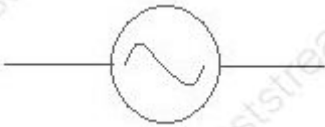
17. A capacitor of known capacitance and a 230V power supply at 50Hz are connected in series to a lamp rated 0.8A current. If the capacitor is replaced by an inductor of 0.9H, what will be the value of the current in the circuit?

- A. 3.0000A.
- B. 2.5232A.
- C. 3.8125A.
- D. 1.6250A.

The correct answer is option [C].

Hint: $I_{r.m.s.} = V_{r.m.s.} / [2\pi f L]$. All parameters retain their usual meanings.

18. What kind of symbol is drawn?



- A. Direct e.m.f.
- B. Direct current.
- C. Alternating e.m.f.
- D. Alternating inductance.

The correct answer is option [C].

19. The battery connection that permits current to flow across a p-n junction is called _____.

- A. amplification
- B. rectification
- C. forward biased
- D. reverse biased

The correct answer is option [C].

Use the information to answer the question.

20. An alternating e.m.f. of 12V and frequency 50Hz is flowing across a capacitor of 2 nanofarad and resistor of 1000Ω . Obtain the result of the phase angle.

- A. $\sin^{-1} 45$.
- B. $\tan^{-1} 19$.
- C. $\tan^{-1} 25$.
- D. $\sin^{-1} 19$.

The correct answer is option [B].

Hint: $\tan \theta = XC/R$

$$\theta = \tan^{-1}[XC/R]$$

Use the information to answer the question.

21. An RLC circuit with $R = 60\Omega$, $L = 0.2H$, $C = 40\mu F$ and $f = 392.86Hz$ experiences the passage of an a.c. with peak value 0.1A. Guess the instantaneous value of the reactive capacitance?

- A. 20Ω .
- B. 50Ω .
- C. 70Ω .
- D. 100Ω .

The correct answer is option [D].

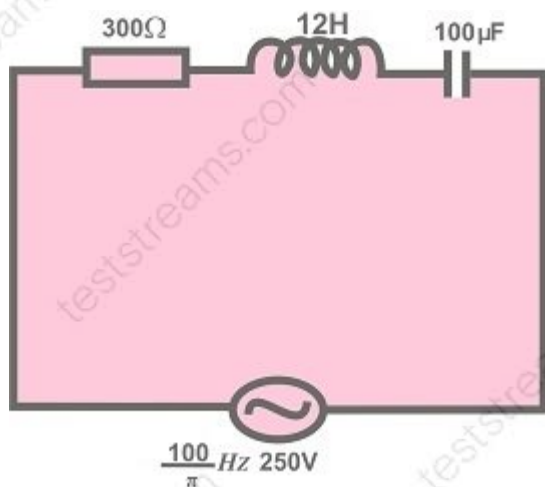
Hint: $X_C = 1/[\omega C]$.

22. A p-n junction diode is used as _____.

- A. a rectifier in a d.c circuit
- B. an amplifier in an a.c circuit
- C. a rectifier in an a.c circuit
- D. an amplifier in an d.c in circuit

The correct answer is option [C].

23. Using the circuit diagram drawn, calculate the inductive reactance.



- A. 3000Ω
- B. 4500Ω
- C. 2400Ω
- D. 1250Ω

The correct answer is option [C].

$$X_L = 2\pi fL$$

Use the information to answer the question.

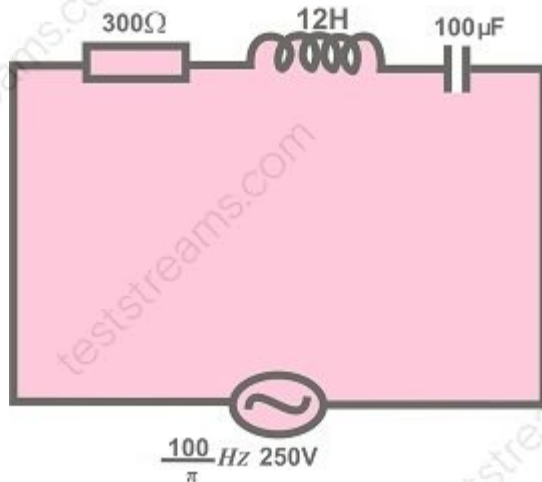
24. A capacitor of known capacitance and a $230V$ power supply at 50Hz are connected in series to a lamp rated $0.8A$ current. If this current is the minimum current needed to light up the lamp, then what is the value of the effective current and voltage?

- A. $0.8A$ and $230V$.
- B. $0.6A$ and $210V$.
- C. $2.0A$ and $2.3V$.
- D. $0.6A$ and $220V$.

The correct answer is option [A].

The effective current = $I_{\text{eff}} = 0.8A$ and the effective voltage = $V_{\text{eff}} = 230V$.

25. Using the circuit diagram drawn, find the impedance of the circuit.



- A. 2418.2Ω
- B. 2369.1Ω
- C. 304.1Ω
- D. 340.1Ω

The correct answer is option [B].

Impedance, $Z = \sqrt{R^2 + (X_L - X_C)^2}$.

Use the information to answer the question.

26. An RLC circuit with $R = 60\Omega$, $L = 0.2\text{H}$, $C = 40\text{mF}$ and $f = 392.86\text{Hz}$ experiences the passage of an a.c. with peak value 0.1A . Measure by calculation the result of the voltage vector, V_L .

- A. 5.0volt .
- B. 21.1volt .
- C. 3.5volt .
- D. 4.25volt .

The correct answer is option [A].

Hint: $V_L = I_0 X_L = 0.1 \times 50 = 5.0\text{Volt}$.

27. The energy stored in an inductor of inductance 5mH when a current of 6A flows through it is _____.

- A. $1.4 \times 10^{-2}\text{J}$

- B. $1.8 \times 10^{-2} \text{J}$
- C. $9.0 \times 10^{-2} \text{J}$
- D. $9.0 \times 10^{-3} \text{J}$

The correct answer is option [C].

$$L = 5\text{mH} = 5 \times 10^{-3} \text{H}, I = 6\text{A}$$

$$E = LI^2/2 = 1/2 \times 5 \times 10^{-3} \times (6)^2 = 1/2 \times 5 \times 10^{-3} \times 36 = 9 \times 10^{-2} \text{J}$$

Use the information to answer the question.

28. An RLC circuit with $R = 60\Omega$, $L = 0.2\text{H}$, $C = 40\text{mF}$ and $f = 392.86\text{Hz}$ experiences the passage of an a.c. with peak value 0.1A . What is the square difference of V_C and V_L ?

- A. 27.8V .
- B. 70V^2 .
- C. 75V^2 .
- D. 57V^2 .

The correct answer is option [C].

Use the information to answer the question.

29. An alternating e.m.f. of 12V and frequency 50Hz is flowing across a capacitor of 2 nanofarad and resistor of 1000Ω . Find the impedance of the circuit.

- A. $10^3\sqrt{3}\Omega$.
- B. $10^6\sqrt{2.53}\Omega$.
- C. $10^2\sqrt{2.50}\Omega$.
- D. 105 .

The correct answer is option [B].

$$\text{Hint: } Z = \sqrt{[R^2 + X_C^2]}$$

30. When the base current of a common-emitter transistor is kept at zero, it operates in the _____.

- A. active-on region

- B. break down region
- C. saturation region
- D. cut-off region

The correct answer is option [C].

31. For semiconductors to have negative temperature coefficient of resistance implies that _____.

- A. their resistance increases with temperature
- B. their resistance decreases with temperature
- C. they have electrons and holes at high
- D. their resistance is constantly changing with temperature

The correct answer is option [B].

32. At a certain measurement, the amplitude voltage was 9.33V across a capacitor and an inductor. The current value recorded at this point was 3.0A. Find the reactance of the system.

- A. 27.99A.V.
- B. 27.99V/A.
- C. 3.11A/V.
- D. 3.11V/A.

The correct answer is option [D].

Hint: Reactance = [Peak voltage across C and L]/[Peak current through it].

33. Which of the following equation is correct for the energy 'E' stored in an inductor of inductance 'L' when current 'I' passes through it?

- A. $E = LI^2/2$
- B. $E = LI^2$
- C. $E = LI/2$
- D. $E = L^2I/2$

The correct answer is option [A]

34. When an given by $I = 10\sin(120\omega)t$ passes through a 12Ω resistor, the power dissipated in the resistor is _____.

- A. 120W
- B. 30W
- C. 600W
- D. 1200W

The correct answer is option [D].

$$I = 10\sin(120\pi)t = I_0 \sin\omega t$$

$$I_0 = 10A, R = 12\Omega$$

$$P = I_0^2 R$$

35. Find the peak voltage of a 240V r.m.s main supply.

- A. 77.1V
- B. 120.0V
- C. 169.7V
- D. 339.4V

The correct answer is option [C]

Use the information to answer the question.

36. An RLC circuit with $R = 60\Omega$, $L = 0.2H$, $C = 40mF$ and $f = 392.86Hz$ experiences the passage of an a.c. with peak value 0.1A. What is the reference voltage?

- A. 43V.
- B. $\sqrt{43}V$.
- C. $\sqrt{20}V$.
- D. 25V.

The correct answer is option [B].

Hint: Reference Voltage $V = \sqrt{VR^2 + [VL - VC]^2}$.

Use the information to answer the question.

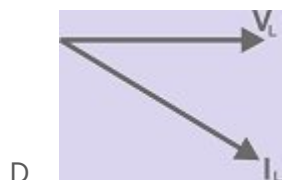
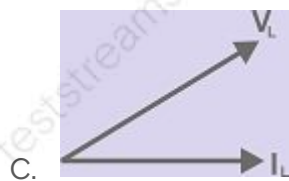
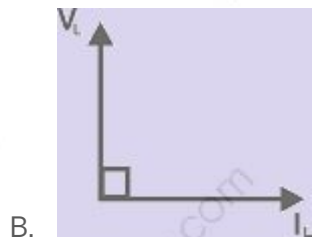
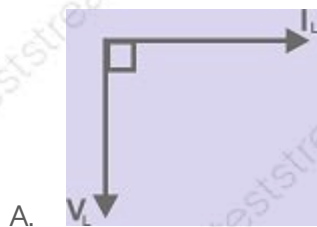
37. An RLC circuit with $R = 60\Omega$, $L = 0.2\text{H}$, $C = 40\text{mF}$ and $f = 392.86\text{Hz}$ experiences the passage of an a.c. with peak value 0.1A . Visualise the result of the voltage at maximum.

- A. 20.1volt .
- B. 7.81volt .
- C. 2.01volt .
- D. 30.7volt .

The correct answer is option [B].

Hint: Voltage at maximum = peak value of the voltage applied and is $V_o = I_o Z$.

38. Which of the following diagrams illustrates the phase difference between the voltage and current of an inductor in a circuit?



The correct answer is option [B].

39. When an given by $I = 10 \sin(120\pi)t$ passes through a 12Ω resistor, the power dissipated in the resistor is _____.

- A. 120W
- B. 30W
- C. 600W
- D. 1200W

The correct answer is option [D].

Using the formula:

$$P = I_o^2 R$$

$$\text{Note: } I = I_o \sin \omega t$$

40. In an a.c. circuit that contains only a capacitor, the current voltage lags behind by _____.

- A. 30°
- B. 60°
- C. 90°
- D. 180°

The correct answer is option [C].

Use the information to answer the question.

41. An RLC circuit with $R = 60\Omega$, $L = 0.2\text{H}$, $C = 40\text{mF}$ and $f = 392.86\text{Hz}$ experiences the passage of an a.c. with peak value 0.1A , calculate the reference voltage V_R .

- A. 0.2A .
- B. 0.0707A .
- C. 4.24V .
- D. 0.03V .

The correct answer is option [C].

Hint: $V_R = I_{\text{eff}} \times R$ but $I_{\text{eff}} = 0.707I_o$, where I_o and R are known, thus V_R is obtainable.

Choose the correct option

42. If a current of 17A pass through a coil such that the magnetic flux set up is 40Weber, determine the self inductance in the coil.

- A. 3.45 H
- B. 1.73 H
- C. 2.35 H
- D. 6.35 H

The correct answer is option [C].

$I = 17\text{A}$ magnetic flux = 40wb

Let $L =$ self inductance $L = \phi/I = 40/17 = 2.35\text{ H}$

Use the information to answer the question.

43. An RLC circuit with $R = 60\Omega$, $L = 0.2\text{H}$, $C = 40\mu\text{F}$ and $f = 392.86\text{Hz}$ experiences the passage of an a.c. with peak value 0.1A. Obtain the impedance of the circuit.

- A. 40Ω .
- B. 20Ω .
- C. 78.1Ω .
- D. 50Ω .

The correct answer is option [C].

Hint: Impedance $Z = \sqrt{R^2 + (X_L - X_C)^2}$

44. The ratio of the effective voltage to effective current is known as _____.

- A. impedance
- B. reactance of capacitor
- C. resistance
- D. phase resistance

The correct answer is option [A].

45. Find the reactance of a capacitor 500/pHz frequency if in a circuit a capacitor has a reactance = 5mF.

- A. 200Ω

- B. 200.5Ω
- C. 80.7Ω
- D. 190.1Ω

The correct answer is option [A].

Hint: $X_c = 1/[2\pi f C]$, where C = Capacitance of capacitor.

46. The overall resistance of a circuit containing a resistor and either a capacitor or an inductor is called _____.

- A. capacitance
- B. impedance
- C. inductance
- D. reactance

The correct answer is option [B].

47. Maximum current is obtained in a series RLC circuit when the

- I. total reactance is zero
- II. impedance is equal to the resistance
- III. capacitive reactance is equal to the inductive reactance
- IV. circuit is in resonance

Which of the statements above is /are correct?

- A. I only
- B. III only
- C. I and II only
- D. I, II, III and IV

The correct answer is option [B].

48. The charge carriers in gases are _____.

- A. electrons only
- B. ions only
- C. electrons and ions

D. electrons and holes

The correct answer is option [D].

49. A radio station delivers at a frequency of 500Hz and current used is 0.5mA. If a capacitor 3 μ F is used, obtain the voltage value across the capacitor.

- A. 0.6V.
- B. 0.1193V.
- C. 0.1250V.
- D. 0.5321V.

The correct answer is option [B].

Hint: Voltage, $V = IX_c$

where X_c = Capacitor reactance.

TOPIC: ELECTRIC FIELDS

DIRECTION: Choose the correct answer from the lettered options.

Use the information to answer the question.

1. Two plates capacitors are separated by a distance of 0.5m in a field at 10^7N/C .

[Take $1/4\pi\epsilon_0 = 9.05 \times 10^9\text{m/f}$].

Determine the power generated by the circuit.

- A. $1.25 \times 10^6\text{W}$.
- B. $26.73 \times 10^4\text{W}$.
- C. $39.22 \times 10^7\text{W}$.
- D. $1.38 \times 10^8\text{W}$.

The correct answer is option [D].

Hint: Power, $P = IV$.

Use the information to answer the question.

2. Two plates capacitors are separated by a distance of 0.5m in a field at 10^7N/C .

[Take $1/4\pi\epsilon_0 = 9.05 \times 10^9\text{m/f}$].

What is the current that could be generated if the system of circuit is left over a period of 10^{-5}sec ?

- A. 10^{-3}A .
- B. $2.5 \times 10^{-2}\text{A}$.
- C. 27.62A .
- D. 3.52A .

The correct answer is option [C].

Hint: Current, $I = \text{Charge, } q/\text{time taken}$.

3. A current of 21A is passed through a 20m length of two conducting wire placed 125cm apart. Determine the force of attraction between the wires assuming the current is flowing in the direction.

[TAKE the force constant to be 2×10^{-7}].

- A. $1.33 \times 10^{-5}\text{N}$
- B. $4.5 \times 10^{-5}\text{N}$
- C. $7.1 \times 10^{-4}\text{N}$
- D. $6.4 \times 10^{-4}\text{N}$

The correct answer is option [D].

current $A = 21\text{A}$, $L = 20\text{m}$ Length wire = $125\text{cm} = 1.25\text{m}$

Let the required force = F

$$F = 2 \times 10^{-7} \times I^2$$

$$L/d = 2 \times 10^{-7} \times 20\text{m} \times 21^2/1.25$$

Use the information to answer the question.

4. Two plates capacitors are separated by a distance of 0.5m in a field at 10^7N/C .

[Take $1/4\pi\epsilon_0 = 9.05 \times 10^9\text{m/f}$].

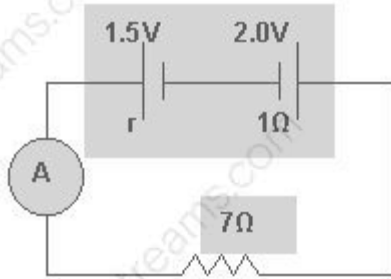
Obtain the possible resistance that could be applied across the capacitors.

- A. $320.056\text{K}\Omega$.
- B. $22.056\text{K}\Omega$.
- C. $520\text{K}\Omega$.
- D. $362.056\text{K}\Omega$.

The correct answer is option [D].

Hint: Resistance, $R = V/I$.

5. In the given circuit shown, the cell P has an e.m.f of 1.5V and an unknown internal resistance, r while the cell Q has an e.m.f. 2.0V and an internal resistance 1. If the ammeter reads 50mA, then R equals _____.



- A. 3.0W
- B. 4.0W
- C. 5.5W
- D. 2.0W

The correct answer is Option [D].

The Total current generated is: $I = \frac{(\Sigma E)}{R_{eq}}$

$$\Sigma E = 2.0 - 1.5 = 0.5$$

$$R_{eq} = 7 + 1 + r$$

$$= 8 + r$$

$$0.05 = \frac{0.5}{(8 + r)}$$

$$0.05r = 0.5 - 0.4 = 0.1$$

$$r = \frac{0.1}{0.05} = 2.0 \Omega$$

6. The force of repulsion between two particles of equal charges of $1.7 \times 10^{-18}C$ is _____, if the distance between them is $5.2 \times 10^{-10}m$.

$$[1/4\pi\epsilon_0 = 9 \times 10^9 Nm^2/C^2]$$

- A. $26.7 \times 10^{-8}N$.
- B. $10.11 \times 10^{-8}N$.
- C. $7 \times 10^{-8}N$.
- D. $9.62 \times 10^{-8}N$.

The correct answer is option [D].

$$\text{Hint: Use the equation } F = \frac{q^2}{[4\pi\epsilon_0 r^2]} = \frac{[9 \times 10^9 \times 1.7 \times 10^{-18} \times 1.7 \times 10^{-18}]}{[(5.2 \times 10^{-10})^2]} = \frac{2.6 \times 10^{-26}}{2.7 \times 10^{-19}} = 9.62 \times 10^{-8}N.$$

7. Which of the following is NOT an effect that can be produced by an electric current?

- A. Heat
- B. Light
- C. Sound
- D. Water

The correct answer is option [D].

8. If the distance between two point charges is increased by a factor of four, the magnitude of the electrostatic force between them will be _____.

- A. 4 times its former value
- B. 1/2 of its former value
- C. 1/4 of its former value
- D. 1/16 of its former value

The correct answer is option [D].

$$F_2 = q_1q_2/4\pi\epsilon_0r^2$$

$$F_2 = q_1q_2/4\pi\epsilon_0(4r)^2 = q_1q_2/4\pi\epsilon_016r^2$$

$$F_2 = 1/16 \times q_1q_2/4\pi\epsilon_0r^2 = 1/16 \times F_1$$

9. Two charged particles are projected into a region where there is a perpendicular to their velocities. If the charges are deflected in opposite directions, which of the following statement is true of charges?

- A. The charges are electrically neutral
- B. The charges must be of opposite sign
- C. The charges are of the same sign
- D. Positive charges are more in number

The correct answer is option [C].

10. If the force on a charge of 0.2C in an electric field is 4N, then the electric field intensity of the field is _____.

- A. 0.8 C/N

- B. 0.8 N/C
- C. 20.0 N/C
- D. 4.2 N/C

The correct answer is option [C].

Electric field intensity = $F/q = 4/0.2 = 20.0 \text{ N/C}$

11. Given three capacitors $0.3\mu\text{F}$, $0.5\mu\text{F}$ and $0.2\mu\text{F}$, the joint capacitance when arranged to give minimum capacitance is _____.

- A. $1.0\mu\text{F}$
- B. $0.5\mu\text{F}$
- C. $0.3\mu\text{F}$
- D. $0.1\mu\text{F}$

The correct answer is option [D].

12. Capacitors are used in the following devices, EXCEPT _____.

- A. water pumping
- B. ceiling fans
- C. electric irons
- D. television set

The correct answer is option [C].

13. Calculate the peak voltage of a mains supply of r.m.s. value 220V.

- A. 112V
- B. 150V
- C. 240V
- D. 311V

The correct answer is option [D].

$$V_{rms} = \frac{V_o}{\sqrt{2}}$$

$$V_o = \sqrt{2} \times V_{rms} = \sqrt{2} \times 220 = 311V$$

14. Which of the following is a pure semiconductor?

- A. Silicon
- B. Phosphorus
- C. Transistor
- D. Carbon

The correct answer is option [A].

15. The force acting on an electron of charge $1.6 \times 10^{-19}C$ placed in an electric field of intensity $108Vm^{-1}$ is _____.

- A. $1.6 \times 10^{-11}N$
- B. $1.6 \times 10^{-14}N$
- C. $1.6 \times 10^{-16}N$
- D. $1.0 \times 10^{-16}N$

The correct answer is option [A].

Given $q = 1.6 \times 10^{-19}C$, $E = 108Vm^{-1}$, $F = ?$

But $F = qE$

$$F = 1.6 \times 10^{-19} \times 108 = 1.6 \times 10^{-11}N$$

TOPIC: ELECTROMAGNETIC INDUCTION

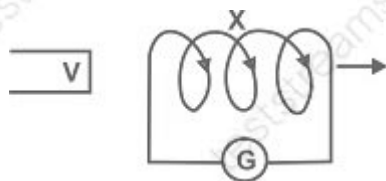
DIRECTION: Choose the correct answer from the lettered options.

1. Which of the options is not a use of soft-iron core being laminated?

- A. To reduce loss of energy in the form of heat
- B. Ensuring that the core is made of hard magnetic material for easy magnetic reversal
- C. Eliminate the effect of eddy current which occurs due to lenz"s law
- D. Increase the efficiency of the transformer

The correct answer is option [B].

2. In the diagram drawn, a coil X is moved quickly away from the end V of a stationary metal bar and a current then flows in X as shown. Which of the following option best explains the diagram drawn?



- A. The bar is not a magnet
- B. V is a north pole
- C. The current in X is constant
- D. V is a south pole

The correct answer is option [B].

3. In an iron-cored transformer, the number of secondary turns is 100 and of primary turns is 2000. When 240V a.c. is connected from the mains, the output is _____.

- A. 240V
- B. 12V
- C. 100V
- D. 4800V

The correct answer is option [B].

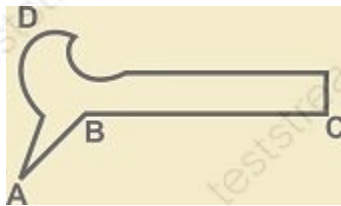
Hints: $E_s/E_p = N_s/N_p$ where E_s = output of a.c. voltage. E_p = input of a.c. voltage i.e. voltage of the mains. While N_s = number of turns of secondary coil N_p = number of turns of primary coil.

4. A dry battery of 6V is joined to the primary of a commercial transformer. The secondary has twice the number of turns of the primary. The primary resistance is 2 ohms. The voltage obtained at the secondary is _____.

- A. 0V
- B. 1.5V
- C. 12V
- D. 3V

The correct answer is option [C].

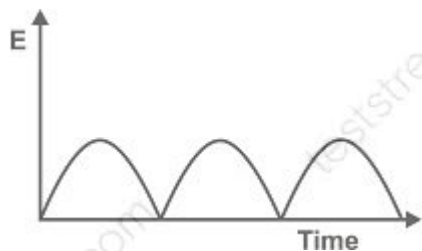
5. Which part of the conductor drawn labelled A-D will have the greatest charge density?



- A. D
- B. A
- C. C
- D. B

The correct answer is option [B].

6. When a coil rotates in a magnetic field, the induced e.m.f E at the brushes varies as shown in the diagram drawn, then _____.



- A. the speed of rotation varies
- B. the has damaged easily

- C. the becomes zero twice per revolution
- D. the ends of the coil are connected to a split-ring commutator

The correct answer is option [A].

7. All of the options are relevant terms in magnetic flux EXCEPT _____.

- A. magnetic lines of force
- B. unit weber (Wb)
- C. telsa unit per unit area
- D. electromotive force

The correct answer is option [D].

8. All of the following are effects of soft-wires as iron-core EXCEPT _____.

- A. to reduce eddy current thereby increasing the secondary emf
- B. to ensure that it is easily magnetised during make and demagnetised during break
- C. provide limited sparks when in use to ignite petrol air mixture in a car cylinder
- D. reduce loss of energy in form of heat

The correct answer is option [C].

9. A transformer connected to 350V supply has 3000 turns of primary coil. Calculate the number of turns in the secondary coil if the voltage is 60V.

- A. 625 turns
- B. 114 turns
- C. 514 turns
- D. 240 turns

The correct answer is option [C].

$$E_s/E_p = N_p/N_s$$

$$60/350 = x/3000 = 60 \times 3000/350 = 514 \text{ turns}$$

10. The instrument used for securing a large number of similar charges by induction is called _____.

- A. electroscope
- B. proofplane
- C. capacitors
- D. electrophorus

The correct answer is option [D].

11. What is the power wasted, when 10kilowatts at 200V is supplied through a cable of total resistance 0.5 ohms?

- A. 1345W
- B. 1250W
- C. 1470W
- D. 1730W

The correct answer is option [B].

$$P = IV$$

Calculate the current at 200V

$$I = 10000/200 = 50A$$

The power loss = I^2R

where $I = 50A$ and $R = 0.5\Omega$

$$\text{Power loss} = 50^2 \times 0.5 = 1250W$$

12. What would be the effect on the amount of power wasted if the applied voltage was increased and the power was transmitted through the same cable?

- A. Decreased
- B. Increased
- C. The same
- D. Zero

The correct answer is option [A].

13. A generator used in converting a mechanical energy to electrical energy is called _____.

- A. a moving-coil galvanometer
- B. a moving-iron ammeter
- C. a moving-coil loud speaker
- D. simple dynamo

The correct answer is option [D].

14. A positive charge moving with a velocity of $3.68 \times 10^{-15} \text{ m/s}$ enters a uniform magnetic field, B of 10^{-7} Telsa. Determine the force on the charge and mass of the positive charge. [Take a positive charge $(+q) = 1.6 \times 10^{-19}$ when radius is 3.78 m].

- A. $5.89 \times 10^{-41} \text{ N}$ and $1.3 \times 10^{-2} \text{ kg}$
- B. $5.89 \times 10^{-41} \text{ N}$ and $8.3 \times 10^{-9} \text{ kg}$
- C. $5.89 \times 10^{-41} \text{ N}$ and $1.64 \times 10^{-11} \text{ kg}$
- D. $5.89 \times 10^{-41} \text{ N}$ and $2.4 \times 10^{-17} \text{ kg}$

The correct answer is option [C].

Velocity of charge $V = 3.68 \times 10^{-15} \text{ m/s}$ $B = 10^{-7} = Bqv = 10^{-7} \times 3.68 \times 10^{-15} \times 1.6 \times 10^{-19} \text{ N} = 5.89 \times 10^{-41} \text{ N}$

Since $MV^2/r = Bev$

Mass-charge ratio $m/e = Br/v$

$Br/v = 10^{-7} \times 3.78/3.68 \times 10^{-15} = 1.027 \times 10^8$

$m = 1.027 \times 10^8 \times e$

$m = 1.027 \times 10^8 \times 1.6 \times 10^{-19} = 1.64 \times 10^{-11} \text{ kg}$.

15. Another name for galvanometer is _____.

- A. ammeter
- B. multimeter
- C. avometer
- D. milliammeter

The correct answer is option [D].

16. Which of the following does not happen when force acts perpendicular to the deflection path?

- A. Work is done on charge by force
- B. Speed (average velocity) is constant
- C. Energy possessed by remains constant
- D. The radius of the circular path can be deduced from the force that tends to keep the charge in circular path

The correct answer is option [A].

17. Eddy currents can be reduced by _____.

- A. using coil of high resistance
- B. winding the coil on a soft iron core
- C. creating holes in the metal plates
- D. using coil of low resistance

The correct answer is option [D].

18. Force experienced can be expressed by mathematical induction $F = BIL\sin\theta$. This deduce that L in the relation denote _____.

- A. density
- B. current density
- C. length of conductor
- D. angle of the field

The correct answer is option [C].

19. Which of the following does not have the application of an electromagnet?

- A. Steel girders handling in industries.
- B. Electric bell.
- C. Microphone.
- D. Telephone earpiece.

The correct answer is option [C].

20. All of the following is to minimize energy loss in a transformer EXCEPT _____.

- A. use of low resistance copper coil so as to minimize energy loss in the coil winding
- B. laminating soft iron core
- C. ensure that the core is made up of hard material for easy magnetic reversal
- D. ensuring that the primary flux links completely with the secondary

The correct answer is option [C].

21. An ideal transformer has a primary coil with 500 turns and a secondary coil with 2500 turns. When the input voltage to the primary is 120V, the output secondary voltage is _____.

- A. 12V
- B. 24V
- C. 300V
- D. 600V

The correct answer is option [D].

Use the formula $E_s/E_p = N_s/N_p$

22. Which of the following statement does not state Fleming"s left hand rule?

- A. It is also called motor rule
- B. The little finger point to the direction of the
- C. The thumb point the direction of the force
- D. The thumb point to the direction of the magnetic fields

The correct answer is option [B].

23. Lenz's law of is essentially a statement of the _____.

- A. inverse-square law of gravitation
- B. inverse-square law of magnetism
- C. inverse-square law of electrostatics
- D. law of conservation of energy

The correct answer is option [D].

24. Which of the following is not a factor that affects the magnitude of the induced e.m.f. or current?

- A. The strength of the magnet
- B. Speed of the coil when magnet is steady
- C. Speed of the magnet when coil is steady
- D. Number of turns of the coil

The correct answer is option [B].

25. Which of the following is an instrument of multiple functions?

- A. Voltmeter
- B. Ammeter
- C. galvanometer
- D. Avometer

The correct answer is option [D].

26. If two inductors of inductances 3H and 6H are arranged in series, the total inductance is

_____.

- A. 0.5H
- B. 2.0H
- C. 9.0H
- D. 18.0H

The correct answer is option [B].

27. Which of the following is an advantage of the capacitor in an induction coil?

- A. The presence of the capacitor is to slow down the fall of current in the primary coil at the instant of break
- B. To produce low voltage from a high voltage for use
- C. To provide sparks required to ignite the petrol air mixture in car cylinder
- D. This is to prevent the induced emf in the primary coil from rising as to cause unwanted spark

The correct answer is option [B].

28. Which of the following is a cause of not achieving maximum efficiency?

- A. Low amount of current
- B. Loss of energy arising from work-done against friction in the bearing and commutator of the motor
- C. Low number of coils
- D. Reduced amount of wind air springs

The correct answer is option [B].

29. A direct current of 2 amps in a coil of 400 turns causes a flux of 10^{-4} weber to link the turns of the coil. Compute the average counter emf induced in the coil if the current is interrupted in 0.008secs.

- A. 0.5 volts
- B. 5 volts
- C. 50 volts
- D. 0.05 volts

The correct answer is option [B].

To calculate the magnetic flux $\phi = BN$

where $N =$ number of turns = 400, $B =$ magnetic induction = 10^{-4} weber

$$\phi = 10^{-4} \times 400 = 0.04 \text{ wb}$$

$$L = \phi/I = 0.04/2 = 0.02 \text{ H}$$

$$E = LI/t = 0.02 \times 2/0.008 = 5 \text{ volts.}$$

30. When an induced current is produced in one coil, the currents direction in another is changed this is called _____.

- A. back emf
- B. mutual induction
- C. self induction
- D. Lenz law

The correct answer is option [B].

31. The force in a current carrying conductor in a magnetic field acts at an _____.

- A. right angle to the plane
- B. angle 60° to the plane
- C. angle 45° to the plane
- D. zero angle

The correct answer is option [A].

32. Which of the following does not happen in a moving-coil galvanometer?

- A. Presence of soft iron cylinder in between the magnet is to ensure that the magnetic flux is concentrated radially
- B. Rotation of coil is due to the force set up in accordance with Fleming's left hand rule
- C. The force set up acts on the two parallel side of the coil
- D. The force set up a deflecting couple which causes the coil to rotate until it balances the control couple set by the air spring

The correct answer is option [C].

33. All these are uses of electromagnet EXCEPT _____.

- A. door bell
- B. audiotapes
- C. electric iron
- D. speakers

The correct answer is option [C].

34. A transformer is rated 240V. If the primary coil is 4000 turns and secondary voltage is 12V, determine the number of turns in the secondary coil.

- A. 100
- B. 150
- C. 200

D. 250

The correct answer is option [C]

Using the formula

=

ES

=

NS

EP

NP

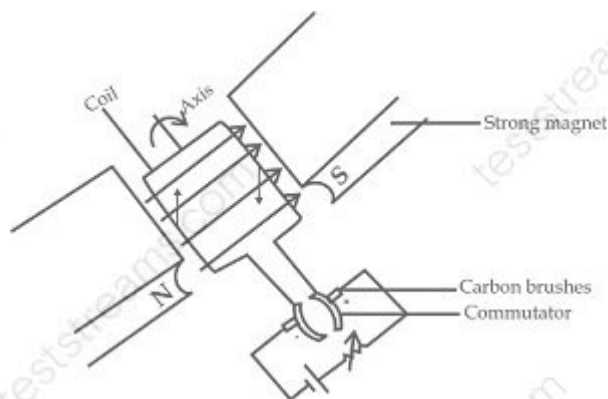
where N_s = number of turns in the secondary

N_p = Number of turns in the primary

E_s = Voltage in the secondary

E_p = voltage in primary

35. The diagram drawn is a simple electric motor that consist of the following parts EXCEPT _____.



- A. a power in which the coil turns
- B. weak hair springs so as to give a small rotational control
- C. a commutator which consist of split copper ring with their two halves insulated from each other
- D. rectangular coil of wire known as the armature about an axis

The correct answer is option [B].

36. Which of the following best defines eddy current?

- A. The induced emf in a circuit is directly proportional to the rate of change of magnetic flux linking the coil.
- B. The induced current flows in such a direction to oppose the change producing it.
- C. An electric current induced within the body of a conductor when that conductor either moves through a non-uniform or is in a region where there is a change in magnetic flux.
- D. The induced emf in a circuit as a result of the change in the current through the circuit.

The correct answer is option [C].

37. Soft iron is used in making the armature of an electric bell because it _____.

- A. retains its magnetism for a long time
- B. loses its magnetism readily
- C. produces permanent magnets
- D. is not easily magnetized

The correct answer is option [B].

38. Which of the following connections is required to convert a millimeter into a voltmeter?

- A. A low resistance in series
- B. A low resistance in parallel
- C. A high resistance in series
- D. A high resistance in parallel

The correct answer is option [A].

39. The current in the primary coil of a transformer is 2.5A. If the coil has 50 turns and the secondary 250 turns, calculate the current in the secondary coil.

[Neglect energy losses in the transformer]

- A. 0.2A
- B. 0.5A
- C. 2.5A
- D. 5.0A

The correct answer is option [B].

$$I_{\text{primary}} N_{\text{primary}} = I_{\text{secondary}} N_{\text{secondary}} \Rightarrow$$

$$I_s = \frac{I_p N_p}{N_s} = \frac{2.5 \times 50}{250} = 0.5A$$

ELECTROMAGNETIC INDUCTION

40. The following options are uses of eddy current EXCEPT _____.

- A. speedometer
- B. induction furnace
- C. inducing a galvanometer
- D. detecting visible cracks on railroads

The correct answer is option [D].

41. The unit of inductance is _____.

- A. Henrys
- B. Tesla
- C. Ohms
- D. mho

The correct answer is option [A].

42. The force and magnitude of a current carrying conductor in a depends on the following EXCEPT _____.

- A. the direction and strength of the by the magnet
- B. the direction and amount of the current flowing through the conductor
- C. the current direction and direction are at right angle to each other
- D. the type of magnet and conductors

The correct answer is option [D].

43. Which of the following defines self-inductance?

- A. Magnetic flux linking the coil per current

- B. Magnetic flux linking the coil per time
- C. Magnetic flux around the coil per current
- D. Change of magnetic flux in a coil per current

The correct answer is option [A].

44. Which of these type of galvanometer converts electrical energy to sound?

- A. Avometer
- B. Mirror-galvanometer
- C. Moving-coil loud speaker
- D. Moving-coil galvanometer

The correct answer is option [C].

45. Which of the following is not a use of an induction coil?

- A. To produce low voltage from high voltage for use
- B. For studying the discharge of electricity through gases
- C. For x-ray tubes to produce to the voltage required for accelerating the electron towards the metal target
- D. To provide sparks required to ignite the petrol air mixture in a car cylinder

The correct answer is option [A].

46. All these are devices that uses electro magnet in its mode of operation EXCEPT _____.

- A. telephones
- B. transformers
- C. microphone
- D. induction coil

The correct answer is option [C].

47. A force F , experience in a field of magnetic induction β , particle of charge q , moving with a velocity v , with angle θ , between the magnetic induction is given by _____.

- A. $q = F \sin \theta / v\beta$.
- B. $F = qv\beta \sin \theta$.
- C. $F = qv\beta \cos \theta$.
- D. $q = F \cos \theta / \beta$.

The correct answer is option [B].

48. The e.m.f. is opposing the motion producing it. This law is similar to _____.

- A. Faraday's law
- B. Ampere's law
- C. Electro-induction law
- D. Lenz's law

The correct answer is option [D].

49. All these are types of moving-coil instruments EXCEPT _____.

- A. moving-coil galvanometer
- B. moving-coil loud speaker
- C. mirror-galvanometer
- D. avometer

The correct answer is option [D].

50. The direction of induced current in a straight wire placed in a is determined using _____.

- A. Fleming left hand rule.
- B. Fleming right hand rule.
- C. Lenz's law.
- D. Faraday's law.

The correct answer is option [B].

51. To convert an dynamo into a direct current dynamo, the _____.

- A. number of turns in the coil is increased

- B. strength of the field magnets is increased
- C. slip rings are replaced with split ring commutators
- D. number of turns in the coil is decreased

The correct answer is option [C].

To convert an dynamo into a direct current dynamo, the slip rings are replaced with split ring commutators.

52. What is the unit of magnetic induction β ?

- A. Force/meter².
- B. Coulomb/meter.
- C. m².
- D. Tesla.

The correct answer is option [D].

53. All of the options are functions of a mirror galvanometer EXCEPT _____.

- A. it can measure current of about 10^{-6} of an ampere
- B. it can measure resistances
- C. it uses torsion as its weak control spring
- D. it uses light beam as it power

The correct answer is option [A].

54. Lines of force

- I. are continuous in any region with charges
- II. cross each other
- III. indicate the direction of the field
- IV. start and end on negative charge only.

Which of the statements above are NOT correct?

- A. I and II only
- B. I and III only
- C. I and IV only
- D. II and IV only

The correct answer is option [D].

55. If current of 4A passing through a coil sets up a magnetic effect of 15H after 12minutes, what is the energy stored in the coil?

- A. 5.0J
- B. 120.0J
- C. 36.0J
- D. 4.0J

The correct answer is option [B].

$E = ?$

where $L = 15\text{H}$, $I = 4$, $t = 12$

$$E = LI^2/2 = 15(4)^2/2 = 60/2 = 30\text{J}$$

56. A wire carrying a current tend to move when it is placed in a which is not parallel to the wire in accordance with _____.

- A. Fleming"s left hand rule
- B. Fleming"s right hand rule
- C. Maxwell"s corkscrew rule
- D. Newton"s principle

The correct answer is option [A].

57. An instrumnt used in detection of current calibrated in milliammeter is called _____.

- A. moving-iron ammeter
- B. moving-coil ammeter
- C. rheostat
- D. hot-wire ammeter

The correct answer is option [B].

58. A galvanometer of resistance 100 ohms has its maximum deflection as 10mA. If it's to be converted to read 0.1A, what would be the magnitude and position of the shunt required?

- A. 11.1ohm shunt in series
- B. 11.1ohm shunt in parallel
- C. 0.09ohms shunt in parallel
- D. 0.09ohms shunt in series

The correct answer is option [B].

59. The magnitude of the induced e.m.f in lenz"s law does NOT depend on the _____.

- A. distance between the magnet and the galvanometer
- B. lines of force linking the circuit
- C. numbers of turns of the coil
- D. surface area of the coil

The correct answer is option [A].

Use the information to answer the question.

60. (i) The presence of a strong radical makes it not to be affected by stray or the earth"s magnetic field

(ii) It has a uniform scale

(iii) It is robust and portable

(iv) The instrument can be used along with shunt to measure large current or potential difference

Which of the following options are the advantages of a strong moving coil instrument?

- A. (i), (ii), (iii) and (iv)
- B. (i) and (iii) only
- C. (iv) only
- D. (i), (ii) and (iii)

The correct answer is option [A].

61. To reduce heat loss in a transformer

- A. the number of turns should be increased.
- B. the soft iron core should be laminated.
- C. the area of the coils in the soft iron core should be increased.
- D. all of the above.

The correct answer is option [B].

62. A coil of inductance 0.48 henry carries a current of 5A. Compute the energy of its magnetic field.

- A. 6J
- B. 40J
- C. 36J
- D. 8J

The correct answer is option [A].

$$E = LI/2 = LI^2/2 = 0.48(5)^2/2 = 0.24(25) = 6$$

63. A coil of 50 turns is pulled in 0.02 secs from between the poles of a magnet where its area includes 31×10^{-5} weber to a place where its area includes 1×10^{-5} weber. Determine the average emf induced in the coil.

- A. 0.75V
- B. 0.075V
- C. 75V
- D. 7.5V

The correct answer is option [A].

$$E = L_1/t - L_2/t$$

where $L_1 = 31 \times 10^{-5}$ weber

$$31 \times 10^{-5} \times 50/0.02 = 0.775V$$

where $L_2 = 1 \times 10^{-5}$

$$1 \times 10^{-5} \times 50 / 0.02 = 0.025V$$

$$0.775V - 0.025V = 0.75V$$

64. Which of the options is not true about transformers?

A. To increase the output voltage which is achieved by reduction in the number of turns of coils

B. Sheets of soft-iron insulated from one another with film of the number

C. The induce emf in a coil is directly proportional to the number of turns ie EN

D. $E_p = I_p =$

$n_s = \text{turns ratio}$

$E_s = E_p$

n_p

The correct answer is option [A].

65. A disadvantage of a moving-iron ammeter is _____.

A. a non-uniform scale

B. a uniform scale

C. there is no scale

D. that the scale is too small

The correct answer is option [A].

66. All of the following is to improve the efficiency of an electric motor EXCEPT _____.

A. increase the current flowing through with the aid of rheostat

B. increase the number of turns of rectangle coil

C. the weak air springs so as to give a small rotational control

D. wind the coil on a soft-iron armature so as to increase the magnetic strength

The correct answer is option [C].

67. An induction core consist of all the following EXCEPT _____.

- A. primary coil of few turns of wire wound on a laminated soft iron core connected to a power source
- B. a secondary coil wound on the primary coil in the opposite direction and connected to an adjustable spark gap
- C. an iron core in between the two coil consist of a ring around the soft-iron amature
- D. a weak air spring so as to give a small rotational control

The correct answer is option [D].

68. A transformer has 800 turns in the primary winding and 40 turns in the secondary winding. The alternating emf connected to the primary is replaced by a steady emf of 240V and the current flowing is 0.2A. Find the secondary emf.

- A. 36V
- B. 24V
- C. 12V
- D. 6V

The correct answer is option [C].

69. A transformer supplies 12V when connected to 240V mains. If this transformer takes 0.55A from the mains when used to light five 12V, 24W lamps in parallel, find its effeciciency and the cost of using it for 10h at 6p per kWh.

- A. 91% 7.2p
- B. 84% 5.5p
- C. 76% 8.1p
- D. 65% 4.6p

The correct answer is option [A].

Efficiency = $\frac{\text{output}}{\text{input}} \times 100$

where input = IV , $I = 0.55\text{A}$, $V = 240\text{V}$

input = $0.55 \times 240 = 132\text{W}$

where output = $IV = 24\text{W} \times 5 = 120\text{W}$

Efficiency = $\frac{120}{132} \times 100 = 90.9\%$ approx 91%

The cost = $5 \times 24\text{W} \times 10 = 1200 \times 6\text{p} = 7.2\text{p}$

70. At step-down transformer has a power output of 500W and efficiency is 80%. If the mains supply voltage is 200V, the primary current of the transformer is _____.

- A. 0.31A
- B. 3.20A
- C. 3.40A
- D. 5.00A

The correct answer is option [A].

71. Which of the following is an advantage of an AC?

- A. It can easily be change from one voltage to another with little loss of energy
- B. It is suitable in changing an accumulator
- C. It cannot be directed into different sources
- D. It can be used directly without conversion

The correct answer is option [A].

72. Electric power is transmitted by the following EXCEPT _____.

- A. low transmission
- B. low voltage transmission
- C. high transmission
- D. high tension transmission

The correct answer is option [D].

73. A multimeter has all these functions EXCEPT _____.

- A. it consist of mutiplier and shunts
- B. it provides different measurements of current and p.d
- C. it also measures D.C. and A.C.
- D. it can also measure resistances

The correct answer is option [C].

74. A transformer is required to give 200V from a 240V mains supply. If the primary coil has 600 turns, how many turns is in the secondary?

- A. 250 turns
- B. 720 turns
- C. 300 turns
- D. 500 turns

The correct answer is option [B].

$$E_s/E_p = N_p/N_s$$

$$200/240 = 600/N_s$$

$$240 \times 600/200 = 720 \text{ turns}$$

75. If a current carrying coil is mounted on a metal frame, the back e.m.f induced in the coil causes _____.

- A. inductance
- B. eddy currents
- C. electromagnetism
- D. dipole moment

The correct answer is option [B].

TOPIC: ELEMENTARY MODERN PHYSICS

DIRECTION: Choose the correct answer from the lettered options.

1. Find the half-life of radio-isotope which has a decay constant 0.000456.

- A. 1520 days.
- B. 1248 days.
- C. 2560 days.
- D. 1452 days.

The correct answer is option [A].

Using the equation $T_{1/2} = 0.693/\lambda$

where $\lambda = 0.000456/\text{day}$, therefore, $T_{1/2} = 0.693/0.000456\text{days} \approx 1520\text{days}$.

2. Which of the following is the correct definition of half-life?

- A. The average life-time of a radioactive material
- B. The time it takes a radioactive material to decay to half of its original quantity
- C. Half the period of a radioactive material decays completely
- D. Half of the decay constant

The correct answer is option [B].

3. In the equation of the Heisenberg uncertainty principle $\Delta X \times \Delta V \geq h/m$ where h = plank constant, m = mass of the particle, X = particle positron, V = particle velocity.

ΔX means what?

- A. Displacement.
- B. Particle positron.
- C. Particle constancy.
- D. Particle uncertainty.

The correct answer is option [D].

4. What is the decay constant of a radioactive element whose half-life is 3seconds?

- A. 0.132s^{-1}
- B. 0.231s^{-1}
- C. 0.347s^{-1}
- D. 0.693s^{-1}

The correct answer is option [B].

The decay constant λ is related to the half-life by the equation

$$\lambda = \frac{0.693}{T_{1/2}}$$

$$\therefore \lambda = \frac{0.693}{3} = 0.231\text{s}^{-1}.$$

ELEMENTARY MODERN PHYSICS

5. Uranium isotopes have the same _____.

- A. nucleon number
- B. number of neutrons
- C. decay rate
- D. proton number

The correct answer is option [D].

6. The work function of sodium is 2eV. Calculate the incident photon energy when sodium is illuminated by a radiation of $1.5 \times 10^{-10}\text{m}$ wavelength.

[$h = 6.63 \times 10^{-34}\text{Js}$, $1\text{eV} = 1.6 \times 10^{-19}\text{C}$, $m_e = 9.1 \times 10^{-31}\text{kg}$, $c = 3 \times 10^8\text{m/s}$].

- A. $13 \times 10^{-18}\text{J}$.
- B. $13.2 \times 10^{-19}\text{J}$.
- C. $13.2 \times 10\text{eV}$.
- D. $4.3 \times 10^{-33}\text{J}$.

The correct answer is option [B].

Hint: Incident photon energy = hf.

7. I. The number of neutrons released exceeds the number that caused the fission.

II. There is loss of mass

III. Energy is produced

IV. Smaller nuclei merge to form larger nuclei

Which of the statements above are correct about nuclear fission?

A. I, II and IV only

B. I, II and III only

C. I, III and IV only

D. II, III and IV

The correct answer is option [D].

8. Which of the following is not a cathode ray property?

A. They carry considerable energy as they heat objects which stop them.

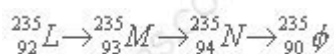
B. They have mass but no momentum.

C. They cause glass and other materials to fluoresce.

D. They throw a shadow at the anode end of a tube.

The correct answer is option [B].

9. Given the radioactive series, what is emitted?



A. β , β , α particles

B. α , γ , β particles

C. γ , α , β particles

D. None of the above

The correct answer is option [D].

In stage 1, a β particle is emitted. In stage 2, another β particle is emitted. In stage 3, 4 protons are released.

10. The wavelength at minimum energy needed just to liberate an electron from a metallic surface is called _____.

- A. minimum wavelength
- B. threshold wavelength
- C. work function
- D. threshold energy

The correct answer is option [B].

11. The following are advantages of radioscotopes EXCEPT _____.

- A. they emit radiation like alpha & beta along with gamma ray
- B. they emitted gamma rays from cobalt-60 are used
- C. isotopes of radioactive substances have other use apart from its original state
- D. they have unstable nuclei

The correct answer is option [B].

12. The mass number of an atom P is 11 and the atomic number is 5. How many neutrons are there in an atom of P?

- A. 6.
- B. 7.
- C. 8.
- D. 10.

The correct answer is option [A].

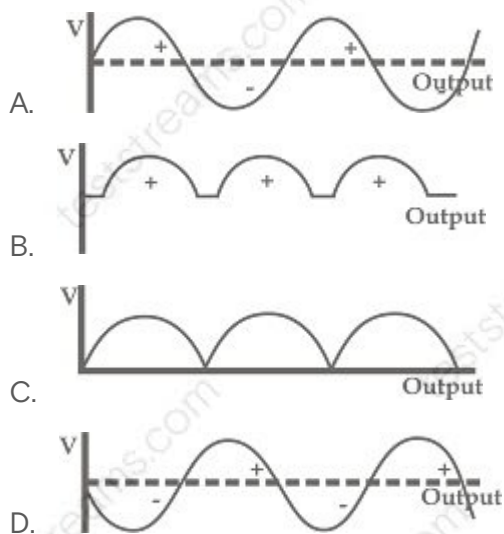
Hint: Mass Number = Neutron + Proton, Neutron P = 11 - 5 = 6.

13. The following is a method of producing spectra of a hot substance by _____.

- A. use of discharge tube
- B. direct application of a bunsen flame
- C. use of two metal electrodes connected to the secondary of an induction coil
- D. use of two non-metal rods connected to a dc voltage

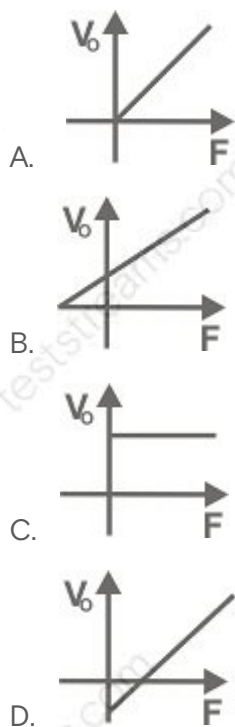
The correct answer is option [D].

14. Which of the following diode valve as a rectifier can attain full-wave rectification as shown on a cathode ray oscilloscope screen?



The correct answer is option [B].

15. In photoelectric effect, which of the following graphs correctly represents the graph of stopping potential V_0 against frequency f of incident light?



The correct answer is option [D].

16. ${}^9_4\text{K}$ represent a beryllium atom. What does the number 9 and 4 represent?

- A. Proton and Neutron.
- B. Electron and Atomic Number.
- C. Mass Number and Atomic Mass.
- D. Mass Number and Atomic Number.

The correct answer is option [D].

17. An electron makes a transition from a certain energy level E_k to the ground state E_0 . If the frequency of emission is $8.0 \times 10^{14}\text{Hz}$, the energy emitted is _____.

$$[h = 6.6 \times 10^{-34}\text{Js}]$$

- A. $5.28 \times 10^{19}\text{J}$
- B. $8.25 \times 10^{-19}\text{J}$
- C. $8.25 \times 10^{19}\text{J}$
- D. $5.28 \times 10^{-19}\text{J}$

The correct answer is option [D].

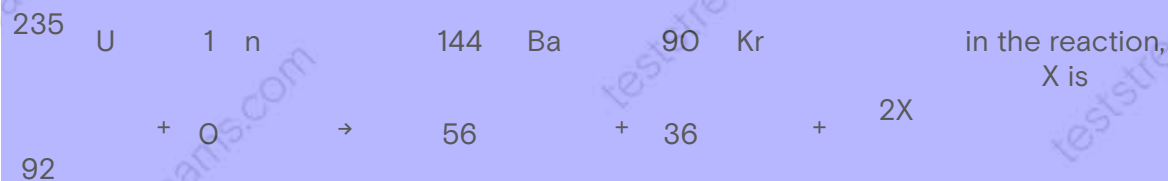
The energy of the emitted electron is given as

$$E = h\nu$$

$$\Rightarrow E = 6.6 \times 10^{-34} \times 8.0 \times 10^{14}$$

$$E = 5.28 \times 10^{-19}\text{J}$$

18.



- A. proton
- B. neutron
- C. electron
- D. neutrino

The correct answer is option [B].

19. Which of the following is not a unit for measuring the plank constant, h ?

- A. Joules.second
- B. Electron-Volt per frequency
- C. Joules per second
- D. Electron-Volt second

The correct answer is option [C].

20. An electron accelerated from rest through a potential difference of 80KV collides with a metal target. If the whole of its kinetic energy is converted to the energy of a photon. Then the wavelength of the photon is _____.

[TAKE $h = 6.6 \times 10^{-34} \text{Js}$, $c = 3 \times 10^8 \text{m/s}$, $e = 1.6 \times 10^{-19}$].

- A. 1.55×10^{-10}
- B. 8.25×10^{-10}
- C. 1.55×10^{-12}
- D. 1.55×10^{-11}

The correct answer is option [D].

21. Which of the following best defines nuclear fusion?

- A. The splitting of heavy nuclei of an element to form a part with roughly the same mass.
- B. The fusion of heavy nuclei of an element to form a light atom.
- C. The splitting of heavy nuclei of an element to form two parts with roughly different mass.
- D. The fusion of light nuclei of an element to form heavy atom.

The correct answer is option [D].

22. Which of these phenomena demonstrate the fact that matter is made of particles?

- I. Diffraction
- II. Compton effect
- III. Photoelectric effect
- IV. Emission and absorption of light

- A. I and II only
- B. II and III only
- C. I, II and III only
- D. II,III,and IV only

The correct answer is option [A].

23. Which of the following is NOT correct about Bohr's model of the atom?

- A. As electrons radiate energy they are drawn closer to the nucleus until the atom collapses
- B. As an electron changes orbit, it either absorbs or emits a photon of energy
- C. The model combines classical physics with quantum physics
- D. The model is applicable to an atom with one electron only

The correct answer is option [A].

24. Which of the following is usually used to capture excess neutrons produced in a nuclear reactor?

- A. Boron rods
- B. Steel rods
- C. Graphite rods

D. X-rays

The correct answer is option [C].

25. The process through which free electrons leave the surface of hot metals is known as _____.

- A. thermionic emission
- B. photo emission
- C. photon emission
- D. electron emission

The correct answer is option [A].

26. Which one of the list below is not strongly deflected by a magnetic field?

- A. X-rays
- B. Gamma rays
- C. Alpha rays
- D. Beta rays

The correct answer is option [B].

27. Similarities in the properties of radioactive substance include all EXCEPT _____.

- A. penetrating power
- B. type of charge
- C. type of trail it leaves
- D. can both be absorb

The correct answer is option [D].

28. Which of the following does the properties of emitted electrons not depend on?

- A. Incident light emitted
- B. Frequency of elected
- C. Velocity of electron
- D. Mass of metallic surface

The correct answer is option [D].

29. A uranium isotope $^{235}_{92}\text{U}$ emits four alpha particles and three beta-particle. The mass and atomic number of the product formed are _____

- A. 223 and 87.
- B. 219 and 81.
- C. 223 and 84.
- D. 219 and 87.

The correct answer is option [D].

Hint: $^{235}_{92}\text{U} \rightarrow 4[{}^4_2\text{He}] + 3[{}^0_{-1}\text{e}] + \text{Y}$ mass number = $235 - 4[4]$, atomic number = $92 - 8 - [-3]$.

30. The time it will take a certain radioactive material with a half-life of 50 days to reduce to $1/32$ of its original number is _____.

- A. 150 days
- B. 200 days
- C. 250 days
- D. 300 days

The correct answer is option [C].

50 days ----- $1/2N$

50 days ----- $1/4N$

50 days ----- $1/8N$

50 days ----- $1/16N$

50 days ----- $1/32N$

Therefore the number of days for the radioactive material to decay to $1/32$ is 250 days

31. When two or more light nuclei are fused together to form a heavy nucleus with liberation of energy. it is called _____.

- A. nuclear fusion
- B. nuclear fission
- C. nuclear reactor

D. nuclear reaction

The correct answer is option [A].

32. The energy associated with the photon of a radio transmission at 3×10^5 Hz is _____.

($h = 6.63 \times 10^{-34}$ Js).

A. 2.00×10^{-28}

B. 1.30×10^{-28}

C. 2.00×10^{-29}

D. 1.30×10^{-29}

The correct answer is Option [C].

$E = hf$

$E = 6.63 \times 10^{-34} \times 3 \times 10^5$

$E = 2.00 \times 10^{-28}$ J

34. Absorption line spectra exhibited by atom is due to _____.

A. excitation of an electron in the atom

B. transition of an electron from a higher to lower energy level

C. instability of the nucleons

D. change in the kinetic energy

The correct answer is option [B].

35. Find the quantum energy carried by a radiation of wavelength 3×10^{-6} m.

[$h = 6.63 \times 10^{-34}$ Js]

A. 10^{-14} Hz.

B. 10^2 Hz.

C. 10^{-2} Hz.

D. 10^{14} Hz.

The correct answer is option [D].

Reason: $f = c/\lambda$ and $E = hf \rightarrow E = hc/\lambda$

where c = electromagnetic speed of light, E = energy, h = plank constant.

36. All these are properties of electrons shown by tetron tube EXCEPT _____.

- A. electrons travels in straight line, a shadow of a metal maltese cross is seen on the flourescent screen
- B. electrons have momentum they exert force when incident on light metals
- C. electrons make certain material fluoresce
- D. electrons do not have energy to make metals glow when they strike on them

The correct answer is option [D].

37. The scientist that showed α -particles is _____.

- A. Rutherford and Royds
- B. Avogadro
- C. Sir Isaac Newton
- D. Albert Einstein

The correct answer is option [A].

38. Which of the following options best defines nuclear fission?

- A. The fusion of heavy nuclei of an element to form heavy atom.
- B. The splitting of heavy nuclei of an element to form two parts with roughly the same mass.
- C. The splitting of heavy nuclei of an element to form two parts with roughly different mass.
- D. The fusion of light nuclei of an element to form heavy atom.

The correct answer is option [B].

39. Electrons can be best produced through thermionic emission by _____.

- A. hot cathode
- B. tungsten lamp
- C. electrolyte plate
- D. electron lens camera

The correct answer is option [A].

40. Uncertainty principle equation can be written in all these forms EXCEPT _____.

- A. $X \times \Delta V \geq h/m$
- B. $\Delta X \times \Delta V \leq h/m$
- C. $\Delta E \times \Delta t \geq h$
- D. $\Delta X \times \Delta V \times m \geq h$

The correct answer is option [B].

41. Which of the following gives the best definition of atomic mass number?

- A. Number of particles in the nucleus
- B. Number of protons in the nucleus
- C. Number of neutrons inside the nucleus
- D. Number of electrons in the orbit

The correct answer is option [A].

42. ${}^{27}_{13}\text{Al} + {}^1_0\text{n} \rightarrow {}^{241}_{88}\text{Ra} + \text{X}$

- A. Electron
- B. Proton
- C. Beta-particle
- D. Alpha-particle

The correct answer is option [D].

43. An atom's energy is increased via an elastic collision with the electron, this process is known as _____.

- A. inelastic collision
- B. excitation
- C. ionisation
- D. energy maximization

The correct answer is option [B].

44. The decay constant is assumed to be 0.5 for a radioactive substance. What is the half-life of the substance?

- A. 0.642secs.
- B. 1.025secs.
- C. 1.382secs.
- D. 2.0435secs.

The correct answer is option [C].

Hint: $T = 0.692/\lambda$, where λ = Decay constant.

45. Nuclear fission occurs where?

- A. The water molecule
- B. Sun and moon
- C. In the bombardment of krypton
- D. In the fission of most nuclei

The correct answer is option [B].

46. Isotopes are nuclei with _____.

- A. equal number of protons and electrons
- B. the same number of neutrons and electrons
- C. equal number of total particles
- D. equal atomic number but different number of neutrons

The correct answer is option [D].

47. Fluorescent tubes produce light by the _____.

- A. thermal agitation of electron in the tube
- B. refraction of light by gas molecules
- C. excitation of gas molecules
- D. conduction of solar energy

The correct answer is option [C].

48. In nuclear fission, the most likely particles that bombard the nucleus are the ____.

- A. neutrons
- B. protons
- C. electrons
- D. α - particles

The correct answer is option [A].

49. Find the momentum of a particle with wavelength $6.6 \times 10^{-11}\text{m}$ given that plank constant , $h = 6.6 \times 10^{-34}\text{Js}$.

- A. 10^{-22}kgm/s .
- B. 10^{-23}kgm/s .
- C. $1.5 \times 10^{-23}\text{kgm/s}$.
- D. $2.0 \times 10^{-22}\text{kgm/s}$.

The correct answer is option [B].

Hint: $P = h/\lambda$

where $P =$ momentum, $\lambda =$ wavelength.

50. Which of the following is not a use of emitted electrons obtained by incident light?

- A. Graphic display on a TV and system monitors
- B. Making sound tracks on films by converting light energy to electrical
- C. Setting of burglary alarms
- D. Light meters in camera

The correct answer is option [A].

51. The work function of sodium is 2eV , when sodium is illuminated by a radiation of $1.5 \times 10^{-10}\text{m}$ wavelength.

[$h = 6.63 \times 10^{-34}\text{Js}$, $1\text{eV} = 1.6 \times 10^{-19}\text{C}$, $m_e = 9.1 \times 10^{-31}\text{kg}$, $c = 3 \times 10^8\text{m/s}$].

What is the speed of the emitted electron in the information given?

- A. $1.0 \times 10^7 \text{m/s}$.
- B. $1.5 \times 10^6 \text{m/s}$.
- C. $2 \times 10^6 \text{m/s}$.
- D. 10^{-6}m/s

The correct answer is option [B].

Hint: Use the equation $\frac{1}{2}m_e v^2 = hf - W_0$. Since the maximum kinetic energy is calculated then using the above equation the speed of the emitted electron is solved.

52. The maximum kinetic energy of the photoelectron emitted from a metal surface is 0.55eV. If the work function of the metal surface is 2.66eV the stopping potential will be _____.

- A. 0.44V
- B. 2.11V
- C. 0.55V
- D. 3.21V

The correct answer is option [C].

53. The following are precautions of x-rays EXCEPT _____.

- A. users of x-ray machines should wear radiation sensing badges to ensure they are not exposed to x-ray
- B. to put on the light in a dark room to reduce intensity
- C. the radiation dose for medical examination must be administered by experts
- D. the surrounding walls of the radiograph room are made of concrete walls so as to minimise radiation effect on the surrounding

The correct answer is option [B].

54. How long would it take to disintegrate 3.5g of a material. If 4g of a radioactive material of half-life of 20 days is spilled on a laboratory floor?

- A. 1.927 days.
- B. 2.0 days.
- C. 3.70 days.
- D. 3.854 days.

The correct answer is option [D].

Using the equation $N = N_0 e^{-\lambda t}$

where $N = 3.5\text{g}$, $N_0 = 4\text{g}$

λ , decay constant = $0.693/T_{1/2}$

where $T_{1/2} = 20\text{days}$.

Therefore, $t_{1/2} = ?$

To disintegrate 3.5g of material = $[\ln(3.5/4)]/-\lambda = [-0.133531392625]/[-0.03465] = 3.854\text{days}$.

55. What is the number of neutrons in the Uranium isotope?



A. 92

B. 141

C. 238

D. 146

The correct answer is option [B].

Mass number = Atomic number + neutron number

$$233 = 92 + N$$

$$N = 233 - 92 = 141$$

56. Which of the atoms are isotopes?

[i] ${}^{234}_{92}\text{P}$

[ii] ${}^{218}_{84}\text{Q}$

[iii] ${}^{226}_{88}\text{R}$

[iv] ${}^{214}_{84}\text{T}$

A. ii and iii.

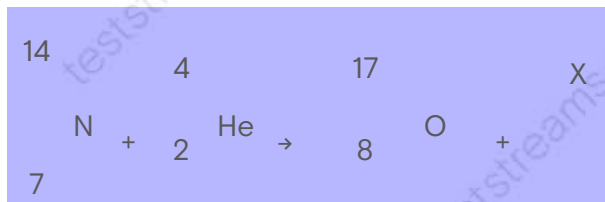
B. iii and i.

C. iv and i.

D. ii and iv.

The correct answer is option [D].

57



In the above equation, the particle X is _____.

- A. a proton
- B. a neutron
- C. an α -particle
- D. a β -particle

The correct answer is option [B].

58. The mass number of two isotopes of chlorine is 35 and 37. If the isotope has a ratio of 3:1. Find the relative atomic mass of chlorine if the lighter isotopes being the more abundant.

- A. 86.4.
- B. 35.5.
- C. 26.4.
- D. 13.9.

The correct answer is option [B].

Hint: Relative atomic mass of chlorine = $[(3 \times 35) + (1 \times 37)]/4 = 35.5$

59. Emitted energy from a radiation is in what form?

- A. Continuous energy.
- B. Discrete packets of energy.
- C. Scattered form of energy.

D. None of the above.

The correct answer is option [B].

60. The commonest natural condition where nuclear fusion can take place is in the _____.

- A. uranium bombardment
- B. mercury bombardment
- C. sun
- D. earth's earthquake

The correct answer is option [C].

61. α -particles are simply _____.

- A. hydrogen nuclei
- B. uranium nuclei
- C. fast accelerating electrons
- D. helium nuclei

The correct answer is option [D].

62. X-rays can be used in the study of crystal structure because they _____.

- A. are visible
- B. are fast
- C. have an extremely short wavelength
- D. have a very long-reaching wavelength

The correct answer is option [C].

63. Which of the following phenomena is called photoelectric effect?

- A. High-energy electrons impinging on a metallic anode which then emits photons
- B. A high energy photon emits photons as it is slowed down
- C. A metal absorbs quanta of light and then emits electrons
- D. Two electrons are created from a quanta of light

The correct answer is option [C].

When a metal absorbs quanta of light and then emits electrons, the process is called photoelectric effect.

64.

$\begin{matrix} 4 \\ \text{He} \\ 2 \end{matrix}$ represents a helium atom. This means that

- A. atomic mass number is 4.
- B. the electron number is 4.
- C. proton has a mass of 2.
- D. atomic number is 4.

The correct answer is option [D].

65. The following are types of radiation in electromagnetic spectrum EXCEPT _____.

- A. infrared radiations
- B. microwaves
- C. radio waves
- D. sound waves

The correct answer is option [D].

66. Which of the following is not correct?

- A. Fission reaction involves splitting atomic nucleus.
- B. Fusion reaction involves fusing atomic nuclei.
- C. The energy required in fission reaction is greater than the energy required in nuclear fusion.
- D. The energy required in fusion reaction is greater than the energy required in fission reaction.

The correct answer is option [C].

Reason: Fusion reaction requires greater energy than fission reaction because nuclei are combined.

67. If the half-life of a radioactive material is 4 days. What is the decay constant assuming that the mass of the original sample of the material is 5g?

- A. 0.124
- B. 0.143
- C. 0.173
- D. 0.693

The correct answer is option [C].

68. Which of these is an advantage of nuclear reactors?

- A. It is used in generating heat energy required to generate electricity
- B. The plant set-up is capital intensive
- C. Principal raw-material (uranium) is not easily available
- D. Exposure to raw-material affects the cell tissues due to radiation

The correct answer is option [A].

69. Which of the following electromagnetic waves has the longest wavelength?

- A. Radio waves
- B. Gamma rays
- C. Infrared waves
- D. Ultraviolet rays

The correct answer is option [A].

70. Which of the following features is NOT a characteristic of natural radioactivity?

- A. Radioactivity is a nuclear phenomenon
- B. Radioactivity is exhibited only by elements of mass number greater than 206

C. The radioactivity of an element is affected by electric and magnetic fields in the surroundings

D. Radioactive substances emit three types of radiation: α - rays, β - rays and γ - rays

The correct answer is option [C].

α and β - particles are deflected by electric and magnetic fields. The fields have no interaction or relationship with how radioactive elements behave.

71. What is the effect of the emission of a β - particle from an atom of radioactive phosphorus of atomic number 15, and mass number 32?

A. There is an increase in both the atomic number and mass number of phosphorus.

B. There is a decrease only in the mass number of phosphorus.

C. There is an increase only in the atomic number of phosphorus.

D. There is a decrease only in the atomic number of phosphorus.

The correct answer is option [C].

72. All these are substances emitted by radioactive substance EXCEPT _____.

A. Alpha rays

B. Beta rays

C. X-rays

D. Gamma rays

The correct answer is option [C].

73. An instrument used in measuring varying current in an experiment in electron deflected in electric and magnetic fields in Tetron tube is called _____.

A. ammeter

B. rheostat

C. galvanometer

D. resistor

The correct answer is option [B].

74. When a green glow at a very low pressure of 0.01mmhg is observed, what is deflected when a strong magnet is brought at right angle to the tube?

- A. Anodes rays
- B. Cathode rays
- C. Anionic rays
- D. Cathion rays

The correct answer is option [B].

75. Which of the following statements are true of isotopes?

- i. Isotopes of an element have the same chemical properties because they have the same number of electrons
- ii. Isotopes of elements are normally separated using physical properties.
- iii. Isotopes of an element have the same number of protons in their nuclei.

- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III only

The correct answer is option [D].

76. The relative atomic masses of elements that are not whole numbers are _____.

- A. magnets
- B. isotopes
- C. metals
- D. poly-atoms

The correct answer is option [B].

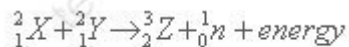
77. The uncertainty principle shows that at any point in time the position and the momentum of a particle can be simultaneously known is _____.

- A. true

- B. false
- C. both particles can be measured
- D. only the momentum of the particles can be measured

The correct answer is option [B].

78. What type of reaction is represented by the following scheme?



- A. Fusion reaction
- B. Fission reaction
- C. Chain reaction
- D. Radioactive decay

The correct answer is option [A].

Fusion involves the combining of two or more nuclei to form a larger nuclei.

79. A light of energy 5eV falls on a metal and the electrons with a maximum kinetic energy of 2eV are ejected. The work function of the metal is _____.

- A. 0.4eV
- B. 2.5eV
- C. 3.0eV
- D. 7.0eV

The correct answer is option [C].

From Einstein's equation, $E = hf - w$

Where E = maximum kinetic energy, h = Planck's constant,

f = frequency of light causing the emission, w = work function.

$$w = E - hf = 5 - 2 = 3\text{eV.}$$

80. Supposing a light of photon energy 2.0eV is incident suitably on the surface of a metal with work function 3.5eV , then _____

- A. most electron will be emitted.
- B. the electron emitted will have 3.5eV K.E.
- C. few electrons will be liberated.
- D. no electron will be liberated.

The correct answer is option [D].

81. In a model of the hydrogen the energy levels W_n are expressed in terms of a constant P and integer as $-P/n^2$. What will be the energy released in the transition from $n = 2$ to $n = 1$?

- A. $3P/4$
- B. $P/2$
- C. P
- D. $-2P/3$

The correct answer is option [A].

82. The ray which causes gas molecules to glow is known as _____.

- A. gamma rays
- B. molecular ray
- C. cathode ray
- D. anode ray

The correct answer is option [C].

83. Beta particles are _____.

- A. decelerating electrons
- B. electrons moving at high speeds
- C. helium particles
- D. non-radioactive electromagnetic particles

The correct answer is option [B].

84. The work function of sodium is 2eV, when sodium is illuminated by a radiation of 1.5×10^{-10} m wavelength

[$h = 6.63 \times 10^{-34}$ Js, $1\text{eV} = 1.6 \times 10^{-19}$ C, $m_e = 9.1 \times 10^{-31}$ kg, $c = 3 \times 10^8$ m/s].

Calculate the maximum energy of the emitted electron.

- A. 10^{-18} J.
- B. 8.9×10^{-19} J.
- C. 10^{-19} J.
- D. 1.2×10^{-18} J.

The correct answer is option [A].

Hint: Use the equation $\frac{1}{2}m_e v^2 = hf - W_0$ i.e. Maximum kinetic equation is $hf - W_0$.

85. The equations in the options represents Einstein photoelectric equation EXCEPT _____.

- A. $E_{\text{max}} = hf - W_0$.
- B. $hf = E_{\text{max}} + W_0$.
- C. $\frac{1}{2}m_e v^2 = hf - W_0$.
- D. $E_{\text{max}} = hf + W_0$.

The correct answer is option [D].

Hint: E_{max} = maximum energy of electron, $\frac{1}{2}m_e v^2$ = maximum kinetic energy of electron, h = plank constant, W_0 = work function, f = frequency of electron, m_e = electron mass, v = speed of electron emitted.

86. The major difference between a direct heated cathode to indirect heated cathode is _____.

- A. amount of heated applied
- B. an emitter of electron is called the cathode
- C. a collected of nickel plates is called anode
- D. electrodes are placed inside and evacuated glass

The correct answer is option [A].

87. An instrument which reacts to the radiation from radioactive sources is called _____.

- A. x-ray tube
- B. Geiger-Muller tube
- C. cathode discharge tube
- D. photoelectric

The correct answer is option [B].

88. When a beam of light falls on metallic surface the maximum kinetic energy of electron that may be emitted from the surface depends on _____.

- A. the surface area of the metal surface
- B. the intensity of the light
- C. the colour of the light
- D. the distance of surface from light

The correct answer is option [B].

89. The work function of sodium is 3.2×10^{-19} J. Calculate the threshold frequency.

[$h = 6.63 \times 10^{-34}$ Js, $c =$ speed of light]

- A. 4.8×10^{14} Hz.
- B. 3.8×10^{14} Hz.
- C. 5.1×10^{14} Hz.
- D. 2.01×10^{-15} Hz.

The correct answer is option [A].

Hint: Threshold frequency, $f_0 = W_0/h$,

where $W_0 =$ work function.

90. The following are emission spectra of light with a definite amount of energy with more than one wavelength in form of electromagnetic radiation EXCEPT _____.

- A. line spectra
- B. band spectra
- C. incontinous spectra
- D. absorption spectra

The correct answer is option [B].

91. The half -life of a radioactive element is 8 days, in what time will the activity of the specimen decay to $1/64$ of it original volume?

- A. 15 days
- B. 25 days
- C. 64 days
- D. 48 days

The correct answer is option [D].

92. A radioactive source has a half-life of 6days. How long will it take for the count-rate to fall from 180 per minute to 45 per minute?

- A. 18days.
- B. 15days.
- C. 10days.
- D. 12days.

The correct answer is option [D].

Hint: Use the equation $N = N_0 e^{-\lambda t}$,

where $N = 45$ per minute count-rate, $N_0 = 180$ per minute count-rate, and $t =$ time in days.

93. Which of the options is the definition of atomic number?

- A. Atomic number is the number of proton in an atom.
- B. Atomic number is the number of electron in an atom.
- C. Atomic number is the number of neutron and proton in an atom.
- D. Atomic number is the number of proton and electron in an atom.

The correct answer is option [A].

94. What is the wavelength of an electron of mass 9×10^{-31} kg moving with an electromagnetic speed?

[$h = 6.626 \times 10^{-34}$ Jsec]

- A. 3.68×10^{-10} m.
- B. 2×10^{-11} m.
- C. 5.32×10^{-10} m.
- D. 4.48×10^{-11} m.

The correct answer is option [A].

Hint: $\lambda = h/P$, where P = momentum i.e. mass x speed.

95. Which is the correct statement from A to D?

- A. At low temperature light elements can produce nuclear fission.
- B. An α -particle can produce nuclear fission.
- C. A neutron can produce nuclear fission.
- D. A neutron can produce nuclear fusion.

The correct answer is option [C].

Hint: They are the major cause of fission reaction and chain reaction.

96. One of the properties of gamma rays is that they are _____.

- A. negatively charged
- B. massive
- C. neutral
- D. positively charged

The correct answer is option [C].

97. The kinetic energy of a photoelectron dislodge from the surface of a metal depends on _____.

- A. temperature of the incident radiation
- B. frequency of the incident radiation
- C. intensity of the incident radiation
- D. time duration of the incident liberation

The correct answer is option [B].

Hint: Recall; $mev^2/2 = hu$, where u = frequency.

Use the information to answer the question.

98. Lithium has a threshold frequency of 5.5×10^{14} Hz, the work function of lithium is _____.

- A. 2.27eV
- B. 2.34eV
- C. 21.2eV
- D. 3.0eV

The correct answer is option [A].

Hint: Work function, $W = hu$, where u = frequency.

99. A radioisotope has a decay constant of 10^{-7}s^{-1} . The average life of the radioisotope is _____.

- A. $1.00 \times 10^{-7}\text{s}$
- B. $1.00 \times 10^7\text{s}$
- C. $6.93 \times 10^6\text{s}$
- D. $6.93 \times 10^8\text{s}$

The correct answer is option [C].

$$t_{1/2} = 0.693/\lambda = 0.693/10^{-7} = 6.93 \times 10^6\text{s}$$

100. The energy needed to separate all the nucleus apart completely in an atomic nucleus is called _____.

- A. work function
- B. binding energy
- C. photo electric effect
- D. none of the above

The correct answer is option [B].

101. Free electrons _____.

- A. can be studied more easily
- B. are free in vacuum/space
- C. are deposited on the surface of a non-conductor as static charge
- D. are detached from atoms but are not carried in conductors

The correct answer is option [C].

Hint: Free electrons are not deposited on the surface of a non - conductor as static charge.

102. The count rate of a radioactive material is 800 count/min. If the half-life of the material is 4 days what would the count rate be 16 days later?

- A. 50 count/min
- B. 25 count/min
- C. 200 count/min
- D. 100 count/min

The correct answer is option [A].

103. The intensity of a light photon in an area of 0.2m^2 is $30\text{J}/\text{m}^2$. Find the energy of the photon.

- A. 5.0J.
- B. 0.3J.
- C. 0.4J.
- D. 6.0J.

The correct answer is option [D].

Hint: Intensity = energy/area.

104. Cathode rays are _____

- A. atoms.
- B. electrons.
- C. neutrons.
- D. ions.

The correct answer is option [B].

TOPIC: FORCE ON A CURRENT-CARRYING CONDUCTOR IN A MAGNETIC FIELD

DIRECTION: Choose the correct answer from the lettered options.

1. Which of the following has a disadvantage of measuring only d.c current?

- A. Hot-wire ammeter
- B. Moving-iron ammeter
- C. Rheostat
- D. Moving-coil galvanometer

The correct answer is option [D].

2. The reading of a galvanometer is so close to the true value of the current under measurement, the galvanometer is therefore said to be _____.

- A. sensitive
- B. accurate
- C. detective
- D. precise

The correct answer is option [B].

3. Which of the following device can be used to measure d.c to a.c and the scale reading is not uniform?

- A. A telephone earpiece
- B. Hot-wire ammeter
- C. Thermopile
- D. Moving-coil loudspeaker

The correct answer is option [B].

4. The moving coil galvanometer is used to measure _____.

- A. small values of current

- B. large values of current
- C. current of about 100A
- D. only A and C

The correct answer is option [A].

Hint: Galvanometer measures current in millimeters.

5. In an electric motor, the rotation can be reversed by _____.

- A. reversing both the current and the
- B. reversing the current
- C. decreasing the current
- D. increasing the current

The correct answer is option [B].

6. In a force only acts on a conductor carrying current _____

- A. across at parallel.
- B. across at right angles.
- C. across at opposite sides.
- D. across at adjacent.

The correct answer is option [B].

7. A galvanometer detects small currents, it is therefore said to be _____.

- A. accurate
- B. sensitive
- C. precise
- D. detective

The correct answer is option [B].

8. When a right handed corkscrew is turned to travel in the direction of the current, then the direction of the is called the maxwell's _____.

- A. electric line of force rule

- B. compass needle rule
- C. magnetic rule
- D. corkscrew rule

The correct answer is option [D].

9. To make a highly sensitive galvanometer _____.

- A. the should be made stronger
- B. the number of turns of coil should be large
- C. the coil should have a small area
- D. should be suspended so it can turn easily

The correct answer is option [C].

10. The rules that states that when the first three fingers of the right hand are held at right angles to each other with the fore finger pointing in the direction of the and the thumb in the direction of the motion of the conductor, then the second finger will point in the direction of the induced current, this explains _____.

- A. Maxwell corkscrew
- B. Fleming"s right hand rule
- C. Fleming"s left hand rule
- D. Mutual induction rule

The correct answer is option [B].

11. To convert a galvanometer to an ammeter, we connect _____.

- A. a high resistance in parallel to the galvanometer
- B. a low resistance in series to the galvanometer
- C. a high resistance in series to the galvanometer
- D. a low resistance in parallel to the galvanometer

The correct answer is option [D].

12. Fleming's left hand rule describes three fingers one in the direction of the conventional current i.e. The second finger, the fore-finger in the direction of the while the thumb in the direction of the _____.

- A. motion
- B. action force
- C. opposing field
- D. repelling field

The correct answer is option [A].

13. The main function of the mouth piece of a telephone is to convert sound energy to _____ energy.

- A. chemical
- B. electrical
- C. kinetic
- D. mechanical

The correct answer is option [B].

14. All of the options are apparatus needed to investigate EXCEPT _____.

- A. Solenoid or coil of many turns
- B. Center scale zero galvanometer
- C. A bar magnet
- D. Ammeter

The correct answer is option [D].

15. Which of the following is not a part of an electric motor?

- A. Armature.
- B. Field magnet.
- C. Commutator.
- D. Transformer.

The correct answer is option [D].

16. A d.c. motor transforms _____.
- A. mechanical energy to electrical energy
 - B. electrical energy to mechanical energy
 - C. heat energy to sound energy
 - D. heat energy to mechanical energy

The correct answer is option [B].

17. If a d.c. motor is to be used as a dynamo then _____.
- A. the armature should be rotated
 - B. use slip-rings instead of carbon brushes
 - C. increase the
 - D. increase the area of the coils and magnet

The correct answer is option [A].

18. A moving-coil galvanometer has a full-scale deflection of 3A equivalent to 30o deflection. The sensitivity of the instrument is _____.
- A. 0.1
 - B. 10.0
 - C. 33.0
 - D. 90.0

The correct answer is option [B].

sensitivity of the instrument = $\theta/I = 30^\circ/3 = 10.0$

19. Which of the following is not an advantage of a galvanometer?
- A. It has a uniform linear scale.
 - B. Can control the effects of external magnetic field.

C. It can be made to read different ranges of currents, p.d. and resistance by appropriate resistance connection.

D. A and B only.

The correct answer is option [D].

20. A coil is wound round a soft iron core, and a current is made to flow round the coil, the product obtained is _____.

A. a magnet

B. an electromagnet

C. a bar magnet

D. an electric bell

The correct answer is option [B].

21. A generator-manufacturing company was contracted to produce an a.c. dynamo but inadvertently produced a d.c. dynamo. To correct this error, the _____.

A. armature coil should be made of aluminium

B. armature coils should be made of silver

C. commutator should be replaced with slip rings

D. commutator should be replaced with rings

The correct answer is option [C].

22. The following consist of a moving-iron ammeter EXCEPT _____.

A. a solenoid in between

B. a Fixed soft iron piece

C. a uniform scale

D. a spring to control angular deflection

The correct answer is option [C].

23. In a moving coil loud speaker current enters it at the coil through _____.

- A. the soft iron core
- B. soft iron core plates
- C. the leads
- D. the paper cone

The correct answer is option [C].

24. To convert a galvanometer to a voltmeter, we connect _____ in _____ to the galvanometer.

- A. high resistance, parallel.
- B. low resistance, parallel.
- C. high resistance, series.
- D. low resistance, series.

The correct answer is option [C].

25. The resistance of a galvanometer is 60Ω and requires 0.02A for a full scale deflection. How will a scientist connect it to a voltmeter to read 45V at a full scale?

- A. 4950Ω .
- B. 200Ω .
- C. 350Ω .
- D. 2190Ω .

The correct answer is option [D].

Hint: $45\text{V} = I[R + 60]$.

26. Two parallel wires have current flowing through them, by ampere's law they should _____.

- A. attract each other
- B. repel each other

- C. remain as they are
- D. interferes with each other if they have very small separation of about 5cm

The correct answer is option [A].

27. The Maxwell's corkscrew rule can be represented by all of the following EXCEPT _____.

- A. a small heavy circle
- B. large concentric or single light circle for lines
- C. straight lines magnet field lines
- D. a cross (x) in the centre of the wire

The correct answer is option [C].

28. Calculate the force acting on a charge, $q = 1.6 \times 10^{-19} \text{C}$ moving with a velocity $2.5 \times 10^7 \text{m/s}$ in a of flux density 2.0Wb/m^2 at an angle 30° with the field.

- A. 10^{-12}N .
- B. $4 \times 10^{-11} \text{N}$.
- C. $4 \times 10^{-12} \text{N}$.
- D. $3 \times 10^{-12} \text{N}$.

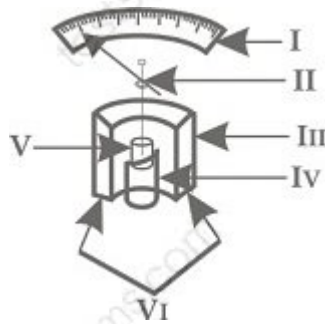
The correct answer is option [C].

Hint: Use the relation and add other info by $F = qv\beta\sin\theta$.

TOPIC: MAGNETIC FIELD

DIRECTION: Choose the correct answer from the lettered options.

1. From the diagram drawn I and IV are _____.



- A. solenoid and spring to contact angle of deflected
- B. scale and current in and out
- C. moveable soft iron and fixed soft iron
- D. scale and moveable soft iron

The correct answer is option [B].

2. Which of the following diagrams shows the correct directions of both the magnetic line of force and current for a vertical wire JK?





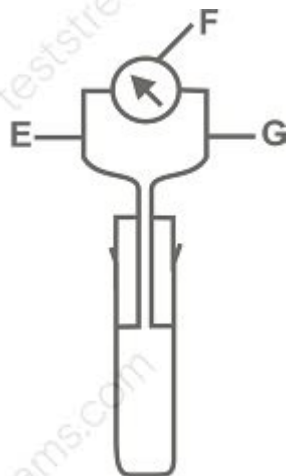
The correct answer is option [B].

3. The point where the earth's imaginary axis of rotation would emerge from the surface in the northern hemisphere is known as _____.

- A. geographical North Pole
- B. geographical South Pole
- C. magnetic north pole
- D. magnetic South Pole

The correct answer is option [A].

4. E in the diagram drawn is the _____.



- A. Constantine wire
- B. copper wire
- C. silk thread spring
- D. resistance wire

The correct answer is option [B].

5. A magnet is placed inside a solenoid through which an flows, what happens to the magnet?

- A. The magnet will become magnetic.
- B. The magnet will be demagnetized.
- C. The magnet will change its poles.
- D. The magnet will become electrically magnetic.

The correct answer is option [B].

6. The difference in magnetic properties of iron and steel is that _____.

- A. iron is more easily magnetized than steel
- B. iron is more easily demagnetized than steel
- C. iron keeps its magnetism much longer than steel
- D. steel keeps its magnetism much longer than iron

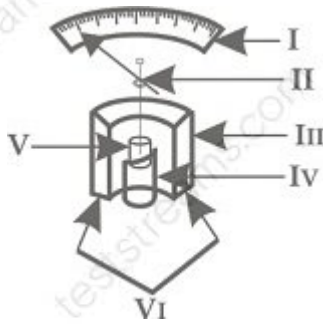
The correct answer is option [C].

7. The thermocouple of a thermopile can consist of _____.

- A. copper and glass
- B. copper and iron
- C. brass and carbon
- D. bismuth and chalk

The correct answer is option [B].

8. From the diagram drawn, the moveable soft iron and fixed soft iron are _____.



- A. II and IV
- B. VI and V
- C. V and III
- D. I and IV

The correct answer is option [B].

9. The strength of a magnetic flux acting in a horizontal direction is called _____.

- A. magnetic meridian
- B. angle of dip
- C. the horizontal component of the earth's field
- D. the magnetic flux density at maximum

The correct answer is option [C].

10. To protect a material from the influence of an external magnetic field, the material should be kept in a _____.

- A. soft iron ring
- B. square steel ring
- C. loop of copper wire
- D. triangular zinc ring

The correct answer is option [C].

11. Angle of dip can be defined as the ratio of the earth's vertical component to the earth's horizontal component.

- A. True.
- B. False.
- C. It is not a ratio.
- D. Only B and C.

The correct answer is option [A].

12. The space around a magnet where a magnetic force is experienced is known as _____.

- A. magnetic field
- B. magnetic space
- C. electro
- D. magnetization potential field

The correct answer is option [A].

13. In electrical method of magnetization, what does the polarity of a magnet depend on?

- A. Magnetic material orientation in space.
- B. Magnetic material size.
- C. Amount of current passed.
- D. Direction of current.

The correct answer is option [D].

14. Which one of the following is true of magnetism?

- A. Like poles attract.
- B. Lodestone is a non-magnetic oxide.
- C. The freely suspended magnet comes to rest in the geographical north-south direction.
- D. Iron fillings cling mainly round the ends of a bar magnet.

The correct answer is option [C].

15. The field around a permanent bar magnet is similar to that around the _____.

- A. north pole
- B. point charge
- C. solenoid carrying current
- D. two parallel wires carrying current

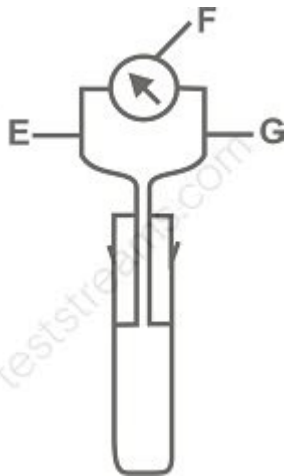
The correct answer is option [C].

16. Which one of these is not a magnetic material?

- A. Cobalt.
- B. Nickel.
- C. Copper.
- D. Steel.

The correct answer is option [C].

17. What is the label G in the diagram drawn?



- A. Resistance wire
- B. Copper wire
- C. Constantine wire
- D. Silk thread

The correct answer is option [C].

18. The angle between the earth's magnetic flux and the horizontal is known as _____.

- A. declination angle
- B. angle of dip
- C. angle of inclination
- D. vertical component of the earth's angle

The correct answer is option [B].

19. What happens when a current flows in along solenoid P?

- A. Both end of P are south poles
- B. Both ends of P are North poles
- C. There is only a at the end of P
- D. P settles in a north -south direction if freely suspended

The correct answer is option [D].

20. The diagram represents the field pattern obtained by bringing the poles of two magnets near each other. The poles must be _____.



- A. N - N poles
- B. S - S poles
- C. S - N poles
- D. N - S poles

The correct answer is option [B].

Since both poles are repelling each other, and the lines of force are directed inwards, they must be south poles.

21. When the resultant magnetic flux density equals zero, it is said to be _____.

- A. zero point
- B. normal point
- C. neutral point
- D. flux density maximum

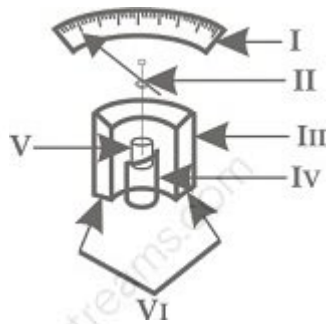
The correct answer is option [C].

22. Which one of these is a method of making a temporary magnet and also demagnetising a magnet in the laboratory?

- A. Single touch method
- B. Divided touch method
- C. Hammering method
- D. Electrical method

The correct answer is option [D].

23. From the diagram drawn, III and II are _____.



- A. solenoid and spring to contact angle of deflection
- B. solenoid and scale
- C. moveable soft iron and fixed soft iron
- D. spring to contact angle of deflection and fixed soft iron

The correct answer is option [A].

24. In order to prevent bar magnets from losing their strength, they are stored with keepers such that the two bars are placed with _____.

- A. like poles facing each other and the keeper placed across their ends
- B. unlike poles adjacent to each other and the keeper placed across their ends
- C. unlike poles facing each other and the keeper placed at their ends
- D. unlike poles facing each other and the keepers placed between them

The correct answer is option [B].

25. Anywhere on the earth surface, a compass needle always points in the north-south direction, this suggests that _____.

- A. the earth is a magnet
- B. the earth is spherical
- C. the earth is gravitational
- D. the earth is surrounded by a

The correct answer is option [D].

26. The path or curve in which a magnetic material traces in a is called all EXCEPT _____.

- A. magnetic wave
- B. lines
- C. magnetic lines of force
- D. magnetic flux

The correct answer is option [A].

27. In the electrical method of magnetisation, the polarity of the magnet depends on the _____.

- A. amount of current passed
- B. direction of current
- C. magnetic material used
- D. size of the magnetic material

The correct answer is option [B].

28. The d.c generator has essentially the same components as the a.c generator except the presence of _____.

- A. slip-ring
- B. carbon-brushes
- C. split ring
- D. armature

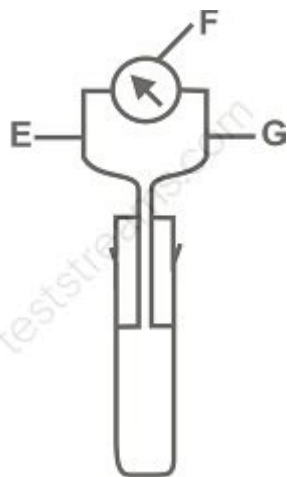
The correct answer is option [C].

29. Which of the following sets comprises magnetic substances only?

- A. Cobalt, Iron, Nickel and Manganese
- B. Cobalt, Steel, Iron and Copper
- C. Copper, Iron, Manganese and steel
- D. Iron, Nickel, Manganese and Copper

The correct answer is option [B].

30. What is F in the diagram of a thermopile drawn?



- A. Galvanometer
- B. Ammeter
- C. voltmeter
- D. Avometer

The correct answer is option [A].

31. Which of the following statement is correct about the earth's magnetic field?

- A. The angle of dip is the angle which a freely suspended needle makes with the vertical
- B. The angle of declination is the angle between the magnetic meridian and the geographic meridian
- C. The angle id declination is the angle which a magnet compass makes with the magnetic meridian
- D. The angle of inclination is the difference between the angle of dip and the angle of declination

The correct answer is option [B].

32. The direction of the force on a north pole placed at the point is _____.

- A. magnetic flux direction
- B. magnetic flux potential
- C. magnetic direction
- D. electromagnetic direction

The correct answer is option [A].

33. Which of the options is not an effect of current?

- A. A is formed
- B. A force between conductors
- C. The direction of lines is known
- D. It can destroy the conductor

The correct answer is option [C].

34. The magnetic element of any given place include all EXCEPT _____.

- A. angle of inclination
- B. angle of dip
- C. angle of declination

D. the horizontal component of the earth's

The correct answer is option [A].

35. Which of the following will NOT be effective in order to increase the e.m.f. obtained from a simple dynamo?

- A. Increasing the number of turns in its coil
- B. Increasing the resistance of its coil
- C. Increasing the speed of its rotation
- D. Increase the strength of the

The correct answer is option [B].

36. Magnetization can be done by all EXCEPT _____.

- A. method of double touch
- B. electrical method
- C. method of single touch
- D. method of putting the magnet in line with the earth

The correct answer is option [D].

37. A proton moving with a speed of $1.0 \times 10^6 \text{ms}^{-1}$ through a of 1.0T experiences a magnetic force of magnitude $8.0 \times 10^{-14}\text{N}$. The angle between the proton's velocity and the field is _____.

[proton charge = $1.6 \times 10^{-19} \text{C}$].

- A. 90°
- B. 60°
- C. 45°
- D. 30°

The correct answer is option [D].

Using the formula $F = Bev \sin \theta$

38. Which one of these is NOT a way by which energy is lost in an electric motor?

- A. Eddy current
- B. Hysteresis
- C. Reducing the number of turns
- D. Unlaminated soft iron core

The correct answer is option [C].

39. Which of the following option would NOT alter the strength of the between the poles of an electromagnet?

- A. Reversing the current in the coils
- B. Halving the number of turns
- C. Doubling the current and change
- D. moving the poles nearer each other

The correct answer is option [B].

40. The north pole of a magnet can never be separated from the south pole because of a property known as _____.

- A. magnetic monopole
- B. magnetic dipoles
- C. magnetic quadrupole
- D. magnetic octopole

The correct answer is option [B].

41. The process of magnetizing an object of magnetic material simply by bringing a magnet near is called _____.

- A. magnetic field
- B. ionic magnetisation
- C. electrolytic magnetization
- D. induced magnetism

The correct answer is option [D].

42. The region around a magnet in which the magnetic influence is experienced is called _____.

- A. magnetic flux
- B. magnetic field
- C. magnetic meridian
- D. magnetic declination

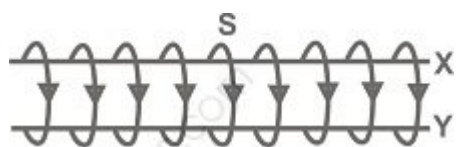
The correct answer is option [B].

43. Which of the following is not the property of a magnet?

- A. They have ends called poles.
- B. They always come to rest with their axis pointing north-south.
- C. Like poles attract while unlike poles repel.
- D. Their attraction power is at the end.

The correct answer is option [C].

44. In the diagram drawn X and Y are two parallel soft iron rods inside a solenoid S. When a high current flows in S then X and Y _____.



- A. stay still
- B. attract each other
- C. move to right and left
- D. repel each other

The correct answer is option [B].

45. Which combination makes iron preferable to steel in making of electromagnets?

- i. It retains its magnetism much longer than steel.
- ii. It is more easily magnetized than steel.
- iii. It is more easily demagnetized than steel.
- iv. It produces a stronger magnet than steel.

- A. II and III only.
- B. I and II only.
- C. II, III and IV only.
- D. I, III and IV only.

The correct answer is option [A].