CBSE EXAMINATION PAPER-2014

NEET-ZOOLOGY

(Solved)

Time allowed : 3 hours | Maximum Marks : 723

General Instructions :

Read the following instructions carefully and follow them :

i. This question paper contains **180 questions.** All questions are **compulsory.**

ii. This question paper is divided into **1 sections.**

iii. **Section A** – questions number **1 to 180** are multiple choice questions

iv. There is no overall choice given in the question paper. However, an internal choice has been provided in few questions.

v. Use of calculator is NOT allowed.

Section A

Question 1.

When 22.4 litres of $H_2(g)$ is mixed with 11.2 litres of $Cl_2(g)$, each at S.T.P., the moles of HCl(g) formed is equal to:

[4 Marks]

(A) 1.5 moles of HCl(g)

(B) 0.5 moles of HCl(g)

(C) 1 mole of HCl(g)

(D) 2 moles of HCl(g)

Explanation:

$H_2(g) + Cl_2(g) \rightarrow 2HCl(g)$

22.4 L 11.2 L 0 Initial

= 1mole = 0.5 mole

1 − 0.5 0.5 − 0.5 2 × 0.5 Final

Moles of HCl formed = 2 × 0.5 = 1

Question 2.

1.0 g of magnesium is burnt with 0.56 g O_2 in a closed vessel. Which reactant is left in excess and how much? (At. wt. Mg = 24; O = 16)

[4 Marks]

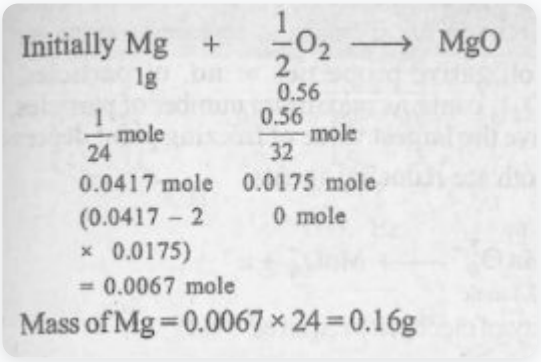
(A) Mg, 0.44 g

(B) O_2, 0.16 g

(C) Mg, 0.16 g

(D) O_2, 0.28 g

Explanation:



Question 3.

Calculate the energy in joule corresponding to light of wavelength 45 nm: (Planck's constant h = 6.63 × 10^{-34} Js; speed of light c = 3 × 10^8 ms^{-1})

[4 Marks]

(A) 4.42 × 10^{-15}

(B) 4.42 × 10^{-18}

(C) 6.67 × 10^{-15}

(D) 6.67 × 10^{11}

Explanation:

E=hc /λ
= $6.63 \times 10^{-34} \times 3 \times 10^{8} / 45 \times 10^{-9}$

= 4.42×10^{-18} J

Question 4.

What is the maximum number of orbitals that can be identified with the following quantum numbers? n = 3, l = 1, m = 0

[4 Marks]

(A) 3

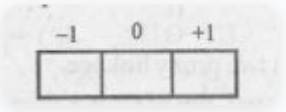
(B) 4

(C) 1

(D) 2

Explanation:

Given: n = 3, l = 1, m = 0 Hence orbital is 3p. For p-orbital, m values are: Hence the number of orbital identified by m = 0 can be one only.



Question 5.

Which of the following orders of ionic radii is correctly represented?

[4 Marks]

(A) $F^- > O^{2-} > Na^+$

(B) $Al^{3+} > Mg^{2+} > N^{3-}$

(C) $Na^+ > F^- > O^{2-}$

(D) $H^- > H^+ > H$

Explanation:

All answers are incorrect.
$H^- > H > H^+$; $O^{2-} > F^- < Na^+$
$O^{2-} > F^- > Na^+$; $N^{3-} > Mg^{2+} > Al^{3+}$

For isoelectronic species, the size is determined by Zeff.
Higher the Zeff, lower is the size of the ionic species.

Question 6.

Which of the following molecules has the maximum dipole moment?

[4 Marks]

(A) CO_2

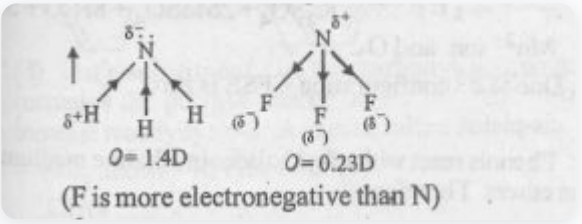
(B) NH_3

(C) CH_4

(D) NF_3

Explanation:

Dipole moment of NH_3 > NF_3



Question 7.

Be^{2+} is isoelectronic with which of the following ions?

[4 Marks]

(A) H^+

(B) Na^+

(C) Mg^{2+}

(D) Li^+

Explanation:

Be^{2+} = (4 − 2) = 2 is isoelectronic with Li^+ (3 − 1 = 2) Since both have same number of electrons in their outermost shell.

Question 8.

Equal masses of H_2, O_2 and methane have been taken in a container of volume V at temperature 27°C in identical conditions. The ratio of the volumes of gases H_2 : O_2 : methane would be:

[4 Marks]

(A) 16 : 1 : 2

(B) 16 : 8 : 1

(C) 8 : 16 : 1

(D) 8 : 1 : 2

Explanation:

According to Avogadro's law, "At same temperature and pressure, equal volume contains equal number of moles."

$^{n}H_2$ = w/2

$^{n}O_2$ = w/32

^{n}CH) = w/16

$V_H_2 : V_O_2_: V_CH_4$

= $^{n}H_2 : ^{n}O_2 : ^{n}CH_4$

= w/2 : w/32 : w/16

= 16 : 1 : 2

Question 9.

Which one of the following species has plane triangular shape?

[4 Marks]

(A) NO_3^-

(B) N_3^-

(C) NO_2^-

(D) CO_2

Explanation:

Hybridization of NO_3^-

= 1/2 (5 + 0 + 1 − 0)

= 6/2 = 3

= sp^2

Hence geometry is **trigonal planar**.

NO_2^- (nitrite ion) also has sp^2 hybridization and gives a trigonal planar geometry, but because there are only two outer atoms, the molecular geometry is **bent** with D1**20°**.bond angels.

Question 10.

'Which property of colloidal solution is independent of charge on the colloidal particles:-

[4 Marks]

(A) Electro-osmosis

(B) Tyndall effect

(C) Electrophoresis

(D) Coagulation

Explanation:

Tyndall' effect is an optical property, and it is . independent of charge on colloidal particles.

Question 11.

For the reversible reaction, $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ + heat The equilibrium shifts in forward direction:

[4 Marks]

(A) By increasing the concentration of $NH_3(g)$

(B) By increasing pressure and decreasing temperature.

(C) By decreasing concentration of $N_2(g)$ and $H_2(g)$

(D) By decreasing the pressure

Explanation:

Given reaction, is exothermxc reaction. Hence: acooldmg to Le-Chatelier's prmclplc low temperature favours the forward reaction and on increasing pressure equilibrium will shift, towards lesser number

of moles i.e. forward direction.

Question 12.

For the reaction: $X_2O_4(l) \rightarrow 2XO_2(g)$

$\Delta U = 2.1$ kcal, $\Delta S = 20$ cal K^{-1} at 300 K Calculate ΔG is:

[4 Marks]

(A) 2.7 kcal

(B) 9.3 kcal

(C) −9.3 kcal

(D) −2.7 kcal

Explanation:

Given:

$\Delta U = 2.1$ kcal

$\Delta S = 20$ cal K^{-1}

$T = 300$ K

$\therefore \Delta H = \Delta U + \Delta n_g RT$

Putting the values in the equation:

$\Delta H = 2.1 + 2 \times (2/1000) \times 300$

$= 2.1 + 1.2$

$= 3.3$ kcal

Now,

$\Delta G = \Delta H - T\Delta S$

$= 3.3 - 300 \times (20/1000)$

$= -2.7$ kcal

Question 13.

Which of the following salts will give highest pH in water?

[4 Marks]

(A) $CuSO_4$

(B) Na_2CO_3

(C) NaCl

(D) KCl

Explanation:

Na_2CO_3 is a salt of strong base (NaOH) and weak acid (H_2CO_3). On hydrolysis this salt will produce a strongly basic solution, i.e. pH will be highest (pH > 7) for this solution.

Others are combinations of:

KCl = Strong acid + Strong base
→ Neutral solution (pH ≈ 7)

NaCl = Strong acid + Strong base
→ Neutral solution (pH ≈ 7)

$CuSO_4$ = Strong acid + Weak base
→ Acidic solution (pH < 7)

Question 14.

For a given exothermic reaction, K_p and K'_p are the equilibrium constants at temperatures T_1 and T_2 respectively. Assuming that heat of reaction is constant in temperature range between T_1 and T_2, it is readily observed that:

[4 Marks]

(A) $K_p = 1/K'_p$

(B) $K_p < K'_p$

(C) $K_p = K'_p$

(D) $K_p > K'_p$

Explanation:

n exothermic reactions, the value of K_p decreases on increasing temperature.

∴ $K_p > K'_p$ (Assuming $T_1 < T_2$)

Question 15.

Using the Gibbs energy change, $\Delta G° = +63.3$ kJ, for the following reaction,

$Ag_2CO_3(s) \rightleftharpoons 2Ag^+(aq) + CO_3^{2-}(aq)$ The K_{sp} of $Ag_2CO_3(s)$ in water at 25°C is: ($R = 8.314\ J\ K^{-1}\ mol^{-1}$)

[4 Marks]

(A) 2.9×10^{-3}

(B) 3.2×10^{-26}

(C) 8.0×10^{-12}

(D) 7.9×10^{-20}

Explanation:

$\Delta G° = -2.303 \log K$

Here $K = [Ag^+]^2 [CO_3^{2-}] = K_{sp}$

$63.3 \times 10^{+3} = -2.303 \times 8.314 \times 298 \log K_{sp}$

$\therefore \log K_{sp} = -63.3 \times 10^{+3} / 5705.8 = -11.09$

$\therefore K_{sp} = \text{Antilog}\ (-11.09) = 8 \times 10^{-12}$

Question 16.

(i) $H_2O_2 + O_3 \rightarrow H_2O + 2O_2$

(ii) $H_2O_2 + Ag_2O \rightarrow 2Ag + H_2O + O_2$

Role of hydrogen peroxide in the above reactions is respectively:

[4 Marks]

(A) Oxidizing in (i) and reducing in (ii)

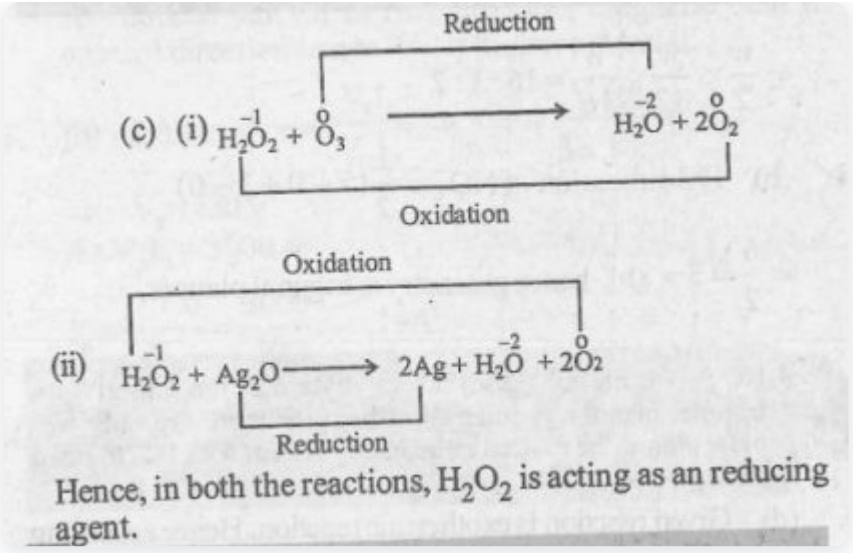
(B) Reducing in (i) and oxidizing in (ii)

(C) Oxidizing in (i) and (ii)

(D) Reducing in (i) and (ii)

Explanation:

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Hence, in both the reactions, H_2O_2 is acting as an reducing agent.

Question 17.

In the Kjeldahl's method for estimation of nitrogen present in a soil sample, ammonia evolved from 0.75 g of sample neutralized 10 mL of 1 M H_2SO_4. The percentage of nitrogen in the soil is:

[4 Marks]

(A) 43.33

(B) 35.33

(C) 45.33

(D) 37.33

Explanation:

10 mL, 1 M H_2SO_4 = 20 mL, 1 M NH_3

∴ wt of N in one mole NH_3 = 14

∴ 20×10^{-3} mol $NH_3 \rightarrow 20 \times 10^{-3} \times 14$ nitrogen

∴ 0.75 g of sample contains

$(14 \times 20 \times 10^{-3}) / 0.75 \times 100$

= 37.33%

Question 18.

Acidity of diprotic acids in aqueous solutions increases in the order:

[4 Marks]

(A) $H_2Se < H_2Te < H_2S$

(B) $H_2Se < H_2S < H_2Te$

(C) $H_2Te < H_2S < H_2Se$

(D) $H_2S < H_2Se < H_2Te$

Explanation:

The weakening of M–H bond with increase in size of M (where M = S, Se, Te) explains the acid character of hydrides.

Question 19.

Which of the following organic compounds has same hybridization as its combustion product (CO_2)?

[4 Marks]

(A) Ethane

(B) Ethanol

(C) Ethene

(D) Ethyne

Explanation:

The combustion reaction of ethylene is:

$C_2H_4 + 5/2O_2 \rightarrow 2CO_2 + 2H_2O$

Both H–C ≡ CH and CO_2 have sp hybridization.

66.

Question 20.

Magnetic moment 2.83 BM is given by which of the following ions? (At. nos. Ti = 22, Cr = 24, Mn = 25, Ni = 28):-

[4 Marks]

(A) Mn^{2+}

(B) Cr^{3+}

(C) Ti^{3+}

(D) Ni^{2+}

Explanation:

Magnetic moment: √n(n + 2)

Question 21.

'Which of the following is not a common component of Photochemical Smog?

[4 Marks]

(A) Peroxyacetyl nitrate

(B) Chlorofluorocarbons

(C) Acrolein

(D) Ozone

Explanation:

The oxidised hydrocarbons and ozone in presence of humidity cause photochemical smog.

Hydrocarbons + O_2, NO_2, NO,O, O_3 → Peroxides, aldehydes, peroxyacetyl nitrate (PAN), acrolein, etc.

Hence, coloured fumes are not common component of photochemical smog.

Question 22.

Reason of lanthanoid contraction is:

[4 Marks]

(A) Decreasing nuclear charge

(B) Negligible screening effect of f-orbitals

(C) Decreasing screening effect

(D) Increasing nuclear charge

Explanation:

The shape of *f*-orbitals is very much diffused and they have poor shielding effect.

Question 23.

out Of the following 0.10 M aqueous solutions, which one will exhibit the largest freezing point depression?

[4 Marks]

(A) K_2SO_4

(B) $Al_2(SO_4)_3$

(C) KCl

(D) $C_6H_{12}O_6$

Explanation:

Colligative properties are properties of particles. Since $Al_2(SO_4)_3$ contains maximum number of particles, it will have the largest value of freezing point depression.

Question 24.

The pair of compounds that can exist together is:

[4 Marks]

(A) $HgCl_2$, $SnCl_2$

(B) $FeCl_3$, $SnCl_2$

(C) $FeCl_2$, $SnCl_2$

(D) $FeCl_3$, KI

Explanation:

Both are reducing agents.

Question 25.

When 0.1 mol MnO_4^{2-} is oxidised, the quantity of electricity required to completely oxidise MnO_4^{2-} to MnO_4^- is:

[4 Marks]

(A) 96500 C

(B) 2 × 96500 C

(C) 96.50 C

(D) 9650 C

Explanation:

$(^{+6})$ $(^{+7})$

$MnO_4^{2-} \rightarrow MnO_4^- + e^-$

0.1 mole

Quantity of electricity required = 0.1 F

= 0.1 × 96500

= 9650 C

Question 26.

In acidic medium, H_2O_2 changes $Cr_2O_7^{2-}$ to CrO_5, which has two (–O–O–) bonds. Oxidation state of Cr in CrO_5 is:

[4 Marks]

(A) −10

(B) +6

(C) +5

(D) +3

Explanation:

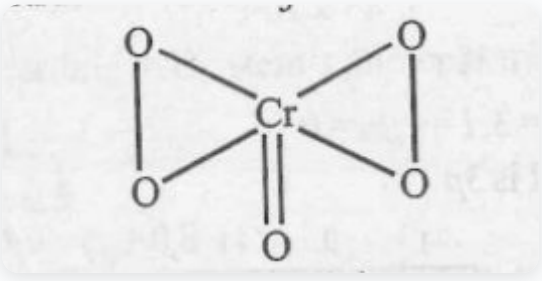
The structure of CrO_5 is:

Hence, CrO_5 has two peroxy linkages.

Now suppose the oxidation no. of Cr is x then:

x +(− 1x 4) + (-2) = 0

x = + 6



Question 27.

The weight of silver (at. wt. = 108) displaced by a quantity of electricity which displaced 5600 mL of O_2 at STP will be:

[4 Marks]

(A) 5.4 g

(B) 10.8 g

(C) 54.9 g

(D) 108.0 g

Explanation:

$w_O_2 = n_O_2 \times 32$

$w_O_2 = 5600/22400 \times 32 = 8$ g
= 1 equivalent of O_2

1 equivalent of Ag = 108

Question 28.

The reaction of aqueous $KMnO_4$ with H_2O_2 in acidic conditions gives:

[4 Marks]

(A) Mn^{2+} and O_2

(B) Mn^{4+} and MnO_2

(C) Mn^{2+} and O_3

(D) Mn^{4+} and O_2

Explanation:

$2KMnO_4 + 3H_2SO_4 + 5H_2O \rightarrow K_2SO_4 + 2MnSO_4 + 8H_2O + 5O_2$

i.e. Mn^{2+} ion and O_2

Question 29.

Among the following complexes the one which shows zero crystal field stabilization energy (CFSE) is:

[4 Marks]

(A) $[Mn(H_2O)_6]^{3+}$

(B) $[Co(H_2O)_6]^{2+}$

(C) $[Fe(H_2O)_6]^{3+}$

(D) $[Co(H_2O)_6]^{3+}$

Explanation:

Due to d^5 configuration CFSE is zero.

Question 30.

Which of the following complexes is used as an anti-cancer agent: _____.

[4 Marks]

(A) Na_2CoCl_4

(B) cis-$K_2[PtCl_2Br_2]$

(C) cis-$[PtCl_2(NH_3)_2]$

(D) mer-$[Co(NH_3)_3Cl_3]$

Explanation:

cis-platin

Question 31.

Among the sets of reactants which one produces anisole?

[4 Marks]

(A) C_6H_5OH; neutral $FeCl_3$

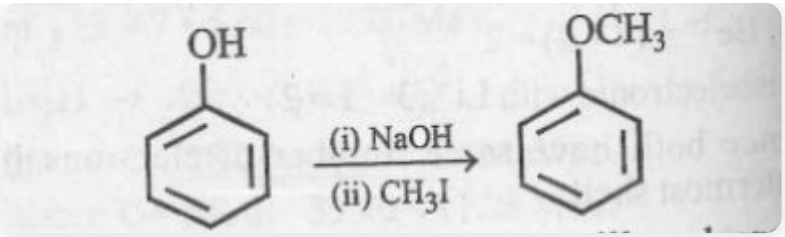
(B) $C_6H_5CH_3$; CH_3COCl; $AlCl_3$

(C) C_6H_5OH; NaOH; CH_3I

(D) CH_3CHO; RMgX

Explanation:

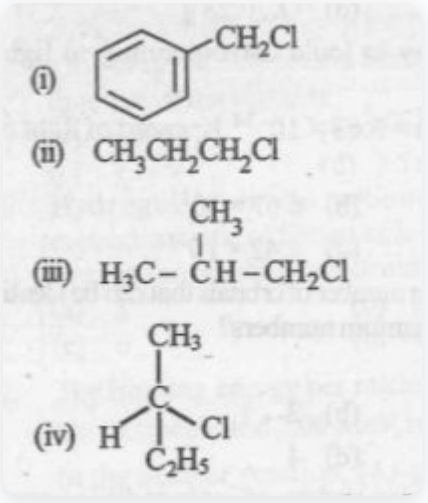
Phenols react with alkyl halides in alkaline medium to form ethers. Therefore:



Question 32.

Which of the following compounds will undergo racemisation with solution of KOH hydrolysis?

[4 Marks]



(A) (iii) and (iv)

(B) (ii) and (iv)

(C) (i) and (ii)

(D) (i) and (iv)

Explanation:

The compound in option (iv) will undergo S_N1 reaction with KOH solution. Hence, only this compound will undergo partial racemisation . Compounds given in other options are not chiral.

Question 33.

'Which of the following will not be soluble in sodium hydrogen carbonate?

[4 Marks]

(A) Benzenesulphonic acid

(B) 2,4-dinitrophenol

(C) o-Nitrophenol

(D) Benzoic acid

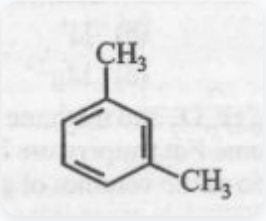
Explanation:

o-nitrophenol will not be soluble in $NaHCO_3$. Due to intramolecular hydrogen bonding, hydrogen on OH is strongly bound. So, it cannot behave as an acid and cannot react with sodium bicarbonate.

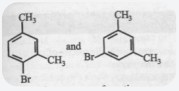
Question 34.

What products are formed when the following compounds are treated with Br_2 in the presence of $FeBr_3$?

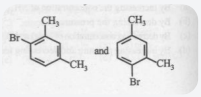
[4 Marks]



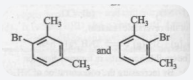
(A)



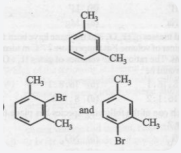
(B)



(C)

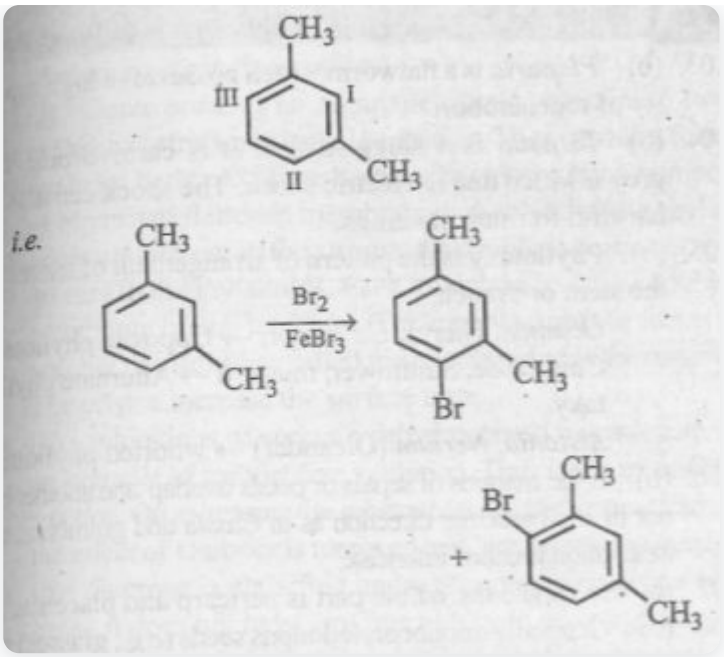


(D)



Explanation:

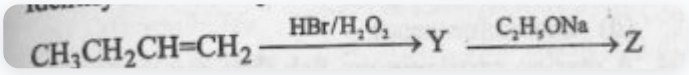
Methyl group is ortho-para directing but due to steric hindrance effect, generated by two CH_3 groups, substitution will not take place on position (I). Hence, only two products are possible.



Question 35.

Identify Z in the sequence of reactions:

[4 Marks]



(A) $CH_3(CH_2)_4–O–CH_3$

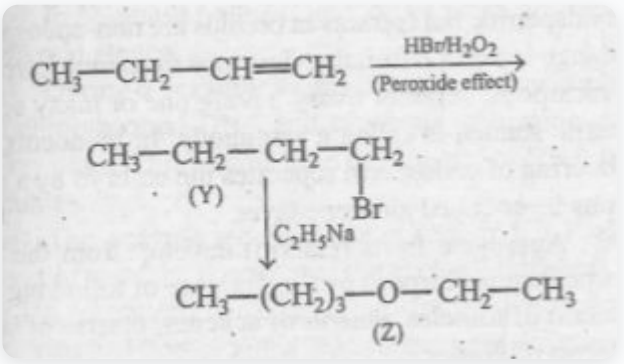
(B) $CH_3CH_2–CH(CH_3)–O–CH_2CH_3$

(C) $(CH_3)_2CH_2–O–CH_2CH_3$

(D) $CH_3–(CH_2)_3)–O–CH_2CH_3$

Explanation:

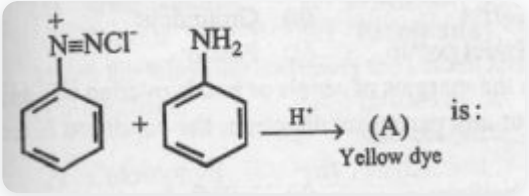
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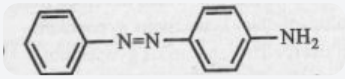
Question 36.

In the following reaction, the product (A)

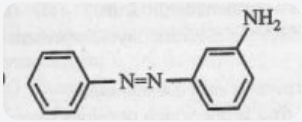
[4 Marks]



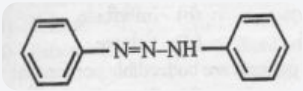
(A)



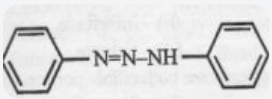
(B)



(C)

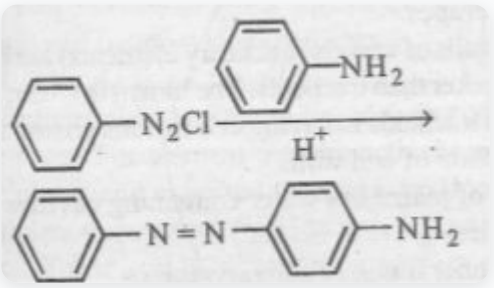


(D)



Explanation:

.

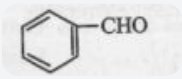


Question 37.

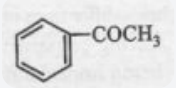
Which one is most reactive towards Nucleophilic addition reaction?

[4 Marks]

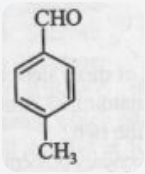
(A)



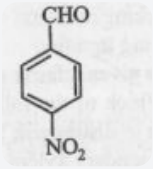
(B)



(C)

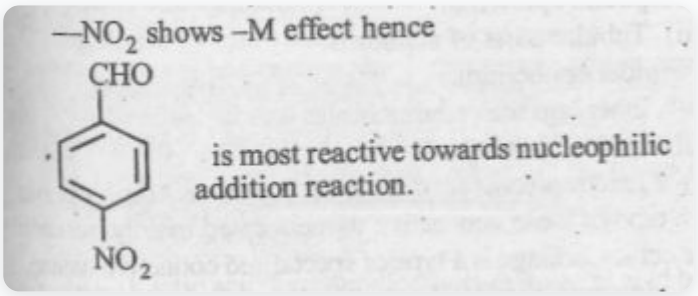


(D)



Explanation:

Any substituent in the carbonyl compound that:increases the positive charge on the carbonyl -carbon will increase reactivity towards nucleophilic addition.



Question 38.

Which of the following will be most stable diazonium salt $RN_2^+ X^-$?

[4 Marks]

(A) $CH_3N_2^+ X^-$

(B) $C_6H_5N_2^+ X^-$

(C) $C_6H_5CH_2N_2^+ X^-$

(D) $CH_3CH_2N_2^+ X^-$

Explanation:

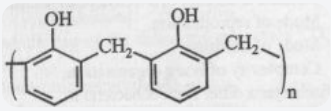
Arene diazonium salts are most stable among the given options because of the dispersal of +ve charge on the benzene ring due to resonance.

Question 39.

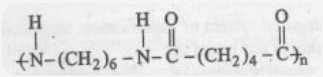
Which one of the following is an example of a thermoset- ting polymer?

[4 Marks]

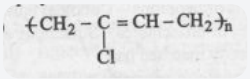
(A)



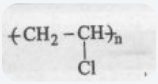
(B)



(C)



(D)

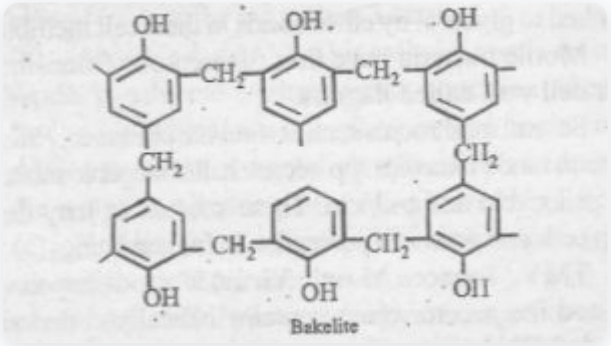


Explanation:

Thermosetting polymers undergo, chemical changes

when heated and set to hard mass when cooled e.g: Bakelite

T



Question 40.

Which of the following compounds polymer- izes to form the polyester Dacron?

[4 Marks]

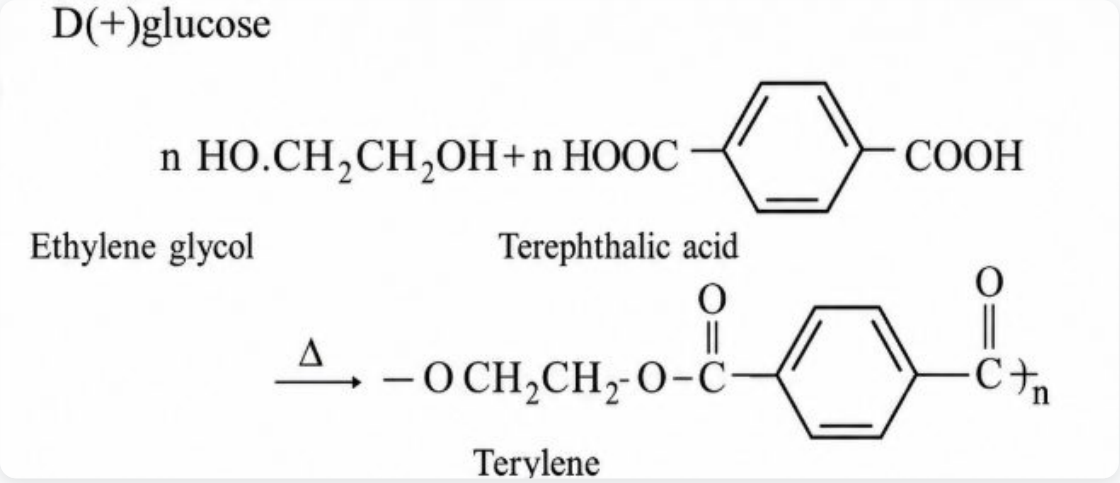
(A) Benzoic acid and para HO─(C_6H_4)─OH

(B) Terephthalic acid and ethylene glycol

(C) Benzoic acid and ethanol

(D) Propylene and para HO–(C_6H_4)–OH

Explanation:



Question 41.

Which of the following hormones is produced under the condition of stress which stimulates glycogenolysis in the liver of human beings?

[4 Marks]

(A) Insulin

(B) Thyroxin

(C) Estradiol

(D) Adrenaline

Explanation:

Adrenaline is a hormone produced by adrenal glands during high stress or exciting situations. This hormone is part of the human body's acute stress system, also called the fight or flight response.

Question 42.

Artificial sweetner which is stable under cold conditions only is:

[4 Marks]

(A) Saccharine

(B) Aspartame

(C) Sucralose

(D) Alitame

Explanation:

Aspartame is stable under cool conditions.

Question 43.

If a is the length of the side of a cube, the distance between the body centred atom and one corner atom in the cube will be

[4 Marks]

(A) 2/ √3 a

(B) √3/4 a

(C) √3/2 a

(D) 4/√3 a

Explanation:

In BCC, 2 atoms are present. One atom lies at the centre of the cube while the other lies at the corners of the cube. The distance between the body-centred atom and a corner atom is half of the body diagonal, i.e. blood group matched atom id half of the body diagonal ,i.e,. even to any other group.

Question 44.

Five kingdom system of classification suggested by RH.'Whittaker is not based on:

[4 Marks]

(A) Mode of nutrition.

(B) Complexity of body organisation.

(C) Presence or absence of a well defined nucleus.

(D) Mode of reproduction.

Explanation:

Fivekingdom system of 'classification was proposed by

RKWhmker(1969). Thefiwldngdnmchssfimfimisbased on the following criteria :

• Complexity of cell structure — Prokaryotes or eukaryotes.

• Complexity of organisms body — Unicellular or multicellular.

• Mode of obtaining nutrition — Autotrophic or heterotrophic.

• Phylogenetic relationships.

Question 45.

Archaebacteria differ from eubacteria in:

[4 Marks]

(A) Mode of nutrition

(B) Mode of reproduction

(C) Cell shape

(D) Cell membrane

Explanation:

Archaebacteria differ from other bacteria in having a different cell wall structure. They lack peptidoglyan in cell wall and possess a monolayer of branched fatty acids attached to glycerol by ether bonds in their cell membranes.

Question 46.

The motile bacteria are able to move by:

[4 Marks]

(A) Cilia

(B) Pili

(C) Fimbriae

(D) Flagella

Explanation:

Motile bacteria have thin filamentous extensions on their cell wall called flagella.

Question 47.

'Which one of the following fungi contains hallucinogens?

[4 Marks]

(A) Ustilago sp.

(B) Neurosporasp.

(C) Amanita muscaria

(D) Morchella esculenta

Explanation:

Several mushrooms such *as Amanitamuscaria, Psilocybe mexicana and Panaeolus spp.* secrete hallucinogenic substances like psilocybin and psilocin. These substances may destroy brain cells and power of perception in human beings.

Question 48.

Which of the following shows coiled RNA strand and capsomeres?

[4 Marks]

(A) Tobacco masaic virus

(B) Polio virus

(C) Measles virus

(D) Retrovirus

Explanation:

TMV (Tobacco Mosaic Virus) is a rod-shaped virus. The rod has a core which contains helically coiled single stranded **RNA.** There is a protective covering of protein called **capsid** around the infective part. Capsid consists of small subunits called capsomeres and has antigenic property.

Question 49.

Viruses have:

[4 Marks]

(A) Prokaryotic nucleus

(B) DNA enclosed in a protein coat

(C) Both DNA and RNA

(D) Single chromosome

Explanation:

Allviruses are nucleoproteins (Nucleic acid + Protein) in the structure. The nucleic acid (DNA and RNA) is the genetic material. In a particular virus either DNA or RNA is the genetic material. Both are never present in a virus. Single stranded RNA or ss RNA - Tobacco mosaic virus (TMV) Virus envelope is known as capsid. The capsid is composed of protein subunits called capsomere. ’

Question 50.

‘Which one of the following shows isogamy with non-flagellated gametes?

[4 Marks]

(A) Spirogyra

(B) Ectocarpus

(C) Sargassum

(D) Ulothrix

Explanation:

In Spirogyra, sexual reproduction occurs through conjugation. Gametes are non-flagellated, morphologically similar. But physiologically different (isogamy with physiological anisogamy).

Conjugation is the biological process by which one bacterium transfers genetic material to another bacterium through direct contact. During conjugation, one bacterium serves as the donor of the genetic material, and the other serves as the recipient.

The donor bacterium carries a DNA sequence called the fertility factor F-factor

Question 51.

‘Which one of the following is wrong about Chara?

[4 Marks]

(A) Globule and nucule present on the same plant.

(B) Upper oogonium and lower round antheridium.

(C) Upper antheridium and lower oogonium.

(D) Globule is male reproductive structure.

Explanation:

Chara belongs to Chlorophyceae, is a green alga found attached to the bottoms of shallow water bodies such as ponds, pools and lakes. Male sex organ is called antheridium.Female sex organ is called oogonium. Oogonium is borne at the top of the four-celled filament.

Question 52.

An alga which can be employed as food for human being is:

[4 Marks]

(A) Polysiphonia

(B) Spirogyra

(C) Ulothrix

(D) Chlorella

Explanation:

Chlorella and Spirulina are unicellular algae, rich in proteins and are used as food supplements by space travellers.

Question 53.

'Which of the following is responsible for peat formation?

[4 Marks]

(A) Sphagnum

(B) Funaria

(C) Marchanita

(D) Riccia

Explanation:

Sphagnum, a moss, provides peat that has long been used as fuel.It has the capacity to retain water for long periods and, as such, is used to cover the plant roots during transportation.

Question 54.

Select the Taxon mentioned that represents both marine and fresh water species:

[4 Marks]

(A) Cnidaria

(B) Ctenophora

(C) Echinoderms

(D) Cephalochordata

Explanation:

Members of Cteqophora, Cephalochordata and Eghnodermata are exclusively marine.

Question 55.

'Which one of the following living organisms completely lacks a cell wall?

[4 Marks]

(A) Saccharomyces

(B) Blue—green algae

(C) Sea—fan(Gorgonia)

(D) Cyanobacteria

Explanation:

Gorgonia (sea-fan)isan animal. All animals lack cell wall.Gorgonia is a genus of soft corals, sea fans in the family Gorgoniidae.

Question 56.

Planaria possesses high capacity of:

[4 Marks]

(A) Bioluminescence

(B) Regeneration

(C) Alternation of generation

(D) Metamorphosis

Explanation:

Planaria is a flatworm which possesses a high capacity of regeneration.

Question 57.

A marine cartilaginous fish that can produce electric current is:

[4 Marks]

(A) Pristis

(B) Torpedo

(C) Scoliodon

(D) Trygon

Explanation:

Torpedo is a sluggish fish. It is carnivorous, The prey is killed due to electric shock. The shock can also be harmful for human beings.

Question 58.

An example of edible underground stem is:

[4 Marks]

(A) Sweet potato

(B) Potato

(C) Carrot

(D) Groundnut

Explanation:

Phyllotaxy is the pattern of arrangement of leaves on the stem or branch.

• *Ocimum,* Guava, *Calotropis* —> Opposite phyllotaxy

• China rose, Suriflower, mustard —> Alternate phyllotaxy

• *Alstonia, Nerium* (Oleander) —> whorled phyllotaxy

Question 59.

'When the margins of sepals or petals overlap one another without any particular direction, the condition is termed as:

[4 Marks]

(A) Valvate

(B) Twisted

(C) Imbricate

(D) Vexillary

Explanation:

If the margins of sepals or petals overlap one another but not in any particular direction, as in Cassia and gulmohur, the aestivation is called imbricate.

Question 60.

Placenta and pericarp are both edible portions in:

[4 Marks]

(A) Banana

(B) Apple

(C) Potato

(D) Tomato

Explanation:

In tomato the edible part is pericarp and placent

Question 61.

An aggregate fruit is one which develops from:

[4 Marks]

(A) Multicarpellary syncarpous gynoecium

(B) Multicarpellary apocarpus gynoecium

(C) Multicarpellary superior ovary

(D) Complete inflorescence

Explanation:

Aggregate fruit (etaerio) develops from the multicarpellary apocarpous ovary. They are of following types: etaerio of follicles, etaerio of achenes, etaerio of berries, etaerio of drupes.

Question 62.

Tracheids differ from other tracheary elements in:

[4 Marks]

(A) being Ygnified

(B) being imperforate

(C) lacking nucleus

(D) having casparian strips

Explanation:

The walls of vessels (tracheary elements) are lignified and less thicker than tracheids. The lumen is wider. Vessels differ from tracheids in having cell fusions arising through the dissolution of end walls.

Question 63.

You are given a fairly old piece of dicot stem and dicot root. Which of the following anatomical structures. will you use to distinguish between the two?

[4 Marks]

(A) Secondary phloem

(B) Secondary xylem

(C) Cortical cells

(D) Protoxylem

Explanation:

Stem of maize has water-containing cavities in vascular bundles.

Question 64.

Choose the correctly matched pair:

[4 Marks]

(A) Tubular parts of nephrons – Cuboidal epithelium

(B) Moist surface of buccal cavity – Glandular epithelium

(C) Inner lining of salivary ducts – Ciliated epithelium

(D) Inner surface of bronchioles – Squamous epithelium

Explanation:

(i) Innerlining of salivary ducts - Compound epithelum

(ii) Moist surface of buccal cavity - Compound epithelium

(iii) Tubular parts of nephorns - Cuboidal epithelium.

(iv) Inner surface of ‘bronchioles — Ciliated epithelium.

Question 65.

Choose the correctly matched pair:

[4 Marks]

(A) Tendon—Specialized connective tissue

(B) Adipose tissue — Dense connective tissue

(C) Cartilage-Loose connective tissue

(D) Areolar tissue — Loose connective tissue

Explanation:

Tendon is dense regular connective tissue. Adipose tissue is a type of loose connective tissue located mainly beneath the skin. Cartilage is a type of specialised connective tissue.

Question 66.

Which structures perform the function of mitochondria in bacteria ?

[4 Marks]

(A) Nucleoid

(B) Ribosomes

(C) Cell wall

(D) Mesosomes

Explanation:

In some bacteria *(e.g., Bacillus subtilis)* the plasma membrane form certain invaginations or infoldings colled ‘mesosomes in the cytoplasm. The mesosomes have various functions, viz., respiratory, secretory etc.

Question 67.

The solid linear cytoskeletal elements having a diameter of 6 nm and made up of a single type of monomer are known as:

[4 Marks]

(A) Lamins

(B) Intermediate filaments

(C) Microfilaments

(D) Microtubules

Explanation:

Microtubule, microfilament and intermediate fila- ‘ments along with ER form cytoskeleton. Microfilaments are non-living, solid and consist of actin protein. They are " 4-6 nm in diameter.

Question 68.

The osmotic expansion of a cell kept in water is chiefly regulated by:

[4 Marks]

(A) Mitochondria

(B) Vacuoles

(C) Plastids

(D) Ribosomes

Explanation:

The vacuole is bound by a single membrane called tonoplast. It also functions as semipermeable membrane. It segregates vacuolar contents from cytoplasm, allows osmotic entry or exit of water, concentration and storage of nutrients as well as wastes.

Question 69.

Match the following and select the correct answer:

[4 Marks]

(1) Centriole	(i) Infoldings in mitochondria
(2) Chlorophyll	(ii) Thylakoids
(3) Cristae	(iii) Nucleic acids
(4) Ribozymes	(iv) Basal body cilia or fiagella

(A) (a) iv ii i iii

(B) (d) i ii iv iii

(C) (b) i iii ii iv

(D) (c) iv iii i ii

Explanation:

Centrosome is an organelle usually containing two cylindrical structures called centrioles. The centrioles form the basal body of cilia or flagella. In chloroplast a number of organised flattened membranous sacs called the thylakoids are present in the stroma. Chlorophyll pigments are present in the thylakoids. Each mitochondrion is a double membrane bound structure. The inner membrane forms a number of infoldings called the cristae towards the matrix. The cristae increase the surface area.

Question 70.

Select the option which is not correct with respect to enzyme action:

[4 Marks]

(A) Substrate binds with enzyme at its active site.

(B) Addition of lot of succinate does not reverse the inhibition of succinic dehydrogenase by malonate.

(C) Malonate is a competitive inhibitor of succinic dehydrogenase.

(D) A non-competitive inhibitor binds the enzyme at a site distinct from that which binds the substrate.

Explanation:

Inhibitions of succinic dehydrogenase by malonate is an example of competitive inhibition. Thus it is a reversible reaction. On increasing the subsrate (succinate) concentration the effect of inhibitor is removed and Vmax remains same.

Question 71.

Which one of the following is a non-reducing carbohydrate?

[4 Marks]

(A) Maltose

(B) Sucrose

(C) Ribose 5 - phosphate

(D) Lactose

Explanation:

Sucrose is classified under non reducing sugars because it does not have any free aldehyde or keto group.

Question 72.

During which phase(s) of cell cycle, amount of DNA ina cell remains at 4C level if the initial amount is denoted as 2C?

[4 Marks]

(A) G_0 and G_1

(B) G_1 and S

(C) G_2 and M

(D) Only G_2

Explanation:

In M-phase both 4C and 2C of DNA are present in different stages.

Question 73.

In 'S' phase of the cell cycle:

[4 Marks]

(A) Amount of DNA doubles in each cell.

(B) Amount of DNA remains same in each cell.

(C) Chromosome number is increased.

(D) -Amount of DNAis reduced to half in each cell

Explanation:

DuringS or synthesis phase, replication or duplication of chromosomal DNA and synthesis of histone proteins takes place. During this time the amount of DNA per cell doubles.

Question 74.

The enzyme recombinase is required at which stage of meiosis:

[4 Marks]

(A) Zygotene

(B) Pachytene

(C) Diplotene

(D) Diakinesis

Explanation:

The enzyme recombinase is required at Pachytene stage of meiosis. It catalyzes the exchange of short pieces of DNA between two long DNA strands, particularly the exchange of homologous regions between the paired maternal and paternal chromosomes.

Question 75.

Deficiency symptoms of nitrogen and potassium are visible first in:

[4 Marks]

(A) Senescent leaves:

(B) Roots

(C) Buds

(D) Young leaves

Explanation:

The parts of the plants that show the deficiency symptoms also depend on the mobility of the element in the plant. For element that are actively mobilised within the plants and exported to young developing tissues, the deficiency symptoms tend to appear first in the older tissues. For example, nitrogen,potassium and magnesium are visible first in the senescent leaves.

Question 76.

Anoxygenic photosynthesis is characteristic of:

[4 Marks]

(A) Rhodospirillum

(B) Ulva

(C) Spirogyra

(D) Chlamydomonas

Explanation:

In Rhodospirillum, electron donor is organic compound during photosynthesis. It helps an organisms to trap light energy and store it as chemical energy.

Question 77.

In which one of the following processes CO_2 in not released?

[4 Marks]

(A) Aerobic respiration in animals

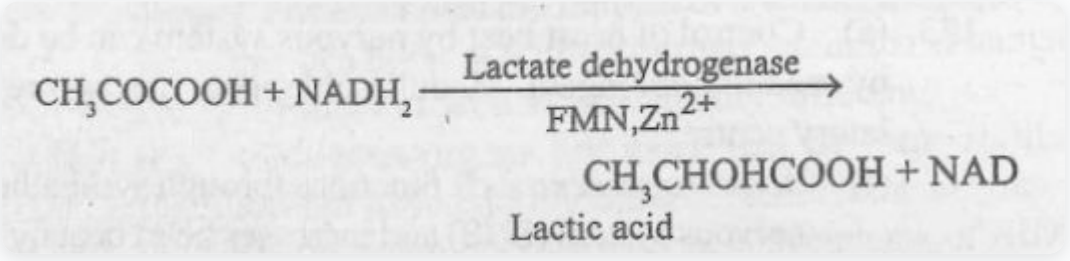
(B) Aerobic respiration in plants

(C) Alcoholic fermentation

(D) Lactate fermentation

Explanation:

Lactic acid fermentation occurs in lactic acid bacteria (Lactobacillus) and muscles (Human). Pyruvic acid produced in glycolysis is reduced by NADH, to form lactic acid without producing carbon dioxide.



Question 78.

Dr. F. Went noted that if coleoptile tips were removed and placed on agar for one hour, the agar would produce a bending when placed on one side of freshly-cut coleoptile stumps. Of what significance is this experiment?

[4 Marks]

(A) It is the basis for quantitative determination of small amounts of growth-promoting substances.

(B) It supports the hypothesis that IAA is auxin.

(C) It made possible the isolation and exact identification of auxin.

(D) It demonstrated polar movement of auxins.

Explanation:

Charles Darwin and his son Francis Darwin observed that the coleoptiles of Oat *(Avena sativa)* and canary grass (*Phalaris canariensis*) responded to unilateral illumination by growing towards the light source **(phototropic curvature or phototropism**). After a series of experiments, it was concluded that the tip of the coleoptile was the site of production of a substance, that caused the bending of coleoptile.

Question 79.

A few normal seedlings of tomato were kept in a dark room.After a few days they were found to have become white-coloured like albinos. Which of the following terms will you use to describe them?

[4 Marks]

(A) Mutated

(B) Embolised

(C) Defoliated

(D) Etiolated

Explanation:

Etiolation is depigmentation of leaf when plant is placed in dark for more than 36 hrs.

Question 80.

Which one of the following growth regulators is known as “stress hormone’?

[4 Marks]

(A) Ethylene

(B) Abscissic acid

(C) Indole acetic acid

(D) GA_3

Explanation:

Abscisic Acid (ABA) is called stress hormane which works in adverse environmental condition when there is low water content in atmosphere or in drought conditions. ABA causes the stomatal closure of leaves due to which the water loss by the plant is minimized.

Question 81.

The initial step in the digestion of milk in humans is carried out by

[4 Marks]

(A) Lipase

(B) Trypsin

(C) Rennin

(D) Pepsin

Explanation:

Rennin (also called chymosin) is an enzyme that occurs in gastric juice and is a constituent of rennet. It coagulates milk by converting caseinogen to casein. The initial step in the digestion of milk in humans is carried out by rennin.

Question 82.

Fructose is absorbed into the blood through mucosa cells of intestine by the process called:

[4 Marks]

(A) facilitated transport

(B) co-transport ‘mechanism

(C) simple diffusion

(D) active transport

Explanation:

Facilitated transport is a form of passive transport in which materials are moved across the plasma membrane by a transport protein down their concentration gradient; hence, it does not require energy.

Question 83.

Approximately seventy percent of carbon-dioxide absorbed by the blood will be transported to the lungs:

[4 Marks]

(A) as bicarbonate ions

(B) by binding to R.B.C.

(C) in the form of dissolved gas ‘molecules

(D) as carbamino - haemoglobin

Explanation:

CO_2 from the respiratory tissues to the lungs is transported by the blood in three ways:
(i) In dissolved state (physical solution): A very small amount is physically dissolved in plasma (7%, i.e.. ≅ 0.3 mL of CO_2 per 100 mL of blood).
(ii) Bicarbonate ions: About . ≅ 70% (i.e. ≅ 2.5 mL per 100 mL of blood). CO_2 diffuses into plasma and then into RBCs where it combines with H_2O to form carbonic acid, which dissociates into hydrogen ions and bicarbonate ions.
(iii) Carbaminohaemoglobin: ≅ About 23% (i.e .≅ 1 mL of CO_2 per 100 mL of blood). CO_2 combines with haemoglobin forming an unstable compound

Question 84.

Person with blood group AB is considered as universal recipient because he has:

[4 Marks]

(A) both A and B antibodies in the plasma.

(B) both A and B antigens in the plasma but no antibodies.

(C) no antigen on RBC and no antibody in the plasma.

(D) both A and B antigens on RBC but no antibodies in the plasma.

Explanation:

Karl Landsteiner first reported ABO blood groups in human beings. A, B and O blood groups were discovered by Landsteiner in 1900 while AB blood group was found out by de Castello and Steini (1902). ABO blood groups are determined by the gene I (isoagglutinin). There are three alleles—I^A, I^B and I^o of this gene. Proteins produced by the I^A and I^B alleles are called A antigen and B antigen. Individuals with AB blood group have both antigen A and antigen B on their RBCs, and no antibodies for either of the antigens in their plasma, so they can receive blood from any blood type.

Question 85.

How do parasympathetic neural signals affect the working of the heart?

[4 Marks]

(A) Reduce both heart rate and cardiac output.

(B) Heart rate is increased without affecting the cardiac output.

(C) Heart rate decreases but cardiac output increases.

(D) Both heart rate and cardiac output increase.

Explanation:

Control of heart beat by nervous system can be done by medulla oblongata. Medulla oblongata has two regulatory centre:

(i) Accelerator centre-It functions through sympathetic nervous system (SNS) and increases heart beat by the secretion of epinephrine or adrenaline.

(ii) Depressor centre-It functions through parasympathetic nervous system (PSNS) by the secretion of acetylcholine. It decreases heart beat, speed of conduction of action potential gnd thereby the cardiac output.

Question 86.

'Which of the following causes an increase in sodium reabsorption in the distal convoluted tubule?

[4 Marks]

(A) Increase in aldosterone levels

(B) Increase in antidiuretic hormone levels

(C) Decrease in aldosterone levels

(D) Decrease in antidiuretic hormone levels

Explanation:

Aldosterone hormone; released by the adrenal glands, helps the body regulate blood pressure. Aldosterone causes the tubules of the kidneys to increase the reabsorption of sodium and water into the blood. This increases the volume of fluid in the body, which also increases blood pressure.

Question 87.

Select the correct matching of the type of the joint with the example in human skeletal system:

[4 Marks]

	Type of joint	Example
(a)	Cartilaginous joint	between frontal and pariental
(b)	Pivot joint	between third and fourth cervical vertebrae
(c)	Hinge joint	between humerus and pectoral girdle
(d)	Gliding joint	between carpals

(A) b

(B) a

(C) c

(D) d

Explanation:

A gliding joint is a common type of synovial joint formed between bones that meet at flat or nearly flat articular surfaces. Gliding joints allow the bones to glide past one another in any direction along the plane of the joint-upand . dowh, left and right, and diagonally. Many gliding joints are formed in the appendicular skeleton between the carpal bones of the Wrist; between the carpals and the nmetacarpals of the palm; between the tarsal bones of the ankle; and between the tarsals and the metatarsals of the foot.

Question 88.

Stimulation of a muscle fiber by a motor neuron occurs at:

[4 Marks]

(A) the transverse tubules

(B) the neuromuscular junction

(C) the myofibril

(D) the sacroplasmic reticulum

Explanation:

The neuromuscular junction connects the nervous system to the-muscular system via synapses between efferent nerve fibres and muscle fibres.

Question 89.

Injury localized to the hypothalamus would most likely disrupt:

[4 Marks]

(A) executive finctions, such as decision making.

(B) regulation of body temperature.

(C) short-term memory.

(D) co-ordination during locomotion.

Explanation:

The hypothalamus is a highly complex structure in the brain that regulates many important brain chemicals. The “hypothalamis is responsible for hormone production. The ‘hormones produced by this area govern ‘body temperature, thirst, hunger, sleep, circadian thythm, ‘moods, sex drive, and the release of other hormones in the body. This area of the brain controls the pituitary gldnd and other glands in the body.

Question 90.

‘Which one of the following statements is not correct?

[4 Marks]

(A) Retinal is the light absorbing portion of visual photo pigments

(B) In retina the rods have the photopigment rhodopsin while cones have three different photopigments.

(C) Retinal is a derivative of Vitamin C.

(D) Rhodopsin is the purplish red protein present in rods only.

Explanation:

Retinal is a derivative of vitamin A. Retinal is a polyene chromophore, and bound to proteins called opsins, is the chemical basis of animal vision. Bound to proteins called type I rhodopsins, retinal allows ceftain microor□ganisms to convert light into metabolic energy.

Question 91.

Identify the hormone with its correct matching of source and function:

[4 Marks]

(A) Melatonin - pineal gland, regulates the normal rthythm of sleepwake cycle.

(B) Oxytocin - posterior pituitary, growth and maintenance of mammary glands.

(C) Progesterone - corpus-luteum, stimulatiuon of growth and activities of female secondary sex organs.

(D) Atrial natriuretic factor - ventricular wall increases the blood pressure.

Explanation:

Oxytocin, a neurohypophysial hormone, is producedby the hypothalamus and stored and secreted by the poste-rior pituitary gland. It stimulates contractions of the smoothmuscle tissue in the wall of the uterus during childbirth.Progesterone is a female hormone produced by the ovariesduring release of a mature egg from an ovary (ovulation).Progesterone helps prepare the lining of the uterus (endo-metrium) to receive the egg if it becomes fertilized by asperm. If the egg is not fertilized, progesterone levels dropand menstrual bleeding begins. Atrial natriuretic factor isa hormonal substance produced by the right atrium of the
heart that stimulates the excretion of sodium and water by
the kidneys and helps regulate blood pressure.

Question 92.

Fight-or-flight reactions cause activation of:

[4 Marks]

(A) the parathyroid glands, leading to increased metabolic rate.

(B) the kidney, leading to suppression of renin-angiotensin- aldosterone pathway.

(C) the adrenal medulla, leading to increased secretion of epinephrine and norepinephrine.

(D) the pancreas leading to a reduction in the blood sugar levels.

Explanation:

Adrenal Medulla is called emergency gland and secretes adrenaline (Epinephrine) and nor-adrenaline (nor-cpinephrine) hormones.Adrenaline (epinephrine) is commonly called as ‘emergency hormone’ or 3F–hormone (For fear, fight & flight). It stimulates sweating, heart beat and breathing rate. It causes the dilation of coronary artery (supplying blood to the heart muscles), bronchioles (for increasing inspiratory volume) and pupil (for better vision).

Question 93.

Geitonogamy involves:

[4 Marks]

(A) fertilization of a flower by the pollen from anothe flower of the same plant.

(B) fertilization of a flower by the pollen from the same flower.

(C) fertilization of a flower by the pollen from a flower of another plant in the same population.

(D) fertilization of a flower by the pollen from a flower of another plant belonging a distant population

Explanation:

Geitonogamy is the transfer of pollen grains in different flowers of the same plant.

Question 94.

Male gametopyte with least number of cell is present in

[4 Marks]

(A) Funaria

(B) Pteris

(C) Lilium

(D) Pinus

Explanation:

Male gametophyte is highly reduced in angiosperm and is known as pollen grain. It is 2 or 3-celled.

Question 95.

Function of filiform apparatus is to:

[4 Marks]

(A) Recognize the suitable pollen at stigma

(B) Stimulate division of generative cell

(C) Produce nectar

(D) Guide the entry of pollen tube

Explanation:

Filiform apparatus helps in the entry of pollen tube into a synergid in ovule. Filiform apparatus is in form of finger-like projection comprising a core of micro fibrils enclosed in a sheath. It resembles transfer cells meant for short distance movement of metabolites. It is responsible for the absorption of food from the nucleus.

Question 96.

Non-albuminous seed is produced in:

[4 Marks]

(A) Maize

(B) Castor

(C) Wheat

(D) Pea

Explanation:

Exalbuminous (non-endospermic) seeds usually store reserve food material in cotyledons. In these seeds, the endosperm is used up and not present in mature seeds, e.g., bean, gram and pea.

Question 97.

The shared terminal duct of the reproductive and urinary system in the human male is:

[4 Marks]

(A) Ureter

(B) Urethra

(C) Vas deferens

(D) Vasa efferentia

Explanation:

Urethra is a tube that connects the urinary bladder to the genitals for the removal of fluids from the body. The urethra travels through the penis, and carries semen as well as urine.

Question 98.

The main function of mammalian corpus luteum is to produce:

[4 Marks]

(A) estrogen only

(B) progesterone

(C) relaxin only

(D) human chorionic gonadotropin

Explanation:

The corpus luteum is a temporary endocrine structure involved in ovulation and early pregnancy. The main secretory product of corpus luteum is progesterone, which is required for the establishment and maintenance of pregnancy.

Question 99.

Select the correct option describing gonadotropin activity in a normal pregnant female:

[4 Marks]

(A) High level of FSH and LH stimulates the thickening of endometrium.

(B) High level of hCG stimulates the synthesis of estrogen and progesterone.

(C) High level of FSH and LH facilitate implantation of the embryo.

(D) High level of hCG stimulates the thickening of endometrium.

Explanation:

Synthesis of estrogen and progesterone due to high level of HCG is a normal gonadotropic activity in a normal pregnant female.

Question 100.

Tubectomy is a method of sterilization in which:

[4 Marks]

(A) small part of the fallopian tube is removed or tied up.

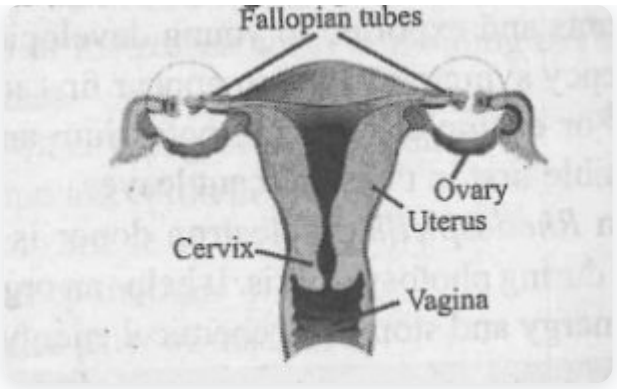
(B) ovaries are removed surgically

(C) small part of vas deferens is removed or tied up.

(D) uterus is removed surgically

Explanation:

Tubectomy also referred to as tubal sterilization is a surgical procedure done on women as a permanent method of contraception. In this method fallopian tubes are blocked or cut, so the sperm are prevented from travelling to the ovary. This prevents any future pregnancies to occur after the surEical procedure.



Question 101.

Which of the following is a hormone releasing Intra Uterine Device (IUD)?

[4 Marks]

(A) LNG-20

(B) Multiload 375

(C) Vault

(D) Cervical cap

Explanation:

An intrauterine device (IUD) is a small contraceptive device, often "T"-shaped, that contains either copper or levonorgestrel, which is inserted into the uterus. They are one form of long-acting reversible contraception which is the most effective types of reversible birth control. The LNG-20 is so called because it releases 20 micrograms of levonorgestrel per 24 hours, compared with 30 micrograms of levonorgestrel in some mini-Pills.

Question 102.

Assisted reproductive technology, IVF involves transfer of:

[4 Marks]

(A) Zygote into the uterus.

(B) Embryo with 16 blastomeres into the fallopian tube.

(C) Zygote into the fallopian tube.

(D) Ovum into the fallopian tube.

Explanation:

IVF (In vitro Fertilization) is the process of fertilization by manually combining an egg and sperm in a laboratory dish.

The process involves monitoring and stimulating a woman's ovulatory process, removing ovum or ova (egg or eggs) from the woman's ovaries and letting sperm fertilise them in a fluid medium in a laboratory. The fertilised egg (zygote) is cultured for 2–6 days in a growth medium and is then transferred to the mother's uterus with the intention of establishing a successful pregnancy.

Question 103.

Fruit colour in squash in an example of

[4 Marks]

(A) Recessive epistasis

(B) Dominant epistasis

(C) Complementary genes

(D) Inhibitory genes

Explanation:

Epistasis is the phenomenon of suppression of phenotypic expression of gene by a nonallelic gene which shows its own effect. A dominant epistatic allele suppresses the expression of a nonallelic gene whether the latter is dominant or recessive. For example, fruit colour of Summer Squash *(Cucurbita pepo*) is governed by a gene which produces yellow colour in dominant state (Y-) and green colour in recessive state (yy).

Question 104.

In a population of 1000 individuals 360 belong to genotype AA, 480 to Aa. and the remaining 160 to aa. Based on this data, the frequency of allele A in the population is:

[4 Marks]

(A) 0.4

(B) 0.5

(C) 0.7

(D) 0.6

Explanation:

According to Hardy Weinberg principle,
$p^2 + 2pq + q^2 = 1$; $(p + q)^2 = 1$
(AA) p^2 = 360 out of 1000 individuals
or p^2 = 36 out of 100

q^2 = 160 out of 1000 or q^2 = 16 out of 100
so q = √16 = 4, As p + q = 1
so p is 0.6.

Question 105.

A man whose father was colour blind marries a womanwhose father was colour blind and her normal father. Whatpercentage of male children of this couple will be colour blind?

[4 Marks]

(A) 25%

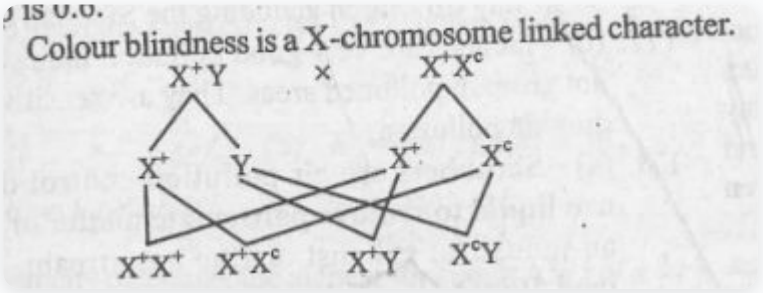
(B) 0%

(C) 50%

(D) 75%

Explanation:

According to Hardy Weinberg principle,
$p^2 + 2pq + q^2 = 1$; $(p + q)^2 = 1$
(AA) p^2 = 360 out of 1000 individuals
or p^2 = 36 out of 100
q^2 = 160 out of 1000 or q^2 = 16 out of 100
so q = √16 = 4, As p + q = 1
so p is 0.6.



Question 106.

A human female with Turner's syndrome:

[4 Marks]

(A) has 45 chromosomes with XO.

(B) is able to produce children with normal husband.

(C) exhibits male characters.

(D) has one additional X chromosome.

Explanation:

Turner's syndrome is a chromosomal condition that affects development in females. A human female with Turner's syndrome has 45 chromosomes with XO. The most common feature of Turner syndrome is short stature, which becomes evident by about age 5.

Question 107.

Transformation was discovered by:

[4 Marks]

(A) Hershey and Chase

(B) Meselson and Stahl

(C) Watson and Crick

(D) Griffith

Explanation:

Frederick Griffith (in 1928), a British Medical officer described the phenomenon of **bacterial transformation.** He carried out experiment with ***Streptococcus, pneumoniae*** (bacterium causing pneumonia) which is used to infect mice. By using S Strain (heat killed) and R strain- (live) it was concluded that R strain has been transformed by some material of S strain which makes R strain virulent and enable to synthesize smooth polysachharide.

Question 108.

Which one of the following is wrongly matched?

[4 Marks]

(A) Transcription – Writing information from DNA to RNA.

(B) Translation – Using information in mRNA to make protein.

(C) Operon – Structural genes, operator and promoter.

(D) Repressor protein – Binds to operator to stop enzyme synthesis.

Explanation:

Process of copying genetic information from DNA to RNA is called **transcription.** Ata time only one DNA strand is being transcribed into RNA. The strand of DNA with polarity 3′→5' actas **template**

strand and the DNA strand with polarity 5′→3’ act as **coding strand.**

Question 109.

Select the correct option:

[4 Marks]

	Direction of RNA synthesis the template	Direction of reading of DNA strand
(a)	5′—3′	3′—5′
(b)	3′—5′	5′—3′
(c)	5′—3′	5′—3′
(d)	3′—5′	3′—5′

(A) a

(B) c

(C) b

(D) d

Explanation:

Synthesis of RNA exhibits several features that are synonymous with DNA replication. RNA synthesis requires accurate and officient initiation, elongation proceeds in the 5′′→ 3’ direction (i.e. the polymerase moves along B the template strand of DNA in the 3′→5’ direction), and RNA synthesis requires distinct and accurate termination.

Question 110.

Forelimbs of cat, lizard used in walking; forelimbs of whale used in swimming and forelimbs of bats used in flying are an example of:

[4 Marks]

(A) Adaptive radiation

(B) Analogous organs

(C) Homologous organs

(D) Convergent evolution

Explanation:

Organs which have a common fundamental anatomical plan and similar émbryonic origin whatever varied functions they may perform are regarded as hm;mlogous organs. For examples the flippers of a

whale, a bats wing, fore-limb of a horse, a bird’s wing and forelimbs of human are structurally as well as functionally different.

Question 111.

Which one of the following are analogous structures?

[4 Marks]

(A) Wings of Bat and Wings of Pigeon.

(B) Gills of Prawn and Lungs of Man.

(C) Thorns of Bougainvillea and Tendrils of Cucurbita

(D) Flippers of Dolphin and Legs of Horse

Explanation:

Analogous organs are those that perform similar Functions but have entirely different embryonic origins.

Question 112.

At which stage of HIV infection does one usually show symptoms of AIDS:-

[4 Marks]

(A) Within 15 days of sexual contact with an infected person.

(B) When the infected retro virus enters host cells.

(C) When HIV damages large number of helper T-Lymphocytes.

(D) When the viral DNA is produced by reverse transcriptase.

Explanation:

HIV infection does usually show symptoms of AIDS. When HIV damages a large number of helper T-Lymphocytes (CD4 cells), AIDS is the stage of HIV infection that occurs when one's immune system is badly damaged and one becomes vulnerable to infections and infection-related cancers called opportunistic infections. When the number of one's CD4 cells falls below 200 cells per cubic millimetre of blood (200 cells/mm^3), one is considered to have progressed to AIDS.

Question 113.

‘Which is the particular type of drug that is obtained from the plant whose one flowering branch is shown below?

[4 Marks]



(A) Depressant

(B) Hallucinogen

(C) Pain - killer

(D) Stimulant

Explanation:

The plant illustrated in the diagram is Datura, which has hallucinogenic properties. A hallucinogen is a substance that produces psychological effects normally associated only with dreams, schizophrenia, or religious visions. It produces changes in perception (ranging from distortions in what is sensed to perceptions of objects where there are none), thought, and feeling.

Question 114.

To obtain virus-fiee healthy plants from a diseased one by tissue culture technique, which part/parts of the diseased plant will be taken:

[4 Marks]

(A) Apical meristem only

(B) Palisade parenchyma

(C) Both apical and axillary meristems

(D) Epidermis only

Explanation:

To obtain virus-free healthy plants from a diseased one by tissue culture technique, both apical and axillary meristems of the diseased plant are taken. Plant tissue culture is used to maintain or grow plant cells, tissues, or organs under sterile conditions on a nutrient culture medium of known composition

Plant tissue culture is widely used to produce clones of a plant in a method known as micro propagation.

Question 115.

What gases are produced in anaerobic sludge digesters?

[4 Marks]

(A) Hydrogen Sulphide and CO_2

(B) Methane, Hydrogen Sulphide and CO_2

(C) Methane, Hydrogen Sulphide and O_2

(D) Methane and CO_2 only

Explanation:

Anaerobic digestion is a series of processes in ‘which microorganisms break down biodegradable material in the

absence of oxygen, used for industrial or domestic purposes

to manage waste and/or to release encrgy. The process of anaerobic digestion produces a biogas, consisting of methane (it will burn), carbon dioxide (it does not burn) and traces of other contaminant gases.

Question 116.

An analysis of chromosomal DNA using the Southern hybridization technique does not use:

[4 Marks]

(A) Blotting

(B) Electrophoresis

(C) Autoradiography

(D) PCR

Explanation:

PCR is a technique for enzymatically replicating DNA without using a living organism such as E. coli or Yeast. It is commonly used in medical and biological research labs for a variety of tasks like detection of hereditary diseases, identification of genetic fingerprints etc.

Blotting is the transfer of the fragmented DNA sequence to the nitrocellulose membrane or nylon membrane. The process is done by either electroblotting or capillary blotting. The DNA molecule is saturated using a NaCl solution and permanently fixed using either UV radiation or drying.

Question 117.

Which vector can clone only a small fragment of DNA?

[4 Marks]

(A) Bacterial artificial chromosome

(B) Yeast artificial chromosome

(C) Plasmid

(D) Cosmid

Explanation:

Plasmids are small extranuclear circular DNAS which carry extrachromosomal genes in bacteria and some fungi.

They replicate independently. The best known vectors which

are also available commerciallly are pBR322 and pUC-18.

Question 118.

In vitro clonal propagation in plants is characterized

[4 Marks]

(A) Northern blotting

(B) PCR and RAPD

(C) Electrophoresis and HPLC

(D) Microscopy

Explanation:

Nowa days PCR and RAPD technique are used for thie characterisation of i vifro clonal propagation in plants.

Random amplified polymorphic DNA (RAPD) is a PCR based technique for identifying genetic variation. It involves the use of a single arbitrary primer in a PCR reaction, resulting in the amplification of many discrete DNA products.

Question 119.

Which of the following statements is correct for the spontaneous adsorption of a gas?

[4 Marks]

(A) ΔS is positive and, therefore, ΔH should be negative

(B) ΔS is negative and, therefore, ΔH should be highly negative

(C) ΔS is positive and, therefore, ΔH should also be highly positive

(D) ΔS is negative and, therefore, ΔH should be highly positive

Explanation:

For adsorption, $\Delta S < 0$ and for a spontaneous change $\Delta G = -ve$.

hence ΔH should be highly negative which is clear from the equation

$\Delta G = \Delta H - T\Delta S$

$= -\Delta H - T(-\Delta S)$

$= -\Delta H + T\Delta S$

So if ΔH is highly negative, ΔG will also be (−ve).

Question 120.

'Which one of the following statements is correct?

[4 Marks]

(A) A sterile pistil is called a staminode.

(B) A proteinaceous aleurone layer is present in maize grain.

(C) Mango is a parthenocarpic fruit.

(D) The seed in grasses is not endospermic.

Explanation:

Generally, monocotyledonous seeds (e.g. grasses) are endospermic but some, as in orchids, are non-endospermic. Mango is a drupe fruit that develops from a multicarpellary syncarpous, superior ovary having one or many seeds. A sterile stamen is called a staminode**.** In monocots, outer covering of endosperm separates the embryo by a proteinaceous layer called aleurone layer.

Question 121.

Commonly used vectors for human genome sequencing are:

[4 Marks]

(A) BAC and YAC

(B) T-DNA

(C) Expression Vectors

(D) KT/A Cloning Vectors

Explanation:

Human genome sequencing is a process that determines the complete DNA sequence of an organism's genome at a single time. This requires sequencing all of an organism's chromosomal DNA as well as DNA contained in the mitochondria and, for plants, in the chloroplast. Commonly used vectors for human genome sequencing are BAC (Bacterial-artificial chromosome) and YAC (Yeast artificial chromosome;

A P1-derived artificial chromosome (PAC) is a DNA construct that was derived from the DNA of P1 bacteriophage.

Question 122.

Pollen tablets are available in the market for:

[4 Marks]

(A) Breeding programmes

(B) Invitro fertilization

(C) Ex situ conservation

(D) Supplementing food

Explanation:

Pollen grains are rich in nutrients therefore used as food supplements. Athletes and race horses use these tablets to enhance performance.

Pollen contains 22.7% of protein on average, including 10.4% of essential amino acids such as methionine, lysine, threonine, histidine, leucine, isoleucine, valine, phenylalanine, and tryptophan. Along with this, it also contains sugars, lipids and sterols.

Question 123.

The first human hormone produced by recombinant DNA technology is:

[4 Marks]

(A) Thyroxin

(B) Progesterone

(C) Estrogen

(D) Insulin

Explanation:

Mammahan hormones were among the first products prepared in bacteria by r-DNA technology. Human insulin and human growth hormone are earliest examples.

Question 124.

Match the following and select the correct option:

Column-I		Column-II
(A) Earthworm	___	(i) Pioneer species
(B) Succession	___	(ii) Detritivore
(C) Ecosystem service	___	(iii) Natality
(D) Population growth	___	(iv) Pollination

[4 Marks]

(A) (c) (iii) (ii) (iv) (i)

(B) (d) (ii) (i) (iv) (iii)

(C) (b) (iv) (i) (iii) (ii)

(D) (a) (i) (ii) (iii) (iv)

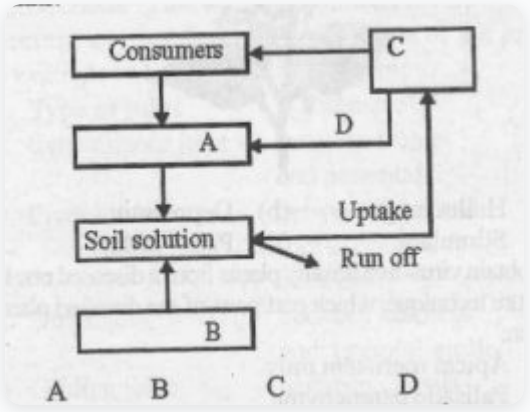
Explanation:

Detrivores, (e.g. earthworm) break down detritus into smaller particles. The species that invade a bare area in succession is called pioneer species. The products of ecosystem processes are termed as ecosystem services, e.g., healthy forest ecosystems purify air and water, mitigate droughts and floods etc. Natality refers to number of births during a given period in the population.

Question 125.

Given below is a simplified model of phosphorus cycling in a terrestrial ecosystem with four blanks (A-D). Identify the blanks:-

[4 Marks]



(A) Litter Producers Rock Detritus fall mineral

(B) Rock Demitus Litterfall Producers minerals

(C) Producers Litter fall Rock Detrifus minerals

(D) Detitus Rock Producer Litter fall minerals

Explanation:

Phosphorus is an important element for living beings.Consumers obfain phosphorus directly or indirectly from plants. Phosphorus is also present in phosphatic rocks. It released during the decomposition of plant and animal re-‘mains. The released phosphorus may reach the deeper layers of soil and gets deposited as phosphate rocks. Al plants and animals eventually die and in due time, their organic remains or debris decay through the action of micro-organism and the phosphates are released into the wstcr for recycling.

Odum is the father of modern ecology. Clements proposed the theory of plant succession. The term ecosystem was proposed by Tansley. Elton proposed the concept of ecological pyramids. Hence, it is also called Eltonian pyramids.

Question 126.

A species facing extremely high risk of extinction in the immediate future is called:

[4 Marks]

(A) Vulnerable

(B) Endemic

(C) Critically endangered

(D) Extinct

Explanation:

Critically Endangered Themxunfacmgvcryhlghnsk - of extinction in the wild can become extinct any moment the immediate future, e.g. Sus salvinus (*Pigmy Hog), Berbers* nilghiriensis.

Question 127.

The organization which publishes the Red List of species is:

[4 Marks]

(A) UNEP

(B) WWF

(C) IUCN

(D) ICFRE

Explanation:

IUCN or WCN maintains a red data book which is a catalogue of threatened plants and animals facing risk of extinction. The IUCN red list (2004) document the extinction of 784 species (including 338 vertebrate, 359 invertebrates and 87 plants) in the last 500 years

Question 128.

Just as a person moving from Delhi to Shimla to escape the heat for the duration of hot summer, thosand of'migratory birds from Siberia and other-extremely cold northern regions move to:

[4 Marks]

(A) Western Ghat

(B) Meghalaya

(C) Keoladeo National park

(D) Corbett National Park

Explanation:

In Ex-situ conservation the threatened animals and plants are taken out of their natural habitat and are protected in special parks or areas like Zoological parks, Wild life safari parks and Botanical gardens etc. The ex-situ conservation also includes cryopreservation, fertilization of eggs in-vitro and propagation of plants through "tissue culture methods", preservation of seeds through Seed banks.

Question 129.

A location with luxuriant growth of lichens on the trees indicates that the:

[4 Marks]

(A) Trees are very healthy

(B) Trees are heavily infested

(C) Location is not poltuted

(D) Location is highly polluted

Explanation:

The Keoladeo National Park is a famous avifauna sanctuary in India that plays host to thousands of birds especially during the summer season. It is formerly known as the Bharatpur Bird Sanctuary in Bharatpur, Rajasthan. October to February is the best time, for the migratory birds there as well as the residents. In August local birds start their nest building and rear their young for the next few months. October/November is when the migrants arrive. Most stay till March including the Siberian Crane.

Question 130.

A scrubber in the exhaust of a chemical industrial Temoves:-

[4 Marks]

(A) gases like sulphur dioxide

(B) particulate matter of the size 5 ‘micrometer or above

(C) gases like ozone and methane

(D) particulate matter of the size 2.5 micrometer or less

Explanation:

Lichens are very good pollution indicators, they do not grow in polluted areas. They are sensitive to sulphur dioxide pollution.

Question 131.

An example of ex situ conservation is:

[4 Marks]

(A) Sacred Grove

(B) Wildlife Sanctuary

(C) National Park

(D) Seed Bank

Explanation:

Scrubbers are air pollution control devices that use liquid to remove particulate matter or gases from an industrial exhaust or flue gas stream. This atomized liquid (typically water) entrains particles and pollutant gases in order to effectively wash them out of the gas flow

Scrubbers remove or scrubs SO_2 emissions from the exhaust of coal-fired power plants.

Question 132.

The zone of atmosphere in which the ozone layer is pressent is called:

[4 Marks]

(A) Ionosphere

(B) Mesosphere

(C) Troposphere

(D) Stratosphere

Explanation:

The ozone (O_3) found in upper part of the atmosphere, i.e., Stratosphere, is **Good ozone,** since it acts as a shield for absorbing UV-radiations from sun.

Question 133.

If 20J of energy is trapped at producer level, then how much energy will be available to peacock as food in the following chain?

Plant → Mice →Snake → Peacock

[4 Marks]

(A) 0.02J

(B) 0.002J

(C) 0.2J

(D) 0.0002J

Explanation:

According to 10% law of energy flow by Raymond Lindman. The total amount of energy that can be transferred to the next trophic level is the 0% hence, peacock will receive 0.02 J of energy as top consumer. Energy received by other organisms are

Plant → 20 J
Mice → 20 × 10% = 2 J
Snake → 2 × 10% = 0.2 J

Question 134.

If force (F), velocity (V) and time (T) are taken as fundamental units, then the dimensions of mass are:

[4 Marks]

(A) $[FV\ T^{-1}]$

(B) $[FV\ T^{-2}]$

(C) $[F^{-1}V^{-1}T^{-1}]$

(D) $[FV^{-1}T]$

Explanation:

Force = Mass × Acceleration
⇒ Mass = Force / Acceleration
⇒ Mass = Force / (Velocity / Time)
= $[FV^{-1}T]$

Question 135.

A particle is moving such that its position coordinate (x, y) are
(2 m, 3 m) at time t = 0
(6 m, 7 m) at time t = 2 s and

(13 m, 14 m) at time t = 5 s.
Average velocity vector ($\bar{v}_{av}$) from t = 0 to
t = 5 s is:

[4 Marks]

(A) (11/5)(î + ĵ)

(B) 2(î + ĵ)

(C) (1/5)(13î + 14ĵ)

(D) (7/3)(î + ĵ)

Explanation:

$\bar{v}_{av}$ = Δr vector(displacement) / Δt(time taken)

= (13-2)î + (14-3)ĵ /5-0= 11/5 (î + ĵ)

Question 136.

A projectile is fired from the surface of the earth with avelocity of 5 ms^{-1} and angle θ with the horizontal.Another projectile fired from another planet with a velocity of 3 ms^{-1} at the same angle follows a trajectory which is identical with the trajectory of the projectile fired from the earth. The value of the acceleration due to gravity on the planet is (in ms^{-2}) given g = 9.8 m/s^2?

[4 Marks]

(A) 110.8

(B) 5.9

(C) 16.3

(D) 3.5

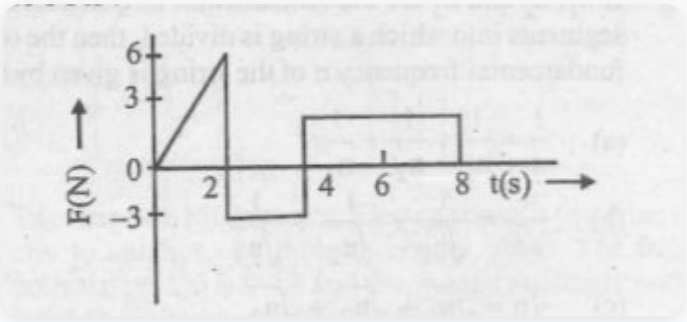
Explanation:

Trajectory is identical for both, Horizontal range,
= $u^2 \sin 2\theta / g$
So that,
$g_{planet} / g_{earth} = (u_{planet} / u_{earth})^2$
Therefore,
$g_{planet} = (3/5)^2 \times (9.8\ m\ s^{-2})$
= 3.5 $m\ s^{-2}$

Question 137.

The force ‘F’ acting on a particle of mass ‘m’ is indicated by the force-time graph shown below. The change in momentum of the particle over the time interval from zero to 8s is:

[4 Marks]



(A) 24Ns

(B) 20Ns

(C) 6Ns

(D) 12Ns

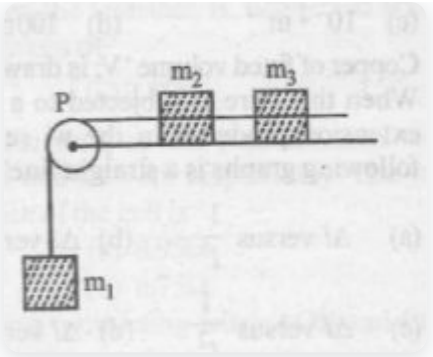
Explanation:

Change in momentum,
$\Delta p = \int F\, dt$
= Area of F–t graph
= ar of $\triangle$ − ar of $\square$ + ar of $\square$
= 1/2 × 2 × 6 − 3 × 2 + 4 × 3
= 12 N-s

Question 138.

A system consists of three masses m_1, m_2 and m_3 connected by a string passing over a pulley P. The massm_1 hangs freely and m_2 and m_3 are on a rough horizontal table (coefficient of friction = μ). The pulley is frictionless and of negligible mass. The downward acceleration of mass m_1 is: (Assume $m_1 = m_2 = m_3 = m$)

[4 Marks]



(A) g(1-2μ)/2

(B) g(1-2μ)/3

(C) 2gμ/3

(D) g(1-gμ)/g

Explanation:

Acceleration =

Net force in the direction of motion / Total mass of system

= $[m_1g - \mu(m_2 + m_3)g] / (m_1 + m_2 + m_3)$

= $g/3\ (1 - 2\mu)$

($\because m_1 = m_2 = m_3 = m$ given)

Question 139.

A mass m is attached to thin wire and whirled in a vertical circle. The wire is most likely to break when:

[4 Marks]

(A) the mass is at the lowest point

(B) inclined at an angle of 60° from vertical

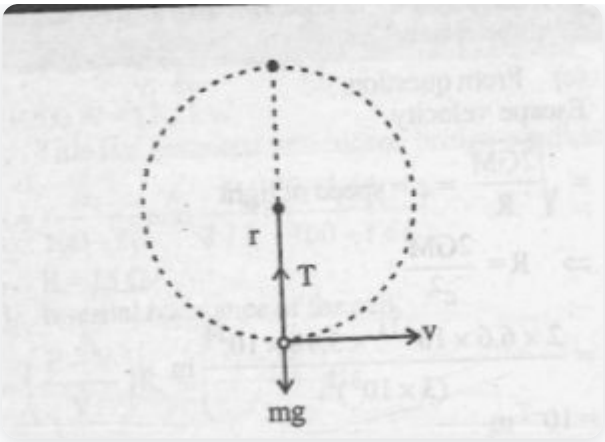
(C) themass is at the highest point

(D) thewireishorizontal

Explanation:

$T - mg = mv^2/r$ [centripetal force] $= mv^2/r$
$\Rightarrow T = mg + mv^2/r$

As the velocity is maximum at lowest point so tension is maximum at the lowest position of mass, so the chance of breaking is maximum.



Question 140.

A bodyof mass (4m) is lying in x-y planeat rest. It suddenly explodes into three pieces. Two pieces, each of mass (m) move perpendicular to each other with equal speeds (v). The total kinetic energy generated due to explosion is :

[4 Marks]

(A) mv^2

(B) 3/2 mv^2

(C) $2mv^2$

(D) $4mv^2$

Explanation:

By conservation of linear momentum Magnitude of the momentum of heavier piece of mass (2m) =Magnitude of the vector sum of momentum of each piece of mass (m)

$(2m)v_1 = \sqrt{[(mv)^2 + (mv)^2]}$
$\Rightarrow 2mv_1 = \sqrt{2}\, mv$
$\Rightarrow v_1 = v/\sqrt{2}$
As two masses of each mass m move perpendicular to
each other.
Total KE generated
$= \frac{1}{2}mv^2 + \frac{1}{2}mv^2 + \frac{1}{2}(2m)v_1^2$
$= mv^2 + mv^2/2$
$= 3/2\, mv^2$

Question 141.

A solid cylinder of mass 50 kg and radius 0.5 mis free to rotate about the horizontal axis. A massless string is wound round the cylinder with one end attached to it and the other hanging freely. Tension in the string required to produce an angular acceleration of 2 revolutions s^{-2} is:

[4 Marks]

(A) 50 N

(B) 157 N

(C) 78.5 N

(D) 25 N

Explanation:

Here $\alpha = 2$ revolutions/$s^2 = 4\pi$ rad/s^2 (given)

$I_{cylinder} = 1/2\ MR^2 = 1/2\ (50)\ (0.5)^2 = 25/4$ Kg-m^2

As $\tau = I\alpha$ so $TR = I\alpha$

$\Rightarrow T = I\alpha/R = (25/4)(4\pi)/(0.5)\ N = 50\pi N = 157N$

Question 142.

The ratio of the accelerations for a solid sphere (mass 'm' and radius 'R') rolling down an incline of: angle '0' without slipping and slipping down the incline without rolling is :

[4 Marks]

(A) 7 : 5

(B) 5 : 7

(C) 2 : 3

(D) 2 : 5

Explanation:

For solid sphere rolling without slipping on inclined plane, acceleration

$a_1 = g \sin\theta / (1+K^2/R^2)$

For solid sphere slipping on inclined plane without rolling, acceleration

$a_2 = g \sin\theta$

Therefore, the required ratio is

$a_1 / a_2 = 1/(1+K^2/R^2) = 1/(1+ 2/5) = 5/7$

Question 143.

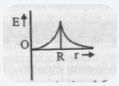
Dependence of intensity of gravitational field (E) of earth with distance (r) from centre of earth is correctly represented by:

[4 Marks]

(A)



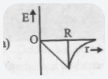
(B)



(C)



(D)



Explanation:

First when ($r < R$) $E \propto r$ and then when $r \geq R$, $E \propto 1/r^2$.

Hence graph (b) correctly depicts.

Question 144.

A black hole is an object whose gravitational field is so strong that even light cannot escape from it. To what approximate radius would our earth (mass = 5.98×10^{24} kg)
have to be compressed to be a black hole?

[4 Marks]

(A) 100 m

(B) 10^{-2} m

(C) 10^{-6} m

(D) 10^{-9} m

Explanation:

From question,

Escape velocity

$\sqrt{}$ 2GM /R =c= (speed of light)

$\Rightarrow R=2GM/c^2 = 2\times6.6\times10^{-11}\times5.98\times10^{24}/(3\times10^8)^2 m$

$10m^{-2}$

Question 145.

Copper of fixed volume 'V; is drawn into wire of length */'. When this wire is subjected to a constant force 'F', the extension produced in the wi re is 'Al Which of the

following graphsis a straight line?

[4 Marks]

(A) Δl versus l

(B) Δl versus 1/l

(C) Δl versus $1/l^2$

(D) Δl versus l^2

Explanation:

Y=F/A /Δl / l

$\Rightarrow \Delta l = Fl/ AY$

But, V=Al

A=V/l

Therefore, $\Delta l = Fl^2 /VY \alpha l^2$

Hence, the graph of Δl versus $\mathbf{l^2}$ will give a straight line.

Question 146.

A certain number of spherical drops of a liquid of radius 'r coalesce to form a single drop of radius 'R' and volume 'V'. If 'T' is the surface tension of the liquid, then:

[4 Marks]

(A) energy is neither released nor absorbed

(B) energy = 3VT (1/r + 1/R) is absorbed

(C) energy = 4VT (1/r − 1/R) is released

(D) energy = 3VT (1/r − 1/R) is released

Explanation:

Volume same= $n(4/3\pi r^3) = 4/3\pi R^3$

$\Rightarrow n = R^3 / r^3$

Change in energy $= T\Delta A$

$= T[4\pi R^2 - n\ 4\pi r^2]$

$= 4\pi T [R^2 - R^3/ r^3 . r^2]$

$= 3\ (4/3\pi R^3)\ T\ [1/R - 1/r]$

$= 3VT [1/R - 1/r]\ (R>r)$

$= -3VT [1/r - 1/R]$ is released

Question 147.

Steam at 100°C is passed into 20 g of water at 10°C. When water acquires a temperature of 80°C, the mass of water present will be:

[Take specific heat of water = 1 cal g^{-1} $°C^{-1}$ and latent heat of steam = 540 cal g^{-1}]

[4 Marks]

(A) 42.5 g

(B) 31.5 g

(C) 22.5 g

(D) 24 g

Explanation:

According to the principle of calorimetry, Heat lost = Heat gained

$mL_v + ms_w\Delta\theta = m_w\ s_w\Delta\theta$

$\Rightarrow m \times 540 + m \times 1 \times (100 - 80)$

= 20 × 1 × (80 − 10)

⇒ m = 2.5 g

Therefore total mass of water at 80°C

= (20 + 2.5) g

= 22.5 g

Question 148.

Certain quantity of water cools from 70°C to 60°C in the first 5 minutes and to 54°C in the next 5 minutes. The temperature of the surroundings is:

[4 Marks]

(A) 10°C

(B) 20°C

(C) 45°C

(D) 42°C

Explanation:

Let the temperature of surroundings be θ_o By Newton' law of cooling

$$\frac{\theta_1-\theta_2}{t}=k\left[\frac{\theta_1+\theta_2}{2}-\theta_0\right]$$

$$\Rightarrow \quad \frac{70-60}{5}=k\left[\frac{70+60}{2}-\theta_0\right]$$

$$\Rightarrow \quad 2=k[65-\theta_0]$$

Similarly, $\frac{60-54}{5}=k\left[\frac{60+54}{2}-\theta_0\right]$

$$\Rightarrow \quad \frac{6}{5}=k\,[57-\theta_0]$$

By dividing (i) by (ii) we have

$$\frac{10}{6}=\frac{65-\theta_0}{57-\theta_0} \quad \Rightarrow \quad \theta_0=45^\circ$$

Question 149.

A monoatomic gas at a pressure P, having a volume V expands isothermally to a volume 2V and then adiabatically to a volume 16V. The final pressure of the gas is :
(take {5}{3}]

[4 Marks]

(A) 16P

(B) P/64

(C) 64P

(D) 32P

Explanation:

For isothermal process,

$P_1V_1=P_2V_2$

$\Rightarrow PV=P_2(2V)$
$\Rightarrow P_2 \Rightarrow P/2$

For adiabatic process,

$P_2V_2\hat{}\gamma=P_3V_3\hat{}\gamma$

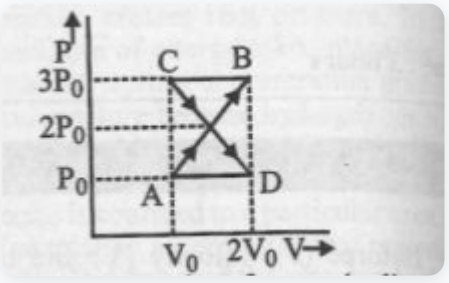
$\Rightarrow (p/2)\ (2v)\hat{}\gamma = P_3\ 16v\hat{}\gamma$

$\Rightarrow P_3 = 3/2\ (1/8)^{5/3} = P/64$

Question 150.

A thermodynamic system undergoes cyclic process ABCDA as shown in fig. The work done by the system in the cycle is :

[4 Marks]



(A) Zero

(B) $P_0V_0/2$

(C) $2P_0V_0$

(D) P_0V_0

Explanation:

Work done by the system in the cycle

= Area under P-V curve and V-axis

= $1/2\ (2P_0 - P_0)(2V_0 - V_0) + [-(1/2)\ (3P_0 - 2P_0)(2V_0 - V_0)]$

= $P_0V_0/2 - P_0V_0/2 = 0$

Question 151.

The mean free path of molecules of a gas, (radius 'r') is inversely proportional to

[4 Marks]

(A) r

(B) r^2

(C) $\sqrt{r}$

(D) r^3

Explanation:

Mean free path $\lambda_m = 1/\sqrt{2}\Pi d^2 n$

where d = diameter of molecule and d =2r

$\lambda_m\ \alpha\ 1/r^2$

Question 152.

The oscillation of a body on a smooth horizontal surface is represented by the equation,

$X = A\cos(\omega t)$

where X = displacement at time t

ω = frequency of oscillation

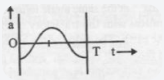
Which one of the following graphs shows correctly the variation of 'a' with 't' ?

[4 Marks]

(A)



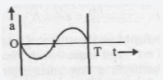
(B)



(C)



(D)



Explanation:

Displacement,

$x=A\cos(\omega t)$ (given)

Velocity,

$v=dx/dt=-A\omega\sin(\omega t)$

Acceleration,

$a= dv/dt=-A\omega^2\cos(\omega t)$

Hence, graph **(c)** correctly depicts the variation of **a** with **t**

Question 153.

If n_1, n_2 and n_3 are the fundamental frequencies of threesegments into which a string is divided, then the original fundamental frequency n of the string is given by:

[4 Marks]

(A) $1/n = 1/n_1 + 1/n_2 + 1/n_3$

(B) $1/\sqrt{n} = 1/\sqrt{n_1} + 1/\sqrt{n_2} + 1/\sqrt{n_3}$

(C) $n = n_1 + n_2 + n_3$

(D) $\sqrt{n} = \sqrt{n_1} + \sqrt{n_2} + \sqrt{n_3}$

Explanation:

$n=1/ 2l \sqrt{T/m}$

or, $n \propto 1/ l$

or,

$n\ l$ = constant, K

Therefore,

$n_1 , l_1=K,$

$, n_2\ l_2 =K,$

$n_3 l_3=K$

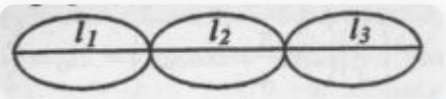
Also,

$l=l_1+l_2+l_3$

or,

$K/n=K/n_1+K/n_2 +K/n_3$

or, $1/n = 1/n_1+1/n_2 +1/n_3$



Question 154.

The number of possible natural oscillation of air column in a pipe closed at one end of length 85 cm whose frequencies lie below 1250 Hz are: (velocity of sound = 340 ms^{-1})

[4 Marks]

(A) 5

(B) 4

(C) 7

(D) 6

Explanation:

In case of closed organ pipe, frequency,

$f_n =(2n + 1)\ v/4l$

For n = 0, f_0 = 100 Hz

n = 1, f_1 = 300 Hz

n = 2, f_2 = 500 Hz

n = 3, f_3 = 700 Hz

n = 4, f_4 = 900 Hz

n = 5, f_5 = 1100 Hz

n = 6, f_6 = 1300 Hz

Hence possible natural oscillation whose frequencies

< 1250 Hz = 6 (n = 0, 1, 2, 3, 4, 5)

Question 155.

A speeding motorcyclist sees traffic jam ahead of him. He slows down to 36 km/hour. He finds that traffic has ceased and a car moving ahead of him at 18 km/hour is honking at a frequency of 1392 Hz. If the speed of sound is 343 m/s, the frequency of the honk as heard by him will be:

[4 Marks]

(A) 1332 Hz

(B) 1412 Hz

(C) 1372 Hz

(D) 1464 Hz

Explanation:

According to Doppler's effect,

Apparent frequency,

$n' = n(v + v_o / v + v_s) = 1392(343 + 10/343 + 5) = 1412$ Hz

Question 156.

In a region, the potential is represented by$V(x, y, z) = 6x - 8xy - 8y + 6yz$, where V is in volts and x, y, z are in metres.
The electric force experienced by a charge of 2 coulomb situated at point (1, 1, 1) is:

[7 Marks]

(A) $6\sqrt{5}$ N

(B) 30 N

(C) 24 N

(D) 4√35 N

Explanation:

(d) $\vec{E} = -\frac{\partial V}{\partial x}\hat{i} - \frac{\partial V}{\partial y}\hat{j} - \frac{\partial V}{\partial z}\hat{k}$

where $V(x, y, z) = 6x - 8xy - 8y + 6yz$

$= -[(6-8y)\hat{i} + (-8x-8+6z)\hat{j} + (6y)\hat{k}]$

At $(1, 1, 1)$, $\vec{E} = 2\hat{i} + 10\hat{j} - 6\hat{k}$

$\Rightarrow \quad (\vec{E}) = \sqrt{(2)^2 + (10)^2 + (-6)^2} = \sqrt{140} = 2\sqrt{35}$

$\therefore \quad F = q\vec{E} = 2 \times 2\sqrt{35} = 4\sqrt{35}$

Question 157.

A conducting sphere of radius R is given a charge Q. The electric potential and the electric field at the centre of the sphere respectively are:

[4 Marks]

(A) $Q/4\pi\varepsilon_0 R$ and $Q/4\pi\varepsilon_0 R^2$

(B) Zero and $Q/4\pi\varepsilon_0 R^2$

(C) Both are zero

(D) $Q/4\pi\varepsilon_0 R$ and Zero

Explanation:

Due to conducting sphere,

At centre, electric field E = 0

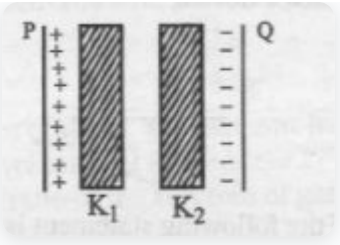
but electric potential,

$V = Q/4\pi\varepsilon_0 R$

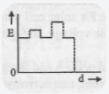
Question 158.

Two thin dielectric slabs of dielectric constant K_1 and K_2 ($K_1 < K_2$) are inserted between the plates of a parallel plate capacitor, as shown in the figure. The variation of electric field 'E' between the plates with distance 'd' as measured from plate P is correctly shown by:

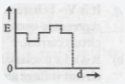
[4 Marks]



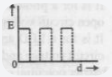
(A)



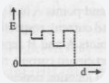
(B)



(C)



(D)



Explanation:

Electric field,

$E \propto 1/K$

As $K_1 < K_2$, so $E_1 > E_2$.

Hence graph correctly depicts the variation of electric

field E with distance d.

Question 159.

Two cities are 150 km apart. Electric power is sent from one city to another city through copper wires. The fall of potential per km is 8 volt and the average resistance per km is 0.5 Ω. The power loss in the wires is:

[4 Marks]

(A) 12.2 kW

(B) 19.2 W

(C) 19.2 J

(D) 19.2 kW

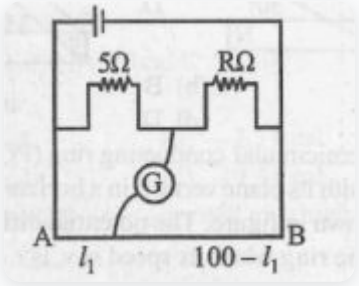
Explanation:

Total resistance R = (0.5 Ω/km) × (150 km)
= 75 Ω
Total voltage drop = (8 V/km) × (150 km) = 1200 V
Power loss = $(\Delta V)^2 / R = (1200)^2 / 75$ W
= 19200 W = 19.2 kW

Question 160.

The resistances in the two arms of the meter bridge are 5Ω and RΩ, respectively. When the resistance R is shunted
with an equal resistance, the new balance point is at 1.6l.$_1$ The resistance 'R' is:

[4 Marks]



(A) 15Ω

(B) 20Ω

(C) 25Ω

(D) 10Ω

Explanation:

(b) This is a balanced wheatstone bridge condition,

$$\frac{5}{R} = \frac{\ell_1}{100-\ell_1} \text{ and } \frac{5}{R/2} = \frac{1.6\ell_1}{100-1.6\ell_1}$$

$$\Rightarrow R = 15\,\Omega$$

Question 161.

A potentiometer circuit has been set up for finding the internal resistance of a given cell. The main battery used across the potentiometer wire, has an emf0of2.0 V and a negligible internal resistance. The potentiometer wire itself is 4m long, When the resistace R, connected across the given cell, has values of (i) infinity (i) 9.5Ω,

The balancing lengths', on the potentiometer wire are found to be 3 m and 2.85 m, respectively. The value of internal resistance of the cell is

[4 Marks]

(A) 0.5Ω,

(B) 0.25Ω,

(C) 0.75Ω,

(D) 0.95Ω,

Explanation:

Internal resistance of the cell,

$(E - V)\ (\ell_1 - \ell_2)$
$r = (E - V / V)\ R = ((\ell_1 - \ell_2)/\ell_2)\ R$

$= ((3 - 2.85) / 2.85) \times (9.5)\ \Omega = 0.5\ \Omega$

Question 162.

Two identical long conducting wires AOB and COD are placed at right angle to each other, with one above other such that 'O' is their common point for the two. The wires carry **I_1** and **I_2** currents respectively. Point **'P'** is lying at distance **'d'** from **'O'** along a direction perpendicular to the plane containing the wires. The magnetic field at the point **'P'** will be:

[4 Marks]

(A) $\mu_o/2\Pi\ d(\ I_1^2 + I_2^2)^{1/2}$

(B) $\mu_o/2\Pi\ d(\ I_1 / I_2)$

(C) $\mu_o/2\Pi\ d(\ I_1^2 - I_2^2)$

(D) $\mu_o/2\Pi\ d(\ I_1 + I_2)$

Explanation:

$\mu_o/2\Pi\ d(\ I_1^2 + I_2^2)^{1/2}$ **)** Net magnetic field $B = \sqrt{B_1^2 + B_2^2}$
where, $B_1 = \mu_o I_1/2\Pi\ d$, $B_2 = \mu_o I_2\ /2\Pi$

Therefore,

$\mu_o/2\Pi\ d(\ I_1^2 + I_2^2)^{1/2}$

Question 163.

In an ammeter **0.2%** of main current passes through galvanometer. If resistance of galvanometer is **G**, the resistance of ammeter will be:

[4 Marks]

(A) 500/499 G

(B) 1/500G

(C) 499/500G

(D) 1/499 G

Explanation:

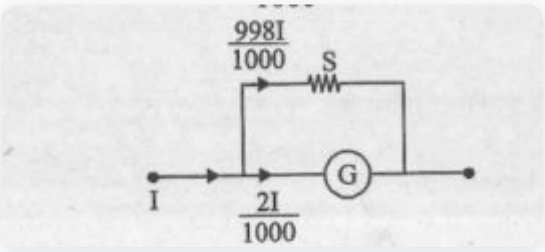
As **0.2%** of the main current passes through the galvanometer, hence 998/ 1000I current passes through the shunt.

(2I/1000)G=(998I/1000)S

S= G/499
Total resistance of the ammeter,

R=SG/ S+G= (G/499) G/(G/499) +G

=G/500

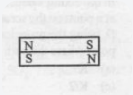


Question 164.

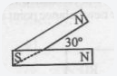
Following figures show the arrangement of bar magnets in different configurations. Each magnet has magnetic dipole moment Which configuration has highest net magnetic dipole moment ?

[4 Marks]

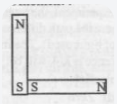
(A)



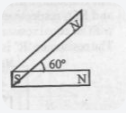
(B)



(C)



(D)



Explanation:

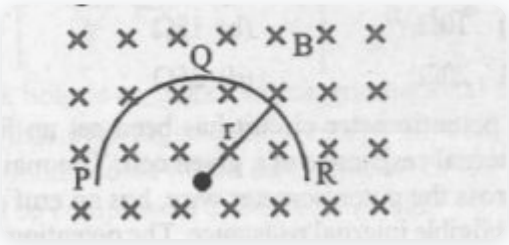
Net magnetic dipole moment = 2 M cos (θ/2)

As value of cos (θ/2) is maximum in case (c) hence net magnetic dipole moment is maximum .

Question 165.

A thin semicircular conducting ring (PQR) of radius ‘r’ is falling with its plane vertical ina horizontal magnetic field B, as shown in figure. The potential difference developed across the ring when its speed is v, is

[4 Marks]



(A) 2rBvand R is at higher potential

(B) Zero

(C) ΠrBv and R is at higher potnetial

(D) BvΠr² /2 and P is at higher potential

Explanation:

Rate of decreasing of area of semicircular ring

dA/ dt = (2r)V

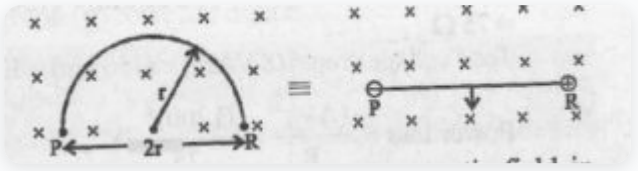
dt

From Faraday's law of electromagnetic induction

$e= -d\theta /dt = B\, dA/dt = -B(2r)V$

As induced current in ring produces magnetic field in

upward direction hence R is at higher potential.



Question 166.

A transformer having efficiency of **90%** is working on **200 V** and **3 kW** power supply. If the current in the secondary coil is **6 A**, the voltage across the secondary coil and the current in the primary coil respectively are:

[4 Marks]

(A) 450 V, 15 A

(B) 300 V, 15 A

(C) 600 V, 15 A

(D) 450 V, 13.5 A

Explanation:

Efficiency

$\eta = V_s I_s / V_p I_p$

$\Rightarrow 0.9 = V_s(6) / 3\times10^3$

$\Rightarrow V_s = 450\ V$

As, $V_p I_p = 3000$ so

$I_p = 3000/V_p = 3000/200\ A = 15A$

Question 167.

The angle of a prism is '**A**'. One of its refracting surfaces is silvered. Light rays falling at an angle of incidence **2A** on the first surface returns back through the same path after suffering reflection at the silvered surface. The refractive index, **μ**, of the prism is

[4 Marks]

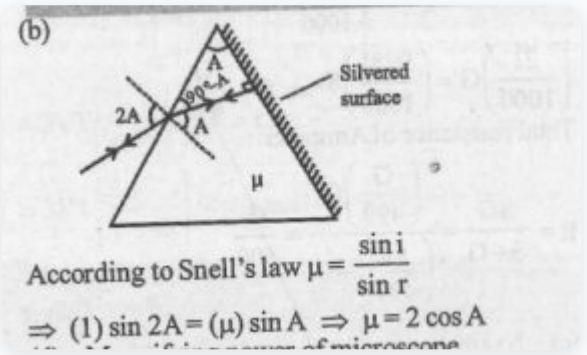
(A) 1/2 cos A

(B) tan A

(C) 2cosA

(D) 2sinA

Explanation:



Question 168.

Light with an energy flux of **25×10^4 W m^{-2}** falls on a perfectly reflecting surface at normal incidence. If the surface area is **15 cm^2**, the average force exerted on the surface is:

[4 Marks]

(A) 3.0×10^{-6} N

(B) 2.50×10^{-6} N

(C) 1.25×10^{-6} N

(D) 1.20×10^{-6} N

Explanation:

Average force,

$F_{av} = \Delta p / \Delta t = 2IA/c$

(∵Power=F·V)

$= 2 \times 25 \times 10^4 \times 15 \times 10 / 3 \times 10^{-4} = 2.50 \times 10^{-6}$ N

Question 169.

If the focal length of objective lens is increased then magnifying power of:

[4 Marks]

(A) microscope will increase but that of telescope decrease

(B) microscope will decrease but that of telescope increase.

(C) microscope and telescope both will increase.

(D) microscope and telescope both will decrease.

Explanation:

Magnifying power of microscope

$=LD / f_o f_e \propto 1/f_o$

Hence, with increase in f_o the magnifying power of the microscope decreases.

Magnifying power of telescope $f_o/f_e \propto f_o$

Hence, with increase in f_o the magnifying power of the telescope increases.

Question 170.

In the Young's double-slit experiment, the intensity of light at a point on the screen where the path difference is λ is K, (λ being the wave length of light used). The intensity at a point where the path difference is λ/4, will be:

[4 Marks]

(A) K

(B) K/2

(C) K/4

(D) Zero

Explanation:

For path difference λ, phase difference

$0=2\pi$ rad.

For path difference λ /4,phase difference $=\pi/2$ rad.

As

$K=4I_o$,so intensity at the given point where path difference is λ /4

$K' = 4I_o\cos^2(\pi/4)(\cos\pi/4 = \cos 45°) = 2I_o = K/2$.

Question 171.

A beam of light of λ = 600 nm from a distant source falls on a single slit 1 mm wide and the resulting diffraction pattern is observed on a screen 2 m away. The distance between first dark fringes on either side of the central bright fringe is:

[4 Marks]

(A) 2.4 cm

(B) 1.2 mm

(C) 2.4 mm

(D) 1.2 cm

Explanation:

Given:

$D = 2$ m ; $d = 1$ mm $= 1 \times 10^{-3}$

$\lambda = 600\text{nm} = 600 \times 10^{-6}$ m

Width of central bright fringe (=2β) = $2\lambda D/d$

$2 \times 600 \times 10^{-6} \times 2 / 1 \times 10^{-3}$ m $= 2.4 \times 10^{-3}$ m $= 2.24$ mm

Question 172.

If the kinetic energy of the particle is increased to 16 times its previous value, the percentage change in the de-Broglie wavelength of the particle is

[4 Marks]

(A) 60

(B) 25

(C) 50

(D) 75

Explanation:

As we know, $\lambda = h/p = h/\sqrt{2mK}$ ($\because P = \sqrt{2mKE}$)

or $\lambda_1/\lambda_2 = \sqrt{K_2}/K_1 = \sqrt{16K}/K = 4/1$

Therefore, the percentage change in de-Broglie wavelength is

$= 1 - 4/4 \times 100 = -75\%$

Question 173.

When the energy of the incident radiation is increased by 20%, the kinetic energy of the photoelectrons emitted from a metal surface increased from 0.5 eV to 0.8 eV. The work function of the metal is:

[4 Marks]

(A) 1.0 eV

(B) 1.5 eV

(C) 1.3 eV

(D) 0.65 eV

Explanation:

According to Einstein's photoelectric equation,

$h\nu = \phi_o + K_max$

We have

$h\nu = \phi_o + 0.5 ...(i)$

and

$1.2h\nu = \phi_o + 0.8 ...(ii)$

Therefore, from the above two equations,

$\phi_o = 1.0$ eV

Question 174.

Hydrogen atom in ground state is excited by a monochromatic radiation of λ = 975 Å. Number of spectral lines in the resulting spectrum emitted will be:

[4 Marks]

(A) 2

(B) 10

(C) 3

(D) 6

Explanation:

For the

λ=975 Å.

$1=R(1/n_1^2-1/n_2^2)$

where R i s the Rydberg constant.

Solving, we get

$n_2=n=4$

(∵n_1=1, ground state)

Therefore, the number of spectral lines is

=n(n−1)/2=4(4−1)=6.

Question 175.

The binding energy per nucleon of $^{7}_{3}Li$ and $^{4}_{2}He$ nuclei are 5.60 MeV and 7.06 MeV, respectively.

In the nuclear reaction, $^{7}_{3}Li + ^{1}_{1}H \rightarrow ^{4}_{2}He + Q$ the value of energy Q released is:

[4 Marks]

(A) 19.6 MeV

(B) - 2.4 MeV

(C) 8.4 MeV

(D) 17.3 MeV

Explanation:

BE of $^{4}_{2}He$ =4x 7.06= 28.24 MeV

BE of $^{7}_{3}Li$ = =7x5.60=39.20 MeV

$^{7}_{3}Li + ^{1}_{1}H \rightarrow {}_{2}He^{4} + Q$

39.20 28.24 x 2 (2(=56.48 MeV)

Question 176.

A radio isotope "X" with a half life 1.4×10^9 years decays to "Y", which is stable. A sample of the rock from a cave was found to contain "X" and "Y" in the ratio 1:7. The age of the rock is:

[4 Marks]

(A) 8.40×10^9years

(B) 4.20×10^9years

(C) 3.92×10^9 years

(D) 1.96×10^9 years

Explanation:

As

$N_x/N_y = 1/7$ (Given)

$\Rightarrow N_x/(N_x + N_y) = 1/8 = (1/2)^3$

Therefore, age of the rock

$t = 3T_1/_2$

$= 3 \times 1.4 \times 10^9$ years

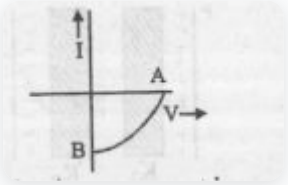
$= 4.2 \times 10^9$ years.

Question 177.

The given graph represents V–I characteristic for a semiconductor device.

Which of the following statement is correct?

[4 Marks]



(A) It is for a photodiode and points A and B represent open circuit voltage and current, respectively.

(B) It is for a LED and points A and B represent open circuit voltage and short circuit current, respectively.

(C) It is for a solar cell and points A and B represent open circuit voltage and current, respectively.

(D) It is V–I characteristic for a solar cell where point A represents open circuit voltage and point B short circuit current.

Explanation:

The given graph represents V–I characteristics of solar cell.

Question 178.

The barrier potential of a p–n junction depends on:

(A) type of semiconductor material

(B) amount of doping

(C) temperature

Which one of the following is correct?

[4 Marks]

(A) (B) and (C) only

(B) (A) and (B) only

(C) (B) only

(D) (A), (B) and (C)

Explanation:

The barrier potential of a p–n junction depends on amount of doping, type of semiconductor material and temperature.

Question 179.

D(+) glucose reacts with hydroxylamine and yields an oxime. The structure of the oxime would be :

[4 Marks]

(A)



(B)



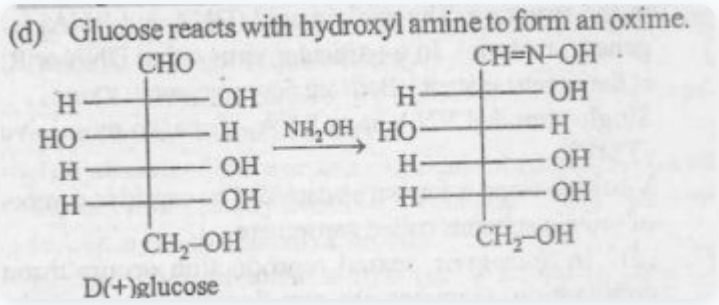
(C)



(D)



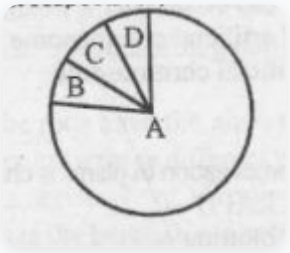
Explanation:



Question 180.

Given below is the representation of the extent of global diversity of invertebrates. What groups the four portion (A-D) represent respectively?

[4 Marks]



(A)

(d)	Insects	Molluscs	Crustaceans	Other animal groups

(B)

(c)	Molluscs	Other animal groups	Crustaceans	Insects

(C)

	A	B	C	D
(a)	Insects	Crusta-ceans	Other ani-mal groups	Molluscs

(D)

(b)	Crusta-ceans	Insects	Molluscs	Other animal groups

Explanation:

Arthropoda is the largest phylum of Animalia which includes insects. Over two-thirds of all named species in earth are arthropods. They have organ system level of organisation. Molluscass the second largest anima] phylum.

They are terrestrial or aquatic (marine or fresh),