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# NEET 2024

## Test Paper Code – R2

### Questions with Solutions

#### Section-A (Physics)

1. Given below are two statements: one is labelled as **Assertion A** and the other is labelled as **Reason R**.  
**Assertion A:** The potential (V) at any axial point, at 2 m distance(r) from the centre of the dipole of dipole moment vector  $\vec{P}$  of magnitude,  $4 \times 10^{-6}$  C m, is  $\pm 9 \times 10^3$  V. (Take  $\frac{1}{4\pi\epsilon_0} = 9 \times 10^9$  SI units)

**Reason R:**  $V = \pm \frac{2P}{4\pi\epsilon_0 r^2}$ , where r is the distance of any axial point, situated at 2m from the centre of the dipole.

In the light of the above statements, choose the correct answer from the options given below:

- (1) Both A and R are true and R is NOT the correct explanation of A.
- (2) A is true but R is false.
- (3) A is false but R is true
- (4) Both A and R are true and R is the correct explanation of A.

**Ans (2)**

$$V = \frac{KP}{r^2} = \frac{9 \times 10^9 \times 4 \times 10^{-6}}{4} = 9 \times 10^3 \text{ V}$$

Assertion is true reason false

2. The mass of a planet is  $\frac{1}{10}$ th that of the earth and its diameter is half that of the earth. The acceleration due to gravity on that planet is

(1)  $9.8 \text{ ms}^{-2}$                       (2)  $4.9 \text{ ms}^{-2}$                       (3)  $3.92 \text{ ms}^{-2}$                       (4)  $19.6 \text{ ms}^{-2}$

**Ans (3)**

$$M_p = \frac{1}{10} M_e$$

$$D_p = \frac{D_e}{2} \quad \therefore R_p = \frac{R_e}{2}$$

$$\begin{aligned} \frac{g_p}{g_e} &= \frac{GM_p}{r_p^2} \times \frac{r_e^2}{GM_e} \\ &= \frac{M_e}{10} \times \frac{4}{R_e^2} \times \frac{r_e^2}{M_e} \end{aligned}$$

$$\begin{aligned} g_p &= \frac{2}{5} g_e \\ &= 3.92 \text{ ms}^{-2} \end{aligned}$$

3. At any instant of time  $t$ , the displacement of any particle is given by  $(2t - 1)$  (SI unit) under the influence of force of 5N. The value of instantaneous power is (in SI unit):

(1) 5                                      (2) 7                                      (3) 6                                      (4) 10

**Ans (4)**

$$P = FV = F \frac{dx}{dt}$$

$$P = F \frac{d}{dt} (2t - 1)$$

$$P = F(2) = 5(2) = 10$$



4. A particle moving with uniform speed in a circular path maintains:

(1) constant acceleration                      (2) constant velocity but varying acceleration  
(3) varying velocity and varying acceleration                      (4) constant velocity

**Ans (3)**

Due to continuous change in the direction particle experiences *Varying velocity and varying acceleration*

5. Match List-I with List-II.

List – I (Material)		List – II (Susceptibility ( $\chi$ ))	
A.	Diamagnetic	I.	$\chi = 0$
B.	Ferromagnetic	II.	$0 > \chi \geq -1$
C.	Paramagnetic	III.	$\chi \gg 1$
D.	Non-magnetic	IV.	$0 < \chi < \epsilon$ (a small positive number)

Choose the correct answer from the options given below

(1) A-II, B-I, C-III, D-IV                      (2) A-III, B-II, C-I, D-IV  
(3) A-IV, B-III, C-II, D-I                      (4) A-II, B-III, C-IV, D-I

**Ans (4)**Paramagnetic  $0 < \chi < \epsilon$  (small positive number)Ferromagnetic  $\chi \gg 1$ Diamagnetic  $0 > \chi \geq -1$ Non-magnetic  $\chi = 0$ 

6. In an ideal transformer, the turns ratio is  $\frac{N_p}{N_s} = \frac{1}{2}$ . The ratio  $V_s : V_p$  is equal to (the symbols carry their usual meaning):

(1) 2 : 1

(2) 1 : 1

(3) 1 : 4

(4) 1 : 2

**Ans (1)**In an ideal transformer,  $\frac{N_p}{N_s} = \frac{V_p}{V_s}$ 

$$\text{Given, } \frac{N_p}{N_s} = \frac{1}{2} \therefore \frac{V_s}{V_p} = \frac{2}{1}$$

7. A tightly wound 100 turns coil of radius 10 cm carries a current of 7A. The magnitude of the magnetic field at the centre of the coil is (Take permeability of free space as  $4\pi \times 10^{-7}$  SI units)

(1) 4.4 T

(2) 4.4 mT

(3) 44 T

(4) 44 mT

**Ans (2)**

$$B = \frac{\mu_0 ni}{2r} = \frac{4\pi \times 10^{-7} \times 7 \times 100}{2 \times 10^{-1}}$$

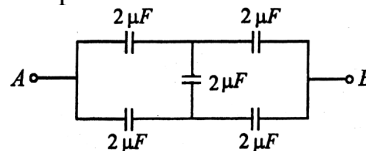
$$= 14 \pi \times 10^{-6+2}$$

$$= 14 \pi \times 10^{-4}$$

$$= 4.396 \approx 4.4 \text{ mT.}$$



8. In the following circuit, the equivalent capacitance between terminal A and terminal B is

(1) 1  $\mu\text{F}$ (2) 0.5  $\mu\text{F}$ (3) 4  $\mu\text{F}$ (4) 2  $\mu\text{F}$ **Ans (4)**It is a balanced Wheatstone bridge. So  $C_{AB} = 2 \mu\text{F}$ 

9. Solenoid - 1      Solenoid - 2

In the above diagram, a strong bar magnet is moving towards solenoid-2 from solenoid-1. The direction of induced current in solenoid-1 and that in solenoid-2, respectively, are through the directions:

(1) BA and CD

(2) AB and CD

(3) BA and DC

(4) AB and DC

**Ans (4)**

10. The maximum elongation of a steel wire of 1m length if the elastic limit of steel and its Young's modulus, respectively, are  $8 \times 10^8 \text{ Nm}^{-2}$  and  $2 \times 10^{11} \text{ Nm}^{-2}$  is

(1) 0.4 mm                      (2) 40 mm                      (3) 8 mm                      (4) 4 mm

**Ans (4)**

$$Y = \frac{\text{Stress}}{\text{Strain}} = \frac{\text{Stress}}{\Delta l} \times \ell$$

$$\therefore \Delta l = \frac{\text{elastic limit}}{Y} \times \ell$$

$$= \frac{8 \times 10^8 \times 1}{2 \times 10^{11}}$$

$$= 4 \times 10^{8-11} = 4 \times 10^{-3} \text{ mm}$$

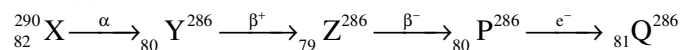
$$= 4 \text{ mm}$$

11.  ${}_{82}^{290}\text{X} \xrightarrow{\alpha} \text{Y} \xrightarrow{e^+} \text{Z} \xrightarrow{\beta^-} \text{P} \xrightarrow{e^-} \text{Q}$

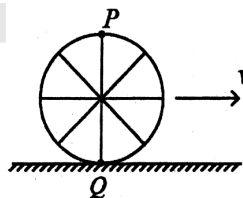
In the nuclear emission stated above, the mass number and atomic number of the product Q respectively, are

(1) 286, 80                      (2) 288, 82                      (3) 286, 81                      (4) 280, 81

**Ans (3)**



12. A wheel of a bullock cart is rolling on a level road as shown in the figure below. If its linear speed is  $v$  in the direction shown, which one of the following options is correct? (P and Q are highest and lowest points on the wheel respectively)



- (1) Point P moves faster than point Q.  
 (2) Both the points P and Q move with equal speed.  
 (3) Point P has zero speed.  
 (4) Point P moves slower than point Q.

**Ans (1)**

Velocity of particle at point P =  $2V$

Velocity of particle at point Q = 0, for pure rolling motion

13. An unpolarized light beam strikes a glass surface at Brewster's angle. Then

- (1) the refracted light will be completely polarized  
 (2) both the reflected and refracted light will be completely polarized.  
 (3) the reflected light will be completely polarized but the refracted light will be partially polarized.  
 (4) the reflected light will be partially polarized.

**Ans (3)**

According to Brewster's law when unpolarized light incident at Brewster's angle, then reflected light will be completely polarized refracted light will be partially polarized.

14. In a Vernier calipers, (N + 1) divisions of Vernier scale coincide with N divisions of main scale. If 1 MSD represents 0.1 mm, the Vernier constant (in cm) is:

- (1)  $\frac{1}{100(N+1)}$                       (2) 100 N                      (3) 10(N + 1)                      (4)  $\frac{1}{10N}$

**Ans (1)**

Vernier constant = LC = 1 MSD – 1 VSD

$$= 1 \text{ MSD} - \frac{N}{(N+1)} \text{ MSD}$$

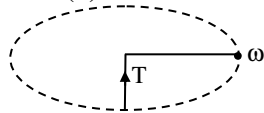
$$\text{LC} = \frac{1}{(N+1)} \text{ MSD}$$

$$= \frac{0.1 \text{ mm}}{(N+1)} = \frac{1 \text{ cm}}{100(N+1)}$$

15. A bob is whirled in a horizontal plane by means of a string with an initial speed of  $\omega$  rpm. The tension in the string is T. If speed becomes  $2\omega$  while keeping the same radius, the tension in the string becomes

- (1) 4T                      (2)  $\frac{T}{4}$                       (3)  $\sqrt{2}T$                       (4) T

**Ans (1)**



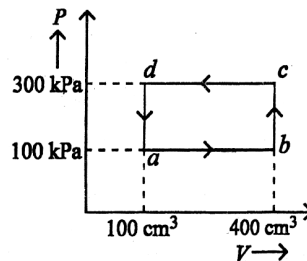
$$T = Mr\omega^2$$

$$\therefore \frac{T_2}{T_1} = \frac{\omega_2^2}{\omega_1^2} = \frac{(2\omega)^2}{\omega^2}$$

$$T_2 = 4T$$



16. A thermodynamic system is taken through the cycle *abcd*. The work done by the gas along the path *bc* is



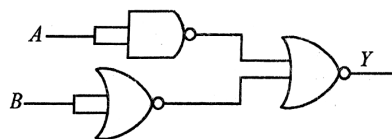
- (1) 30 J                      (2) -90 J                      (3) -60 J                      (4) zero

**Ans (4)**

From the diagram, path *bc* is isochoric process

Hence,  $W = 0$

17. The output (Y) of the given logic gate is similar to the output of an/a



- (1) NOR gate                      (2) OR gate                      (3) AND gate                      (4) NAND gate

$$\underline{\underline{\text{Ans (3)}}}$$

$$\underline{\underline{\vec{A} + \vec{B}}} = \underline{\underline{\vec{A} \cdot \vec{B}}} = \underline{\underline{A \cdot B}}$$

18. Two bodies A and B of same mass undergo completely inelastic one dimensional collision. The body A moves with velocity  $v_1$  while body B is at rest before collision. The velocity of the system after collision is  $v_2$ . The ratio  $v_1 : v_2$  is

- (1) 2 : 1                                      (2) 4 : 1                                      (3) 1 : 4                                      (4) 1 : 2

**Ans (1)**

$$v_{\text{common}} = v_2 = \frac{m_1 v_1 + 0}{m_1 + m_2}$$

$$v_2 = \frac{m v_1}{2m} = \frac{v_1}{2}$$

$$\frac{v_1}{v_2} = \frac{2}{1}$$

19. The moment of inertia of a thin rod about an axis passing through its mid point and perpendicular to the rod is  $2400 \text{ g cm}^2$ . The length of the 400 g rod is nearly:

- (1) 17.5 cm                                      (2) 20.7 cm                                      (3) 72.0 cm                                      (4) 8.5 cm

**Ans (4)**

$$\frac{ML^2}{12} = 2400$$

$$L^2 = \frac{2400 \times 12}{400} = 72$$

$$\therefore L = 8.5 \text{ cm}$$

20. A thin flat circular disc of radius 4.5 cm is placed gently over the surface of water. If surface tension of water is  $0.07 \text{ Nm}^{-1}$ , then the excess force required to take it away from the surface is

- (1) 198 N                                      (2) 1.98 mN                                      (3) 99 N                                      (4) 19.8 mN

**Ans (4)**

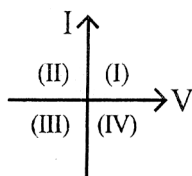
$$F = T \times L = T 2\pi r$$

$$= 0.07 \times 2\pi \times 4.5 \times 10^{-2}$$

$$= 0.0197$$

$$= 19.8 \text{ mN}$$

21. Consider the following statements A and B and identify the correct answer:



A. For a solar-cell, the I-V characteristics lies in the IV quadrant of the given graph.

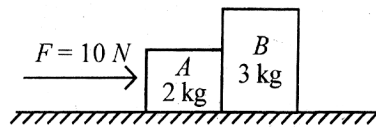
B. In a reverse biased pn junction diode, the current measured in ( $\mu\text{A}$ ), is due to majority charge carriers.

- (1) A is incorrect but B is correct                                      (2) Both A and B are correct  
(3) Both A and B are incorrect                                      (4) A is correct but B is incorrect

**Ans (4)**

In a reverse biased pn junction diode, the current measured in ( $\mu\text{A}$ ), is due to *minority* charge carriers.

22. A horizontal force 10 N is applied to a block A as shown in figure. The mass of blocks A and B are 2 kg and 3 kg, respectively. The blocks slide over a frictionless surface. The force exerted by block A on block B is



- (1) 4N                                      (2) 6N                                      (3) 10 N                                      (4) zero

**Ans** (2)

$$a = \frac{F}{m} = \frac{10}{5} = 2$$

Contact force between A and B is  $3 \times a = 3 \times 2 = 6$  N

23. If  $x = 5 \sin\left(\pi t + \frac{\pi}{3}\right)$  m represents the motion of a particle executing simple harmonic motion, the amplitude and time period of motion, respectively, are

- (1) 5m, 2s                                      (2) 5 cm, 1s                                      (3) 5m, 1s                                      (4) 5 cm, 2s

**Ans** (1)

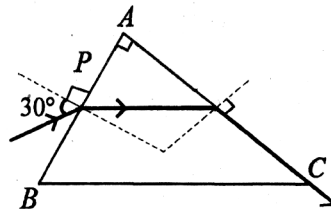
$$x = A \sin(\omega t + \phi)$$

on comparing, amplitude  $A = 5$  m,  $\omega = \pi$

$$\frac{2\pi}{T} = \pi$$

Time period  $T = 2$ s

24. A light ray enters through a right angled prism at point P with the angle of incidence  $30^\circ$  as shown in figure. It travels through the prism parallel to its base BC and emerges along the face AC. The refractive index of the prism is



- (1)  $\frac{\sqrt{5}}{2}$                                       (2)  $\frac{\sqrt{3}}{4}$                                       (3)  $\frac{\sqrt{3}}{2}$                                       (4)  $\frac{\sqrt{5}}{4}$

**Ans** (1)

$$A = r_1 + r_2$$

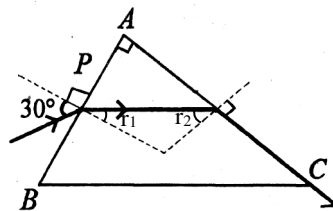
$$90 = r_1 + C$$

$$r_1 = 90 - C$$

$$\sin 30^\circ = n \cdot \sin r_1$$

$$\frac{1}{2} = n \cdot \sin(90 - C)$$

$$\frac{1}{2} = n \cos C$$



$$\frac{1}{2} = n\sqrt{1 - \sin^2 C}$$

$$\text{but } \sin C = \frac{1}{n}$$

$$\therefore \frac{1}{2} = n\sqrt{1 - \frac{1}{n^2}}$$

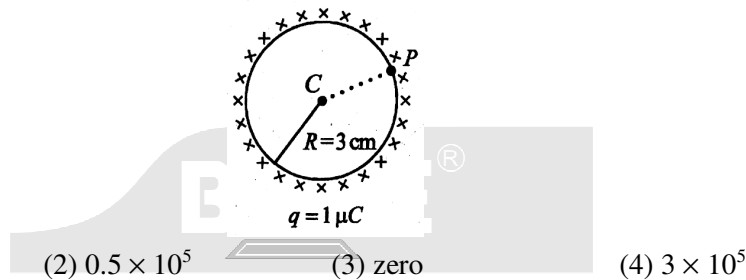
$$\Rightarrow \frac{1}{2} = \sqrt{n^2 - 1}$$

$$\Rightarrow \frac{1}{4} = n^2 - 1$$

$$\Rightarrow n^2 = \frac{5}{4}$$

$$\Rightarrow n = \frac{\sqrt{5}}{2}$$

25. A thin spherical shell is charged by some source. The potential difference between the two points C and P (in V) shown in the figure is (Take  $\frac{1}{4\pi\epsilon_0} = 9 \times 10^9$  SI units)



(1)  $1 \times 10^5$

(2)  $0.5 \times 10^5$

(3) zero

(4)  $3 \times 10^5$

**Ans (3)**

Electric potential throughout spherical shell is constant and is same as that on the surface.

$$\Delta V = 0$$

Potential at any point inside and on the surface is same

26. If  $c$  is the velocity of light in free space, the correct statements about photon among the following are

A. The energy of a photon is  $E = hv$ .

B. The velocity of a photon is  $c$ .

C. The momentum of a photon,  $p = \frac{hv}{c}$

D. In a photon-electron collision, both total energy and total momentum are conserved.

E. Photon possesses positive charge.

Choose the correct answer from the options given below:

(1) A, B, C and D only

(2) A, C and D only

(3) A, B, D and E only

(4) A and B only

**Ans (1)**

Photons are electrically neutral



27. Match List-I with List-II.

List – I (Spectral Lines of Hydrogen for transitions from)		List – II (Wavelengths (nm))	
A.	$n_2 = 3$ to $n_1 = 2$	I.	410.2
B.	$n_2 = 4$ to $n_1 = 2$	II.	434.1
C.	$n_2 = 5$ to $n_1 = 2$	III.	656.3
D.	$n_2 = 6$ to $n_1 = 2$	IV.	486.1

Choose the correct answer from the options given below

(1) A-III, B-IV, C-II, D-I

(2) A-IV, B-III, C-I, D-II

(3) A-I, B-II, C-III, D-IV

(4) A-II, B-I, C-IV, D-III

Ans (1)

$$\frac{1}{\lambda} = R \left[ \frac{1}{n_1^2} - \frac{1}{n_2^2} \right]$$

 $\lambda \uparrow E \downarrow$ 

28. Given below are two statements:

**Statement I:** Atoms are electrically neutral as they contain equal number of positive and negative charges.

**Statement II:** Atoms of each elements are stable and emit their characteristic spectrum.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both Statement I and Statement II are incorrect.

(2) Statement I is correct but Statement II is incorrect

(3) Statement I is incorrect but Statement II is correct

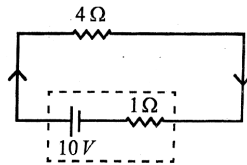
(4) Both Statement I and Statement II are correct

Ans (2)\*

According to Atomic model, atom is electrically neutral hence statement I is correct.

According to Mosley's law, "the square root of frequency of spectral line emitted by an atom is proportional to its atomic number." However, all atoms are not stable.

\*Note: Ambiguity in Statement II.

29. The terminal voltage of the battery, whose emf is 10 V and internal resistance  $1\Omega$ , when connected through an external resistance of  $4\Omega$  as shown in the figure is

(1) 6V

(2) 8V

(3) 10V

(4) 4V

Ans (2)

$$V = E - Ir$$

$$= 10 - \left( \frac{10}{4+1} \right) 1$$

$$= 10 - 2 = 8V$$

30. If the monochromatic source in Young's double slit experiment is replaced by white light, then
- (1) there will be a central dark fringe surrounded by a few coloured fringes.
  - (2) there will be a central bright white fringe surrounded by a few coloured fringes.
  - (3) all bright fringes will be of equal width.
  - (4) interference pattern will disappear.

**Ans (2)**

31. A logic circuit provides the output Y as per the following truth table:

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

The expression for the output Y is

- (1)  $A \cdot \bar{B} + \bar{A}$                       (2)  $\bar{B}$                       (3) B                      (4)  $A \cdot B + \bar{A}$

**Ans (2)**

32. A wire of length 'l' and resistance  $100 \Omega$  is divided into 10 equal parts. The first 5 parts are connected in series while the next 5 parts are connected in parallel. The two combinations are again connected in series. The resistance of this final combination is

- (1)  $52 \Omega$                       (2)  $55 \Omega$                       (3)  $60 \Omega$                       (4)  $26 \Omega$

**Ans (1)**

Resistance of each part is  $10 \Omega$ .

Resistance of 5 parts in series,  $R_S = nR = 50 \Omega$

Resistance of 5 parts in parallel,  $R_P = \frac{R}{n} = 2 \Omega$

$$\therefore R_S + R_P = 52 \Omega$$

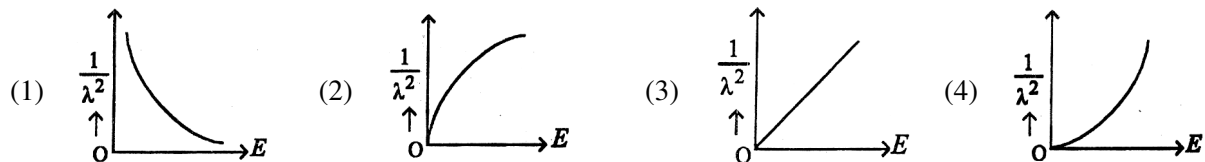
33. The quantities which have the same dimensions as those of solid angle are

- (1) stress and angle                      (2) strain and arc  
(3) angular speed and stress                      (4) strain and angle

**Ans (4)**

Solid angle is dimensionless and even the strain and angle are also dimensionless

34. The graph which shows the variation of  $\left(\frac{1}{\lambda^2}\right)$  and its kinetic energy, E is (where  $\lambda$  is de Broglie wavelength of a free particle):



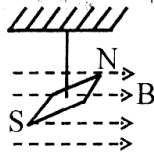
**Ans (3)**

$$p = \frac{h}{\lambda}$$

$$\sqrt{2mE} = \frac{h}{\lambda}$$

$$\lambda^2 = \frac{h^2}{2mE} \quad E \propto \frac{1}{\lambda^2}$$

35. In a uniform magnetic field of 0.049 T, a magnetic needle performs 20 complete oscillations in 5 seconds as shown. The moment of inertia of the needle is  $9.8 \times 10^{-6} \text{ kg m}^2$ . If the magnitude of magnetic moment of the needle is  $x \times 10^{-5} \text{ Am}^2$ ; then the value of 'x' is:



- (1)  $128 \pi^2$                       (2)  $50 \pi^2$                       (3)  $1280 \pi^2$                       (4)  $5 \pi^2$

**Ans (3)**

$$T^2 = \frac{4\pi^2 I}{MB}$$

$$M = \frac{4\pi^2 I}{T^2 B}$$

$$= \frac{4\pi^2 \times 9.8 \times 10^{-6}}{\left(\frac{1}{4}\right)^2 \times 4.9 \times 10^{-2}}$$

$$= 128\pi^2 \times 10^{-4}$$

$$= 1280\pi^2 \times 10^{-5}$$

$$x = 1280\pi^2$$



### Section-B (Physics)

#### Answer any TEN of the following

36. If the plates of a parallel plate capacitor connected to a battery are moved close to each other, then
- the charge stored in it, increases.
  - the energy stored in it, decreases.
  - its capacitance increases.
  - the ratio of charge to its potential remains the same.
  - the product of charge and voltage increases.

Choose the most appropriate answer from the options given below:

- (1) A, C and E only                      (2) B, D and E only                      (3) A, B and C only                      (4) A, B and E only

**Ans (1)**

As the distance between the plates is reduced, capacitance increases keeping the potential constant and hence charge and energy increases.

37. A metallic bar of Young's modulus,  $0.5 \times 10^{11} \text{ Nm}^{-2}$  and coefficient of linear thermal expansion  $10^{-5} \text{ }^\circ\text{C}^{-1}$ , length 1 m and area of cross-section  $10^{-3} \text{ m}^2$  is heated from  $0 \text{ }^\circ\text{C}$  to  $100 \text{ }^\circ\text{C}$  without expansion or bending. The compressive force developed in it is:
- (1)  $50 \times 10^3 \text{ N}$                       (2)  $100 \times 10^3 \text{ N}$                       (3)  $2 \times 10^3 \text{ N}$                       (4)  $5 \times 10^3 \text{ N}$

**Ans (1)**

$$\begin{aligned}
 F &= AY\alpha\Delta T \\
 &= 10^{-3} \times 0.5 \times 10^{11} \times 10^{-5} \times 100 \\
 &= 0.5 \times 10^5 \\
 F &= 50 \times 10^3 \text{ N}
 \end{aligned}$$

38. If the mass of the bob in a simple pendulum is increased to thrice its original mass and its length is made half its original length, then the new time period of oscillation is  $\frac{x}{2}$  times its original time period. Then

the value of x is:

- (1)  $\sqrt{2}$                       (2)  $2\sqrt{3}$                       (3) 4                      (4)  $\sqrt{3}$

**Ans (1)**

$$\begin{aligned}
 T &= 2\pi\sqrt{\frac{\ell}{g}} \\
 T' &= 2\pi\sqrt{\frac{\ell}{2g}} = \frac{1}{\sqrt{2}} \times T \\
 T' &= \frac{x}{2} T \\
 \frac{x}{2} &= \frac{1}{\sqrt{2}} \\
 x &= \frac{2}{\sqrt{2}} = \sqrt{2}
 \end{aligned}$$

39. A small telescope has an objective of focal length 140 cm and an eye piece of focal length 5.0 cm. The magnifying power of telescope for viewing a distance object is:

- (1) 28                      (2) 17                      (3) 32                      (4) 34

**Ans (1)**

$$M = \frac{f_o}{f_e} = \frac{140}{5} = 28$$

40. Two heaters A and B have power rating of 1 kW and 2 kW, respectively. Those two are first connected in series and then in parallel to a power source. The ratio of power outputs for these two cases is:

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

**Ans (1)**

$$\begin{aligned}
 P_s &= \frac{P_1 \times P_2}{P_1 + P_2} = \frac{1 \times 2}{1 + 2} = \frac{2}{3} \text{ kW} \\
 P_p &= P_1 + P_2 = 1 + 2 = 3 \text{ kW} \\
 \therefore \frac{P_s}{P_p} &= \frac{2}{9}
 \end{aligned}$$

41. A force defined by  $F = \alpha t^2 + \beta t$  acts on a particle at a given time t. The factor which is dimensionless, if  $\alpha$  and  $\beta$  are constants, is:

- (1)  $\frac{\alpha t}{\beta}$                       (2)  $\alpha\beta t$                       (3)  $\frac{\alpha\beta}{t}$                       (4)  $\frac{\beta t}{\alpha}$

**Ans (1)**

Dimensions of  $\alpha$  is  $[M^1L^1T^{-4}]$

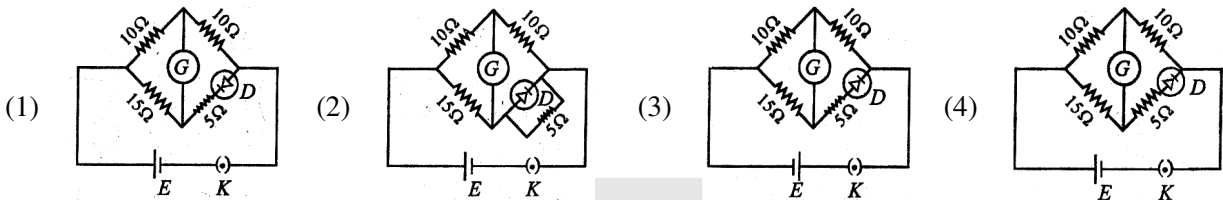
Dimensions of  $\beta$  is  $[M^1L^1T^{-3}]$

$\therefore \frac{\alpha t}{\beta}$  is dimensionless

42. A sheet is placed on a horizontal surface in front of a strong magnetic pole. A force is needed to:
- hold the sheet there if it is magnetic.
  - hold the sheet there if it is non-magnetic.
  - move the sheet away from the pole with uniform velocity if it is conducting.
  - move the sheet away from the pole with uniform velocity if it is both, non-conducting and non-polar.
- Choose the correct statement(s) from the options given below:
- (1) A and C only                      (2) A, C and D only                      (3) C only                      (4) B and D only

**Ans (1)**

43. Choose the correct circuit which can achieve the bridge balance:



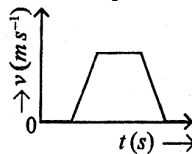
**Ans (4)**

In figure (1) and (3) Diode is reverse biased  $\Rightarrow$  arm with  $5\ \Omega$  resistor is open circuit hence bridge is not balanced

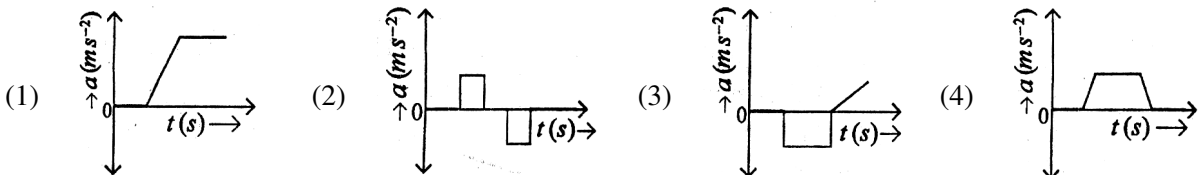
In figure (2), Diode is forward biased  $\Rightarrow$  effective resistance of the arm with  $5\ \Omega$  resistor is tending to zero hence bridge is not balanced

In figure (4), Diode is forward biased  $\Rightarrow$  effective resistance of the arm will be  $5\ \Omega$  hence bridge can be balanced

44. The velocity ( $v$ ) – time ( $t$ ) plot of the motion of a body is shown below:



The acceleration ( $a$ ) – time ( $t$ ) graph that best suits this motion is:



**Ans (2)**

Slope of  $v$ - $t$  graph represents acceleration

45. A 10  $\mu\text{F}$  capacitor is connected to a 210 V, 50 Hz source as shown in figure. The peak current in the circuit is nearly ( $\pi = 3.14$ ):

(1) 0.93 A                      (2) 1.20 A                      (3) 0.35 A                      (4) 0.58 A

**Ans (1)**

$$X_c = \frac{1}{\omega c} = \frac{1}{2\pi \times 50 \times 10 \times 10^{-6}}$$

$$I_0 = \frac{V_0}{X_c} = 210 \times \sqrt{2} \times 2\pi \times 50 \times 10 \times 10^{-6}$$

$$I_0 = 0.93 \text{ A}$$

46. The property which is not of an electromagnetic wave travelling in free space is that:

(1) the energy density in electric field is equal to density in magnetic field.

(2) they travel with a speed equal to  $\frac{1}{\sqrt{\mu_0 \epsilon_0}}$ .

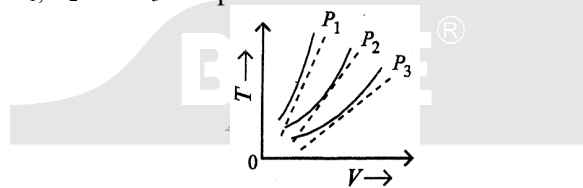
(3) they originate from charges moving with uniform speed.

(4) they are transverse in nature

**Ans (3)**

Electromagnetic waves are produced with charges in *accelerated motion*.

47. The following graph represents the T-V curves of an ideal gas (where T is the temperature and V the volume) at three pressure  $P_1$ ,  $P_2$  and  $P_3$  compared with those of Charles's law represented as dotted lines.



Then the correct relation is:

(1)  $P_1 > P_3 > P_2$                       (2)  $P_2 > P_1 > P_3$                       (3)  $P_1 > P_2 > P_3$                       (4)  $P_3 > P_2 > P_1$

**Ans (3)**

Slope of T-V graph proportional to pressure

48. The minimum energy required to launch a satellite of mass  $m$  from the surface of earth of mass  $M$  and radius  $R$  in a circular orbit at an altitude of  $2R$  from the surface of the earth is

(1)  $\frac{2GmM}{3R}$                       (2)  $\frac{GmM}{2R}$                       (3)  $\frac{GmM}{3R}$                       (4)  $\frac{5GmM}{6R}$

**Ans (4)**

$$\begin{aligned} \Delta E &= E_2 - E_1 \\ &= \frac{GMm}{2(3R)} - \left( \frac{GMm}{R} \right) \\ &= GMm \left( \frac{1}{R} - \frac{1}{6R} \right) \\ &= \frac{GMm}{R} \left( \frac{6-1}{6} \right) \\ &= \frac{5GMm}{6R} \end{aligned}$$

49. A parallel plate capacitor is charged by connecting it to a battery through a resistor. If  $I$  is the current in the circuit, then in the gap between the plates:
- (1) displacement current of magnitude equal to  $I$  flows in the same direction as  $I$ .
  - (2) displacement current of magnitude equal to  $I$  flows in a direction opposite to that of  $I$ .
  - (3) displacement current of magnitude greater than  $I$  flows but can be in any direction.
  - (4) there is no current.

**Ans (1)**

Displacement current is same in magnitude as that of conduction current.

50. An iron bar of length  $L$  has magnetic moment  $M$ . It is bent at the middle of its length such that the two arms make an angle  $60^\circ$  with each other. The magnetic moment of this new magnet is:

- (1)  $\frac{M}{2}$                       (2)  $2M$                       (3)  $\frac{M}{\sqrt{3}}$                       (4)  $M$

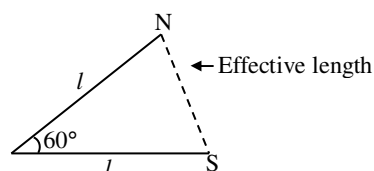
**Ans (1)**

$$\text{Effective length of bar magnet} = 2l \sin \frac{\theta}{2}$$

$$\text{New magnetic moment } M' = m \times 2l \sin \frac{\theta}{2}$$

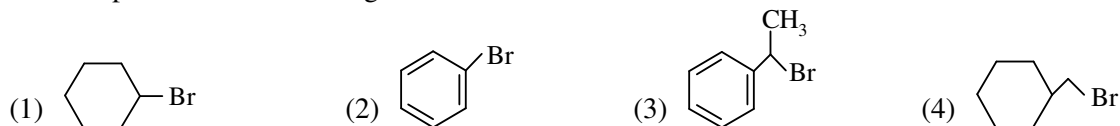
$$\therefore M' = M \sin \frac{\theta}{2} = M \sin \left( \frac{60^\circ}{2} \right) = M \sin 30^\circ$$

$$M' = \frac{M}{2}$$

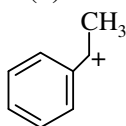


### Section-A (Chemistry)

51. The compound that will undergo  $S_N1$  reaction with the fastest rate is



**Ans (3)**



Benzyl carbocation

52. Given below are two statements:

**Statement I:** Both  $[\text{Co}(\text{NH}_3)_6]^{3+}$  and  $[\text{CoF}_6]^{3-}$  complexes are octahedral but differ in their magnetic behavior.

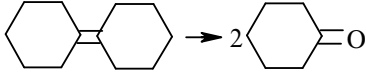
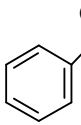
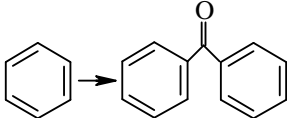
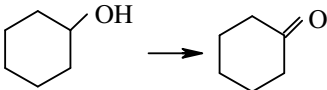
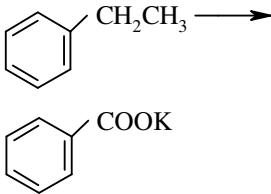
**Statement II:**  $[\text{Co}(\text{NH}_3)_6]^{3+}$  is diamagnetic whereas  $[\text{CoF}_6]^{3-}$  is paramagnetic.

In the light of the above statements, choose the *correct* answer from the options given below.

- (1) Both Statement I Statement II are false.
- (2) Statement I is true but Statement II is false.
- (3) Statement I is false but Statement II is true.
- (4) Both Statement I Statement II are true.

**Ans (4)** $\text{Co}^{3+} \rightarrow d^6 \rightarrow \text{NH}_3$  is a strong ligand,  $n = 0$ , diamagnetic $\text{Co}^{3+} \rightarrow d^6 \rightarrow \text{F}^-$  is a weak ligand,  $n = 4$ , paramagnetic

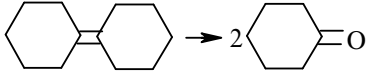
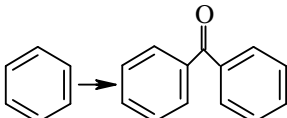
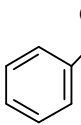
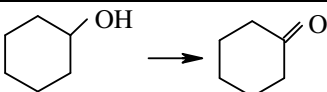
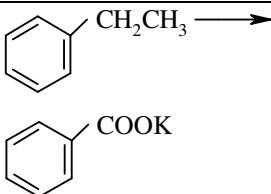
53. Match List I with List II.

List I (Reaction)		List II (Reagents/Condition)	
A.		I.	 Cl/Anhyd. $\text{AlCl}_3$
B.		II.	$\text{CrO}_3$
C.		III.	$\text{KMnO}_4/\text{KOH}, \Delta$
D.		IV.	(i) $\text{O}_3$ (ii) $\text{Zn-H}_2\text{O}$

Choose the correct answer from the options given below

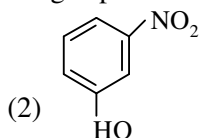
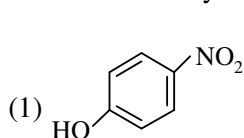
- (1) A-III, B-I, C-II, D-IV  
 (2) A-IV, B-I, C-II, D-III  
 (3) A-I, B-IV, C-II, D-III  
 (4) A-IV, B-I, C-III, D-II

**Ans (2)**

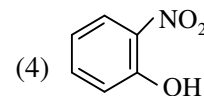
List I (Reaction)		List II (Reagents/Condition)	
A.		I.	(i) $\text{O}_3$ (ii) $\text{Zn-H}_2\text{O}$
B.		II.	 Cl/Anhyd. $\text{AlCl}_3$
C.		III.	$\text{CrO}_3$
D.		IV.	$\text{KMnO}_4/\text{KOH}, \Delta$



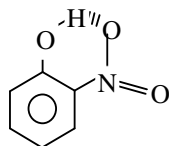
54. Intramolecular hydrogen bonding is present in



(3) HF



Ans (4)



Intramolecular H-Bonding

55. In which of the following processes entropy increases?

A. A liquid evaporates to vapour.

B. Temperature of a crystalline solid lowered from 130 K to 0 K.

C.  $2 \text{NaHCO}_3(\text{s}) \rightarrow \text{Na}_2\text{CO}_3(\text{s}) + \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{g})$

D.  $\text{Cl}_2(\text{g}) \rightarrow 2\text{Cl}(\text{g})$

Choose the correct answer from the options given below:

(1) A, B and D

(2) A, C and D

(3) C and D

(4) A and C

Ans (2)

A → Entropy increases

B → Entropy decreases

C → Entropy increases

D → Entropy increases



56. Arrange the following elements in increasing order of first ionization enthalpy:

Li, Be, B, C, N

Choose the correct answer from the options given below:

(1)  $\text{Li} < \text{B} < \text{Be} < \text{C} < \text{N}$

(2)  $\text{Li} < \text{Be} < \text{C} < \text{B} < \text{N}$

(3)  $\text{Li} < \text{Be} < \text{N} < \text{B} < \text{C}$

(4)  $\text{Li} < \text{Be} < \text{B} < \text{C} < \text{N}$

Ans (1)

$\text{Li} < \text{B} < \text{Be} < \text{C} < \text{N}$

57. In which of the following equilibria,  $K_p$  and  $K_c$  are **NOT** equal?

(1)  $\text{H}_{2(\text{g})} + \text{I}_{2(\text{g})} \rightleftharpoons 2\text{HI}_{(\text{g})}$

(2)  $\text{CO}_{(\text{g})} + \text{H}_2\text{O}_{(\text{g})} \rightleftharpoons \text{CO}_{2(\text{g})} + \text{H}_{2(\text{g})}$

(3)  $2\text{BrCl}_{(\text{g})} \rightleftharpoons \text{Br}_{2(\text{g})} + \text{Cl}_{2(\text{g})}$

(4)  $\text{PCl}_{5(\text{g})} \rightleftharpoons \text{PCl}_{3(\text{g})} + \text{Cl}_{2(\text{g})}$

Ans (4)

$\text{PCl}_{5(\text{g})} \rightleftharpoons \text{PCl}_{3(\text{g})} + \text{Cl}_{2(\text{g})}$

$\Delta n_g \neq 0$

$\therefore K_p \neq K_c$ .

58. Match List I with List II.

List I (Molecule)		List II (Number and types of bond/s between two carbon atoms)	
A.	ethane	I.	one $\sigma$ -bond and two $\pi$ -bonds
B.	ethene	II.	two $\pi$ -bonds
C.	carbon molecule, $C_2$	III.	one $\sigma$ -bond
D.	ethyne	IV.	one $\sigma$ -bond and one $\pi$ -bond

Choose the correct answer from the options given below:

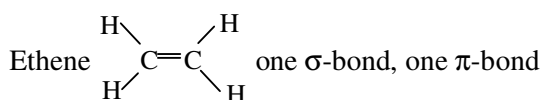
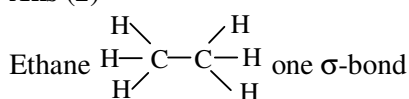
(1) A-IV, B-III C-II, D-I

(2) A-III, B-IV C-II, D-I

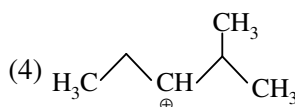
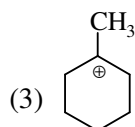
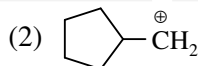
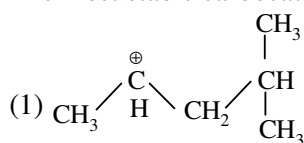
(3) A-III, B-IV, C-I, D-II

(4) A-I, B-IV, C-II, D-III

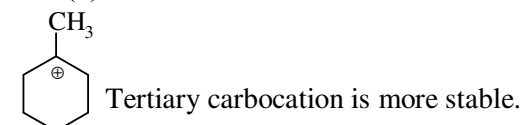
Ans (2)

Carbon molecule ( $C_2$ ) 2- $\pi$  bondsEthyne  $H-C \equiv C-H$  1- $\sigma$  bond, 2- $\pi$  bonds

59. The most stable carbocation among the following is:



Ans (3)



60. 1 gram of sodium hydroxide was treated with 25 mL of 0.75 M HCl solution, the mass of sodium hydroxide left unreacted equal to

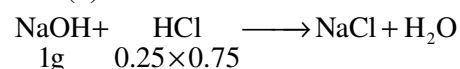
(1) 250 mg

(2) Zero mg

(3) 200mg

(4) 750mg

Ans (1)



$$18.75 \times 10^{-3} \text{ mol}$$

$$18.75 \times 10^{-3} \times 36.5 = 0.684 \text{ g}$$

40 g of NaOH reacts  $\rightarrow$  36.5 g of HCl

1g of NaOH reacts  $\rightarrow$  x g of HCl

$$x = \frac{36.5 \times 1}{40} = 0.9125 \text{ g of HCl}$$

Hence, HCl is limiting reagent

1g of NaOH reacts  $\rightarrow$  0.9125g of HCl

'y' g of NaOH reacts  $\rightarrow$  0.684 g of HCl

$$y = \frac{0.684 \times 1}{0.9125} = 0.750 \text{ g}$$

$$\begin{aligned} \text{Amount of NaOH unreacted} &= 1 - 0.750 \text{ g} \\ &= 0.250 \text{ g} \\ &= 250 \text{ mg} \end{aligned}$$

61. The Henry's law constant ( $K_H$ ) values of three gases (A, B, C) in water are 145,  $2 \times 10^{-5}$  and 35 kbar, respectively. The solubility of these gases in water follow the order:

- (1)  $B > C > A$                       (2)  $A > C > B$                       (3)  $A > B > C$                       (4)  $B > A > C$

**Ans (1)**

Higher the Henry's constant ( $K_H$ ) value, lesser the solubility of gas in water.

62. Arrange the following elements in increasing order of electronegativity:

N, O, F, C, Si

Choose the correct answer from the options given below:

- (1)  $Si < C < O < N < F$                       (2)  $O < F < N < C < Si$   
 (3)  $F < O < N < C < Si$                       (4)  $Si < C < N < O < F$

**Ans (4)**

Across the period electronegativity value increases.

Down the group electronegativity values decreases.

63. Among Group 16 elements, which one does **NOT** show  $-2$  oxidation state?

- (1) Se                      (2) Te                      (3) Po                      (4) O

**Ans (3)**

Down the group negative oxidation state stability decreases.

64. The  $E^\circ$  value for the  $Mn^{3+}/Mn^{2+}$  couple is more positive than that of  $Cr^{3+}/Cr^{2+}$  or  $Fe^{3+}/Fe^{2+}$  due to change of

- (1)  $d^5$  to  $d^2$  configuration  
 (2)  $d^4$  to  $d^5$  configuration  
 (3)  $d^3$  to  $d^5$  configuration  
 (4)  $d^5$  to  $d^4$  configuration

**Ans (2)**

$d^4 - d^5$  configuration

$\Rightarrow d^5$  configuration is half filled

$\therefore Mn^{2+}$  is particularly stable due to half filled configuration

65. Match List I with List II.

List I (Reaction)		List II (Type of isomerism)	
A.	$[\text{Co}(\text{NH}_3)_5(\text{NO}_2)]\text{Cl}_2$	I.	Solvate Isomerism
B.	$[\text{Co}(\text{NH}_3)_5(\text{SO}_4)]\text{Br}$	II.	Linkage Isomerism
C.	$[\text{Co}(\text{NH}_3)_6][\text{Cr}(\text{CN})_6]$	III.	Ionization Isomerism
D.	$[\text{Co}(\text{H}_2\text{O})_6]\text{Cl}_3$	IV.	Coordination isomerism

Choose the correct answer from the options given below:

(1) A-I, B-III, C-IV, D-II

(2) A-I, B-IV, C-III, D-II

(3) A-II, B-IV, C-III, D-I

(4) A-II, B-III, C-IV, D-I

Ans (4)

List I (Reaction)		List II (Type of isomerism)	
A.	$[\text{Co}(\text{NH}_3)_5(\text{NO}_2)]\text{Cl}_2$	I.	Linkage Isomerism
B.	$[\text{Co}(\text{NH}_3)_5(\text{SO}_4)]\text{Br}$	II.	Ionization Isomerism
C.	$[\text{Co}(\text{NH}_3)_6][\text{Cr}(\text{CN})_6]$	III.	Coordination isomerism
D.	$[\text{Co}(\text{H}_2\text{O})_6]\text{Cl}_3$	IV.	Coordination isomerism

66. Given below are two statements:

**Statement I:** The boiling point of hydrides of Group 16 elements follow the order  $\text{H}_2\text{O} > \text{H}_2\text{Te} > \text{H}_2\text{Se} > \text{H}_2\text{S}$ .

**Statement II:** On the basis of molecular mass,  $\text{H}_2\text{O}$  is expected to have lower boiling point than the other members of the group but due to the presence of extensive H-bonding in  $\text{H}_2\text{O}$ , it has higher boiling point.

In the light of the above statements, choose the correct answer from the options given below:

(1) Both Statement I and Statement II are false.

(2) Statement I is true but Statement II is false.

(3) Statement I is false but Statement II is true,

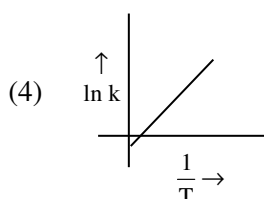
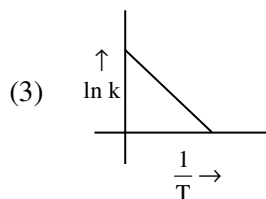
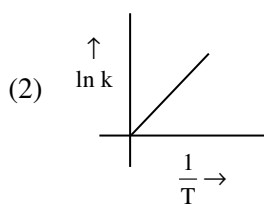
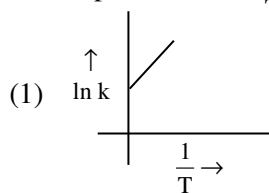
(4) Both Statement I and Statement II are true.

Ans (4)

Boiling point increases with increase in molar mass.

Higher boiling point of  $\text{H}_2\text{O}$  is due to the presence of extensive hydrogen bonding.

67. Which plot of  $\ln k$  vs  $\frac{1}{T}$  is consistent with Arrhenius equation?



**Ans (3)**

$$k = A \cdot e^{-E_a/RT}$$

$$\ln k = \ln A - \frac{E_a}{RT}$$

$$y = C + mx$$

68. The highest number of helium atoms is in

(1) 4 u of helium

(2) 4 g of helium

(3) 2.271098 L of helium at STP

(4) 4 mol of helium

**Ans (4)**

4 u of helium = 4 Helium atom

4 g of helium = 1 mol =  $N_A$  atoms

2.271098 L of helium at STP = 0.1 mol =  $0.1 \times N_A$  atoms

4 mol of helium =  $4N_A$  atoms

69. The reagents with which glucose does **not** react to give the corresponding tests/products are

A. Tollen's reagent

B. Schiff's reagent

C. HCN

D.  $\text{NH}_2\text{OH}$

E.  $\text{NaHSO}_3$

Choose the correct options from the given below:

(1) A and D

(2) B and E

(3) E and D

(4) B and C

**Ans (2)**

Glucose does not react with Schiff's reagent and  $\text{NaHSO}_3$ .

70. Match List I with List II.

List I (Conversion)		List II (Number of Faraday required)	
A.	1 mol of $\text{H}_2\text{O}$ to $\text{O}_2$	I.	3F
B.	1 mol of $\text{MnO}_4^-$ to $\text{Mn}^{2+}$	II.	2F
C.	1.5 mol of Ca from molten $\text{CaCl}_2$	III.	1F
D.	1 mol of $\text{FeO}$ to $\text{Fe}_2\text{O}_3$	IV.	5F

Choose the correct answer from the options given below

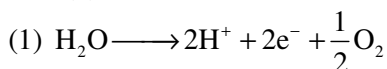
(1) A-III, B-IV, C-I, D-II

(2) A-II, B-III, C-I, D-IV

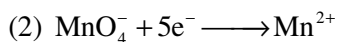
(3) A-III, B-IV, C-II, D-I

(4) A-II, B-IV, C-I, D-III

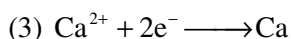
**Ans (4)**



$\therefore 2F$



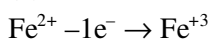
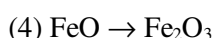
$\therefore 5F$



$1\text{mol} \rightarrow 2F$

$1.5\text{mol} \rightarrow ?$

$1.5 \times 2 = 3$



$\therefore 1F$

71. Match List-I with List-II.

List – I (Quantum Number)		List – II (Information provided)	
A.	$m_l$	I.	shape of orbital
B.	$m_s$	II.	size of orbital
C.	$l$	III.	orientation of orbital
D.	$n$	IV.	orientation of spin of electron

Choose the correct answer from the options given below

(1) A-III, B-IV, C-I, D-II

(2) A-III, B-IV, C-II, D-I

(3) A-II, B-I, C-IV, D-III

(4) A-I, B-III, C-II, D-IV

**Ans (1)**

$n \rightarrow$  size of orbital

$l \rightarrow$  shape of orbital

$m_l \rightarrow$  orientation of orbital

$m_s \rightarrow$  orientation of spin of electron

72. Match List-I with List-II.

List – I (Process)		List – II (Conditions)	
A.	Isothermal process	I.	No heat exchange
B.	Isochoric process	II.	Carried out at constant temperature
C.	Isobaric process	III.	Carried out at constant volume
D.	Adiabatic process	IV.	Carried out at constant pressure

Choose the correct answer from the options given below

(1) A-IV, B-II, C-III, D-I

(2) A-I, B-II, C-III, D-IV

(3) A-II, B-III, C-IV, D-I

(4) A-IV, B-III, C-II, D-I

**Ans (3)**

Isothermal process is carried out at constant temperature.

Isochoric process is carried out at constant volume.

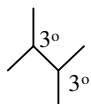
Isobaric process is carried out at constant pressure.

Adiabatic process → no heat exchange.

73. A compound with a molecular formula of  $C_6H_{14}$  has two tertiary carbons. Its IUPAC name is

- (1) 2-methylpentane (2) 2,3-dimethylbutane  
(3) 2,2-dimethylbutane (4) n-hexane

**Ans (2)**



2, 3-Dimethyl butane

74. Which one of the following alcohols reacts instantaneously with Lucas reagent?

- (1)  $CH_3 - CH_2 - \underset{\substack{| \\ CH_3}}{CH} - OH$  (2)  $CH_3 - \underset{\substack{| \\ CH_3}}{CH} - CH_2OH$   
(3)  $CH_3 - \underset{\substack{| \\ CH_3}}{\overset{\substack{CH_3 \\ |}}{C}} - OH$  (4)  $CH_3 - CH_2 - CH_2 - CH_2OH$

**Ans (3)**

Tertiary alcohols reacts instantaneously with Lucas reagent to give turbidity.

75. On heating, some solid substances change from solid to vapour state without passing through liquid state. The technique used for the purification of such solid substances based on the above principle is known as

- (1) Sublimation (2) Distillation  
(3) Chromatography (4) Crystallization

**Ans (1)**

76. The energy of an electron in the ground state ( $n = 1$ ) for  $He^+$  ion is  $-xJ$ , then that for an electron in  $n = 2$  state for  $Be^{3+}$  ion in J is

- (1)  $-\frac{x}{9}$  (2)  $-4x$  (3)  $-\frac{4}{9}x$  (4)  $-x$

**Ans (4)**

$$\frac{E_{He^+}}{E_{Be^{3+}}} = \frac{\left( -2.18 \times 10^{-18} \times \frac{Z^2}{n^2} \right)_{He^+}}{\left( -2.18 \times 10^{-18} \times \frac{Z^2}{n^2} \right)_{Be^{3+}}}$$

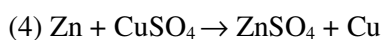
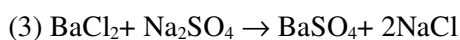
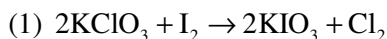
$$\frac{-xJ}{E_{Be^{3+}}} = \left( \frac{Z^2}{n^2} \right)_{He^+} \times \left( \frac{n^2}{Z^2} \right)_{Be^{3+}}$$

$$\frac{-xJ}{E_{\text{Be}^{3+}}} = \frac{2^2}{1^2} \times \frac{2^2}{4^2}$$

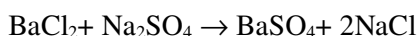
$$\frac{-xJ}{E_{\text{Be}^{3+}}} = \frac{16}{16}$$

$$E_{\text{Be}^{3+}} = -xJ$$

77. Which reaction is NOT a redox reaction?



**Ans** (3)



Not a redox reaction.

78. Activation energy of any chemical reaction can be calculated if one knows the value of

(1) probability of collision

(2) orientation of reactant molecules during collision

(3) rate constant at two different temperatures.

(4) rate constant at standard temperature.

**Ans** (3)

$$\ln \frac{k_2}{k_1} = -\frac{E_a}{R} \left[ \frac{1}{T_2} - \frac{1}{T_1} \right]$$

79. Identify the correct reagents that would bring about the following transformation.



(1) (i)  $\text{BH}_3$  (ii)  $\text{H}_2\text{O}_2 / \overset{\ominus}{\text{O}}\text{H}$  (iii) PCC

(2) (i)  $\text{BH}_3$  (ii)  $\text{H}_2\text{O}_2 / \overset{\ominus}{\text{O}}\text{H}$  (iii) alk.  $\text{KMnO}_4$  (iv)  $\text{H}_3\text{O}^{\oplus}$

(3) (i)  $\text{H}_2\text{O}/\text{H}^+$  (ii) PCC

(4) (i)  $\text{H}_2\text{O}/\text{H}^+$  (ii)  $\text{CrO}_3$

**Ans** (1)

80. Given below are two statements:

**Statement I:** The boiling point of three isomeric pentanes follows the order  
n-pentane > isopentane > neopentane

**Statement II:** When branching increases, the molecule attains a shape of sphere. This results in smaller surface area for contact, due to which the intermolecular forces between the spherical molecules are weak, thereby lowering the boiling point.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both Statement I and Statement II are incorrect.

(2) Statement I is correct but Statement II is incorrect

(3) Statement I is incorrect but Statement II is correct

(4) Both Statement I and Statement II are correct

**Ans** (4)



81. Fehling's solution 'A' is
- (1) alkaline copper sulphate
  - (2) alkaline solution of sodium potassium tartrate (Rochelle's salt)
  - (3) aqueous sodium citrate
  - (4) aqueous copper sulphate

**Ans (4)**

Fehling's solution 'A' (99% CuSO<sub>4</sub>)

82. 'Spin only' magnetic moment is same for which of the following ions?

- A. Ti<sup>3+</sup>
- B. Cr<sup>2+</sup>
- C. Mn<sup>2+</sup>
- D. Fe<sup>2+</sup>
- E. Sc<sup>3+</sup>

Choose the most appropriate answer from the options given below:

- (1) A and E only                      (2) B and C only                      (3) A and D only                      (4) B and D only

**Ans (4)**

Spin only magnetic moment

$$\mu = \sqrt{n(n+2)}$$

A → Ti <sup>3+</sup>	d <sup>1</sup> <sub>n=1</sub>	$\mu = \sqrt{1(1+2)} = \sqrt{3}$
B → Cr <sup>2+</sup>	d <sup>4</sup> <sub>n=4</sub>	$\mu = \sqrt{4(4+2)} = \sqrt{24}$
C → Mn <sup>2+</sup>	d <sup>5</sup> <sub>n=5</sub>	$\mu = \sqrt{5(5+2)} = \sqrt{35}$
D → Fe <sup>2+</sup>	d <sup>6</sup> <sub>n=4</sub>	$\mu = \sqrt{4(4+2)} = \sqrt{24}$
E → Sc <sup>3+</sup>	d <sup>0</sup> <sub>n=0</sub>	$\mu = 0$

83. For the reaction  $2A \rightleftharpoons B + C$ ,  $K_c = 4 \times 10^{-3}$ . At a given time, the composition of reaction mixture is:  $[A] = [B] = [C] = 2 \times 10^{-3}$  M.

Then, which of the following is correct?

- (1) Reaction has a tendency to go in forward direction.
- (2) Reaction has a tendency to go in backward direction.
- (3) Reaction has gone to completion in forward direction.
- (4) Reaction is at equilibrium.

**Ans (2)**



$$Q_c = \frac{[B][C]}{[A]^2} = \frac{2 \times 10^{-3} \times 2 \times 10^{-3}}{(2 \times 10^{-3})^2} = 1$$

$$Q_c > K_c$$

84. Match List-I with List-II.

List – I (Compound)		List – II (Shape/geometry)	
A.	NH <sub>3</sub>	I.	Trigonal Pyramidal
B.	BrF <sub>5</sub>	II.	Square Planar
C.	XeF <sub>4</sub>	III.	Octahedral
D.	SF <sub>6</sub>	IV.	Square Pyramidal

Choose the correct answer from the options given below

(1) A-II, B-IV, C-III, D-I

(2) A-III, B-IV, C-I, D-II

(3) A-II, B-III, C-IV, D-I

(4) A-I, B-IV, C-II, D-III

**Ans** (4)A → NH<sub>3</sub>, sp<sup>3</sup> hybridised with one lone pair

Hence trigonal pyramidal

B → BrF<sub>5</sub>, sp<sup>3</sup>d hybridised with a lone pair hence square pyramidalC → XeF<sub>4</sub>, sp<sup>3</sup>d<sup>2</sup> hybridised with two lone pair hence square planarD → SF<sub>6</sub>, sp<sup>3</sup>d<sup>2</sup> hybridised no lone pair hence octahedral

85. Given below are two statements.

**Statement I:** Aniline does not undergo Friedel-Crafts alkylation reaction.**Statement II:** Aniline cannot be prepared through Gabriel synthesis.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both Statement I and Statement II are incorrect.

(2) Statement I is correct but Statement II is incorrect.

(3) Statement I is incorrect but Statement II is correct

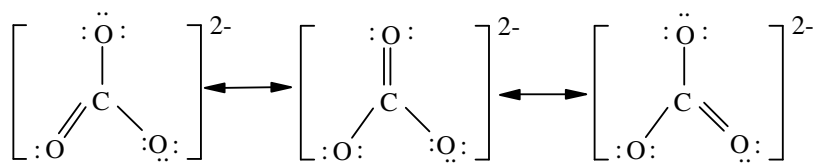
(4) Both Statement I and Statement II are correct

**Ans** (4)**Section-B (Chemistry)****Answer any TEN of the following**

86. Identify the correct answer

(1) BF<sub>3</sub> has non-zero dipole moment(2) Dipole moment of NF<sub>3</sub> is greater than that of NH<sub>3</sub>(3) Three canonical forms can be drawn from CO<sub>3</sub><sup>2-</sup> ion

(4) Three resonance structures can be drawn for ozone

**Ans** (3)

87. During the preparation of Mohr's salt solution (Ferrous ammonium sulphate), which of the following acid is added to prevent hydrolysis of  $\text{Fe}^{2+}$  ion?

- (1) concentrated sulphuric acid                      (2) dilute nitric acid  
 (3) dilute sulphuric acid                              (4) dilute hydrochloric acid

**Ans (3)**

88. Given below are two statements

**Statement I:**  $[\text{Co}(\text{NH}_3)_6]^{3+}$  is a homoleptic complex whereas  $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^+$  is a heteroleptic complex

**Statement II:** Complex  $[\text{Co}(\text{NH}_3)_6]^{3+}$  has only one kind of ligands but  $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^+$  has more than one kind of ligands

In the light of the above statements, choose the correct answer from the options given below:

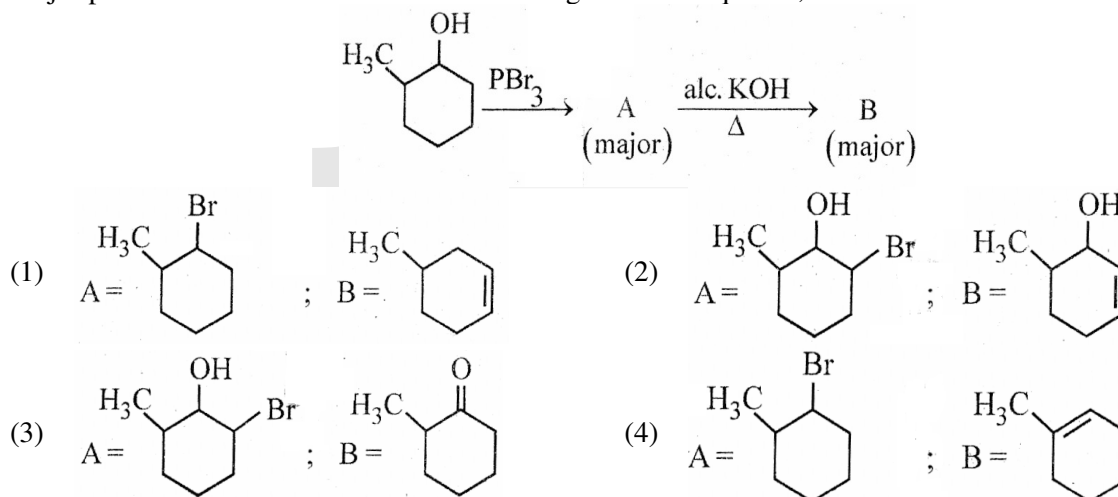
- (1) Both Statement I and Statement II are false.                      (2) Statement I is true but Statement II is false.  
 (3) Statement I is false but Statement II is true                      (4) Both Statement I and Statement II are true.

**Ans (4)**

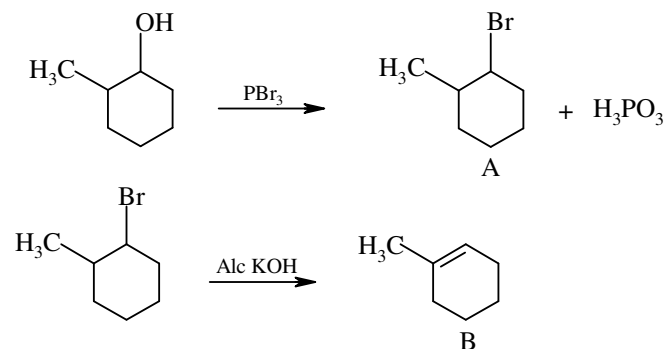
Homoleptic complex: Complex which contain identical ligands.

Heteroleptic complex: Complex which contains more than one kind of ligands.

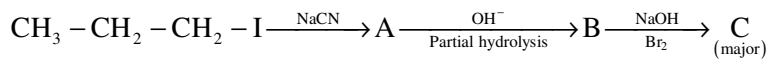
89. Major products A and B formed in the following reaction sequence, are



**Ans (4)**

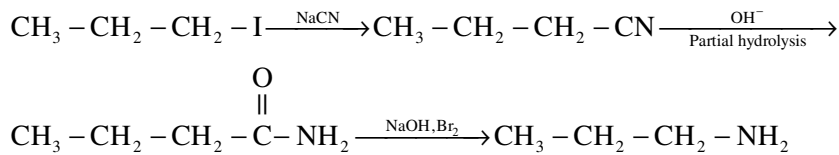


90. Identify the major product C formed in the following reaction sequence:



- (1) butylamine (2) butanamide  
(3)  $\alpha$ -bromobutanoic acid (4) propylamine

Ans (4)



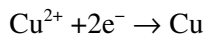
91. Mass in grams of copper deposited by passing 9.6487 A current through a voltmeter containing copper sulphate solution for 100 seconds is:

(Given: Molar mass of Cu:  $63 \text{ g mol}^{-1}$ ,  $1F = 96487 \text{ C}$ )

- (1) 0.315 g (2) 31.5 g (3) 0.0315 g (4) 3.15 g

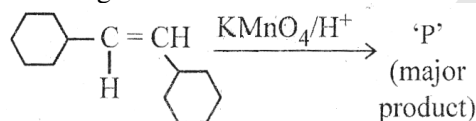
Ans (1)

$$W = Z \times I \times t \quad Z = \frac{E}{96487}$$



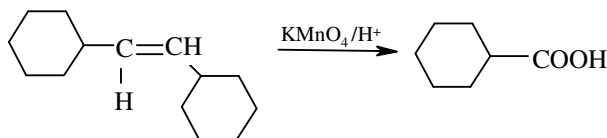
$$W = ZIT = \frac{63.1 \times 9.6487 \times 100}{2 \times 96487} = 0.315 \text{ g}$$

92. For the given reaction:



- (1) Cyclohexyl-COOH (2) Cyclohexyl-CH(OH)-CH(OH)-Cyclohexyl  
(3) Cyclohexyl-C(=O)-C(=O)-Cyclohexyl (4) Cyclohexyl-CHO

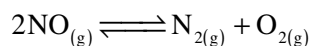
Ans (1)



93. Consider the following reaction in a sealed vessel at equilibrium with concentrations of

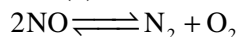
$\text{N}_2 = 3.0 \times 10^{-3} \text{ M}$ ,  $\text{O}_2 = 4.2 \times 10^{-3} \text{ M}$  and

$\text{NO} = 2.8 \times 10^{-3} \text{ M}$ .

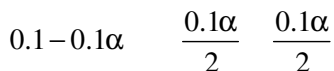
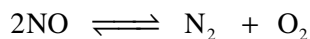


If  $0.1 \text{ mol L}^{-1}$  of  $\text{NO}_{(\text{g})}$  is taken in a closed vessel, what will be degree of dissociation ( $\alpha$ ) of  $\text{NO}_{(\text{g})}$  at equilibrium?

- (1) 0.0889 (2) 0.8889 (3) 0.717 (4) 0.00889

**Ans (3)**

$$K_c = \frac{[\text{N}_2][\text{O}_2]}{[\text{NO}]^2} = \frac{(3 \times 10^{-3})(4.2 \times 10^{-3})}{(2.8 \times 10^{-3})^2} = 1.6$$



$$K_c = \frac{\left(\frac{0.1\alpha}{2}\right)\left(\frac{0.1\alpha}{2}\right)}{(0.1(1-\alpha))^2}$$

$$1.6 = \frac{\alpha^2}{4(1-\alpha)^2}$$

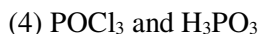
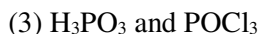
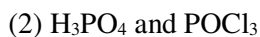
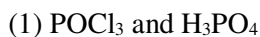
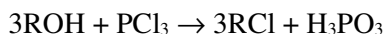
$$1.6 \times 4 = \frac{\alpha^2}{(1-\alpha)^2}$$

$$1.26 \times 2 = \frac{\alpha}{1-\alpha}$$

$$2.52(1-\alpha) = \alpha$$

$$\alpha = 0.7$$

94. The products A and B obtained in the following reactions, respectively, are
- $$3\text{ROH} + \text{PCl}_3 \rightarrow 3\text{RCl} + \text{A}$$
- $$\text{ROH} + \text{PCl}_5 \rightarrow \text{RCl} + \text{HCl} + \text{B}$$

**Ans (3)**

95. The plot of osmotic pressure ( $\pi$ ) vs concentration ( $\text{mol L}^{-1}$ ) for a solution gives a straight line with slope  $25.73 \text{ L bar mol}^{-1}$ . The temperature at which the osmotic pressure measurement is done is: (Use  $R = 0.083 \text{ L bar mol}^{-1}\text{K}^{-1}$ )

(1)  $310^\circ\text{C}$

(2)  $25.73^\circ\text{C}$

(3)  $12.05^\circ\text{C}$

(4)  $37^\circ\text{C}$

**Ans (4)**

$$\pi = CRT$$

Plot  $\pi$  vs C gives a straight line

Slope =  $RT$

$$25.73 \text{ L bar mol}^{-1} = 0.083 \text{ L bar mol}^{-1} \text{K}^{-1} \times T$$

$$\Rightarrow T = \frac{25.73}{0.083} \text{K}$$

$$= 310 \text{ K}$$

$$= 310 - 273$$

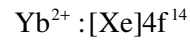
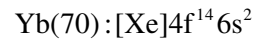
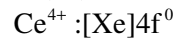
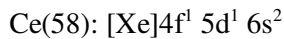
$$= 37^\circ \text{C}$$

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96. The pair of lanthanoid ions which are diamagnetic is

- (1)  $\text{Ce}^{3+}$  and  $\text{Eu}^{2+}$                       (2)  $\text{Gd}^{3+}$  and  $\text{Eu}^{3+}$                       (3)  $\text{Pm}^{3+}$  and  $\text{Sm}^{3+}$                       (4)  $\text{Ce}^{4+}$  and  $\text{Yb}^{2+}$

**Ans (4)**



$\therefore \text{Ce}^{4+}$  and  $\text{Yb}^{2+}$  does not contain unpaired electron

97. The work done during reversible isothermal expansion of one mole of hydrogen gas at  $25^\circ\text{C}$  from pressure of 20 atmosphere to 10 atmosphere is: (given  $R = 2.0 \text{ cal K}^{-1} \text{ mol}^{-1}$ )

- (1)  $-413.14$  calories                      (2)  $413.14$  calories                      (3)  $100$  calories                      (4)  $0$  calories

**Ans (1)**

$$W = -2.303 nRT \log \frac{P_1}{P_2}$$

$$= -2.303 \times 2 \times 298 \times \log \left( \frac{20}{10} \right)$$

$$= -2.303 \times 2 \times 298 \times 0.3010$$

$$= -413.14 \text{ cal}$$

98. Given below are certain cations. Using inorganic qualitative analysis, arrange them in increasing group number 0 to VI.

- A.  $\text{Al}^{3+}$                       B.  $\text{Cu}^{2+}$   
 C.  $\text{Ba}^{2+}$                       D.  $\text{Co}^{2+}$   
 E.  $\text{Mg}^{2+}$

Choose the correct answer from the options given below:

- (1) B, C, A, D, E                      (2) E, C, D, B, A                      (3) E, A, B, C, D                      (4) B, A, D, C, E

**Ans (4)**

Group number	Basic radical
II	$\text{Cu}^{2+}$
III	$\text{Al}^{3+}$
IV	$\text{Co}^{2+}$
V	$\text{Ba}^{2+}$
VI	$\text{Mg}^{2+}$

99. The rate of a reaction quadruples when temperature changes from  $27^\circ\text{C}$  to  $57^\circ\text{C}$ . Calculate the energy of activation. Given  $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$ ,  $\log 4 = 0.6021$

- (1)  $380.4 \text{ kJ/mol}$                       (2)  $3.80 \text{ kJ/mol}$                       (3)  $3804 \text{ kJ/mol}$                       (4)  $38.04 \text{ kJ/mol}$

**Ans (4)**

$$\log \left( \frac{k_2}{k_1} \right) = \frac{E_a}{2.303R} \left( \frac{1}{T_1} - \frac{1}{T_2} \right)$$

$$\log 4 = \frac{E_a}{2.303 \times 8.314} \left( \frac{1}{300} - \frac{1}{330} \right)$$

$$E_a = 38.04 \text{ kJ/mol}$$

100. A Compound X contains 32% of A, 20% of B and remaining percentage of C. Then, the empirical formula of X is (Given atomic masses of A = 64; B = 40; C = 32 u)

- (1)  $ABC_3$                       (2)  $AB_2C_2$                       (3)  $ABC_4$                       (4)  $A_2BC_2$

Ans (1)

Element	% of composition	Atomic mass	Simple ratio	Simple ratio
A	32	64	$\frac{32}{64} = 0.5$	$\frac{0.5}{0.5} = 1$
B	20	40	$\frac{20}{40} = 0.5$	$\frac{0.5}{0.5} = 1$
C	48	32	$\frac{48}{32} = 1.5$	$\frac{1.5}{0.5} = 3$

∴ Empirical formula of X is  $ABC_3$ .

### Section-A (Biology: Botany)

101. Spindle fibers attach to kinetochores of chromosomes during

- (1) Metaphase                      (2) Anaphase                      (3) Telophase                      (4) Prophase

Ans (1)

102. Bulliform cells are responsible for

- (1) Protecting the plant from salt stress.                      (2) increased photosynthesis in monocots.  
(3) Providing large spaces for storage of sugars.                      (4) Inward curling of leaves in monocots.

Ans (4)

103. The capacity to generate a whole plant from any cell of the plant is called:

- (1) Micropropagation                      (2) Differentiation  
(3) Somatic hybridization                      (4) Totipotency

Ans (4)

104. A transcription unit in DNA is defined primarily by the three regions in DNA and these are with respect to upstream and down stream end;

- (1) Structural gene, Transposons, Operator gene                      (2) Inducer, Repressor, Structural gene  
(3) Promoter, Structural gene, Terminator                      (4) Repressor, Operator gene, Structural gene

Ans (3)

105. Match List I with List II

	List I		List II
A.	<i>Clostridium butylicum</i>	I.	<i>Ethanol</i>
B.	<i>Saccharomyces cerevisiae</i>	II.	<i>Streptokinase</i>
C.	<i>Trichoderma polysporum</i>	III.	<i>Butyric acid</i>
D.	<i>Streptococcus sp.</i>	IV.	<i>Cyclosporin-A</i>

Choose the correct answer from the options given below:

- (1) A-II, B-IV, C-III, D-I (2) A-III, B-I, C-IV, D-II  
 (3) A-IV, B-I, C-III, D-II (4) A-III, B-I, C-II, D-IV

**Ans (2)**

106. Match List I with List II

	List I		List II
A.	Two or more alternative forms of a gene	I.	Back cross
B.	Cross of F <sub>1</sub> progeny with homozygous recessive parent	II.	Ploidy
C.	Cross of F <sub>1</sub> progeny with any of the parents	III.	Allele
D.	Number of chromosome sets in plant	IV.	Test cross

Choose the correct answer from the options given below:

- (1) A-II, B-I, C-III, D-IV (2) A-III, B-IV, C-I, D-II  
 (3) A-IV, B-III, C-II, D-I (4) A-I, B-II, C-III, D-IV

**Ans (2)**

107. Hind II always cuts DNA molecules at a particular point called recognition sequence and it consists of:

- (1) 6 bp (2) 4 bp (3) 10 bp (4) 8 bp

**Ans (1)**

108. In a plant, black seed color (BB/Bb) is dominant over white seed color (bb). In order to find out the genotype of the black seed plant, with which of the following genotype will you cross it?

- (1) bb (2) Bb (3) BB/Bb (4) BB

**Ans (1)**

109. These are regarded as major causes of biodiversity loss:

- A. Over exploitation  
 B. Co-extinction  
 C. Mutation  
 D. Habitat loss and fragmentation  
 E. Migration

Choose the correct option

- (1) A, B, C and D only (2) A, B and E only  
 (3) A, B and D only (4) A, C and D only

**Ans (3)**

110. How many molecules of ATP and NADPH are required for every molecule of CO<sub>2</sub> fixed in the Calvin cycle?

- (1) 2 molecules of ATP and 2 molecules of NADPH  
 (2) 3 molecules of ATP and 3 molecules of NADPH  
 (3) 3 molecules of ATP and 2 molecules of NADPH  
 (4) 2 molecules of ATP and 3 molecules of NADPH

**Ans (3)**



111. Which one of the following can be explained on the basis of Mendel's Law of Dominance
- Out of one pair of factors one is dominant and the other is recessive,
  - Alleles do not show any expression and both the characters appear as such in  $F_2$  generation.
  - Factors occur in pairs in normal diploid plants.
  - The discrete unit controlling a particular character is called factor.
  - The expression of only one of the parental characters is found in a monohybrid cross.

Choose the correct answer from the options given below:

- (1) A, C, D and E only      (2) B, C and D only      (3) A, B, C, D and E      (4) A, B and C only

**Ans** (1)

112. List of endangered species was released by

- (1) WWF      (2) FOAM      (3) IUCN      (4) GEAC

**Ans** (3)

113. Tropical regions show, greatest level of species richness because

- Tropical latitudes have remained relatively undisturbed for millions of years, hence more time was available for species diversification.
- Tropical environments are more seasonal.
- More solar energy is available in tropics.
- Constant environments promote niche specialization.
- Tropical environments are constant and predictable.

Choose the correct answer from the options given below:

- (1) A and B only      (2) A, B and E only      (3) A, B and D only      (4) A, C, D and E only

**Ans** (4)

114. Match List I with List II

	<b>List I</b>		<b>List II</b>
A.	Nucleolus	I.	Site of formation glycolipid
B.	Centriole	II.	Organization like the cart wheel
C.	Leucoplasts	III.	Site for active ribosomal RNA synthesis
D.	Golgi apparatus	IV.	For storing nutrients

Choose the correct answer from the options given below:

- (1) A-II, B-III, C-I, D-IV      (2) A-III, B-IV, C-II, D-I  
 (3) A-I, B-II, C-III, D-IV      (4) A-III, B-II, C-IV, D-I

**Ans** (4)

115. Which of the following, is an example of actinomorphic flower?

- (1) *Cassia*      (2) *Pisum*      (3) *Sesbania*      (4) *Datura*

**Ans** (4)

116. Identify the set of correct statements:

- The flowers of *Vallisneria* are colourful and produce nectar.
- The flowers of waterlily are not pollinated by water.
- In most of water-pollinated species, the pollen grains are protected from wetting.
- Pollen grains of some hydrophytes are long and ribbon like.
- In some hydrophytes, the pollen grains are carried passively inside water.

Choose the correct answer from the options given below:

- (1) A, B, C and D only      (2) A, C, D and E only      (3) B, C, D and E only      (4) C, D and E only

**Ans** (3)

117. What is the fate of a piece of DNA carrying only gene of interest which is transferred into an alien organism?

- A. The piece of DNA would be able to multiply itself independently in the progeny cells of the organism.  
 B. It may get integrated into the genome of the recipient.  
 C. It may multiply and be inherited along with the host DNA.  
 D. The alien piece of DNA is not an integral part of chromosome.  
 E. It shows ability to replicate.

Choose the correct answer from the options given below:

- (1) D and E only      (2) B and C only      (3) A and E only      (4) A and B only

**Ans** (2)

118. Given below are two statements:

**Statement I:** Parenchyma is living but collenchyma is dead tissue.

**Statement II:** Gymnosperms lack xylem vessels but presence of xylem vessels is the characteristic of angiosperms.

In the light of the above statements, choose the correct answer from the options given below:

- (1) Both Statement I and Statement II are false      (2) Statement I is true but Statement II is false  
 (3) Statement I is false but Statement II is true      (4) Both Statement I and Statement II are true

**Ans** (3)

119. Formation of interfascicular cambium from fully developed parenchyma cells is an example for

- (1) Redifferentiation      (2) Dedifferentiation      (3) Maturation      (4) Differentiation

**Ans** (2)

120. Which one of the following is not a criterion for classification of fungi?

- (1) Mode of nutrition      (2) Mode of spore formation  
 (3) Fruiting body      (4) Morphology of mycelium

**Ans** (1)

121. The cofactor of the enzyme carboxypeptidase is:

- (1) Niacin      (2) Flavin      (3) Haem      (4) Zinc

**Ans** (4)

122. Auxin is used by gardeners to prepare weed-free lawns. But no damage is caused to grass as auxin

- (1) promotes abscission of mature leaves only.  
 (2) does not affect mature monocotyledonous plants.  
 (3) can help in cell division in grasses, to produce growth.  
 (4) promotes apical dominance

**Ans** (2)

123. A pink flowered Snapdragon plant was crossed with a red flowered Snapdragon plant. What type of phenotype/s is/are expected in the progeny?

- (1) Red flowered as well as pink flowered plants      (2) Only pink flowered plants  
(3) Red, Pink as well as white flowered plants      (4) Only red flowered plants

**Ans (1)**

124. Which of the following are required for the dark reaction of photosynthesis?

- A. Light  
B. Chlorophyll  
C. CO<sub>2</sub>  
D. ATP  
E. NADPH

Choose the correct answer from the options given below:

- (1) B, C and D only      (2) C, D and E only      (3) D and E only      (4) A, B and C only

**Ans (2)**

125. Match List I with List II

	List I		List II
A.	<i>Rhizopus</i>	I.	Mushroom
B.	<i>Ustilago</i>	II.	Smut fungus
C.	<i>Puccinia</i>	III.	Bread mould
D.	<i>Agaricus</i>	IV.	Rust fungus

Choose the correct answer from the options given below:

- (1) A-I, B-III, C-II, D-IV      (2) A-III, B-II, C-I, D-IV  
(3) A-IV, B-III, C-II, D-I      (4) A-III, B-II, C-IV, D-I

**Ans (4)**

126. The lactose present in the growth medium of bacteria is transported to the cell by the action of:

- (1) Acetylase      (2) Permease  
(3) Polymerase      (4) Beta-galactosidase

**Ans (2)**

127. The equation of Verhulst-Pearl logistic growth is

$$\frac{dN}{dt} = rN \left[ \frac{K - N}{K} \right]$$

From this equation, K indicates:

- (1) Biotic potential      (2) Carrying capacity  
(3) Population density      (4) Intrinsic rate of natural increase

**Ans (2)**

128. Inhibition of Succinic dehydrogenase enzyme by malonate is a classical example of:

- (1) Feedback inhibition      (2) Competitive inhibition  
(3) Enzyme activation      (4) Cofactor inhibition

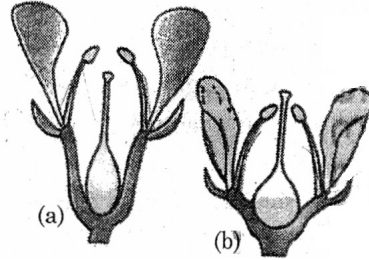
**Ans (2)**

129. The type of conservation in which the threatened species are taken out from their natural habitat and placed in special setting where they can be protected and given special care is called;

- (1) Biodiversity conservation (2) Semi-conservative method  
(3) Sustainable development (4) in-situ conservation

**Ans (1)**

130. Identify the type of flower based on the position of calyx, corolla and androecium with respect to the ovary from the given figures (a) and (b)



- (1) (a) Hypogynous; (b) Epigynous. (2) (a) Perigynous; (b) Epigynous  
(3) (a) Perigynous; (b) Perigynous (4) (a) Epigynous; (b) Hypogynous

**Ans (3)**

131. Given below are two statements:

**Statement I:** Bt toxins are insect group specific and coded by a gene *cry I Ac*

**Statement II:** Bt toxin exists as inactive protoxin in *B. thuringiensis*. However, after ingestion by the insect the inactive protoxin gets converted into active form due to acidic pH of the insect gut.

In the light of the above statements, choose the correct answer from the options given below:

- (1) Both Statement I and the Statement II are false  
(2) Statement I is true but statement II is false  
(3) Statement I is false but statement II is true  
(4) Both Statement I and statement II are true

**Ans (2)**

132. Lecithin, a small molecular weight organic compound found in living tissues, is an example of:

- (1) Phospholipids (2) Glycerides (3) Carbohydrates (4) Amino acids

**Ans (1)**

133. Given below are two statements:

**Statement I:** Chromosomes become gradually visible under light, microscope during leptotene stage.

**Statement II:** The beginning of diplotene stage is recognized by dissolution of synaptonemal complex.

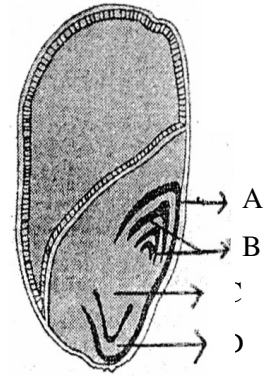
In the light of the above statements, choose the correct answer from the options given below:

- (1) Both Statement I and Statement II are false  
(2) Statement I is true but Statement II is false  
(3) Statement I is false but Statement II is true  
(4) Both Statement I and Statement II are true

**Ans (4)**

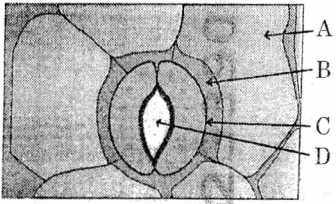
134. Identify the part of the seed from the given figure which is destined to form root when the seed germinates.

- (1) B
- (2) C
- (3) D
- (4) A



Ans (2)

135. In the given figure, which component has thin outer walls and highly thickened inner walls?



- (1) D
- (2) A
- (3) B
- (4) C

Ans (4)

### Section-B (Biology: Botany)

Answer any TEN of the following

136. Match List I with List II.

List I		List II	
A.	GLUT-4	I.	Hormone
B.	Insulin	II.	Enzyme
C.	Trypsin	III.	Intercellular ground substance
D.	Collagen	IV.	Enables glucose transport into cells

Choose the correct answer from the options given below:

- (1) A-I, B-II, C-III, D-IV
- (2) A-II, B-III, C-IV, D-I
- (3) A-III, B-IV, C-I, D-II
- (4) A-IV, B-I, C-II, D-III

Ans (4)

137. Match List I with List II.

List I		List II	
A.	Citric acid cycle	I.	Cytoplasm
B.	Glycolysis	II.	Mitochondrial matrix
C.	Electron transport system	III.	Intermembrane space of mitochondria
D.	Proton gradient	IV.	Inner mitochondrial membrane

Choose the correct answer from the options given below:

- (1) A-II, B-I, C-IV, D-III
- (2) A-III, B-IV, C-I, D-II
- (3) A-IV, B-III, C-II, D-I
- (4) A-I, B-II, C-III, D-IV

Ans (1)

138. Match List I with List II.

List I		List II	
A.	Robert May	I.	Species-Area relationship
B.	Alexander von Humboldt	II.	Long term ecosystem experiment using out door plots
C.	Paul Ehrlich	III.	Global species diversity at about 7 million
D.	David Tilman	IV.	Rivet popper hypothesis

Choose the correct answer from the options given below:

(1) A-III, B-I, C-IV, D-II

(2) A-I, B-III, C-II, D-IV

(3) A-III, B-IV, C-II, D-I

(4) A-II, B-III, C-I, D-IV

**Ans (1)**

139. Spraying sugarcane crop with which of the following plant growth regulators, increases the length of stem, thus, increasing the yield?

(1) Gibberellin

(2) Cytokinin

(3) Abscisic acid

(4) Auxin

**Ans (1)**

140. Match List I with List II.

List I		List II	
A.	Frederick Griffith	I.	Genetic code
B.	Francois Jacob & Jacque Monod	II.	Semi-conservative mode of DNA replication
C.	Har Gobind Khorana	III.	Transformation
D.	Meselson & Stahl	IV.	Lac operon

Choose the correct answer from the options given below:

(1) A-III, B-IV, C-I, D-II

(2) A-II, B-III, C-IV, D-I

(3) A-IV, B-I, C-II, D-III

(4) A-III, B-II, C-I, D-IV

**Ans (1)**141. In an ecosystem if the Net Primary Productivity (NPP) of first trophic level is  $100x \text{ (kcal m}^{-2}\text{) yr}^{-1}$ , what would be the GPP (Gross Primary Productivity) of the third trophic level of the same ecosystem?(1)  $x \text{ (kcal m}^{-2}\text{) yr}^{-1}$ (2)  $10x \text{ (kcal m}^{-2}\text{) yr}^{-1}$ (3)  $\frac{100x}{3x} \text{ (kcal m}^{-2}\text{) yr}^{-1}$ (4)  $\frac{x}{10} \text{ (kcal m}^{-2}\text{) yr}^{-1}$ **Ans (1)**

142. Identify the step in tricarboxylic acid cycle, which does not involve oxidation of substrate.

(1) Succinic acid  $\rightarrow$  Malic acid(2) Succinyl-CoA  $\rightarrow$  Succinic acid(3) Isocitrate  $\rightarrow$   $\alpha$ -ketoglutaric acid(4) Malic acid  $\rightarrow$  Oxaloacetic acid**Ans (2)**

143. Which of the following are fused in somatic hybridization involving two varieties of plants?

(1) Somatic embryos

(2) Protoplasts

(3) Pollens

(4) Callus

**Ans (2)**



149. Given below are two statements:

**Statement I:** In  $C_3$  plants, some  $O_2$  binds to RuBisCO, hence  $CO_2$  fixation is decreased.

**Statement II:** In  $C_4$  plants, mesophyll cells show very little photorespiration while bundle sheath cells do not show photorespiration.

In the light of the above statements, choose the correct answer from the options given below:

- (1) Both Statement I and Statement II are false
- (2) Statement I is true but Statement II is false
- (3) Statement I is false but Statement II is true
- (4) Both Statement I and Statement II are true

**Ans (2)**

150. Match List I with List II.

List I		List II	
A.	Rose	I.	Twisted aestivation
B.	Pea	II.	Perigynous flower
C.	Cotton	III.	Drupe
D.	Mango	IV.	Marginal placentation

Choose the correct answer from the options given below:

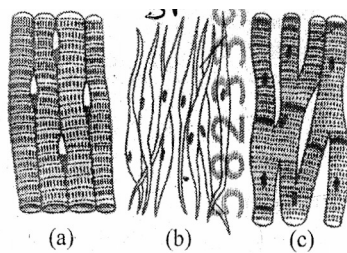
- (1) A-I, B-II, C-III, D-IV
- (2) A-IV, B-III, C-II, D-I
- (3) A-II, B-III, C-IV, D-I
- (4) A-II, B-IV, C-I, D-III

**Ans (4)**



### Section-A (Biology: Zoology)

151. Three types of muscles are given as a, b and c. identify the correct matching pair along with their location in human body



Name of muscle location

- (1) (a) Skeletal-Triceps; (b) Smooth-Stomach; (c) Cardiac-Heart
- (2) (a) Skeletal-Biceps; (b) involuntary - Intestine; (c) Smooth-Heart.
- (3) (a) Involuntary - Nose tip; (b) Skeletal - Bone; (c) Cardiac-Heart.
- (4) (a) Smooth-toes; (b) Skeletal-Legs; (c) Cardiac-Heart.

**Ans (1)**



152. Following are the stages of pathway for conduction of an action potential through the heart:

- A. AV bundle
- B. Purkinje fibres
- C. AV node
- D. Bundle branches
- E. SA node

Choose the correct sequence of pathway from the options given below:

- (1) A-E-C-B-D                      (2) B-D-E-C-A                      (3) E-A-D-B-C                      (4) E-C-A-D-B

**Ans (4)**

153. Which one of the following factors will not affect the Hardy-Weinberg equilibrium?

- (1) Genetic drift                      (2) Gene migration                      (3) Constant gene pool                      (4) Genetic recombination

**Ans (3)**

154. Which of the following statements is incorrect?

- (1) Most commonly used bio-reactors are of stirring type.
- (2) Bio-reactors are used to produce small scale bacterial cultures.
- (3) Bio-reactors have an agitator system, an oxygen delivery system and foam control system.
- (4) A bio-reactor provides optimal growth conditions for achieving the desired product.

**Ans (2)**

155. Which one is the correct product of DNA dependent RNA polymerase to the given template?

3'TACATGGCAAATATCCATTCA5'

- (1) 5'AUGUAAAGUUUAUAGGUAAGU3'                      (2) 5'AUGUACCGUUUAUAGGGAAGU3'  
 (3) 5'ATGTACCGTTTATAGGTAAGT3'                      (4) 5'AUGUACCGUUUAUAGGUAAGU3'

**Ans (4)**

156. Match List I with List II

List I		List II	
A.	$\alpha$ -1 antitrypsin	I.	Cotton bollworm
B.	Cry IAb	II.	ADA deficiency
C.	Cry IAc	III.	Emphysema
D.	Enzyme replacement therapy	IV	Corn borer

Choose the correct answer from the options given below:

- (1) A - III, B - I, C - II, D - IV                      (2) A - III, B - IV, C - I, D - II  
 (3) A - II, B - IV, C - I, D - III                      (4) A - II, B - I, C - IV, D - III

**Ans (2)**

157. Which of the following are Autoimmune disorders?

- A. Myasthenia gravis
- B. Rheumatoid arthritis
- C. Gout
- D. Muscular dystrophy
- E. Systemic Lupus Erythematosus (SLE)

Choose the most appropriate answer from the options given below:

- (1) A, B and E only      (2) B, C and E only      (3) C, D and E only      (4) A, B and D only

**Ans (1)**

158. Match List I with List II:

List I		List II	
A.	Down's syndrome	I.	11 <sup>th</sup> chromosome
B.	$\alpha$ -Thalassemia	II.	'X' chromosome
C.	$\beta$ -Thalassemia	III.	21 <sup>st</sup> chromosome
D.	Klinefelter's syndrome	IV.	6 <sup>th</sup> chromosome

Choose the correct answer from the options given below:

- (1) A - II, B - III, C - IV, D - I      (2) A - III, B - IV, C - I, D - II  
 (3) A - IV, B - I, C - II, D - III      (4) A - I, B - II, C - III, D - IV

**Ans (2)**

159. Given below are two statements:

**Statement I:** In the nephron, the descending limb of loop of Henle is impermeable to water and permeable to electrolytes.

**Statement II:** The proximal convoluted tubule is lined by simple columnar brush border epithelium and increases the surface area for reabsorption.

In the light of the above statements, choose the correct answer from the options given below

- (1) Both Statement I and Statement II are false  
 (2) Statement I is true but Statement II is false  
 (3) Statement I is false but Statement II is true  
 (4) Both Statement I and Statement II are true

**Ans (1)**

160. Match List I with List II

List I		List II	
A.	Pons	I.	Provides additional space for Neurons, regulates posture and balance.
B.	Hypothalamus	II.	Controls respiration and gastric secretions.
C.	Medulla	III.	Connects different regions of the brain.
D.	Cerebellum	IV.	Neuro secretory cells

Choose the correct answer from the options given below:

- (1) A - III, B - IV, C - II, D - I      (2) A - I, B - III, C - II, D - IV  
 (3) A - II, B - I, C - III, D - IV      (4) A - II, B - III, C - I, D - IV

**Ans (1)**

161. Match List I with List II

List I		List II	
A.	Axoneme	I.	Centriole
B.	Cartwheel pattern	II.	Cilia and flagella
C.	Crista	III.	Chromosome
D.	Satellite	IV.	Mitochondria

Choose the correct answer from the options given below:

(1) A - IV, B - II, C - III, D - I

(2) A - II, B - IV, C - I, D - III

(3) A - II, B - I, C - IV, D - III

(4) A - IV, B - III, C - II, D - I

**Ans (3)**

162. Match List I with List II

List I		List II	
A.	Fibrous joints	I.	Adjacent vertebrae, limited movement
B.	Cartilaginous joints	II.	Humerus and Pectoral girdle, rotational movement
C.	Hinge joints	III.	Skull, don't allow any movement
D.	Ball and socket joints	IV.	Knee, help in locomotion

Choose the correct answer from the options given below:

(1) A - I, B - III, C - II, D - IV

(2) A - II, B - III, C - I, D - IV

(3) A - III, B - I, C - IV, D - II

(4) A - IV, B - II, C - III, D - I

**Ans (3)**

163. Match List I with List II

List I		List II	
A.	<i>Pterophyllum</i>	I.	Hag fish
B.	<i>Myxine</i>	II.	Saw fish
C.	<i>Pristis</i>	III.	Angel fish
D.	<i>Exocoetus</i>	IV.	Flying fish

Choose the correct answer from the options given below:

(1) A - III, B - I, C - II, D - IV

(2) A - IV, B - I, C - II, D - III

(3) A - III, B - II, C - I, D - IV

(4) A - II, B - I, C - III, D - IV

**Ans (1)**

164. Following are the stages of cell division:

A. Gap 2 phase

B. Cytokinesis

C. Synthesis phase

D. Karyokinesis

E. Gap 1 phase

Choose the correct sequence of stages from the options given below:

(1) E-B-D-A-C

(2) B-D-E-A-C

(3) E-C-A-D-B

(4) C-E-D-A-B

**Ans (3)**

165. Match List I with List II

List I		List II	
A.	Non-medicated IUD	I.	Multiload 375
B.	Copper releasing IUD	II.	Progestogens
C.	Hormone releasing IUD	III.	Lippes loop
D.	Implants	IV.	LNG-20

Choose the correct answer from the options given below:

- (1) A - I, B - III, C - IV, D - II  
 (2) A - IV, B - I, C - II, D - III  
 (3) A - III, B - I, C - IV, D - II  
 (4) A - III, B - I, C - II, D - IV

**Ans (3)**

166. Match List I with List II

List I		List II	
A.	Lipase	I.	Peptide bond
B.	Nuclease	II.	Ester bond
C.	Protease	III.	Glycosidic bond
D.	Amylase	IV.	Phosphodiester bond

Choose the correct answer from the options given below:

- (1) A - III, B - II, C - I, D - IV  
 (2) A - II, B - IV, C - I, D - III  
 (3) A - IV, B - I, C - III, D - II  
 (4) A - IV, B - II, C - III, D - I

**Ans (2)**

167. Match List I with List II

List I		List II	
A.	Expiratory capacity	I.	Expiratory reserve volume + Tidal volume + Inspiratory reserve volume
B.	Functional residual capacity	II.	Tidal volume + Expiratory reserve volume
C.	Vital capacity	III.	Tidal volume + Inspiratory reserve volume
D.	Inspiratory capacity	IV.	Expiratory reserve volume + Residual volume

Choose the correct answer from the options given below:

- (1) A - III, B - II, C - IV, D - I  
 (2) A - II, B - I, C - IV, D - III  
 (3) A - I, B - III, C - II, D - IV  
 (4) A - II, B - IV, C - I, D - III

**Ans (4)**

168. Match List I with List II

List I		List II	
A.	Cocaine	I.	Effective sedative in surgery
B.	Heroin	II.	<i>Cannabis sativa</i>
C.	Morphine	III.	<i>Erythroxylum</i>
D.	Marijuana	IV.	<i>Papaver somniferum</i>

Choose the correct answer from the options given below:

- (1) A - I, B - III, C - II, D - IV  
 (2) A - II, B - I, C - III, D - IV  
 (3) A - III, B - IV, C - I, D - II  
 (4) A - IV, B - III, C - I, D - II

**Ans (3)**

169. The flippers of the Penguins and Dolphins are the example of the

- (1) Natural selection  
 (2) Convergent evolution  
 (3) Divergent evolution  
 (4) Adaptive radiation

**Ans (2)**

170. Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R:

**Assertion A:** Breast-feeding during initial period of infant growth is recommended by doctors for bringing a healthy baby.

**Reason R:** Colostrum contains several antibodies absolutely essential to develop resistance for the new born baby.

In the light of the above statements, choose the most appropriate answer from the options given below:

- (1) Both A and R are correct but R is NOT the correct explanation of A.  
 (2) A is correct but R is not correct.  
 (3) A is not correct but R is correct.  
 (4) Both A and R are correct and R is the correct explanation of A.

**Ans** (4)

171. Which of the following is not a component of Fallopian tube?

- (1) Isthmus                                      (2) Infundibulum                                      (3) Ampulla                                      (4) Uterine fundus

**Ans** (4)

172. Match List I with List II

List I		List II	
A.	Typhoid	I.	Fungus
B.	Leishmaniasis	II.	Nematode
C.	Ringworm	III.	Protozoa
D.	Filariasis	IV.	Bacteria

Choose the correct answer from the options given below:

- (1) A - IV, B - III, C - I, D - II                                      (2) A - III, B - I, C - IV, D - II  
 (3) A - II, B - IV, C - III, D - I                                      (4) A - I, B - III, C - II, D - IV

**Ans** (1)

173. Match List I with List II

List I		List II	
A.	Common cold	I.	<i>Plasmodium</i>
B.	Haemozoin	II.	Typhoid
C.	Widal test	III.	Rhinoviruses
D.	Allergy	IV.	Dust mites

Choose the correct answer from the options given below:

- (1) A - I, B - III, C - II, D - IV                                      (2) A - III, B - I, C - II, D - IV  
 (3) A - IV, B - II, C - III, D - I                                      (4) A - II, B - IV, C - III, D - I

**Ans** (2)

174. Given below are some stages of human evolution. Arrange them in correct sequence. (Past to Recent)

- A. *Homo habilis*  
 B. *Homo sapiens*  
 C. *Homo neanderthalensis*  
 D. *Homo erectus*

Choose the correct sequence of human evolution from the options given below:

- (1) B-A-D-C                                      (2) C-B-D-A                                      (3) A-D-C-B                                      (4) D-A-C-B

**Ans** (3)

175. Given below are two statements: one is labelled as Assertion A and the other is labelled as

Reason R:

**Assertion A:** FSH acts upon ovarian follicles in female and Leydig cells in male.

**Reason R:** Growing ovarian follicles secrete estrogen in female while interstitial cells secrete androgen in male human being.

In the light of the above statements, choose the correct answer from the options given below:

- (1) Both A and R are true but R is NOT the correct explanation of A.  
 (2) A is true but R is false  
 (3) A is false but R is true  
 (4) Both A and R are true and R is the correct explanation of A.

**Ans (3)**

176. Which of the following is not a steroid hormone?

- (1) Testosterone (2) Progesterone (3) Glucagon (4) Cortisol

**Ans (3)**

177. Consider the following statements:

- A. Annelids are true coelomates  
 B. Poriferans are pseudocoelomates  
 C. Aschelminthes are acoelomates  
 D. Platyhelminthes are pseudocoelomates

Choose the correct answer from the options given below:

- (1) A only (2) C only (3) D only (4) B only

**Ans (1)**

178. Match List I with List II

List I (Sub Phases of Prophase I)		List II (Specific characters)	
A.	Diakinesis	I.	Synaptonemal complex formation
B.	Pachytene	II.	Completion of terminalisation of chiasmata
C.	Zygotene	III.	Chromosomes look like thin threads
D.	Leptotene	IV	Appearance of recombination nodules

Choose the correct answer from the options given below:

- (1) A - I, B - II, C - IV, D - III (2) A - II, B - IV, C - I, D - III  
 (3) A - IV, B - III, C - II, D - I (4) A - IV, B - II, C - III, D - I

**Ans (2)**

179. Which of the following factors are favourable for the formation of oxyhaemoglobin in alveoli?

- (1) High  $PO_2$  and Lesser  $H^+$  concentration (2) Low  $pCO_2$  and high  $H^+$  concentration  
 (3) Low  $pCO_2$  and high temperature (4) High  $PO_2$  and High  $pCO_2$

**Ans (1)**

180. In both sexes of cockroach, a pair of jointed filamentous structure called anal cerci are present on:

- (1) 10<sup>th</sup> segment (2) 8<sup>th</sup> and 9<sup>th</sup> segment (3) 11<sup>th</sup> segment (4) 5<sup>th</sup> segment

**Ans (1)**

181. Match List I and List II:

List I		List II	
A.	<i>Pleurobrachia</i>	I.	Mollusca
B.	Radula	II.	Ctenophora
C.	Stomochord	III.	Osteichthyes
D.	Air bladder	IV.	Hemichordata

(1) A-II, B-I, C-IV, D-III

(2) A-II, B-IV, C-I, D-III

(3) A-IV, B-III, C-II, D-I

(4) A-IV, B-II, C-III, D-I

**Ans (1)**

182. The “Ti plasmid” of *Agrobacterium tumefaciens* stands for:

(1) Tumor independent plasmid

(2) Tumor inducing plasmid

(3) Temperature independent plasmid

(4) Tumor inhibiting plasmid

**Ans (2)**

183. Give below are two statements:

**Statement I:** The presence or absence of hymen is not a reliable indicator of virginity.

**Statement II:** The hymen is torn during the first coitus only

In the light of the above statements, choose the correct answer from the option given below:

(1) Both Statement I and Statement II are false

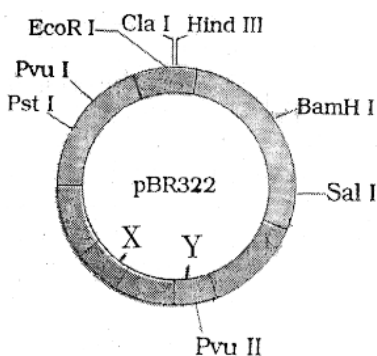
(2) Statement I is true but Statement II is false

(3) Statement I is false but Statement II is true

(4) Both Statement I and Statement II are true

**Ans (2)**

184. The following diagram showing restriction sites in *E.coli* cloning vector pBR322. Find the role of ‘X’ and ‘Y’ genes:



(1) The gene ‘X’ is responsible for controlling the copy number of the linked DNA and ‘Y’ for protein involved in the replication of Plasmid.

(2) The gene ‘X’ is for protein involved in replication of Plasmid and ‘Y’ for resistance to antibiotics.

(3) Gene ‘X’ is responsible for recognition sites and ‘Y’ is responsible for antibiotic resistance.

(4) The gene ‘X’ is responsible for resistance to antibiotics and ‘Y’ for protein involved in the replication of Plasmid.

**Ans (1)**

185. Which of the following is not a natural/ traditional contraceptive method?

- (1) Periodic abstinence (2) Lactational amenorrhea  
(3) Vaults (4) Coitus interruptus

Ans (3)

### Section-B (Biology: Zoology)

Answer any TEN of the following

186. Match List I and List II

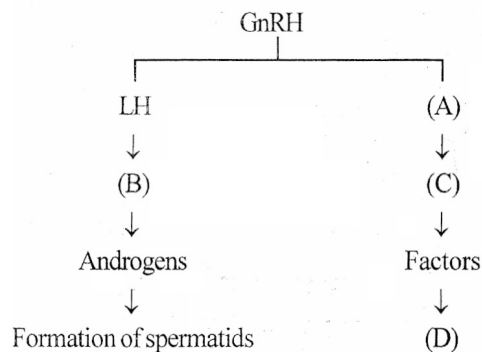
List I		List II	
A.	Exophthalmic goiter	I.	Excess secretion of cortisol, moon face and hyperglycemia
B.	Acromegaly	II.	Hypo-secretion of thyroid hormone and stunted growth
C.	Cushing's syndrome	III.	Hyper secretion of thyroid hormone and protruding eye balls.
D.	Cretinism	IV.	Excessive secretion of growth hormone.

Choose the correct answer from the options given below:

- (1) A-IV, B-II, C-I, D-III (2) A-III, B-IV, C-II, D-I  
(3) A-III, B-IV, C-I, D-II (4) A-I, B-III, C-II, D-IV

Ans (3)

187. Identify the correct option (A), (B), (C), (D) with respect to spermatogenesis.



- (1) ICSH, Interstitial cells, Leydig cells, spermiogenesis.  
(2) FSH, Sertoli cells, Leydig cells, spermatogenesis  
(3) ICSH, Leydig cells, Sertoli cells, spermatogenesis  
(4) FSH, Leydig cells, Sertoli cells, spermiogenesis

Ans (4)

188. Given below are two statements:

**Statement I:** Mitochondria and chloroplasts are both double membrane bound organelles

**Statement II:** Inner membrane of mitochondria is relatively less permeable, as compared to chloroplast.

In the light of the above statement, choose the most appropriate answer from the options given below:

- (1) Both Statement I and Statement II are incorrect  
(2) Statement I is correct but Statement II is incorrect  
(3) Statement I is incorrect but Statement II is correct  
(4) Both Statement I and Statement II are correct

Ans (4)



189. Given below are two statements:

**Statement I:** Gause's competitive exclusion principle states that two closely related species competing for different resources cannot exist indefinitely.

**Statement II:** According to Gause's principle, during competition, the inferior will be eliminated. This may be true if resources are limiting.

In the light of the above statements, choose the correct answer from the options given below:

- (1) Both Statement I and Statement II are false.
- (2) Statement I is true but Statement II is false.
- (3) Statement I is false but Statement II is true.
- (4) Both Statement I and Statement II are true.

**Ans (3)**

190. Regarding catalytic cycle of an enzyme action, select the correct sequential steps:

- A. Substrate enzyme complex formation.
- B. Free enzyme ready to bind with another substrate.
- C. Release of products.
- D. Chemical bonds of the substrate broken
- E. Substrate binding to active site.

Choose the correct answer from the options given below:

(1)	A	E	B	D	C
(2)	B	A	C	D	E
(3)	E	D	C	B	A
(4)	E	A	D	C	B

**Ans (4)**

191. Match List I and List II.

List I		List II	
A.	P wave	I.	Heart muscles are electrically silent.
B.	QRS complex	II.	Depolarisation of ventricles
C.	T wave	III.	Depolarisation of atria
D.	T-P gap	IV.	Repolarisation of ventricles

Choose the correct answer from the options given below:

- (1) A-III, B-II, C-IV, D-I
- (2) A-II, B-III, C-I, D-IV
- (3) A-IV, B-II, C-I, D-III
- (4) A-I, B-III, C-IV, D-II

**Ans (1)**

192. Match List I and List II

List I		List II	
A.	RNA polymerase III	I.	snRNPs
B.	Termination of transcription	II.	Promotor
C.	Splicing of Exons	III.	Rho factor
D.	TATA box	IV.	SnRNAs, tRNA

Choose the correct answer from the options given below:

- (1) A-III, B-II, C-IV, D-I (2) A-III, B-IV, C-I, D-II  
 (3) A-IV, B-III, C-I, D-II (4) A-II, B-IV, C-I, D-III

**Ans (3)**

193. Given below are two statements:

**Statement I:** The cerebral hemispheres are connected by nerve tract known as corpus callosum.

**Statement II:** The brain stem consists of the medulla oblongata, pons and cerebrum.

In the light of the above statements, choose the most appropriate answer from the options given below:

- (1) Both Statement I and Statement II are incorrect.  
 (2) Statement I is correct but Statement II is incorrect  
 (3) Statement I is incorrect but Statement II is correct.  
 (4) Both Statement I and Statement II are correct.

**Ans (2)**

194. Match List I with List II related to digestive system of cockroach.

List I		List II	
A.	The structures used for storing of food.	I.	Gizzard
B.	Ring of 6-8 blind tubules at junction of foregut and midgut.	II.	Gastric Caeca
C.	Ring of 100-150 yellow coloured thin filaments at junction of midgut and hindgut.	III.	Malpighian tubules
D.	The structures used for grinding the food.	IV.	Crop

Choose the correct answer from the options given below:

- (1) A-I, B-II, C-III, D-IV  
 (2) A-IV, B-III, C-II, D-I  
 (3) A-III, B-II, C-IV, D-I  
 (4) A-IV, B-II, C-III, D-I

**Ans (4)**

195. Match List I with List II:

List I		List II	
A.	Mesozoic Era	I.	Lower invertebrates
B.	Proterozoic Era	II.	Fish & Amphibia
C.	Cenozoic Era	III.	Birds & Reptiles
D.	Paleozoic Era	IV.	Mammals

Choose the correct answer from the options given below:

- (1) A-III, B-I, C-II, D-IV  
 (2) A-I, B-II, C-IV, D-III  
 (3) A-III, B-I, C-IV, D-II  
 (4) A-II, B-I, C-III, D-IV

**Ans (3)**

196. Given below are two statements:

**Statement I:** Bone marrow is the main lymphoid organ where all blood cells including lymphocytes are produced

**Statement II:** Both bone marrow and thymus provide micro environments for the development and maturation of T-lymphocytes.

In the light of the above statements, choose the most appropriate answer from the options given below:

- (1) Both Statement I and Statement II are incorrect.
- (2) Statement I is correct but Statement II incorrect.
- (3) Statement I is incorrect but Statement II is correct,
- (4) Both Statement I and Statement II are correct.

**Ans (4)**

197. Match List I with List II.

List I		List II	
A.	Unicellular glandular epithelium	I.	Salivary glands
B.	Compound epithelium	II.	Pancreas
C.	Multicellular glandular epithelium	III.	Goblet cells of alimentary canal
D.	Endocrine glandular epithelium	IV.	Moist surface of buccal cavity

Choose the correct answer from the options given below:

- (1) A-IV, B-III, C-I, D-II
- (2) A-III, B-IV, C-I, D-II
- (3) A-II, B-I, C-IV, D-III
- (4) A-II, B-I, C-III, D-IV

**Ans (2)**

198. Choose the correct statement given below regarding juxta medullary nephron.

- (1) Renal corpuscle of juxta medullary nephron lies in the outer portion of the renal medulla.
- (2) Loop of Henle of juxta medullary nephron runs deep into medulla.
- (3) Juxta medullary nephrons out number the cortical nephrons.
- (4) Juxta medullary nephrons are located in the columns of Bertini.

**Ans (2)**

199. As per ABO blood grouping system, the blood group of father is B<sup>+</sup>, mother is A<sup>+</sup> and child is O<sup>+</sup>. Their respective genotype can be

- A. I<sup>B</sup>i / I<sup>A</sup>i / ii
- B. I<sup>B</sup>I<sup>B</sup> / I<sup>A</sup>I<sup>A</sup> / ii
- C. I<sup>A</sup>I<sup>B</sup> / ii<sup>A</sup> / I<sup>B</sup>i
- D. I<sup>A</sup>i / I<sup>B</sup>i / I<sup>A</sup>i
- E. ii<sup>B</sup> / ii<sup>A</sup> / I<sup>A</sup>I<sup>B</sup>

Choose the most appropriate answer from the options given below:

- (1) B only
- (2) C & B only
- (3) D & E only
- (4) A only

**Ans (4)**

200. The following are the statements about non-chordates:

- A. Pharynx is perforated by gill slits.
- B. Notochord is absent.
- C. Central nervous system is dorsal.
- D. Heart is dorsal if present.
- B. Post anal tail is absent.

Choose the most appropriate answer from the options given below:

- (1) A, B and D only
- (2) B, D and E only
- (3) B, C and D only
- (4) A and C only

**Ans (2)**

\* \* \*

