NEET (UG)-2019

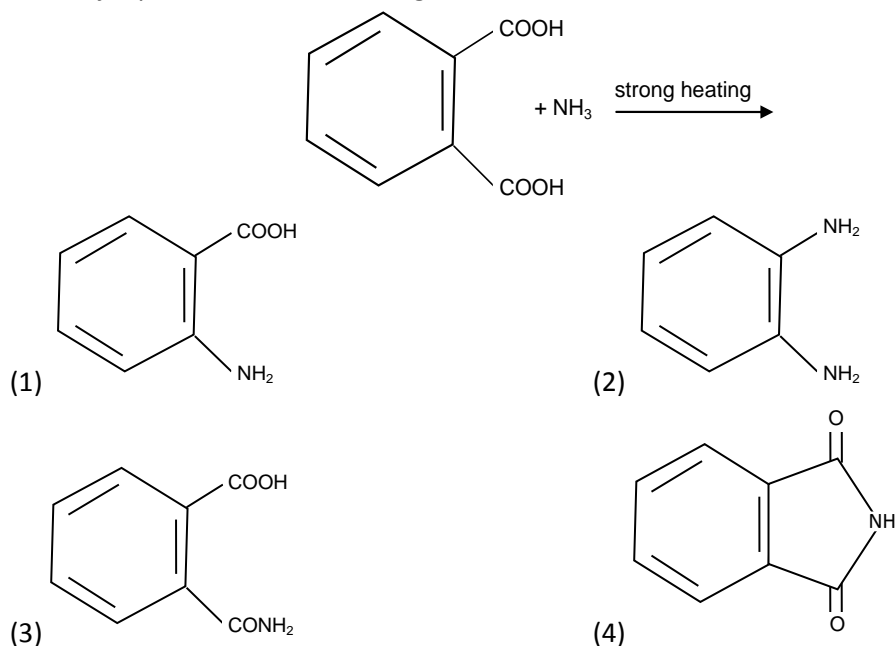**Q.1** Which of the following species is not stable ?

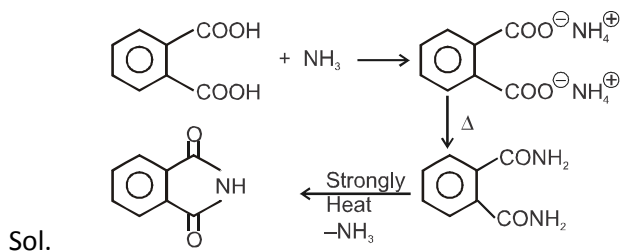(1) $[Sn(OH)_6]^{2-}$ (2) $[SiCl_6]^{2-}$ (3) $[SiF_6]^{2-}$ (4) $[GeCl_6]^{2-}$

Ans: (2)

Sol. $SiCl_6^{2-}$ does not exist

due to steric hindrance of surrounding chlorine

Q.2 The major product of the following reaction

+ NH₃ → strong heating

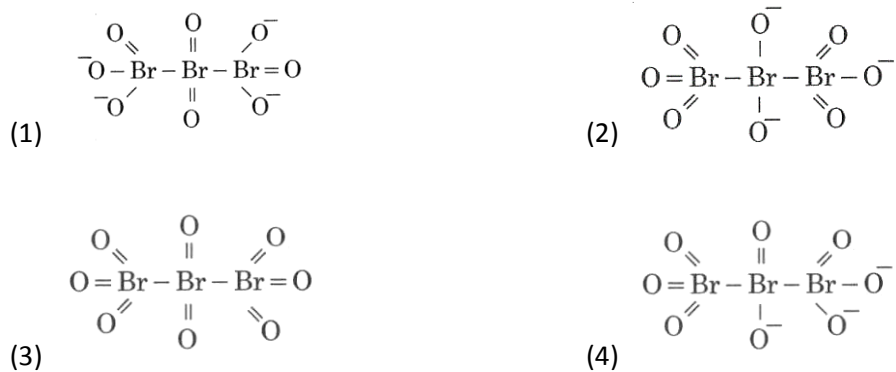

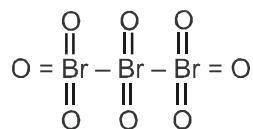(1)   (2)

(3)   (4)

Ans: (4)

Sol.

Q.3 The **correct** structure of tribromooctaoxide is :

(1)   (2)

(3)   (4)

Ans: (3)

Sol.

$$O = \overset{\overset{\displaystyle O}{\|}}{\underset{\underset{\displaystyle O}{\|}}{Br}} - \overset{\overset{\displaystyle O}{\|}}{\underset{\underset{\displaystyle O}{\|}}{Br}} - \overset{\overset{\displaystyle O}{\|}}{\underset{\underset{\displaystyle O}{\|}}{Br}} = O$$

Q.4 Under isothermal condition, a gas at 300 K expands from 0.1 L to 0.25 L against a constant external pressure of 2 bar. The work done by the gas is :

[Given that 1 L bar = 100 J]

(1) 25 J   (2) 30 J   (3) – 30 J   (4) 5 kJ

Ans: (3)

Sol. P_{ext} = 2 bar

V_1 = 0.1 L

V_2 = 0.25 L

$W = -P_{ext} \Delta V$

$= -2 \times (0.25 - 0.10)$

$= -2 \times 0.15$

$= -0.3$ Litre bar

$= -0.3 \times 100$

$= -30$ J

Q.5 A gas at 350 K and 15 bar has molar volume 20 percent smaller than that for an ideal gas under the same conditions. The correct option about the gas and its compressibility factor (Z) is :

(1) Z < 1 and attractive forces are dominant   (2) Z < 1 and repulsive forces are dominant

(3) Z > 1 and attractive forces are dominant   (4) Z > 1 and repulsive forces are dominant

Ans: (1)

Sol. $Z = \dfrac{V_{real}}{V_{ideal}}$

$V_{real} < V_{ideal}$ $\therefore$ Z < 1

For Z < 1, attractive forces are dominant.

Q.6 A compound is formed by cation C and anion A. The anions form hexagonal close packed (hcp) lattice and the cations occupy 75% of octahedral voids. The formula of the compound is :

(1) C_3A_4 (2) C_4A_3 (3) C_2A_3 (4) C_3A_2

Ans: (1)

Sol. $A \longrightarrow hcp \longrightarrow 6$

$C \longrightarrow 75\%$ of OHV $\longrightarrow \dfrac{75}{100} \times 6 = \dfrac{9}{2}$

$\therefore \quad C_{\frac{9}{2}}A_6$

Simplest formula = $C_3 A_4$

Q.7 If the rate constant for a first order reaction is k, the time (t) required for the completion of 99% of the reaction is given by :

(1) t = 4.606/k   (2) t = 2.303/k   (3) t = 0.693/k   (4) t = 6.909/k

Ans: (1)

Sol. $K = \dfrac{2.303}{t} log \left(\dfrac{a_o}{a_o - x}\right)$

$\therefore t_{99}\% = \dfrac{2.303}{K} log \left(\dfrac{100}{1}\right)$

$$t_{99\%} = \frac{2.303}{K} \times 2$$

$$\boxed{t_{99}\% = \frac{4.606}{K}}$$

Q.8 The **correct** order of the basic strength of methyl substituted amines in aqueous solution is :

(1) $(CH_3)_3N > (CH_3)_2NH > CH_3NH_2$ (2) $CH_3NH_2 > (CH_3)_2NH > (CH_3)_3N$

(3) $(CH_3)_2NH > CH_3NH_2 > (CH_3)_3N$ (4) $(CH_3)_3N > CH_3NH_2 > (CH_3)_2NH$

Ans: (3)

Sol. $(CH_3)_2 NH > CH_3 NH_2 > (CH_3)_3 N$

Q.9 For a cell involving one electron E^0_{cell} = 0.59V at 298 K, the equilibrium constant for the cell reaction is : $\left[Given\,that\, \frac{2.303RT}{F} = 0.059V\,at\,T = 298K \right]$

(1) 1.0×10^{10} (2) 1.0×10^{30} (3) 1.0×10^{2} (4) 1.0×10^{5}

Ans: (1)

Sol. n = 1; E^0 = 0.59 V

$E^{\circ}_{cell} = \frac{0.0591}{n} \log K_c$

$0.59 = \frac{0.0591}{1} \log K_c$

$\log K_c = \frac{0.59}{0.0591} = 10$

$\therefore K_c = 1 \times 10^{10}$

Q.10 Which of the following is **incorrect** statement ?

(1) GeX_4 (X = F, Cl, Br, I) is more stable than GeX_2

(2) SnF_4 is ionic in nature

(3) PbF_4 is covalent in nature

(4) $SiCl_4$ is easily hydrolysed

Ans: (3)

Sol. PbF_4 is ionic in nature

Q.11 Match the Xenon compounds in **Column – I** with its structure is **Column – II** and assign the **correct** code :

	Column – I		Column-II
(a)	XeF_4	(i)	Pyramidal
(b)	XeF_6	(ii)	square planar
(c)	$XeOF_4$	(iii)	Distorted octahedral
(d)	XeO_3	(iv)	square pyramidal

Code :

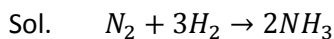|	(a)	(b)	(c)	(d)
(1)	(ii)	(iii)	(i)	(iv)
(2)	(iii)	(iv)	(i)	(ii)
(3)	(i)	(ii)	(iii)	(iv)
(4)	(ii)	(iii)	(iv)	(i)

Ans: (4)

Sol. VSEPR theory

XeF_4 AB_4L_2 Square planar

XeF$_6$	AB$_6$L$_1$	Distorted octahedral
XeOF$_4$	AB$_5$L$_1$	Square pyramidal
XeO$_3$	AB$_3$L$_1$	Pyramidal

Q.12 The number of moles of hydrogen molecules required to produce 20 moles of ammonia through Haber's process is :

(1) 30   (2) 40   (3) 10   (4) 20

Ans: (1)

Sol. $N_2 + 3H_2 \rightarrow 2NH_3$

Stoichiometric Ratio   1 3 2

$\therefore$ To form 20 mol of NH$_3$, 30 mol of H$_2$ are required.

Q.13 The manganate and permanganate ions are tetrahedral due to :

(1) The π-bonding involves overlap of p-orbitals of oxygen with p-orbitals of manganese

(2) The π-bonding involves overlap of d-orbitals of oxygen with d-orbitals of manganese

(3) The π-bonding involves overlap of p-orbitals of oxygen with d-orbitals of manganese

(4) There is no π-bonding

Ans: (3)

Sol. π-bonding involves overlap of p-orbital of oxygen with d-orbitals of manganese.

Q.14 Enzymes that utilize ATP in phosphate transfer require an alkaline earth metal (M) as the cofactor M is :

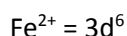(1) Ca   (2) Sr   (3) Be   (4) Mg

Ans: (4)

Sol. All enzymes that utilises ATP in phosphate transfer require magnesium as the cofactor.

Q.15 What is the **correct** electronic configuration of the central atom in K$_4$[Fe(CN)$_6$] based on crystal field theory ?

(1) $e^3 t_2^3$ (2) $e^4 t_2^2$ (3) $t_{2g}^4 e_g^2$ (4) $t_{2g}^6 e_g^0$

Ans: (4)

Sol. K$_4$ [Fe(CN)$_6$]

Fe^{2+} = 3d^6

As CN$^-$ is a strong field ligand
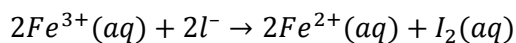
Hence $t_{2g}^6 e_g^0$

Q.16 Among the following, the one that is **not** a green house gas is :

(1) ozone   (2) sulphur dioxide   (3) nitrous oxide   (4) methane

Ans: (2)

Sol. sulphur dioxide

Q.17 For the cell reaction

$2Fe^{3+}(aq) + 2l^- \rightarrow 2Fe^{2+}(aq) + I_2(aq)$

$E_{cell}^0 = 0.24 V \, at \, 298 K$.

The standard Gibbs energy ($\Delta_r G^\ominus$) of the cell reaction is :

[Given that Faraday constant F = 96500 C mol^{-1}]

(1) 46.32 kJ mol^{-1} (2) 23.16 kJ mol^{-1} (3) $-$ 46.32 kJ mol^{-1} (4) $-$ 23.16 kJ mol^{-1}
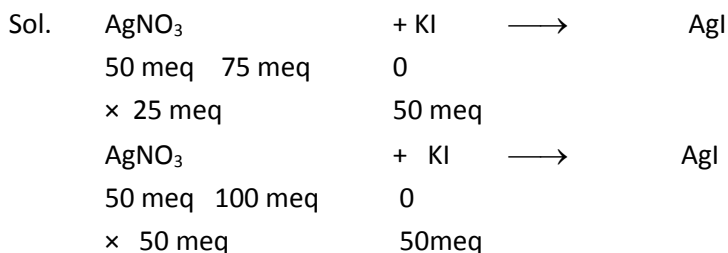
Ans: (3)

Sol. $\Delta G° = - nFE°$

$\qquad = - 2 \times 96500 \times 0.24$

$\qquad = - 46.32 \text{ kJ mol}^{-1}$

Q.18 Which mixture of the solutions will lead to the formation of negatively charged colloidal $[AgI]I^-$ sol. ?

(1) 50 ml of 2 M $AgNO_3$ + 50 ml of 1.5 M KI   (2) 50 ml of 0.1 M $AgNO_3$ + 50 ml of 0.1 M KI

(3) 50 ml of 1 M $AgNO_3$ + 50 ml of 1.5 M KI   (4) 50 ml of 1 M $AgNO_3$ + 50 ml of 2 M KI

Ans: (3,4)

Sol.
$AgNO_3$ $\qquad\qquad$ + KI $\qquad \longrightarrow \qquad$ AgI

50 meq   75 meq $\qquad$ 0

× 25 meq $\qquad\qquad$ 50 meq

$AgNO_3$ $\qquad\qquad$ + KI $\qquad \longrightarrow \qquad$ AgI

50 meq   100 meq $\qquad$ 0

× 50 meq $\qquad\qquad$ 50 meq

Q.19 Which one is malachite from the following?

(1) Fe_3O_4 $\qquad$ (2) $CuCO_3.Cu(OH)_2$ $\qquad$ (3) $CuFeS_2$ $\qquad$ (4) $Cu(OH)_2$

Ans: (2)

Sol. $CuCO_3. Cu(OH)_2$ is malachite

Q.20 Among the following, the narrow spectrum antibiotic is :

(1) amoxycillin $\qquad$ (2) chloramphenicol $\qquad$ (3) penicillin G $\qquad$ (4) ampicillin

Ans: (3)

Sol. Penicillin G

Q.21 Which of the following is an amphoteric hydroxide ?

(1) $Mg(OH)_2$ $\qquad$ (2) $Be(OH)_2$ $\qquad$ (3) $Sr(OH)_2$ $\qquad$ (4) $Ca(OH)_2$

Ans: (2)

Sol. $Be(OH)_2$

Q.22 The non-essential amino acid among the following is :

(1) alanine $\qquad$ (2) lysine $\qquad$ (3) valine $\qquad$ (4) leucine

Ans: (1)

Sol. Alanine

Q.23 Which of the following diatomic molecular species has only π bonds according to Molecular Orbital Theory ?

(1) C_2 $\qquad$ (2) Be_2 $\qquad$ (3) O_2 $\qquad$ (4) N_2

Ans: (1)

Sol. C_2 has 2 π-bonds according to molecular orbital theory

Q.24 The biodegradable polymer is :

(1) nylon-6 $\qquad$ (2) Buna-S $\qquad$ (3) nylon-6,6 $\qquad$ (4) nylon 2-nylon 6

Ans: (4)

Sol.   nylon 2-nylon 6

Q.25   In which case change in entropy is negative ?
        (1) Sublimation of solid to gas   (2) $2H(g) \rightarrow H_2(g)$
        (3) Evaporation of water   (4) Expansion of a gas at constant temperature
Ans: (2)
Sol.   In reaction $2 H(g) \longrightarrow H_2(g)$ number of particles decreases in forward reaction
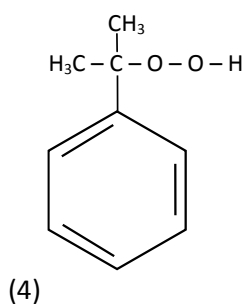 $\therefore$ Entropy decreases
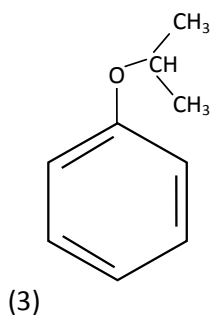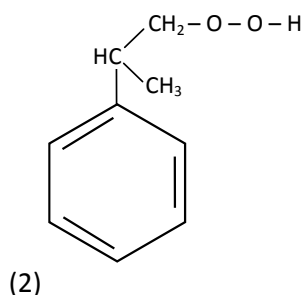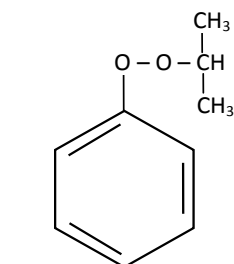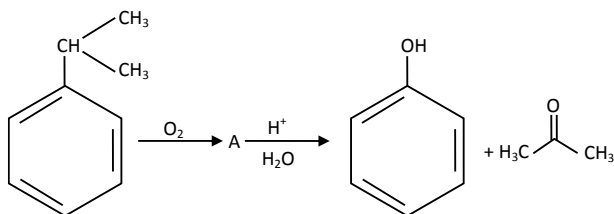
Q.26   The mixture that forms maximum boiling azeotrope is :
        (1) Acetone + Carbon disulphide   (2) Heptane + Octane
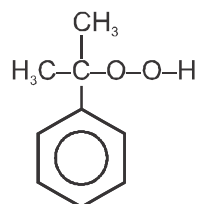   (3) Water + Nitric Acid   (4) Ethanol + Water
Ans: (3)
Sol. H_2O + HNO_3 forms maximum boiling azeotrope

Q.27   The structure of intermediate A in the following reaction, is :

Ans: (4)

Sol.   Intermediate

Q.28   Match the following :
        (a) Pure nitrogen   (i) Chlorine

(b) Haber process   (ii) Sulphuric acid

(c) Contact process   (iii) Ammonia

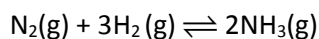(d) Deacon's process   (iv) Sodium azide or Barium azide

Which of the following is the correct option ?

	(a)	(b)	(c)	(d)
(1)	(iii)	(iv)	(ii)	(i)
(2)	(iv)	(iii)	(ii)	(i)
(3)	(i)	(ii)	(iii)	(iv)
(4)	(ii)	(iv)	(i)	(iii)

Ans: (2)

Sol.   Theory based.

Q.29   For the chemical reaction

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

The correct option is :

(1) $-\dfrac{d[N_2]}{dt} = \dfrac{1}{2}\dfrac{d[NH_3]}{dt}$

(2) $3\dfrac{d[H_2]}{dt} = 2\dfrac{d[NH_3]}{dt}$

(3) $-\dfrac{1}{3}d\dfrac{d[H_2]}{dt} = -\dfrac{1}{2}\dfrac{d[NH_3]}{dt}$

(4) $-\dfrac{d[N_2]}{dt} = 2\dfrac{d[NH_3]}{dt}$
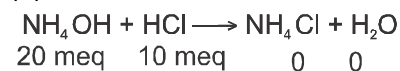
Ans: (1)

Sol. $-\dfrac{dN_2}{dt} = -\dfrac{1}{3}\dfrac{dH_2}{dt} = \dfrac{1}{2}\dfrac{dNH_3}{dt}$

$-\dfrac{dN_2}{dt} = \dfrac{1}{2}\dfrac{dNH_3}{dt}$

Q.30   Which will make basic buffer ?

(1) 100 ml of 0.1 M HCl + 200 ml of 0.1 M NH_4OH

(2) 100 ml of 0.1 M HCl + 100 ml of 0.1 M NaOH

(3) 50 ml of 0.1 M NaOH + 25 ml of 0.1 M CH_3COOH

(4) 100 ml of 0.1 M CH_3COOH + 100 ml of 0.1 M NaOH

Ans: (1)

Sol.

$\begin{array}{cccc}NH_4OH &+\ HCl &\longrightarrow\ NH_4Cl &+\ H_2O\\ 20\ meq & 10\ meq & 0 & 0\\ 10\ meq & 0 & 10\ meq & 10\ meq\end{array}$

$\therefore NH_4OH + NH_4Cl$ is a basic buffer.

Q.31   The compound that is most difficult to protonate is :

(1)   (2)

(3)   (4)

Ans: (2)

Sol.
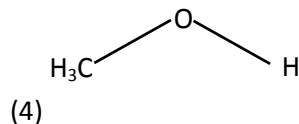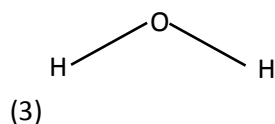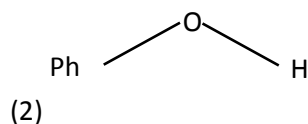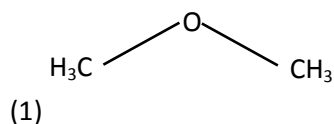
ℓP is involved in resonance

Q.32 Which of the following reactions are disproportionation reaction ?

(a) $2 Cu^+ \rightarrow Cu^{2+} + Cu^0$

(b) $3MnO_4^{2-} + 4H^+ \rightarrow 2MnO_4^- + MnO_2 + 2H_2O$

(c) $2KMnO_4 \xrightarrow{\Delta} K_2MnO_4 + MnO_2 + O_2$

(d) $2MnO_4^- + 3Mn^{2+} + 2H_2O \rightarrow 5MnO_2 + 4H^{\oplus}$

Select the **correct** option from the following :

(1) (a), (c) and (d)   (2) (a) and (d) only   (3) (a) and (b) only   (4) (a), (b) and (c)
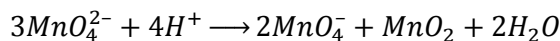
Ans: (3)

Sol. $2Cu^+ \longrightarrow Cu^{2+} + Cu^{\underline{o}}$

In above reaction,

Cu is in +1 oxidation state in Cu^+

which is changing in +2 in Cu^{2+} & 0 in Cu.

$3MnO_4^{2-} + 4H^+ \longrightarrow 2MnO_4^- + MnO_2 + 2H_2O$

In above reaction, Mn has + 6 oxidation state in MnO_4^{2-} which is changing in +7 in MnO_4^- and +4 in MnO_2.

Q.33 Identify the incorrect statement related to PCl₅ from the following :

(1) Axial P — Cl bonds are longer than equatorial P— Cl bonds

(2) PCl₅ molecule is non-reactive

(3) Three equatorial P—Cl bonds make an angle of 120º with each other

(4) Two axial P—Cl bonds make an angle of 180 with each other

Ans: (2)

Sol. PCl₅ is reactive in nature
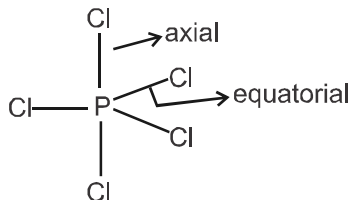
Bond length

axial > equatorial

Q.34 4d, 5p, 5f and 6p orbitals are arranged in the order of decreasing energy. The **correct** option is :

(1) 6p > 5f > 4d > 5p   (2) 5f > 6p > 4d > 5p   (3) 5f > 6p > 5p > 4d   (4) 6p > 5f > 5p > 4d

Ans: (3)

Sol.

	6p	5f	5p	4d
$(n + \ell)$	6+1	5+3	5+1	4+2
	7	8	6	6

order : 5f > 6p > 5p > 4d

Q.35 The number of sigma (σ) and pi (π) bonds in pent-2-en-4-yne is :

(1) 11 σ bonds and 2 π bonds   (2) 13 σ bonds and no π bonds

(3) 10 σ bonds and 3 π bonds   (4) 8 σ bonds and 5 π bonds

Ans: (3)

Sol.

$$H-\overset{\overset{\displaystyle H}{|}}{\underset{\underset{\displaystyle H}{|}}{C}}-\overset{\overset{\displaystyle H}{|}}{C}=\overset{\overset{\displaystyle H}{|}}{C}-C\equiv C-H$$

No. of σ bonds = 10
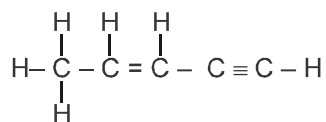
No. of π bonds = 3

Q.36 Which is the **correct** thermal stability order for H_2E (E = O, S, Se, Te and Po) ?

(1) $H_2Po < H_2Te < H_2Se < H_2S < H_2O$

(2) $H_2Se < H_2Te < H_2Po < H_2O < H_2S$

(3) $H_2S < H_2O < H_2Se < H_2Te < H_2Po$

(4) $H_2O < H_2S < H_2Se < H_2Te < H_2Po$

Ans: (1)

Sol. $H_2Po < H_2Te < H_2Se < H_2S < H_2O$

H_2O has maximum bond energy.

Q.37 Conjugate base for $Br\ddot{o}nsted$ acids H_2O and HF are :

(1) OH^- and F^-, respectively

(2) H_3O^+ and H_2F^+, respectively

(3) OH^- and H_2F^+, respectively

(4) H_3O^+ and F^-, respectively

Ans: (1)

Sol. $\underset{Acid}{H_2O} \longrightarrow H^+ + \underset{conjugate\ Base}{OH^-}$

$\underset{Acid}{HF} \longrightarrow H^+ + \underset{Bronsted\ Base}{HF}$

Q.38 Which of the following series of transitions in the spectrum of hydrogen atom falls in visible region ?

(1) Paschen series (2) Brackett series (3) Lyman series (4) Balmer series

Ans: (4)

Sol. Balmer series

Q.39 The most suitable regent for the following conversion is :

cis-2-butene

$H_3C-C\equiv C-CH_3 \longrightarrow$
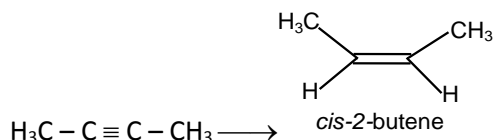
(1) Zn/HCl (2) Hg^{2+}/H^+, H_2O (3) Na/liquid NH_3 (4) H_2, Pd/C, quinoline

Ans: (4)

Sol. H_2/Pd/C quinoline (The reaction involves syn addition)

Q.40 For the second period elements the **correct** increasing order of first ionization enthalpy is :

(1) Li < B < Be < C < N < O < F < Ne

(2) Li < Be < B < C < O < N < F < Ne

(3) Li < Be < B < C < N < O < F < Ne

(4) Li < B < Be < C < O < N < F < Ne

Ans: (4)

Sol. Li < B < Be < C < O < N < F < Ne

Q.41 pH of a saturated solution of $Ca(OH)_2$ is 9. The solubility product (K_{sp}) of Ca $(OH)_2$ is :

(1) 0.125×10^{-15} (2) 0.5×10^{-10} (3) 0.5×10^{-15} (4) 0.25×10^{-10}

Ans: (3)

Sol. If $p^H = 9$ then $p^{OH} = 5$

$$\therefore [OH^-] = 10^{-5} = 25$$

So $S = \frac{1}{2} \times 10^{-5}$

$Ksp = 4S^3$

$$= 4 \times \left(\frac{1}{2} \times 10^{-5}\right)^3$$

$$\boxed{Ksp = 0.5 \times 10^{-15}}$$

Q.42 An alkene ''A'' on reaction with O_3 and $Zn - H_2O$ gives propanone and ethanal in equimolar ratio. Addition of HCl to alkene ''A'' gives "B" as the major product. The structure of product "B" is :

(1)
$$H_3C - CH_2 - \underset{\underset{Cl}{|}}{\overset{\overset{CH_3}{|}}{C}} - CH_3$$

(2)
$$H_3C - \underset{\underset{Cl}{|}}{CH} - \underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{CH}}$$

(3)
$$Cl - CH_2 - CH_2 - \underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{CH}}$$

(4)
$$H_3C - CH_2 - \underset{\underset{CH_2Cl}{|}}{CH} - CH_3$$
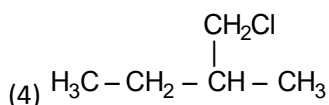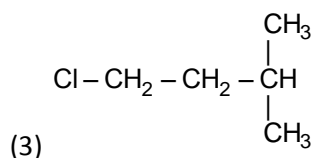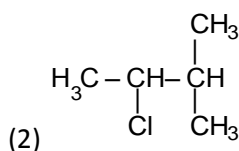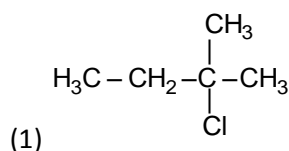
Ans: (1)
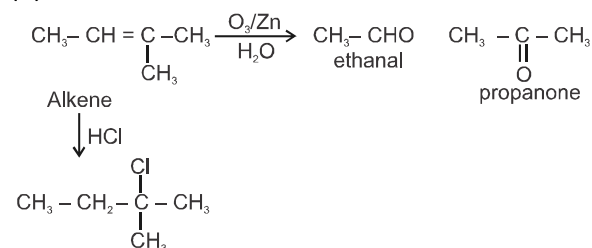
Sol.

Q.43 The method used to remove temporary hardness of water is :

(1) Ion-exchange method (2) Synthetic resins method

(3) Calgon's method (4) Clark's method

Ans: (4)

Sol. Clark's method is used to remove temporary hardness.

Q.44 For an ideal solution, the **correct** option is :

(1) $\Delta_{mix} H = 0$ at constant T and P (2) $\Delta_{mix} G = 0$ at constant T and P

(3) $\Delta_{mix} S = 0$ at constant T and P (4) $\Delta_{mix} V \neq 0$ at constant T and P

Ans: (1)

Sol. For ideal solution, enthalpy of mixing is zero.

$\therefore \Delta H_{mix} = 0$ at constant T & P

Q.45 Among the following, the reaction that proceeds through an electrophilic substitution, is :

(1) $\bigcirc + Cl_2 \xrightarrow{\text{UV light}}$ Cl—[ring with Cl, Cl, Cl, Cl, Cl, Cl]—Cl

(2) $\bigcirc-CH_2OH + HCl \xrightarrow{\text{heat}} \bigcirc-CH_2Cl + H_2O$

(3) $\bigcirc-\overset{+}{N}_2Cl^- \xrightarrow{Cu_2Cl_2} \bigcirc-Cl + N_2$

(4) $\bigcirc + Cl_2 \xrightarrow{AlCl_3} \bigcirc-Cl + HCl$

Ans: (4)
Sol.   (1) FRAR
      (2) $S_N{}^1$
      (3) NSR
      (4) ESR

Q.46   What is the site of perception of photoperiod necessary for induction of flowering in plants?
      (1) Shoot apex   (2) Leaves   (3) Lateral buds   (4) Pulvinus
Ans: (2)
Sol.

Q.47   Match the following hormones with the respective disease :
      (a) Insulin   (i) Addison's disease
      (b) Thyroxin   (ii) Diabetes insipidus
      (c) Corticoids   (iii) Acromegaly
      (d) Growth   (iv) Goitre Hormone
      (v) Diabetes mellitus
      Select the **correct** option.
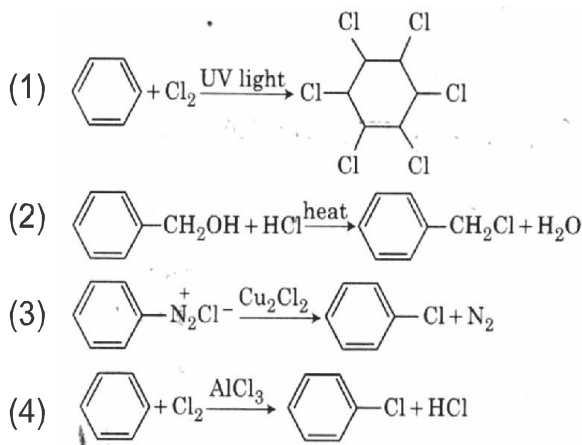
	(a)	(b)	(c)	(d)
(1)	(v)	(iv)	(i)	(iii)
(2)	(ii)	(iv)	(i)	(iii)
(3)	(v)	(i)	(ii)	(iii)
(4)	(ii)	(iv)	(iii)	(i)

Ans: (1)
Sol.

Q.48   Use of an artificial kidney during hemodialysis may result in :
      (a) Nitrogenous waste build-up in the body
      (b) Non-elimination of excess potassium ions
      (c) Reduced absorption of calcium ions from gastro-intestinal tract
      (d) Reduced RBC production
      Which of the following options is the most **appropriate** ?
      (1) (c) and (d) are correct   (2) (a) and (d) are correct
      (3) (a) and (b) are correct   (4) (b) and (c) are correct
Ans: (1)

Sol.

Q.49 Which of the following ecological pyramids is generally inverted ?
(1) Pyramid of biomass in a forest
(2) Pyramid of biomass in a sea
(3) Pyramid of numbers in grassland
(4) Pyramid of energy
Ans: (2)
Sol.

Q.50 Select the hormone-releasing Intra-Uterine Devices.
(1) Progestasert, LNG-20
(2) Lippes Loop, Multiload 375
(3) Vaults, LNG-20
(4) Multiload 375, Progestasert
Ans: (1)
Sol.

Q.51 Respiratory Quotient (RQ) value of tripalmitin is :
(1) 0.07
(2) 0.09
(3) 0.9
(4) 0.7
Ans: (4)
Sol.

Q.52 Which of the following statements regarding mitochondria is **incorrect** ?
(1) Inner membrane is convoluted with infoldings.
(2) Mitochondrial matrix contains single circular DNA molecule and ribosomes
(3) Outer membrane is permeable to monomers of carbohydrates fats and proteins
(4) Enzymes of electron transport are embedded in outer membrane
Ans: (4)
Sol.

Q.53 Which of the following can be used as a biocontrol agent in the treatment of plant disease ?
(1) *Anabaena*
(2) *Lactobacillus*
(3) *Trichoderma*
(4) *Chlorella*
Ans: (3)
Sol.

Q.54 Xylem translocates :
(1) Water, mineral salts and some organic nitrogen only
(2) Water, mineral salts, some organic nitrogen and hormones
(3) Water only
(4) Water and mineral salts only
Ans: (2)
Sol.

Q.55 Which one of the following equipments is essentially required for growing microbes on a large scale, for industrial production of enzymes ?
(1) Industrial oven
(2) Bioreactor
(3) BOD incubator
(4) Sludge digester
Ans: (2)
Sol.

Q.56 A gene Locus has two alleles, A, a. If the frequency of dominant allele A is 0.4, then what will be the frequency of homozygous dominant, heterozygous and homozygous recessive individuals in the population ?

(1) 0.16(AA); 0.48 (Aa); 0.36 (aa)   (2) 0.16(AA); 0.36(Aa); 0.48 (aa)

(3) 0.36(AA); 0.48(Aa); 0.16 (aa)   (4) 0.16(AA); 0.24(Aa); 0.36 (aa)

Ans: (1)

Sol.

Q.57 Expressed Sequence Tags (ESTs) refers to :

(1) DNA polymorphism   (2) Novel DNA sequences

(3) Genes expressed as RNA   (4) Polypeptide expression

Ans: (3)

Sol.

Q.58 Which of the following sexually transmitted diseases is **not** completely curable ?

(1) Genital herpes   (2) Chlamydiasis   (3) Gonorrhoea   (4) Genital warts

Ans: (3)

Sol.

Q.59 DNA precipitation out of a mixture of biomolecules can be achieved by treatment with :

(1) Methanol at room temperature   (2) Chilled chloroform

(3) Isopropanol   (4) Chilled ethanol

Ans: (4)

Sol.

Q.60 Which of the following immune responses is responsible for rejection of kidney graft ?

(1) Inflammatory immune response   (2) Cell-mediated immune response

(3) Auto-immune response   (4) Humoral immune response

Ans: (2)

Sol.

Q.61 Variations caused by mutation, as proposed by Hugo de Vries, are :

(1) small and directional   (2) small and directionless

(3) random and directional   (4) random and directionless

Ans: (4)

Sol.

Q.62 Which of the following statements is **not** correct ?

(1) Lysosomes are membrane bound structures.

(2) Lysosomes are formed by the process of packaging in the endoplasmic reticulum.

(3) Lysosomes have numerous hydrolytic enzymes.

(4) The hydrolytic enzymes of lysosomes are active under acidic pH.

Ans: (2)

Sol.

Q.63 Which of the following statements is **incorrect ?**

(1) Conidia are produced exogenously and ascospores endogenously.

(2) Yeasts have filamentous bodies with long thread-like hyphae.

(3) Morels and truffles are edible delicacies.

(4) *Claviceps* is a source of many alkaloids and LSD

Ans: (2)

Sol.

Q.64 Identify the **correct** pair representing the causative agent of typhoid fever and the confirmatory test for typhoid.

(1) *Salmonella typhi* / Anthrone test

(2) *Salmonella typhi* / Widal test

(3) *Plasmodium vivax* / UTI test

(4) *Streptococcus peumoniae* / Widal test

Ans: (2)

Sol.

Q.65 What is the genetic disorder in which an individual has an overall masculine development, gynaecomastia, and is sterile ?

(1) Edward syndrome

(2) Down's syndrome

(3) Turner's syndrome

(4) Klinefelter's syndrome

Ans: (4)

Sol.

Q.66 Match the **Column-I** with **Column-II** :

	Column-I		**Column-II**
(a)	P-wave	i.	Depolarisation of ventricles
(b)	QRS complex	ii.	Repolarisation of ventricles
(c)	T – wave	iii.	Coronary schemia
(d)	Reduction in the size of T - wave	iv.	Depolarisation of atria
		v.	Repolarisation of atria

Select the **correct** option.

	(a)	**(b)**	**(c)**	**(d)**
(1)	(ii)	(i)	(v)	(iii)
(2)	(ii)	(iii)	(v)	(iv)
(3)	(iv)	(i)	(ii)	(iii)
(4)	(iv)	(i)	(ii)	(v)

Ans: (3)

Sol.

Q.67 Which of the following glucose transporters is insulin-dependent ?

(1) GLUT III   (2) GLUT IV   (3) GLUT I   (4) GLUT II

Ans: (2)

Sol.

Q.68 Identify the cells whose secretion protects the lining of gastro-intestinal tract from various enzymes.

(1) Oxyntic Cells   (2) Duodenal Cells   (3) Chief Cells   (4) Goblet Cells

Ans: (4)

Sol.

Q.69 Which one of the following statements regarding post-fertilization development in flowering plant is **incorrect** ?

(1) Central cell develops into endosperm   (2) Ovules develop into embryo sac

(3) Ovary develops into fruit   (4) Zygote develops into embryo

Ans: (2)

Sol.

Q.70 The **correct** sequence of phases cell cycle is :

(1) $S \rightarrow G_1 \rightarrow G_2 \rightarrow M$ (2) $G_1 \rightarrow S \rightarrow G_2 \rightarrow M$ (3) $S \rightarrow G_1 \rightarrow G_2 \rightarrow S$ (4) $G_1 \rightarrow G_2 \rightarrow S \rightarrow M$

Ans: (2)

Sol.

Q.71 The concept of *"Omnis cellula-e cellula"* regarding cell division was first proposed by

(1) Schleiden   (2) Aristotle   (3) Rudolf Virchow   (4) Theodore Schwann

Ans: (3)

Sol.

Q.72 What triggers activation of protoxin to active Bt toxin of *Bacillus thuringiensis* in boll worm?

(1) Alkaline pH of gut   (2) Acidic pH of stomach

(3) Body temperature   (4) Moist surface of midgut

Ans: (1)

Sol.

Q.73 Concanavalin A is :

(1) a lectin   (2) a pigment   (3) an alkaloid   (4) an essential oil

Ans: (1)

Sol.

Q.74 Select the **correct** sequence for transport of sperm cells in male reproductive system.

(1) Seminiferous tubules → Vasa efferetia → Epididymis → Inguinal canal → Urethra

(2) Testis → Epididymis → Vasa efferentia → Vas deferens → Ejaculatory duct → Inguinal canal → Urethra → Urethral meatus

(3) Testis → Epididymis → Vasa efferentia → Rete testis → Inguinal canal → Urethra

(4) Seminiferous tubules → Rete testis → Vasa efferentia → Epididymis → Vas deferens → Ejaculatory duct → Urethra → Urethral meatus

Ans: (4)

Sol.

Q.75 Which of the following statements is **correct** ?

(1) Cornea is convex, transparent layer which is highly vascularised.

(2) Cornea consists of dense matrix of collagen and is the most sensitive portion of the eye.

(3) Cornea is an external, transparent and protective proteinacious covering of the eye-ball.

(4) Cornea consists of dense connective tissue of elastin and can repair itself.

Ans: (3)

Sol.

Q.76   Drug called 'Heroin' is synthesized by :

(1) glycosylation of morphine   (2) nitration of morphine

(3) Methylation of morphine   (4) Acetylation of morphine

Ans: (4)

Sol.

Q.77   Under which of the following conditions will there be no change in the reading frame of following mRNA ?

5' AACAGCGGUGCUAUU 3'

(1) Insertion of A and G at 4th and 5th positions respectively.

(2) Deletion of GGU from 7th, 8th and 9th positions

(3) Insertion of G at 5th position

(4) Deletion of G from 5th position

Ans: (2)

Sol.

Q.78   Which of the following is **true** for Golden rice ?

(1) It is drought tolerant, developed using *Agrobacterium* vector.

(2) It has yellow grains, because of a gene introduced from a primitive variety of rice.

(3) It is Vitamin A enriched, with a gene from daffodil.

(4) It is pest resistant, with a gene from *Bacillus thuringiensis*.

Ans: (3)

Sol.

Q.79   The ciliated epithelial cells are required to move particles or mucus in a specific direction. In humans, these cells are mainly present in :

(1) Eustachian tube and Salivary duct   (2) Bronchioles and Fallopian tubes

(3) Bile duct and Bronchioles   (4) Fallopian tubes and Pancreatic duct

Ans: (2)

Sol.

Q.80   Phloem in gymnosperms lacks :

(1) Companion cells only   (2) Both sieve tubes and companion cells

(3) Albuminous cells and sieve cells   (4) Sieve tubes only

Ans: (2)

Sol.

Q.81   Grass leaves curl inwards during very dry weather. Select the most appropriate reason from the following :

(1) Shrinkage of air spaces in spongy mesophyll (2) Tyloses in vessels

(3) Closure of stomata (4) Flaccidity of bulliform cells

Ans: (4)

Sol.

Q.82 Tidal Volume and Expiratory Reserve Volume of an athlete is 500 mL and 1000 mL respectively. What will be his Expiratory Capacity if the Residual Volume is 1200 mL ?

(1) 2200 mL (2) 2700 mL (3) 1500 mL (4) 1700 mL

Ans: (3)

Sol.

Q.83 Select the **correct** sequence of organs in the alimentary canal of cockroach starting from mouth :

(1) Pharynx → Oesophagus → Gizzard → Ileum → Crop → Colon → Rectum

(2) Pharynx → Oesophagus → Ileum → Crop → Gizzard → Colon → Rectum

(3) Pharynx → Oesophagus → Crop → Gizzard → Ileum → Colon → Rectum

(4) Pharynx → Oesophagus → Gizzard → Crop → Ileum → Colon → Rectum

Ans: (3)

Sol.

Q.84 Select the **incorrect** statement.

(1) Inbreeding selects harmful recessive genes that reduce fertility and productivity.

(2) Inbreeding helps in accumulation of superior genes and elimination of undesirable genes.

(3) Inbreeding increases homozygosity.

(4) Inbreeding is essential to evolve purelines in any animal.

Ans: (1)

Sol.

Q.85 Select the **correct** group of biocontrol agents.

(1) *Oscillatoria, Rhizobium, Trichoderma*

(2) *Nostoc, Azospirillium Nucleopolyhedrovirus*

(3) *Bacillus thuringiensis*, Tobacco mosaic virus, Aphids

(4) *Trichoderma, Baculovirus, Bacillus thuringiensis*

Ans: (4)

Sol.

Q.86 *Thiobacillus* is a group of bacteria helpful in carrying out :

(1) Nitrification (2) Denitrification

(3) Nitrogen fixation (4) Chemoautotrophic fixation

Ans: (2)

Sol.

Q.87 Which of the statements given below is **not** true about formation of Annual Rings in trees ?

(1) Activity of cambium depends upon variation in climate.

(2) Annual rings are not prominent in trees of temperate region.

(3) Annual ring is a combination of spring wood and autumn wood produced in a year.

(4) Differential activity of cambium causes light and dark bands of tissue – early and late wood respectively.

Ans: (2)

Sol.

Q.88 It takes long time for pineapple plants to produce flowers. Which combination of hormones can be applied to artificially induce flowering in pineapple plants throughout the year to increase yield ?

(1) Gibberellin and Abscisic acid   (2) Cytokinin and Abscisic acid

(3) Auxin and Ethylene   (4) Gibberellin and Cytokinin

Ans: (3)

Sol.

Q.89 Polyblend, a fine powder of recycled modified plastic, has proved to be a good material for :

(1) construction of roads   (2) making tubes and pipes

(3) making plastic sacks   (4) use as a fertilizer

Ans: (1)

Sol.

Q.90 The shorter and longer arms of a submetacentric chromosome are referred to as :

(1) q-arm and p-arm respectively   (2) m-arm and n-arm respectively

(3) s-arm and l-arm respectively   (4) p-arm and q-arm respectively

Ans: (4)

Sol.

Q.91 Which of the following statements is **incorrect** ?

(1) Infective constituent in viruses is the protein coat.

(2) Prions consist of abnormally folded proteins.

(3) Viroids lack a protein coat.

(4) Viruses are obligate parasites.

Ans: (1)

Sol.

Q.92 Conversion of glucose to glucose-6-phosphate, the first irreversible reaction of glycolysis, is catalyzed by :

(1) Enolase   (2) Phosphofructokinase

(3) Aldolase   (4) Hexokinase

Ans: (4)

Sol.

Q.93 Select the **correctly** written scientific name of Mango which was first described by Carolus Linnaeus :

(1) *Mangifera indica*   (2) *Mangifera Indica*

(3) *Mangifera indica Car*. Linn.   (4) *Mangifera indica* Linn.

Ans: (4)

Sol.

Q.94   Persistant nucellus in the seed is known as :
        (1) Hilum   (2) Tegmen   (3) Chalaza   (4) Perisperm
Ans: (4)
Sol.

Q.95   Placentation, in which ovules develop on the inner wall of the ovary or in peripheral part, is :
        (1) Parietal   (2) Free central   (3) Basal   (4) Axile
Ans: (1)
Sol.

Q.96   Match the following organisms with their respective characteristics :
        (a) *Pila*   (i) Flame cells
        (b) *Bombyx*   (ii) Comb plates
        (c) *Pleurobrachia*   (iii) Radula
        (d) *Taenia*   (iv) Malpighian tubules
        Select the **correct** option from the following :
               (a)   **(b)**   **(c)**   **(d)**
        (1)   (ii)   (iv)   (iii)   (i)
        (2)   (iii)   (ii)   (iv)   (i)
        (3)   (iii)   (ii)   (i)   (iv)
        (4)   (iii)   (iv)   (ii)   (i)
Ans: (4)
Sol.

Q.97   Which of these following methods is the most suitable for disposal of nuclear waste ?
        (1) Dump the waste within rocks under deep ocean
        (2) Bury the waste within rocks deep below the Earth's surface.
        (3) Shoot the waste into space.
        (4) Bury the waste under Antarctic ice-cover
Ans: (2)
Sol.

Q.98   In some plants, the female gamete develops into embryo without fertilization. This phenomenon is
        known as :
        (1) Syngamy   (2) Parthenogenesis   (3) Autogamy   (4) Parthenocarpy
Ans: (2)
Sol.

Q.99   Cells in G_0 phase :
        (1) suspend the cell cycle   (2) terminate the cell cycle
        (3) exit cell cycle   (4) enter the cell cycle
Ans: (3)
Sol.

Q.100   Select the **correct** option.

(1) Each rib is a flat thin bone and all the ribs are connected dorsally to the thoracic vertebrae and ventrally to the sternum.

(2) There are seven pairs of vertebrosternal, three pairs of vertebrochondral and two pairs of vertebral ribs.

(3) 8^{th,} 9th and 10th pairs of ribs articulate directly with the sternum

(4) 11th and 12th Pairs of ribs are connected to the sternum with the help of hyaline cartilage.

Ans: (2)

Sol.

Q.101 Match the hominids with their **correct** brain size :

(a) *Homo habilis*   (i) 900 cc

(b) *Home neanderthalensis*   (ii) 1350 cc

(c) Home erectus   (iii) 650-800 cc

(d) Homo sapiens   (iv) 1400 cc

Select the **correct** option.

	(a)	(b)	(c)	(d)
(1)	(iii)	(iv)	(i)	(ii)
(2)	(iv)	(iii)	(i)	(ii)
(3)	(iii)	(i)	(iv)	(ii)
(4)	(iii)	(ii)	(i)	(v)

Ans: (1)

Sol.

Q.102 The frequency of recombination between gene pairs on the same chromosome as a measure of the distance between genes was explained by :

(1) Alfred Sturtevant   (2) Sutton Boveri   (3) T.H. Morgan   (4) Gregor J. Mendel

Ans: (1)

Sol.

Q.103 Colostrum, the yellowish fluid, secreted by mother during the initial days of lactation is very essential to impart immunity to the newborn infants because it contains :

(1) Macrophages   (2) Immunoglobulin A   (3) Natural killer cells   (4) Monocytes

Ans: (2)

Sol.

Q.104 Which of the following factors is responsible for the formation of concentrated urine ?

(1) Secretion of erythropoietin by Juxtaglomerular complex.

(2) Hydrostatic pressure during glomerular filtration.

(3) Low levels of antidiuretic hormone.

(4) Maintaining hyperosmolarity towards inner medullary interstitium in the kidneys.

Ans: (4)

Sol.

Q.105 Which of the following protocols did aim for reducing emission of chlorofluorocarbons into the atmosphere ?

(1) Gothenburg Protocol   (2) Geneva Protocol

(3) Montreal Protocol   (4) Kyoto Protocol

Ans: (3)

Sol.

Q.106   Match the following genes of the Lac operon with their respective products :

(a) i gene   (i) β-galactosidase

(b) z gene   (ii) Permease

(c) a gene   (iii) Repressor

(d) y gene   (iv) Transacetylase

Select the **correct** option:

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(i)	(iv)	(ii)
(2)	(iii)	(iv)	(i)	(ii)
(3)	(i)	(iii)	(ii)	(iv)
(4)	(iii)	(i)	(ii)	(iv)

Ans: (1)

Sol.

Q.107   Purines found both in DNA and RNA are :

(1) Guanine and cytosine   (2) Cytosine and thymine

(3) Adenine and thymine   (4) Adenine and guanine

Ans: (4)

Sol.

Q.108   What would be the heart rate of a person it the cardiac output is 5L, blood volume in the ventricles at the end of diastole is 100 mL and at the end of ventricular systole is 50 mL ?

(1) 100 beats per minute   (2) 125 beats per minute

(3) 50 beats per minute   (4) 75 beats per minute

Ans: (1)

Sol.

Q.109   Following statement describe the characteristics of the enzyme Restriction Endonuclease. Identify the **incorrect** statement.

(1) The enzyme cuts the sugar-phosphate backbone at specific sites on each strand.

(2) The enzyme recognizes s specific palindromic nucleotide sequence in the DNA.

(3) The enzyme cuts DNA molecule at identified position within the DNA.

(4) The enzyme binds DNA at specific sites and cuts only one of the two strands.

Ans: (4)

Sol.

Q.110   Which of the following features of genetic code does allow bacteria to produce human insulin by recombinant DNA technology ?

(1) Genetic code is nearly universal   (2) Genetic code is specific

(3) Genetic code is not ambiguous   (4) Genetic code is redundant

Ans: (1)

Sol.

Q.111 Match the following structures with their respective location in organs :
(a) Crypts of Lieberkuhn (i) Pancreas
(b) Glisson's Capsule   (ii) Duodenum
(c) Islets of Langerhans (iii) Small intestine
(d) Brunner's glands   (iv) Liver
Select the correct option

	(a)	(b)	(c)	(d)
(1)	(iii)	(iv)	(i)	(ii)
(2)	(iii)	(ii)	(i)	(iv)
(3)	(iii)	(i)	(ii)	(iv)
(4)	(ii)	(iv)	(i)	(iii)

Ans: (1)
Sol.

Q.112 Which of the following pairs of gases is mainly responsible for green house effect ?
(1) Nitrogen and Sulphur dioxide   (2) Carbon dioxide and Methane
(3) Ozone and Ammonia   (4) Oxygen and Nitrogen
Ans: (2)
Sol.

Q.113 What is the direction of movement of sugars in phloem ?
(1) Downward   (2) Bi-directional
(3) Non-multidirectional   (4) Upward
Ans: (2)
Sol.

Q.114 In *Antirrhinum* (Snapdragon), a red flower was crossed with a white flower and in F_1 generation, pink flowers were obtained. When pink flowers were selfed, F_2 generation showed white, red and pink flowers. Choose the **incorrect** statement from the following :
(1) Ration of F_2 is $\frac{1}{4}$ (Red) : $\frac{2}{4}$ (Pink) : $\frac{1}{4}$ (White)
(2) Law of Segregation does not apply in this experiment.
(3) This experiment does not follow the Principle of Dominance.
(4) Pink colour in F_1 is due to incomplete dominance
Ans: (2)
Sol.

Q.115 Consider the following statements :
(A) Coenzyme or metal ion that is tightly bound to enzyme protein is called prosthetic group.
(B) A complete catalytic active enzyme with its bound prosthetic group is called apoenzyme.
Select the **correct** option.
(1) Both **(A)** and **(B)** are false.   (2) **(A)** is false but **(B)** is true.
(3) Both **(A)** and **(B)** are true.   (4) **(A)** is true but **(B)** is false.
Ans: (1)
Sol.

Q.116 Extrusion of second polar body from egg nucleus occurs :

(1) before entry of sperm into ovum

(2) simultaneously with first cleavage

(3) after entry of sperm but before fertilization

(4) after fertilizaiton

Ans: (3)

Sol.

Q.117 Which of the following contraceptive methods do involve a role of hormone ?

(1) CuT, Pills, Emergency contraceptives

(2) Pills, Emergency contraceptives, Barrier methods

(3) Lactational amenorrhea, Pills, Emergency contraceptives

(4) Barrier method, Lactational amenorrhea Pills

Ans: (3)

Sol.

Q.118 Consider following features :

(a) Organ system level of organisaiton

(b) Bilateral symmetry

(c) True coelomates with segmentation of body

Select the **correct** option of animal groups which possess all the above characteristics.

(1) Arthropoda, Mollusca and Chordata   (2) Annelida, Mollusca and Chordata

(3) Annelida, Arthropoda and Chordata   (4) Annelida, Arthropoda and Mollusca

Ans: (3)

Sol.

Q.119 Which one of the following is **not** a method of *in situ* conservation of biodiversity ?

(1) Botanical Garden   (2) Sacred Grove

(3) Biosphere Reserve   (4) Wildlife' Sancturay

Ans: (1)

Sol.

Q.120 What map unit (Centimorgan) is adopted in the construction of genetic maps ?

(1) A unit of distance between genes on chromosomes, representing 1% cross over.

(2) A unit of distance between genes on chromosomes, representing 50% cross over.

(3) A unit of distance between two expressed genes, representing 10% cross over.

(4) A unit of distance between two expressed genes, representing 100% cross over.

Ans: (1)

Sol.

Q.121 What is the fate of the male gametes discharged in the synergid?

(1) One fuses with the egg, other(s) fuse(s) with synergid nucleus.

(2) One fuses with the egg and other fuses with central cell nuclei.

(3) One fuses with the egg, other(s) degenerate(s) in the synergid.

(4) All fuse with the egg.

Ans: (2)

Sol.

Q.122 Which of the following muscular disorders is inherited ?
(1) Myasthenia gravis (2) Botulism   (3) Tetany   (4) Muscular dystrophy
Ans: (4)
Sol.

Q.123 Which of the following is a commercial blood cholesterol lowering agent?
(1) Streptokinase   (2) Lipases   (3) Cyclosporin A   (4) Statin
Ans: (4)
Sol.

Q.124 Which of the following is the most important cause for animals and plants being driven to extinction ?
(1) Economic exploitation   (2) Alien species invasion
(3) Habitat loss and fragmentation   (4) Drought and floods
Ans: (3)
Sol.

Q.125 The Earth Summit held in Rio de Janeiro in 1992 was called :
(1) to assess threat posed to native species by invasive weed species.
(2) for immediate steps to discontinue use of CFCs that were damaging the ozone layer.
(3) to reduce CO_2 emissions and global warming.
(4) for conservation of biodiversity and sustainable utilization of its benefits.
Ans: (4)
Sol.

Q.126 How does steroid hormone influence the cellular activities ?
(1) Activating cyclic AMP located on the cell membrane.
(2) Using aquaporin channels as second messenger.
(3) Changing the permeability of the cell membrane.
(4) Binding to DNA and forming a gene-hormone complex.
Ans: (4)
Sol.

Q.127 Which part of the brain is responsible for thermoregulation ?
(1) Corpus callosum   (2) Medulla oblongata
(3) Cerebrum   (4) Hypothalamus
Ans: (4)
Sol.

Q.128 Select the **incorrect** statement.
(1) In domesticated fowls, sex of progeny depends on the type of sperm rather than egg.
(2) Human males have one of their sex-chromosome much shorter than the other.
(3) Male fruit fly is heterogametic.
(4) In male grasshoppers, 50% of sperms have no sex-chromosome.

Ans: (1)
Sol.

Q.129 Match the following organisms with the products they produce :

(a) *Lactobacillus*   (i) Cheese

(b) *Saccharomyces*   (ii) Curd *cerevisiae*

(c) *Aspergillus niger*   (iii) Citric Acid

(d) *Acetobacter aceti*   (iv) Bread

                           (v) Acetic acid

Select the **correct** option.

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(iv)	(v)	(i)
(2)	(ii)	(i)	(iii)	(v)
(3)	(ii)	(iv)	(v)	(iii)
(4)	(ii)	(iv)	(ii)	(v)

Ans: (4)
Sol.

Q.130 Match **Column-I** with **Column-II.**

	Column-I		Column-II
(a)	Saprophyte	(i)	Symbiotic association of fungi with plant roots
(b)	Parasite	(ii)	Decomposition of dead organic materials
(c)	Lichens	(iii)	Living on living plants or animals
(d)	Mycorrhiza	(iv)	Symbiotic association of algae and fungi

Choose the **correct** answer form the options given below.

	(a)	**(b)**	**(c)**	**(d)**
(1)	(ii)	(i)	(iii)	(iv)
(2)	(ii)	(iii)	(iv)	(i)
(3)	(i)	(ii)	(ii)	(iv)
(4)	(iii)	(ii)	(i)	(iv)

Ans: (2)
Sol.

Q.131 Pinus seed **cannot** germinate and establish without fungal association. This is because.

(1) it has very hard seed coat.

(2) its seeds contain inhibitors that prevent germination.

(3) its embryo is immature.

(4) it has obligate association with mycorrhaizae.

Ans: (4)
Sol.

Q.132 Which of the following pair of organelles **does not** contain DNA ?

(1) Lysosomes and Vacuoles   (2) Nuclear envelope and Mitochondria

(3) Mitochondria and Lysosomes   (4) Chloroplast and Vacuoles

Ans: (1)
Sol.

Q.133 In a species, the weight of newborn ranges from 2 to 5 kg. 97% of the newborn with an average weight between 3 to 3.3 kg survive whereas 99% of the infants born with weights from 2 to 2.5 kg or 4.5 to 5 kg die. Which type of selection process is taking place ?
(1) Disruptive Selection
(2) Cyclical Selection
(3) Directional Selection
(4) Stabilizing Selection

Ans: (4)

Sol.

Q.134 Due to increasing air-borne allergens and pollutants, many people in urban areas are suffering from respiratory disorder causing wheezing due to :
(1) proliferation of fibrous tissues and damage of the alveolar walls.
(2) reduction in the secretion of surfactants by pneumocytes.
(3) benign growth on mucous lining of nasal cavity.
(4) inflammation of bronchi and bronchioles.

Ans: (4)

Sol.

Q.135 From evolutionary point of view, retention of the female gametophyte with developing young embryo on the parent sporophyte for some time, is first observed in :
(1) Pteridophytes   (2) Gymnosperms   (3) Liverworts   (4) Mosses

Ans: (1)

Sol.

Q.136 In which of the following processes, heat is neither absorbed nor released by a system ?
(1) isobaric   (2) isochoric   (3) isothermal   (4) adiabatic

Ans: (4)

Sol. Adiabatic.

Q.137 Two point charges A and B, having charges +Q and –Q respectively, are placed at certain distance apart and force acting between them is F. If 25% charge of A is transferred to B, then force between the charges becomes :
(1) $\frac{16F}{9}$ (2) $\frac{4F}{3}$ (3) F   (4) $\frac{9F}{16}$

Ans: (4)

Sol.

$$F = \frac{-kQ^2}{r^2}$$

$$Q - \frac{Q}{4} = \frac{3Q}{4} \qquad -Q + \frac{Q}{4} = -\frac{3Q}{4}$$

$$F' = \frac{k\left(\frac{3Q}{4}\right)\left(\frac{-3Q}{4}\right)}{r^2} \Rightarrow F' = \frac{-9}{16}\frac{kQ^2}{r^2} = \frac{+9}{16}F$$

Q.138 A hollow metal sphere of radius R is uniformly charged. The electric field due to the sphere at a distance r from the centre :
(1) zero as r increases for r < R, increases as r increases for r > R
(2) decreases as r increases for r < R and for r > R
(3) increases as r increases for r < R and for r > R

(4) zero as r increases for r < R, decreases as r increases for r > R

Ans: (4)
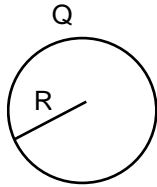
Sol.

$E_{in} = 0$

$E_{out} = \dfrac{kQ}{r^2}$

Q.139   In an experiment, the percentage of error occurred in the measurement of physical quantities A, B, C and D are 1%, 2%, 3% and 4% respectively. Then the maximum percentage of error in the measurement X, where $X = \dfrac{A^2 B^{1/2}}{C^{1/3} D^3}$, will be :

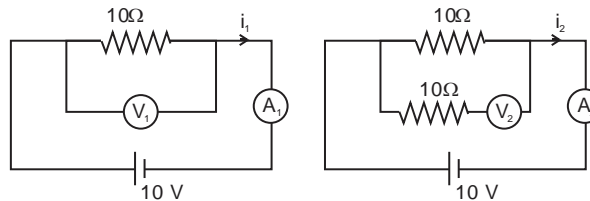(1) −10%   (2) 10%   (3) $\left(\dfrac{3}{13}\right)$%   (4) 16%

Ans: (4)

Sol. $\dfrac{\Delta x}{x} = 2\left(\dfrac{\Delta A}{A}\right) + \dfrac{1}{2}\left(\dfrac{\Delta B}{B}\right) + \dfrac{1}{3}\left(\dfrac{\Delta C}{C}\right) + 3\left(\dfrac{\Delta D}{D}\right)$

= 2 [1%] + $\dfrac{1}{2}$ [2%] + $\dfrac{1}{3}$ [3%] + 3[4%]

= (2 + 1 + 1 + 12)% = 16%

Q.140   In the circuits shown below, the readings of the voltmeters and the ammeters will be :

Circuit-1   Circuit-2

(1) $V_1 = V_2$ and $i_1 = i_2$ (2) $V_2 > V_1$ and $i_1 > i_2$ (3) $V_2 > V_1$ and $i_1 = i_2$ (4) $V_1 = V_2$ and $i_1 > i_2$

Ans: (1)

Sol.
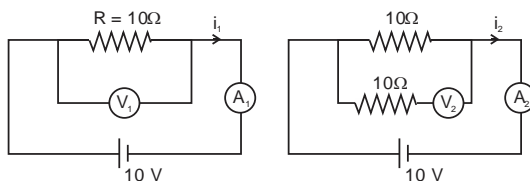
$V_1 = 10$ V

$i_1 = \dfrac{10}{10} = 1A$ $i_2 = \dfrac{V}{R} = \dfrac{10}{10} = 1A$ (Resistance of ideal volt meter is infinite)

$V_2 = 10 \times 1 = 10$ V

$V_1 = V_2$

$i_2 = i_1$

Q.141   A force F = 20 + 10y acts on a particle in y-direction where F is in newton and y in meter. Work done by this force to move the particle from y = 0 to y = 1 m is :

(1) 25 J   (2) 20 J   (3) 30 J   (4) 5 J

Ans: (1)

Sol.   dW = $\int F dy = \int_0^1 (20 + 10y) dy$

$$= \left[20(y) + 10\frac{y^2}{2}\right]_0^1$$
$$= 20 + 5$$
$$= 25 \text{ J}$$

Q.142 At a point A on the earth's surface the angle of dip, δ = +25°. At a point B on the earth's surface the angle of dip δ = –25°. We can interpret that :

(1) A is located in the northern hemisphere and B is located in the southern hemisphere.

(2) A and B are both located in the southern hemisphere.

(3) A and B are both located in the northern hemisphere.

(4) A is located in the southern hemisphere and B is located in the northern hemisphere.

Ans: (1)

Sol.

$\delta_A = +25^o$ $\delta_B = -25^o$

↓   ↓

So A at NHS   B at SHS

At southern hemisphere (SHS) – ve dip and In northern hemisphere (NHS) +ve dip

Q.143 Body A of mass 4m moving with speed u collides with another body B of mass 2m, at rest. The collision is head on and elastic in nature. After the collision the fraction of energy lost by the colliding body A is :

(1) $\frac{4}{9}$ (2) $\frac{5}{9}$ (3) $\frac{1}{9}$ (4) $\frac{8}{9}$

Ans: (4)

Sol.
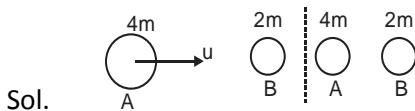
$$\frac{E_2}{E_1} = \frac{4m_1 m_2}{(m_1 + m_2)^2} = \frac{4 \times 4m \times 2m}{(4m + 2m)^2}$$
$$= 8/9$$

Q.144 Increase in temperature of a gas filled in a container would lead to :

(1) decrease in its pressure   (2) decrease in intermolecular distance

(3) increase in its mass   (4) increase in its kinetic energy

Ans: (4)

Sol.   T ↑ ⇒ U ↑ ⇒ K.E. ↑

Q.145 Which of the following acts as a circuit protection device ?

(1) switch   (2) fuse   (3) conductor   (4) inductor

Ans: (2)

Sol.   Fuse

Q.146 Pick the **wrong** answer in the context with rainbow.

(1) An observer can see a rainbow when his front is towards the sun.

(2) Rainbow is a combined effect of dispersion, refraction and reflection of sunlight.

(3) When the light rays undergo two internal reflections in a water drop, a secondary rainbow is formed.

(4) The order of colours is reversed in the secondary rainbow.

Ans: (1)

Sol. When back is towards sun, then rainbow can be seen

Q.147 In a double slit experiment, when light of wavelength 400 nm was used, the angular width of the first minima formed on a screen placed 1 m away, was found to be 0.2°. What will be the angular width of the first minima, if the entire experimental apparatus is immersed in water ?

(μ_{water} = 4/3)

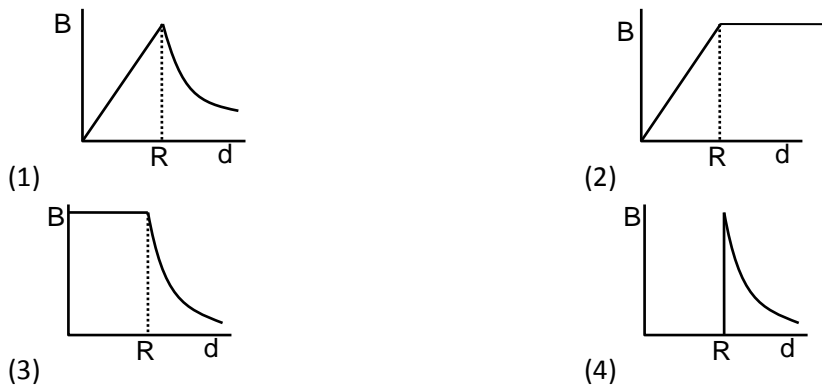(1) 0.05°   (2) 0.1°   (3) 0.266°   (4) 0.15°

Ans: (4)

Sol. As $\lambda' = \dfrac{\lambda}{\mu}$

also $\beta \propto \lambda$

then $\beta' = \dfrac{\beta}{\mu} = \dfrac{0.2°}{4} \times 3 = 0.15°$

Q.148 A cylindrical conductor of radius R is carrying a constant current. The plot of the magnitude of the magnetic field, B with the distance, d from the centre of the conductor, is **correctly** represented by the figure.

(1)

(2)

(3)

(4)

Ans: (1)

Sol. $B_{IN} = \dfrac{\mu_0 I r}{2\pi R^2} \propto r$

$B_{out} = \dfrac{\mu_0 I}{2\pi r} \propto \dfrac{1}{r}$
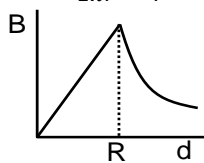
Q.149 The radius of circle, the period of revolution, initial position and sense of revolution are indicated in the fig.
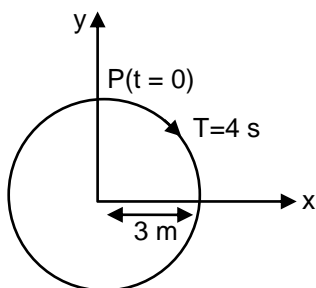
y-projection of the radius vector of rotating particle P is

(1) $y(t) = 3 \cos\left(\dfrac{3\pi t}{2}\right)$, where y in m   (2) $y(t) = 3 \cos\left(\dfrac{\pi t}{2}\right)$, where y in m

(3) $y(t) = -3 \cos 2\pi t$, where y in m   (4) $y(t) = 4 \sin\left(\dfrac{\pi t}{2}\right)$, where y in m
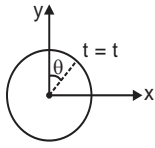
Ans: (2)

Sol. A = 3m

$\theta = \omega t$

$\omega = \frac{2\pi}{4} \Rightarrow \theta = \frac{\pi}{2}t$

y = 3 cos $\left(\frac{\pi}{2}t\right)$

Q.150 A copper rod of 88 cm and an aluminium rod of unknown length have their increase in length independent of increase in temperature. The length of aluminium rod is: ($\alpha_{Cu} = 1.7 \times 10^{-5}$ K^{-1} and $\alpha_{Al} = 2.2 \times 10^{-5}$ K^{-1})

(1) 88 cm (2) 68 cm (3) 6.8 cm (4) 113.9 cm

Ans: (2)

Sol. As $\ell_1\alpha_1 = \ell_2\alpha_2$

$88 \times 1.7 \times 10^{-5} = \ell_2 \times 2.2 \times 10^{-5}$

68 cm = ℓ_2

Q.151 A mass m is attached to a thin wire and whirled in a vertical circle. The wire is most likely to break when:

(1) the mass is at the lowest point (2) inclined at an angle of 60º from vertical
(3) the mass is at the highest point (4) the wire is horizontal

Ans: (1)

Sol. at lowest point tension

T = mg + $\frac{mv^2}{r}$ which is maximum

Q.152 An electron is accelerated through a potential difference of 10,000 V. Its de Broglie wavelength is (nearly):

($m_e = 9 \times 10^{-31}$ kg)

(1) 12.2×10^{-14} m (2) 12.2 nm (3) 12.2×10^{-13} m (4) 12.2×10^{-12} m

Ans: (4)

Sol. $\lambda_e = \frac{12.27}{\sqrt{V}} \overset{\circ}{A}$

$= \frac{12.27}{\sqrt{10000}} \times 10^{-10}$

$= 12.27 \times 10^{-12}$ m

Q.153 A block of mass 10 kg is in contact against the inner wall of a hollow cylindrical drum of radius 1m. The coefficient of friction between the block and the inner wall of the cylinder is 0.1. The minimum angular velocity needed for the cylinder to keep the block stationary when the cylinder is vertical and rotating about its axis, will be: (g = 10 m/s^2)
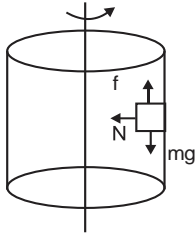
(1) 10 rad/s (2) 10π rad/s (3) $\sqrt{10}$ rad/s (4) $\frac{10}{2\pi}$ rad/s

Ans: (1)

Sol.

f = mg $\qquad$ N = mω^2R

μN = mg

μmω^2R = mg

μ ω^2R = g
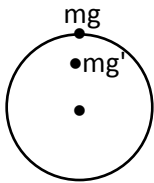
$\omega = \sqrt{\frac{10}{1 \times 0.1}} = \sqrt{100}\,rad/sec$

= 10 rad/sec

Q.154 A body weighs 200 N on the surface of the earth. How much will it weigh half way down to the centre of the earth ?

(1) 250 N $\qquad$ (2) 100 N $\qquad$ (3) 150 N $\qquad$ (4) 200 N

Ans: (2)

Sol.

$g' = g\left(1 - \frac{d}{R_e}\right)$

$mg' = mg\left[1 - \frac{R_e/2}{R_e}\right]$

$mg' = mg/2$

Half the surface hence 100 N

Q.155 Average velocity of a particle executing SHM in one complete vibration is:

(1) $\frac{A\omega^2}{2}$ $\qquad$ (2) zero $\qquad$ (3) $\frac{A\omega}{2}$ $\qquad$ (4) Aω

Ans: (2)

Sol. Avg. Velocity = $\frac{Total\ displacement}{time}$

$= \frac{0}{T}$

= 0

Q.156 Two particles A and B are moving in uniform circular motion in concentric circles of radii r_A and r_B with speed v_A and v_B respectively. Their time period of rotation is the same. The ratio of angular speed of A to that of B will be :

(1) $r_B : r_A$ $\qquad$ (2) 1 : 1 $\qquad$ (3) $r_A : r_B$ $\qquad$ (4) $v_A : v_B$

Ans: (2)

Sol. As time period is same

$\frac{\omega_1}{\omega_2} = \frac{1}{1}$

Q.157 The unit of thermal conductivity is -

(1) W m K^{-1} (2) W m^{-1} K^{-1} (3) J m K^{-1} (4) J m^{-1} K^{-1}
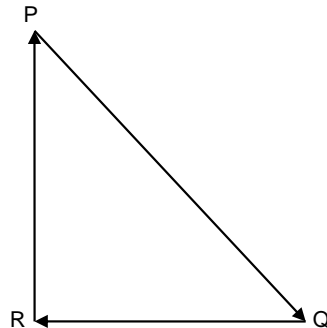
Ans: (2)

Sol. $\frac{Q}{T} = KA\frac{\Delta T}{L}$

     [K] = W/mk   Unit : W m^{-1} k^{-1}

Q.158 A particle moving with velocity $\vec{V}$ is acted by three forces shown by the vector triangle PQR. The velocity of the particle will :

(1) remain constant   (2) change according to the smallest force $\overrightarrow{QR}$

(3) increase   (4) decrease

Ans: (1)

Sol.   Here F$_{net}$ = 0

     $\Rightarrow$ Acceleration = 0

     $\Rightarrow$ Velocity = constant

Q.159 The displacement of a particle executing simple harmonic motion is given by

y = A$_0$ + A sinωt + B cosωt

Then the amplitude of its oscillation is given by:

(1) $\sqrt{A_0^2 + (A + B)^2}$ (2) A + B   (3) $A_0 + \sqrt{A^2 + B^2}$ (4) $\sqrt{A^2 + B^2}$

Ans: (4)

Sol.   Y = A$_0$ + A sin ωt + B cos ωt

     Amp = $\sqrt{A^2 + B^2}$

Q.160 α-particle consists of:

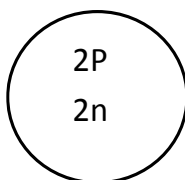(1) 2 electrons and 4 protons only   (2) 2 protons only

(3) 2 protons and 2 neutrons only   (4) 2 electrons, 2 protons and 2 neutrons

Ans: (3)

Sol. α = $_2$He^4

Q.161 In total internal reflection when the angle of incidence is equal to the critical angle for the pair of media in contact, what will be angle of refraction ?

(1) Equal to angle of incidence   (2) 90°

(3) 180°   (4) 0°

Ans: (2)

Sol. $\theta = \theta_C = 90° = r$

Q.162 In which of the following devices, the eddy current effect is not used ?
(1) electromagnet   (2) electric heater
(3) induction furnace   (4) magnetic braking in train
Ans: (2)
Sol. Based on joule's law of heating

Q.163 Which colour of the light has the longest wavelength ?
(1) green   (2) violet   (3) red   (4) blue
Ans: (3)
Sol. $\xrightarrow[\text{VIBGYOR}]{\lambda}$

Red

Q.164 A solid cylinder of mass 2 kg and radius 4 cm is rotating about its axis at the rate of 3 rpm. The torque required to stop after 2π revolutions is:
(1) 12×10^{-4} N m   (2) 2×10^{6} N m   (3) 2×10^{-6} N m   (4) 2×10^{-3} N m
Ans: (3)
Sol. $\alpha = \frac{\omega^2}{2\theta} = \left(\frac{3 \times 2\pi}{60}\right)^2 \frac{1}{2 \times (2\pi)(2\pi)}$

$= \frac{9}{(3600) \times 2} = \frac{1}{800}$

$\tau = I\alpha = \frac{mR^2}{2} \times \alpha = \frac{2}{2} \times \left(\frac{4}{100}\right)^2 \times \frac{1}{800}$

$\tau = 2 \times 10^{-6}$ N-m

Q.165 Ionized hydrogen atoms and α-particles with same momenta enters perpendicular to a constant magnetic field, B. The ratio of their radii of their paths $r_H : r_\alpha$ will be
(1) 4 : 1   (2) 1 : 4   (3) 2 : 1   (4) 1 : 2
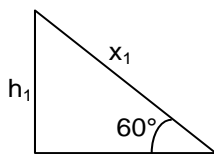Ans: (3)
Sol. $r_H : r_\alpha$

$\Rightarrow \frac{p}{q_H B} : \frac{p}{q_\alpha B}$

$= 2 : 1$

Q.166 When an object is shot from the bottom of a long smooth inclined plane kept at an angle 60º with horizontal, it can travel a distance x_1 along the plane. But when the inclination is decreased to 30º and the same object is shot with the same velocity, it can travel x_2 distance. Then $x_1 : x_2$ will be :
(1) $1 : \sqrt{3}$ (2) $1 : 2\sqrt{3}$ (3) $1 : \sqrt{2}$ (4) $\sqrt{2} : 1$
Ans: (1)

Sol.

$\frac{1}{2}mv_1^2 = mgh_1;$ $\frac{1}{2}mv_2^2 = mgh_2$

$h_1 = h_2$

$x_1 \sin 60° = x_2 \sin 30°$

$$\frac{x_1}{x_2} = \frac{1/2}{\sqrt{3}/2} = \frac{1}{\sqrt{3}}$$

Q.167 A parallel plate capacitor of capacitance 20μF is being charged by a voltage source whose potential is changing at the rate of 3 V/s. The conduction current through the connecting wires, and the displacement current through the plates of the capacitor, would be, respectively :

(1) 60μA, Zero   (2) Zero, Zero   (3) Zero, 60μA   (4) 60μA, 60μA

Ans: (4)

Sol.   C = 20 μF, $\frac{dv}{dt} = 3V/S$

$I_C = I_D = \frac{dQ}{dt} = \frac{d(CV)}{dt} = \frac{CdV}{dt}$

= 20 μ × 3 = 60 μA

Q.168 The **correct** Boolean operation represented by the circuit diagram drawn is
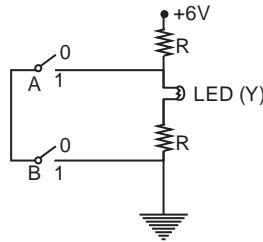
(1) NAND   (2) NOR   (3) AND   (4) OR

Ans: (1)

Sol.

A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

NAND GATE

Q.169 A soap bubble having radius of 1 mm, is blown from a detergent solution having a surface tension of 2.5×10^{-2} N/m. The pressure inside the bubble equals at a point Z_0 below the free surface of water in a container. Taking g = 10 m/s², density of water = 10^3 kg/m³, the value of Z_0 is :

(1) 1 cm   (2) 0.5 cm   (3) 100 cm   (4) 10 cm

Ans: (1)

Sol.   R = 1 mm = 1 × 10⁻³ m

S = 2.5 × 10⁻² N/m

$P_l = Z_0$ below water from surface

ρ = 10 m/s²

g = 10³ kg/m³

$P_h = P_0 + hg\rho$ ... (1)

$P_l = P_0 + \frac{4S}{R}$ ... (2)

Solving

$$hg\rho = \frac{4S}{R}$$

$$Z_0 = \frac{4S}{\rho Rg} = \frac{4 \times 2.5 \times 10^{-2}}{10^3 \times 10^{-3} \times 10}$$

$$= \frac{10 \times 10^{-2}}{10^4 \times 10^{-3}}$$

= 10⁻² m

= 1 cm

Q.170 A disc of radius 2 m and mass 100 kg rolls on a horizontal floor. Its centre of mass has speed of 20 cm/s. How much work is needed to stop it ?

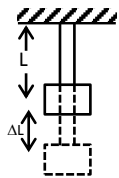(1) 2 J   (2) 1 J   (3) 3 J   (4) 30 kJ

Ans: (3)

Sol. $\Delta W = \Delta K$

$\Delta W = \frac{1}{2}mv^2[1 + k^2/R^2]$

$= \frac{1}{2} \times 100 \times [0.2]^2 [1 + 1/2]$

$= \frac{1}{2} \times 100 \times 4 \times 10^{-2} \times \frac{3}{2}$

= 3 Joule

Q.171 When a block of mass M is suspended by a long wire of length L, the length of the wire becomes (L + ℓ). The elastic potential energy stored in the extended wire is

(1) $\frac{1}{2}Mg\ell$ (2) $\frac{1}{2}MgL$ (3) $Mg\ell$ (4) MgL

Ans: (1)

Sol.

$\frac{1}{2}Mg\ell$

Q.172 Two similar thin equi-convex lenses, of focal length f each are kept coaxially in contact with each other such that the focal length of the combination is F_1. When the space between the two lenses is filled with glycerin (which has the same refractive index (μ = 1.5) as that of glass) then the equivalent focal length is F_2. The ratio $F_1 : F_2$ will be
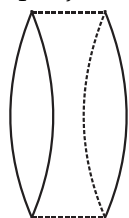
(1) 2 : 3   (2) 3 : 4   (3) 2 : 1   (4) 1 : 2

Ans: (4)
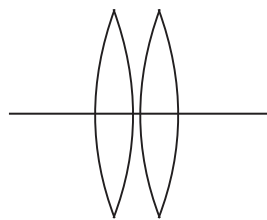
Sol.

$\frac{1}{F_1} = \frac{2}{f} \Rightarrow F_1 = \frac{f}{2}$

$\frac{1}{F_2} = \frac{1}{f} + \frac{1}{f} - \frac{1}{f} = \frac{1}{f}, F_2 = f$

$\frac{F_2}{F_1} = 1 : 2$

Q.173 The total energy of an electron in an atom in an orbit is –3.4 eV. Its kinetic and potential energies are respectively :
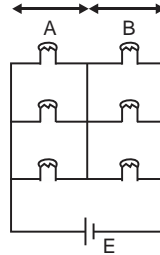
(1) 3.4 eV, –6.8 eV   (2) 3.4 eV, 3.4 eV   (3) –3.4 eV, –3.4 eV   (4) –3.4 eV, –6.8 eV

Ans: (1)

Sol.   K = |T| = 3.4 eV
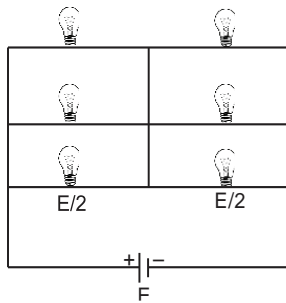
$\frac{U}{2}$ = T $\Rightarrow$ U = – 6.8 eV

Q.174 Six similar bulbs are connected as shown in the figure with a DC source of emf E, and zero internal resistance.

The ratio of power consumption by the bulbs when (i) all are glowing and (ii) in the situation when two from section A and one from section B are glowing will be

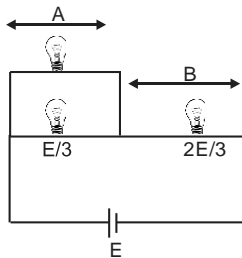(1) 1 : 2   (2) 2 : 1   (3) 4 : 9   (4) 9 : 4

Ans: (4)

Sol.

(A) P$_{diss}$ in each bulb = $\left(\frac{V_a}{V_r}\right)^2 P$

$= \frac{1}{4}P$

Total P$_{diss}$ in All $= \frac{6P}{4}$

(B)

P$_{diss}$ in A bulb

$= \frac{P}{9} + \frac{P}{9} = \frac{2P}{9}$

In B bulb

$= \frac{4P}{9}$

= Total $= \frac{6P}{9}$

P$_1$: P$_2$ $= \frac{6P}{4} : \frac{6P}{9}$

P$_1$: P$_2$ = 9 : 4

Q.175 A 800 turn coil of effective area 0.05 m² is kept perpendicular to a magnetic field 5×10^{-5} T. When the plane of the coil is rotated by 90º around any of its coplanar axis in 0.1s, the emf induced in the coil will be

(1) 2×10^{-3} V (2) 0.02 V (3) 2 V (4) 0.2 V

Ans: (2)

Sol. N = 800 turn

A = 0.05 m²

$B = 5 \times 10^{-5}$ T

t = 0.1 sec

$\theta_{rot} = 90º$

$e = -\frac{\Delta\phi}{\Delta t} = -\frac{\phi_2 - \phi_1}{\Delta t} = \frac{NBA}{t}$

$= \frac{800 \times 5 \times 10^{-5} \times 0.05}{0.1}$

$= 8 \times 5 \times 5 \times 10^{-5+2-2+1}$

$= 200 \times 10^{-4} = 2 \times 10^{-2}$ V

= 0.02 V

Q.176 A small hole of area of cross-section 2 mm² is present near the bottom of a fully filled open tank of height 2m. Taking g = 10 m/s², the rate of flow of water through the open hole would be nearly :

(1) 2.23×10^{-6} m³/s (2) 6.4×10^{-6} m³/s (3) 12.6×10^{-6} m³/s (4) 8.9×10^{-6} m³/s

Ans: (3)

Sol. Rate = AV

$= 2 \times 10^{-6} \sqrt{2gh}$
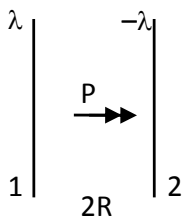
$= 2 \times 10^{-6} \times \sqrt{2 \times 10 \times 2}$

$= 12.6 \times 10^{-6}$ m³/s

Q.177 Two parallel infinite line charges with linear charge density $+\lambda$ C/m and $-\lambda$ C/m are placed at a distance of 2R in free space. What is the electric field mid-way between the two lines charges ?

(1) $\frac{\lambda}{\pi \epsilon_0 R} N/C$ (2) $\frac{\lambda}{2\pi \epsilon_0 R} N/C$ (3) zero (4) $\frac{2\lambda}{\pi \epsilon_0 R} N/C$

Ans: (1)

Sol.

$E_P = E_1 + E_2$

$= \frac{2k\lambda}{R} + \frac{2k\lambda}{R}$

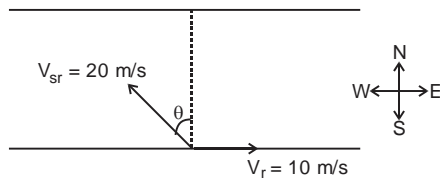$\frac{4k\lambda}{R} = \frac{\lambda}{\pi \varepsilon_0 R}$ N/C

Q.178 The speed of a swimmer in still water is 20 m/s. The speed of river water is 10 m/s and is flowing due east. If he is standing on the south bank and wishes to cross the river along the shortest path, the angle at which he should make his strokes w.r.t. north is given by:

(1) 60° west (2) 45° west (3) 30° west (4) 0°

Ans: (3)

Sol. $V_{sr}\sin\theta = V_r$

$\sin\theta = \frac{10}{20} \Rightarrow \theta = 30^\circ$ (West)

Q.179 The work done to raise a mass m from the surface of the earth to a height h, which is equal to the radius of the earth, is-

(1) $\frac{1}{2}mgR$　　　　　(2) $\frac{3}{2}mgR$　　　　　(3) mgR　　　　　(4) 2 mgR

Ans: (1)

Sol. $\Delta u = u_2 - u_1$

$= \frac{-GMm}{R+R} - \left(\frac{-GMm}{R}\right)$

$= \frac{-GMm}{2R} + \frac{GMm}{R}$

$= \frac{GMm}{2R}$ as $g = \frac{GM}{R^2}$

$= \frac{mgR}{2}$

Q.180 For a p-type semiconductor, which of the following statements is **true** ?

(1) Holes are the majority carriers and pentavalent atoms are the dopants.

(2) Electrons are the majority carriers and pentavalent atoms are the dopants.

(3) Electrons are the majority carriers and trivalent atoms are the dopants.

(4) Holes are the majority carriers and trivalent atoms are the dopants.

Ans: (4)

Sol. For p type semiconductor the majorities are of holes & minorities are of e^- and impurity would be trivalent.