

NEET(UG)

03/05/2026



MATRIX

Paper Code

13

Question Paper with Solutions & Answer Keys

Time : 3 hrs.

for

M.M. : 720

NEET (UG)-2026

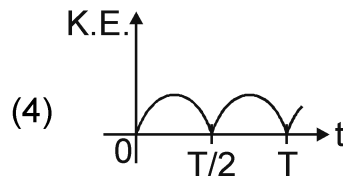
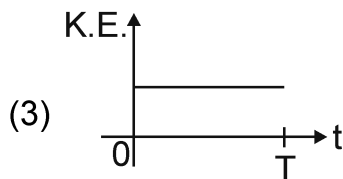
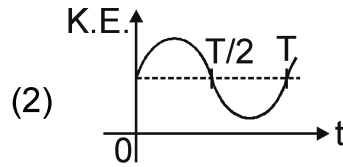
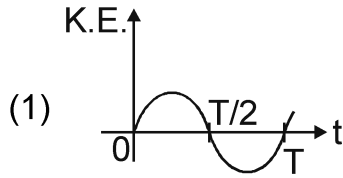
Read carefully the Instructions on the Cover of this Test Booklet.

Important Instructions :

1. The test is of 3 hours duration and the Test Booklet contains 180 multiple choice questions (Four options with a single correct answer) from **Physics, Chemistry and Biology (Botany and Zoology)**.
2. Each question carries 4 marks. For each correct response, the candidate will get 4 marks. For every wrong response 1 mark shall be deducted from the total scores. The maximum marks are 720.
3. Use Blue / Black Ball point Pen only for writing particulars on this page / marking responses on Answer Sheet.
4. Rough work is to be done in the space provided for this purpose in the Test Booklet only.
5. On completion of the test, the candidate must handover the Answer Sheet to the Invigilator before leaving the Room / Hall. The candidates are allowed to take away this Test Booklet with them.
6. The CODE for this Booklet is 47.
7. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your Roll No. anywhere else except in the specified space in the Test Booklet/Answer Sheet. Use of white fluid for correction is NOT permissible on the Answer Sheet.
8. Each candidate must show on-demand his/her Admission Card to the Invigilator.
9. No candidate, without special permission of the Centre Superintendent or Invigilator, would leave his/her seat.
10. Use of Electronic/Manual Calculator is prohibited.
11. The candidates are governed by all Rules and Regulations of the examination with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of this examination.
12. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
13. The candidates will write the Correct Test Booklet Code as given in the Test Booklet / Answer Sheet in the Attendance Sheet.



1. For a simple pendulum, having time period T , the variation of kinetic energy (K.E.) with time (t) is represented by -



Ans. (4)

Sol. K.E. always positive.

Time period of kinetic energy is $\frac{T}{2}$.

2. A room heater is rated 400 W, 220 V. If the supply voltage drops to 200 V, what will be the power consumed (approximately) -

(1) 400 W

(2) 121 W]

(3) 331 W

(4) 200 W

Ans. (3)

Sol.
$$P_c = \left(\frac{V_s}{V_r} \right)^2 \times P_r$$

$$P_c = \left(\frac{200}{220} \right)^2 \times 400 = 331 \text{ W}$$



3. The angular speed of a flywheel is increased from 600 rpm to 1200 rpm in 10 s. The number of revolutions completed by the flywheel during this time is -

- (1) 600 (2) 300 (3) 900 (4) 150

Ans. (4)

Sol. $\omega_i = 600 \text{ rpm} = \frac{600 \times 2\pi}{60} = 20\pi \text{ rad/s}$

$$\omega_f = 1200 \text{ rpm} = \frac{1200 \times 2\pi}{60} = 40\pi \text{ rad/s}$$

$$\text{Angular acceleration } (\alpha) = \frac{\omega_f - \omega_i}{t} = 2\pi \text{ rad/s}^2$$

$$\omega_f^2 = \omega_i^2 + 2\alpha\theta$$

$$\theta = \frac{1600\pi^2 - 400\pi^2}{2(2\pi)} = 300\pi$$

$$\text{No. of rotation} = \frac{\theta}{2\pi} = 150$$

4. The sum of kinetic energy and potential energy of a simple pendulum bob is 0.02 joule. The speed of the simple pendulum bob at equilibrium position is approximately -

(Consider mass of the bob = 20 g)

- (1) 2.0 m/s (2) 0.2 m/s (3) 14.1 m/s (4) 1.41 m/s

Ans. (4)

Sol. $\frac{1}{2}mv_{\text{max}}^2 = \text{Total energy}$

$$\frac{1}{2} \times 20 \times 10^{-3} \times v_{\text{max}}^2 = 0.02$$

$$v_{\text{max}} = 1.414 \text{ m/s}$$



7. Match List-I with List-II -

List-I

- A. $E = h\nu$
- B. Diffraction and Interference
- C. $\lambda = h/p$
- D. Compton effect

List-II

- I. de-Broglie wavelength
- II. Particle nature of light
- III. Wave nature of light
- IV. Energy of photon

Choose the **correct** answer from the options given below -

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

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

Ans. (2)

Sol. $E = h\nu$ (Energy of photon)

Diffraction and Interference are associated with wave nature of light

$\lambda = h/p$ (de-Broglie wavelength)

Compton effect involves the scattering of a photon by an electron (Particle nature of light)

8. Match List-I with List-II -

List-I

- A. Young's Modulus
- B. Compressibility
- C. Bulk Modulus
- D. Poisson's Ratio

List-II

- I. $\frac{\Delta d}{\Delta L} \left(\frac{L}{d} \right)$
- II. $\frac{FL}{A(\Delta L)}$
- III. $-\frac{1}{\Delta P} \left(\frac{\Delta V}{V} \right)$
- IV. $-P \left(\frac{V}{\Delta V} \right)$

Choose the **correct** answer from the options given below -

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

Ans. (2)

Sol. Formula based

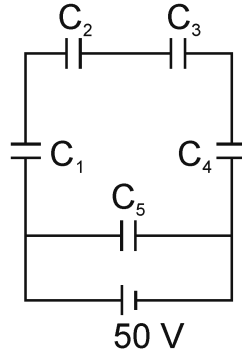
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9. Five capacitors of capacitances $C_1 = C_2 = C_3 = C_4 = 10 \mu\text{F}$ and $C_5 = 2.5 \mu\text{F}$ are connected as shown, along with a battery of 50 V.



The equivalent capacitance and the charges on each capacitor respectively are -

- (1) $4 \mu\text{F}$, $250 \mu\text{C}$ on C_1 to C_4 and $125 \mu\text{C}$ on C_5
- (2) $5 \mu\text{F}$, $250 \mu\text{C}$ on all capacitors
- (3) $5 \mu\text{F}$, $125 \mu\text{C}$ on C_1 to C_4 and $25 \mu\text{C}$ on C_5
- (4) $5 \mu\text{F}$, $125 \mu\text{C}$ on all capacitors

Ans. (4)

Sol. $C_{\text{eq}} = 2.5 \mu\text{F} + 2.5 \mu\text{F}$

$$C_{\text{eq}} = 5 \mu\text{F}$$

$$Q = 2.5 \times 50 = 125 \mu\text{C} \text{ on each}$$

10. The amount of work done to raise a mass 'm' from the surface of the Earth to a height equal to the radius of the Earth 'R', will be -

- (1) $mg \frac{R}{2}$
- (2) $mg R$
- (3) $mg \frac{R}{4}$
- (4) $2 mg R$

Ans. (1)

Sol. $W = \frac{mgh}{1 + \frac{h}{R}} = \frac{mgR}{2}$



11. When a ruler falls vertically, 5 different persons catch it with different reaction times.

$$(g = 9.8 \text{ m s}^{-2})$$

- A. Person A has reaction time of 0.20 s.
- B. Person B has reaction time of 0.22 s.
- C. Person C has reaction time of 0.18 s.
- D. Person D has reaction time of 0.19 s.
- E. Person E has reaction time of 0.21 s.

What is the **correct** order of the distance travelled by the ruler for each person -

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

Ans. (4)

Sol. More reaction time \Rightarrow more travelled distance

12. The power of a crane, which lifts a mass of 1000 kg to a height of 20 m in 10 s is -

$$(g = 9.8 \text{ m/s}^2)$$

- (1) 19.6 kW
- (2) 19.6 W
- (3) 39.2 kW
- (4) 39.2 W

Ans. (1)

Sol.
$$\text{Power} = \frac{mgh}{t} = \frac{1000 \times 9.8 \times 20}{10} = 19.6 \text{ kW}$$

13. Consider two uncharged capacitors of equal capacitance 200 pF. One of them is charged by a 100 V supply and disconnected. Now this capacitor is connected to the uncharged capacitor. The amount of electrostatic energy lost in the process is -

- (1) 0.5 J
- (2) $1.0 \times 10^{-6} \text{ J}$
- (3) $0.5 \times 10^{-6} \text{ J}$
- (4) 1.0 J

Ans. (3)

Sol.
$$\text{Energy loss } \Delta U = \frac{1}{2} \frac{C_1 C_2}{(C_1 + C_2)} (V_1 - V_2)^2$$

$$= \frac{1}{4} CV^2 = 0.5 \times 10^{-6} \text{ J}$$

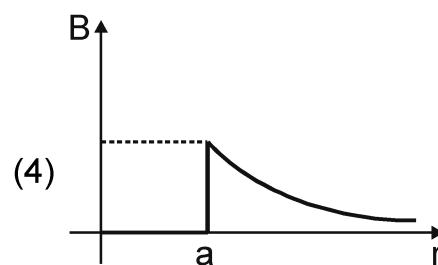
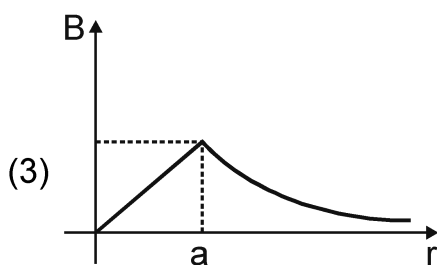
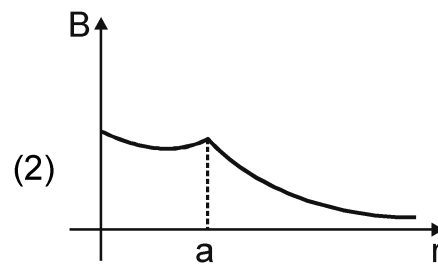
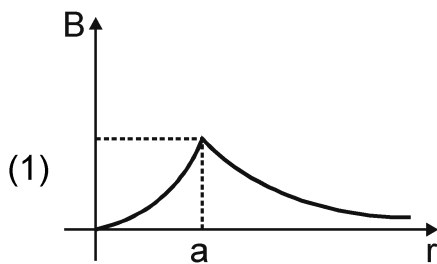
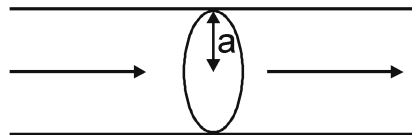


14. An ac circuit contains a resistance of $1\text{ k}\Omega$, a capacitor of $0.1\text{ }\mu\text{F}$ and an inductor of 1 mH connected in series. The resonance frequency of the circuit is approximately -
 (1) 15.9 kHz (2) 20.7 kHz (3) 10.1 kHz (4) 13.5 kHz

Ans. (1)**Sol.** Resonant frequency in RLC series A.C. current

$$f_0 = \frac{1}{2\pi\sqrt{LC}} = \frac{1}{2\pi\sqrt{10^{-3} \times 10^{-7}}} \approx 15.9\text{ kHz}$$

15. The figure given below shows a long straight solid wire of circular cross-section of radius 'a' carrying steady current I. The current I is uniformly distributed across its cross-section. The plot which correctly represents the variation of magnetic field (B) with distance (r) from the axis of the conductor in the region is -

**Ans. (3)**

Sol. When $r < a \Rightarrow B_{in} = \frac{\mu_0 I r}{2\pi R^2}$ ($B_{in} \propto r$)

$$r > a \Rightarrow B_{out} = \frac{\mu_0 I}{2\pi r} \quad (B_{out} \propto \frac{1}{r})$$



16. An electric heater supplies heat to a system at a rate of 100 W. If the system performs work at a rate of 75 J/s, then the rate at which internal energy increases will be -

- (1) 75 W (2) 25 W (3) 100 W (4) 125 W

Ans. (2)

Sol. $Q_{in} = W + \Delta U$

$$100 = 75 + \Delta U \text{ (All data is for one second)}$$

17. The peak value of an alternating current is 5 A and frequency is 60 Hz. How long will the current, starting from zero, take to reach the peak value -

- (1) $\frac{1}{120}$ s (2) $\frac{1}{240}$ s (3) $\frac{1}{30}$ s (4) $\frac{1}{60}$ s

Ans. (2)

Sol. Time taken to reach from zero to peak value $\Rightarrow t = \frac{T}{4} = \frac{1}{4f} = \frac{1}{240}$ sec.

18. In Young's double slip experiment, using monochromatic light of wavelength λ , the intensity of light at a point on the screen where the path difference is λ , is K units. The intensity of light at a point where the path difference is $\frac{\lambda}{3}$ will be -

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

Ans. (4)

Sol. $\Delta\phi = \frac{2\pi}{\lambda} \times \Delta x = \frac{2\pi}{\lambda} \times \frac{\lambda}{3} = \frac{2\pi}{3}$

$$I = K \cos^2 \left(\frac{\Delta\phi}{2} \right)$$

$$I = K \cos^2 \left(\frac{\pi}{3} \right) = \frac{K}{4}$$



19. Four statements are given (A is mass number) -

- A. The volume of a nucleus is proportional to $A^{1/3}$.
- B. The volume of a nucleus is proportional to A.
- C. The difference in mass of an atom and its nucleus is called the mass defect.
- D. The difference in mass of a nucleus and its constituents is called the mass defect.

Choose the **correct** answer from the options given below -

- (1) A and D are true, but B and C are false
- (2) B and D are true, but A and C are false
- (3) B and C are true, but A and D are false
- (4) A and C are true, but B and D are false

Ans. (2)

Sol. $r = r_0 A^{1/3}$

$$V \propto r^3 \propto A$$

The difference in mass of a nucleus and its constituents is called the mass defect.

20. In interference and diffraction, the light energy is redistributed. If it reduces in one region, producing a dark fringe, it increases in another region, producing a bright fringe.

- A. As there is no gain or loss of energy, these phenomena are consistent with the principle of conservation of energy.
- B. Diffraction and interference are characteristics exhibited only by light waves.

Choose the **correct** answer from the options given below -

- (1) A is false, but B is true
- (2) A is true, but B is false
- (3) A is true and B is also true
- (4) Both A and B are false

Ans. (2)

Sol. As there is no gain or loss of energy, these phenomena are consistent with the principle of conservation of energy.

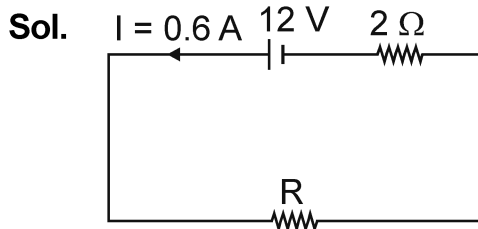
Diffraction and interference are characteristics exhibited by all types of waves.



21. A resistor is connected to a battery of 12 V emf and internal resistance 2Ω . If the current in the circuit is 0.6 A, the terminal voltage of the battery is -

- (1) 12 V (2) 1.2V (3) 10 V (4) 10.8 V

Ans. (4)



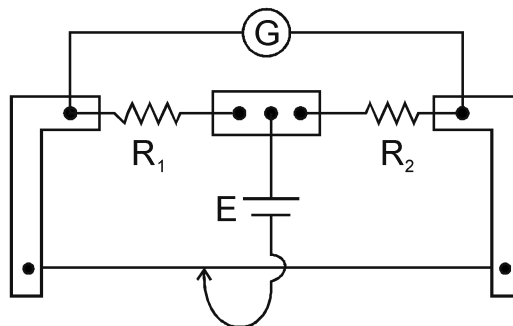
Terminal voltage

$$V = E - Ir$$

$$V = 12 - 0.6(2)$$

$$V = 10.8 \text{ volt}$$

22. In a metre bridge experiment (see figure), the positions of the cell, E, and galvanometer, G, are interchanged. We shall observe in the galvanometer -



- (1) Only the right-sided deflection
(2) Only the left-sided deflection
(3) There will be no deflection irrespective of the position of the jockey
(4) Both right-sided and left-sided deflection and at balance point, no deflection

Ans. (4)

Sol. If metre bridge is unbalanced then galvanometer can show deflection in any side and if metre bridge is balanced then null deflection.



25. Two statements are given below -

A. When the forward bias voltage across a p-n junction diode increases above a certain threshold voltage, the diode current increases significantly.

B. This current is called reverse saturation current.

Choose the **correct** answer from the options given below -

- (1) Both Statements A and B are true
- (2) Both Statements A and B are false
- (3) Statement A is true, but Statement B is false
- (4) Statement A is false, but Statement B is true

Ans. (3)

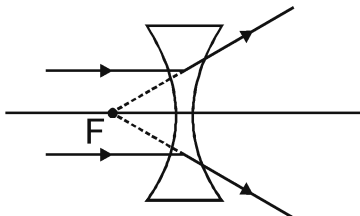
Sol. In forward bias of diode, below knee voltage no current flows.

26. In a concave lens, a ray of light emanating from the object parallel to the principal axis of the lens, after refraction -

- (1) passes through the second principal focus.
- (2) appears to diverge from the first principal focus.
- (3) passes through $2F$, which is the radius of curvature of the lens.
- (4) emerges parallel to the principal axis.

Ans. (2)

Sol.



27. An unknown nucleus has a nuclear density of $2.29 \times 10^{17} \text{ kg/m}^3$ and mass of $19.926 \times 10^{-27} \text{ kg}$. Its mass number A is approximately -

(Take $R_0 = 1.2 \times 10^{-15} \text{ m}$, $4\pi = 12.56$)

- (1) 16
- (2) 20
- (3) 12
- (4) 19

Ans. (3)

Sol.
$$V = \frac{m}{\rho} = \frac{4}{3} \pi R_0^3 A$$

$$A = \frac{3m}{4\pi R_0^3 \rho} = \frac{3 \times 19.926 \times 10^{-27}}{4\pi \times 2.29 \times 10^{17} \times (1.2)^3 \times 10^{-45}}$$

$$A = 12$$



28. A galvanometer of resistance 100Ω gives full scale deflection for a current of 1 mA . It is converted into an ammeter of range $0 - 10 \text{ A}$. The shunt required is -

- (1) 0.001Ω (2) 0.10Ω (3) 1.0Ω (4) 0.01Ω

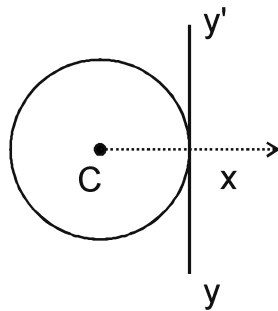
Ans. (4)

Sol. $I_g = 1 \text{ mA}$; main current $I = 10 \text{ A} = 10^4 I_g$

$$(I = NI_g)$$

$$\text{Shunt } S = \frac{R_g}{N} = \frac{100}{10^4} = 0.01 \Omega$$

29. A thin wire of length ' L ' and linear mass density ' m ' is bent into a circular ring (in x - y plane) with centre ' C ' as shown in figure. The moment of inertia of the ring about an axis yy' will be -



- (1) $\frac{3mL^3}{8\pi}$ (2) $\frac{3mL^2}{8\pi^2}$ (3) $\frac{3mL^3}{8\pi^2}$ (4) $\frac{3mL^2}{8\pi}$

Ans. (3)

Sol. $L = 2\pi r$

$$r = \frac{L}{2\pi}$$

$$\text{MOI about } yy' = \frac{3}{2} mLr^2 = \frac{3}{2} mL \left(\frac{L^2}{4\pi^2} \right) = \frac{3mL^3}{8\pi^2}$$



30. For a travelling harmonic wave

$y(x, t) = 2.0 \cos 2\pi (10t - 0.0080x + 0.35)$ where x and y are in cm and t in s. The phase difference between oscillatory motion of two points separated by a distance of 0.5 m is -

- (1) 0.08π rad (2) 0.008π rad (3) 0.8π rad (4) 8π rad

Ans. (3)

Sol. $\phi = K\Delta x$

$$= (0.0080 \times 2\pi) \times 0.5 \times 100 \quad \therefore \text{Put } \Delta x \text{ in cm}$$

$$= 0.8\pi \text{ radian}$$

31. A box of mass 15 kg is kept on the floor of a stationary trolley. The coefficient of static friction between the box and the trolley is 0.12. Keeping the box in stationary state over the trolley, the maximum acceleration with which the trolley can be moved horizontally in ms^{-2} is ($g = 10 \text{ ms}^{-2}$)

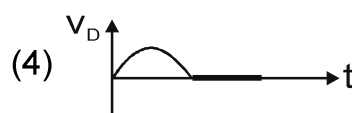
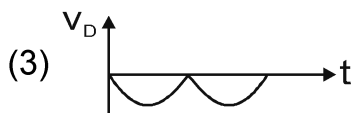
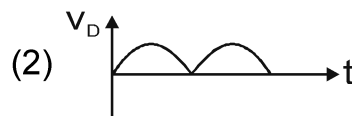
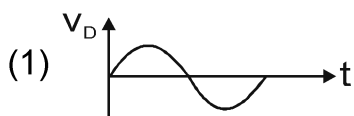
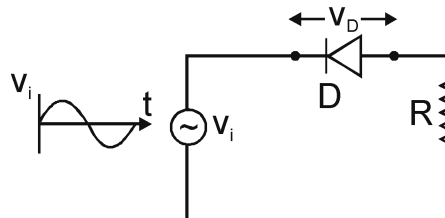
- (1) 1.8 (2) 1.2 (3) 1.5 (4) 2.1

Ans. (2)

Sol. $\mu mg \geq ma$

$$a \leq 1.2 \text{ m/s}^2$$

32. In the circuit shown below, the voltage appearing across the diode D will be of the form :



Ans. (4)

Sol. For positive half cycle diode is in reverse bias hence this applied voltage (positive cycle) will appear across diode.



33. A flask contains argon and chlorine in the ratio of 2 : 1 by mass. The temperature of the mixture is 27°C. The ratio of root mean square speed of the molecules of the two gases

$\left(\frac{V_{\text{rms}}^{\text{Ar}}}{V_{\text{rms}}^{\text{Cl}}}\right)$ is (Atomic mass of argon = 40.0 u and molecular mass of chlorine = 70.0 u)

(1) $\frac{7}{4}$

(2) $\frac{2}{\sqrt{7}}$

(3) $\frac{\sqrt{7}}{2}$

(4) $\frac{7}{2}$

Ans. (3)

Sol. $v_{\text{rms}} = \sqrt{\frac{3RT}{\text{Molar mass}}}$

$$\frac{v_{\text{Ar}}}{v_{\text{Cl}}} = \sqrt{\frac{M_{\text{Cl}}}{M_{\text{Ar}}}} = \sqrt{\frac{70}{40}} = \frac{\sqrt{7}}{2}$$

34. Match List-I with List-II :

List-I

(Electromagnetic wave)

A. Microwave

B. Visible light

C. Gamma rays

D. Infra-red rays

List-II

(Production)

I. Electrons in atoms emit light when they move from a higher energy level to a lower energy level

II. Radioactive decay of nucleus

III. Vibration of atoms and molecules

IV. Klystron valve or magnetron valve

Choose the **correct** answer from the options given below -

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

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

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

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

Ans. (4)

Sol. Theory based



35. The magnitude and direction of the acceleration produced in a body of mass 5 kg when two mutually perpendicular forces 8 N and 6 N act on it, are respectively -

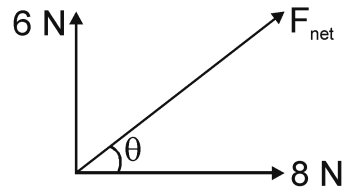
- (1) 2 ms^{-2} ; $\tan^{-1} (3/4)$ with 8 N force (2) 2 ms^{-2} ; $\tan^{-1} (4/3)$ with 8 N force
 (3) 2 ms^{-2} ; $\tan^{-1} (3/4)$ with 6 N force (4) 20 ms^{-2} ; $\tan^{-1} (4/3)$ with 8 N force

Ans. (1)

Sol. $F_{\text{net}} = \sqrt{F_1^2 + F_2^2} = \sqrt{6^2 + 8^2} = 10 \text{ N}$

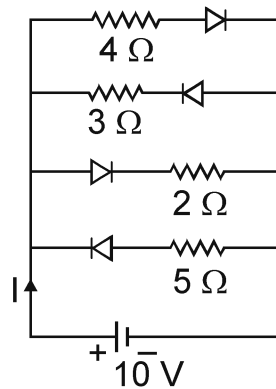
$$a_{\text{net}} = \frac{10}{5} = 2 \text{ m/s}^2$$

$$\theta = \tan^{-1}\left(\frac{6}{8}\right) = \tan^{-1}\left(\frac{3}{4}\right)$$



36. The current I in the circuit shown below is :

(All diodes are ideal and identical)



(1) $\frac{1}{3} \text{ A}$

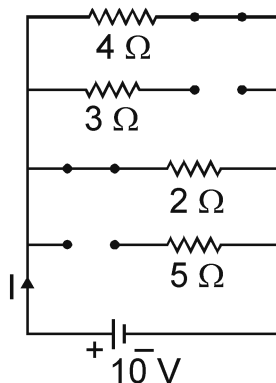
(2) $\frac{15}{2} \text{ A}$

(3) $\frac{5}{3} \text{ A}$

(4) $\frac{5}{9} \text{ A}$

Ans. (2)

Sol.



$$I = \frac{10}{4/3} = \frac{15}{2} \text{ A}$$



37. For a metal of work function 6.6 eV, which of the following wavelength of incident radiation does **not** give rise to the photoelectric effect -

(Take Plank's constant as 6.6×10^{-34} J s)

- (1) 200 nm (2) 100 nm
(3) 50 nm (4) 150 nm

Ans. (1)

Sol. Threshold wavelength $\lambda_0 = \frac{1240}{6.6} = 187.87$ nm

For $\lambda \leq \lambda_0 \Rightarrow$ PEE will occur

For $\lambda > \lambda_0 \Rightarrow$ PEE will not occur

38. The speed of light in vacuum is taken as unity. If light takes 6 min 40 s to reach the Earth from the Sun, the distance between the Sun and the Earth in new unit is -

- (1) 3×10^8 (2) 500
(3) 3×10^{10} (4) 400

Ans. (4)

Sol. Distance = speed \times time = $1 \times 400 = 400$

39. A rectangular wire loop of sides 8 cm and 3 cm with a small cut, is moving out of a region of uniform magnetic field of magnitude 0.3 T directed normal to the plane of the loop. The emf developed across the cut, if the velocity of the loop is 2 cm s^{-1} , in a direction normal to the shorter side of the loop, will be -

- (1) 1.8×10^{-4} volt
(2) 1.3×10^{-4} volt
(3) 1.2×10^{-4} volt
(4) 4.8×10^{-4} volt

Ans. (1)

Sol. $\varepsilon = Bv = 0.3 \times 3 \times 10^{-2} \times 2 \times 10^{-2}$

$\varepsilon = 1.8 \times 10^{-4}$ volt

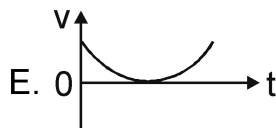
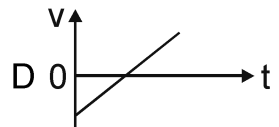
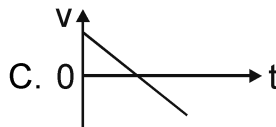
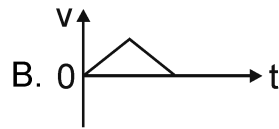
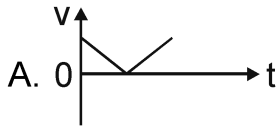
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40. The following plots show variation of velocity (v) with time (t), of a ball thrown vertically upward, and falling back. Which of the following plot is/are **correct** -



(1) B only

(2) A and E only

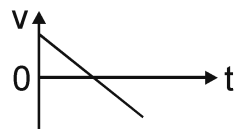
(3) C only

(4) D only

Ans. (3)

Sol. $\vec{v} = \vec{u} + \vec{a}t$

$$v = u - gt$$



41. In a vernier callipers, 20 VSD coincide with 16 MSD (each division of length 1 mm). The least count of the vernier callipers is -

(1) 0.2 cm

(2) 0.1 cm

(3) 0.02 cm

(4) 0.01 cm

Ans. (3)

Sol. 20 VSD = 16 MSD

$$1 \text{ VSD} = \frac{16}{20} = 0.8 \text{ MSD}$$

$$\text{L.C.} = 1 \text{ MSD} - 1 \text{ VSD} = 1 \text{ mm} - 0.8 \text{ mm} = 0.2 \text{ mm} = 0.02 \text{ cm}$$

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42. Each side of a metallic cube of mass 5.580 kg is measured to be 9.0 cm. Keeping the significant figure in view, the density of the material of the cube can be best expressed as $X \times 10^3 \text{ kg m}^{-3}$ where the value of X is -

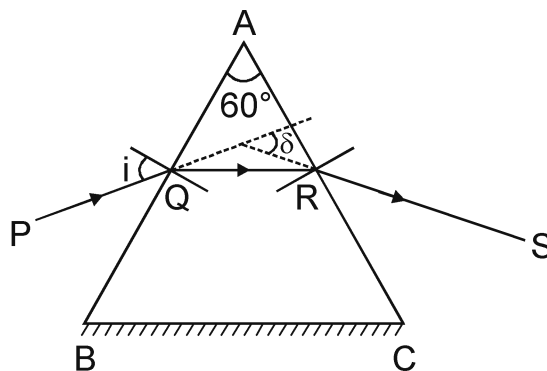
- (1) 7.654
- (2) 7.7
- (3) 7.65
- (4) 7.6

Ans. (2)

Sol. $\text{Density} = \frac{\text{Mass}}{\text{Volume}} = \frac{5.580}{(9.0 \times 10^{-2})^3} = 7654.32 \text{ kg/m}^3 = 7.65432 \times 10^3 \text{ kg/m}^3$

$X = 7.65432 \Rightarrow$ This rounds up to 7.7

43. A ray of monochromatic light is passing through an equilateral prism (ABC) as shown in the figure. The refracted ray (QR) is parallel to its base (BC) and the angle of incidence (i) is 50° . Then the angle of deviation (δ) is -



- (1) 45°
- (2) 55°
- (3) 35°
- (4) 40°

Ans. (4)

Sol. $\delta = i + e - A$ (It is case of minimum deviation)
 $= 50^\circ + 50^\circ - 60^\circ = 40^\circ$



44. In the first excited state of hydrogen atom, the energy of its electron is -3.4 eV. The radial distance of the electron from the hydrogen nucleus in this case is approximately -

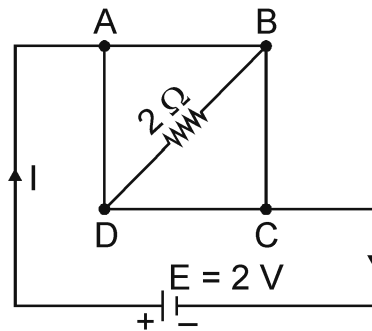
(Take $1 \text{ eV} = 1.6 \times 10^{-19} \text{ J}$, $e = 1.6 \times 10^{-19} \text{ J C}$ and $\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ N m}^2/\text{C}^2$)

- (1) $2.1 \times 10^{-8} \text{ m}$ (2) $2.1 \times 10^{-10} \text{ m}$ (3) $2.1 \times 10^{-11} \text{ m}$ (4) $2.1 \times 10^{-9} \text{ m}$

Ans. (2)

Sol. $r = 0.529 \frac{n^2}{Z} = 0.529 \times \frac{4}{1} \times 10^{-10}$
 $= 2.1 \times 10^{-10} \text{ m}$

45. A uniform metallic wire having resistance 4Ω is bent to form a square loop (ABCD) (see figure). A resistance of 2Ω is connected between points B and D and a battery of 2 V is connected across points A and C as shown in the figure. Now the value of current (I) is -



- (1) 4 A (2) 4.5 A (3) 8 A (4) 2 A

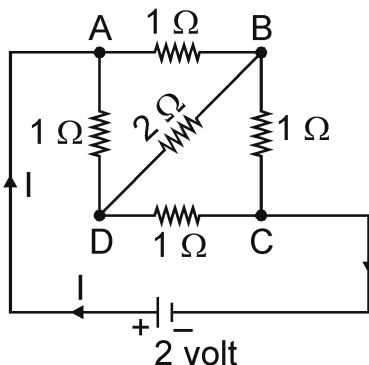
Ans. (4)

Sol. Balanced W.S.B.

$$R_{eq} = 1 \Omega$$

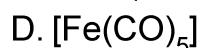
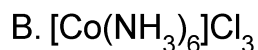
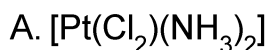
$$I = \frac{V}{R_{eq}} = \frac{2}{1}$$

$$I = 2 \text{ A}$$





46. Match List-I with List-II -

List-I**(Complex/ion)****List-II****(Shape/geometry)**

I. Octahedral

II. Trigonal bipyramidal

III. Square planar

IV. Tetrahedral

Choose the **correct** answer from the options given below -

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

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

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

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

Ans. (3)**Sol.** (A) $[\text{Pt}(\text{Cl}_2)(\text{NH}_3)_2] \rightarrow$ Square planar, dsp^2 (B) $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3 \rightarrow d^2sp^3$, Octahedral(C) $[\text{NiCl}_4]^{2-} \rightarrow sp^3$, Tetrahedral(D) $[\text{Fe}(\text{CO})_5] \rightarrow dsp^3$, Trigonal bipyramidal

47. Calculate emf of the half cell given below -

Pt (s) | H_2 (g, 2 atm) | HCl (aq, 0.02 M)

$$E_{\text{H}_2/\text{H}^+}^0 = 0 \text{ V}$$

$$\text{(Given : } \frac{2.303RT}{F} = 0.059, \log 2 = 0.3010)$$

(1) -0.109 V (2) 0.109 V (3) 0.035 V (4) -0.035 V **Ans. (2)****Sol.** $\text{H}_2(\text{g}) \rightarrow 2\text{H}^+(\text{aq.}) + 2e^-$

$$Q = \frac{[\text{H}^+]^2}{P_{\text{H}_2(\text{g})}} = \frac{(0.02)^2}{2} = 2 \times 10^{-4}$$

$$E_{\text{H}_2/\text{H}^+} = E_{\text{H}_2/\text{H}^+}^0 - \frac{2.303RT}{nF} \log Q$$

$$= 0 - \frac{0.059}{2} \log 2 \times 10^{-4}$$

$$= -0.0295 (-3.7) = 0.10915$$

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48. At 298 K, a certain buffer solution contains equal concentrations of X^- and HX , K_b for X^- is 10^{-10} . What is the pH of this buffer solution ?

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

Ans. (2)

Sol. HX & $X^- \Rightarrow$ Acidic buffer

$$pH = pK_a + \log \frac{[C.B.]}{[Acid]}$$

$$K_a(HX) = \frac{K_w}{K_b(X^-)} = \frac{10^{-14}}{10^{-10}} = 10^{-4}$$

$$pH = 4 + \log \frac{x}{x} = 4$$

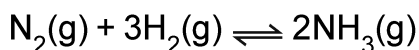
$$pH = 4$$

49. Given below are certain reactions. Identify the reaction for which $K_p \neq K_c$ -

- (1) $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$
(2) $H_2O(g) + CO(g) \rightleftharpoons H_2(g) + CO_2(g)$
(3) $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$
(4) $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$

Ans. (3)

Sol. $K_p = K_c (RT)^{\Delta n_g}$

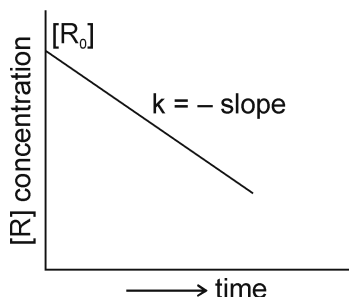


$$\Delta n_g = 2 - 4 = -2$$

$$\Delta n_g \neq 0 \Rightarrow K_p \neq K_c$$

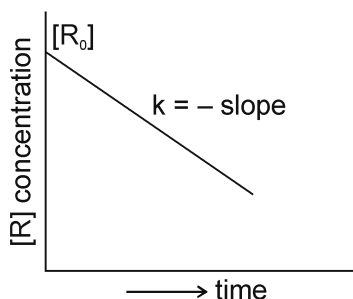


50. For a certain reaction $R \rightarrow \text{Product}$, the plot of concentration $[R]$ vs time has a negative slope as shown. The order of reaction is -



- (1) 1 (2) 2.5 (3) 2 (4) 0

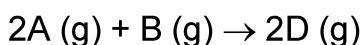
Ans. (4)



Sol.

Concentration of $[R]$ is decreasing linearly, So reaction is zero order

51. Consider the following reaction -

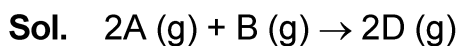


$$\Delta U^\ominus = -10 \text{ kJ mol}^{-1} \text{ and } \Delta S^\ominus = -44 \text{ J K}^{-1} \text{ at } 298 \text{ K.}$$

Identify the **correct** option with ΔG^\ominus for the reaction and spontaneity of the reaction at 298 K - (Given $R = 8.31 \text{ J mol}^{-1} \text{ K}^{-1}$)

- (1) $+0.63568 \text{ kJ mol}^{-1}$, non-spontaneous (2) $-0.63568 \text{ kJ mol}^{-1}$, spontaneous
 (3) $-1.635 \text{ kJ mol}^{-1}$, spontaneous (4) $+1.635 \text{ kJ mol}^{-1}$, non-spontaneous

Ans. (1)



$$\Delta U = -10 \text{ kJ mol}^{-1} \text{ and } \Delta S = -44 \text{ J K}^{-1} \text{ at } 298 \text{ K}$$

$$\Delta G = \Delta H - T\Delta S, \quad \Delta H = \Delta U + \Delta n_g RT$$

$$\Delta G = \Delta U + \Delta n_g RT - T\Delta S$$

$$= -10 \times 1000 - 1 \times 8.31 \times 298 - \{298 \times (-44)\}$$

$$= 635.68 \text{ J mol}^{-1}$$

$$= 0.63568 \text{ kJ mol}^{-1}$$



52. Given below is an expression for the rate constant of a first order reaction occurring at a certain temperature, T (K).

$$\ln k = 14.34 - \frac{1.25 \times 10^4}{T}$$

The energy of activation in kcal mol⁻¹ for the reaction is -

(Given : k in s⁻¹, R = 1.987 cal mol⁻¹ K⁻¹)

- (1) 12.42 (2) 18.63 (3) 14.34 (4) 24.84

Ans. (4)

Sol. On comparing with $\ln k = \ln A - \frac{E_a}{RT}$

$$-\frac{E_a}{RT} = \frac{-1.25 \times 10^4}{T}$$

$$\begin{aligned} E_a &= 1.25 \times 10^4 R \\ &= 1.25 \times 10^4 \times 1.987 \\ &= 2.484 \times 10^4 \text{ cal mol}^{-1} \\ &= 24.84 \text{ Kcal mol}^{-1} \end{aligned}$$

53. Select the reagent that reduce nitriles to primary amines -

- A. (i) LiAlH₄; (ii) H₂O B. Sn + HCl
C. H₂/Ni D. Na(Hg)/C₂H₅OH
E. Br₂/aq.NaOH

Choose the **correct** answer from the option given below -

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

Ans. (3)

Sol. $R-C \equiv N \longrightarrow R-CH_2-NH_2$

Reducing Agent used \rightarrow A. (i) LiAlH₄; (ii) H₂O

C. H₂/Ni

D. Na(Hg)/EtOH

$Sn + HCl \rightarrow R-CN \rightarrow RCH=NH$

$Br_2 + NaOH \rightarrow R-CN \rightarrow X$

Correct answer - (3) A, C and D only



54. The **correct** statement with regard to the secondary structure of DNA/RNA is -
- (1) DNA possesses a double strand helix structure and contains thymine as one of the four bases.
 - (2) DNA possesses a single strand helix structure and contains uracil as one of the four bases.
 - (3) RNA possesses a double strand helix structure and contains uracil as one of the four bases.
 - (4) RNA possesses a single strand helix structure and contains thymine as one of the four bases.

Ans. (1)

Sol. Theoretical

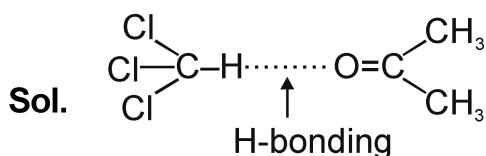
55. During Lassaigne's test, the elements present in an organic compound are converted from-
- (1) Ionic form to ionic form
 - (2) Covalent form to ionic form
 - (3) Ionic form to covalent form
 - (4) Covalent form to covalent form

Ans. (2)

Sol. Organic compound → Sodium extract (salt of sodium)
(Covalent) (Ionic)

56. Mixture of chloroform and acetone forms a solution with negative deviation from Raoult's law due to -
- (1) Stronger intermolecular forces between chloroform molecules than those between chloroform and acetone molecules.
 - (2) Formation of hydrogen bonding between acetone and chloroform.
 - (3) Repulsive forces.
 - (4) Increase in escaping tendency of molecules of each component.

Ans. (2)



intermolecular force is increases as H-bonding is formed.



57. In a test tube containing a salt, a few drops of dilute H_2SO_4 was added, which gave colourless vapours having the smell of vinegar. The vapours turned the blue litmus paper red.

Identify the **correct** anion from the following -

- (1) Carbonate, CO_3^{2-} (2) Sulphide, S^{2-}
(3) Acetate, CH_3COO^- (4) Sulphate, SO_4^{2-}

Ans. (3)

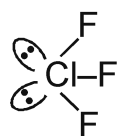
Sol. $\text{CH}_3\text{COO}^- \xrightarrow{\text{dil. H}_2\text{SO}_4} \text{CH}_3\text{COOH}$, Vinegar smell acidic nature.

58. Identify the **correct** statement about ClF_3 from the following options -

- (1) It has T-shaped geometry with three lone pairs on Cl atom.
(2) It has T-shaped geometry with two lone pairs on Cl atom.
(3) It has a trigonal pyramidal geometry with two lone pairs on Cl atom.
(4) It has a planar trigonal geometry with two lone pairs on Cl atom.

Ans. (2)

Sol. $\text{ClF}_3 \rightarrow \text{sp}^3\text{d}$ ($3\sigma + 2 \text{ l.p}$)



T-shape

59. Match List-I with List-II -

List-I

(Complex)

- A. $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$
B. $[\text{Co}(\text{en})_3]^{3+}$
C. $[\text{Co}(\text{NH}_3)_5\text{NO}_2]\text{Cl}_2$
D. $[\text{Cr}(\text{H}_2\text{O})_6]\text{Cl}_3$

List-II

(Type of isomerism)

- I. Optical
II. Solvate
III. Geometrical
IV. Linkage

Choose the **correct** answer from the options given below -

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

Ans. (3)

Sol. (A) $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2] \rightarrow$ Geometrical
(B) $[\text{Co}(\text{en})_3]^{3+} \rightarrow$ Optical
(C) $[\text{Co}(\text{NH}_3)_5\text{NO}_2]\text{Cl}_2 \rightarrow$ Linkage
(D) $[\text{Cr}(\text{H}_2\text{O})_6]\text{Cl}_3 \rightarrow$ Solvate

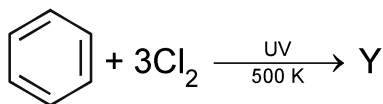
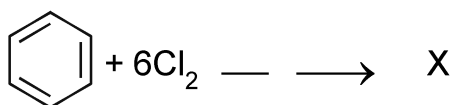
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60. The number of chlorine atoms present in the organic products X and Y of the following reactions, respectively, are -



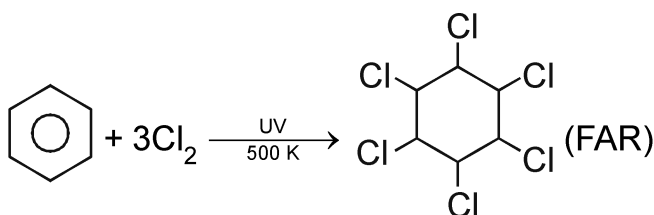
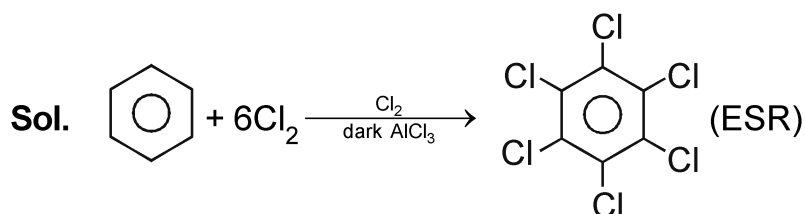
(1) 3 and 3

(2) 6 and 6

(3) 6 and 3

(4) 3 and 6

Ans. (2)



Correct answer (2)

61. Identify the **incorrect** statement from the following -

- (1) Phosphorus, arsenic and antimony show catenation property.
- (2) $\text{P}(\text{C}_2\text{H}_5)_3$ and $\text{As}(\text{C}_6\text{H}_5)_3$ form $d\pi-d\pi$ bond with transition metals.
- (3) Nitrogen can form $d\pi-p\pi$ bond with oxygen.
- (4) Nitrogen can form $p\pi-p\pi$ multiple bonds with itself.

Ans. (3)

Sol. 2nd period element can't form $p\pi-d\pi$ bond



62. At a certain temperature, T (K), during a process 500 J is absorbed by the system and work of 200 J is done by the system. Then change in internal energy of the system is -
(1) 700 J (2) 400 J (3) 300 J (4) 500 J

Ans. (3)

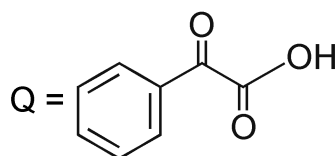
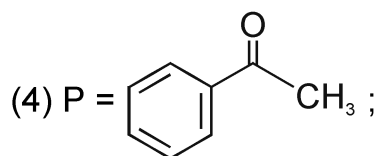
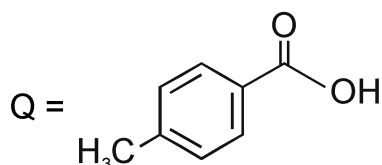
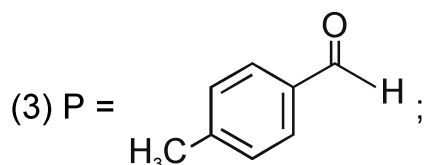
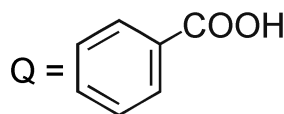
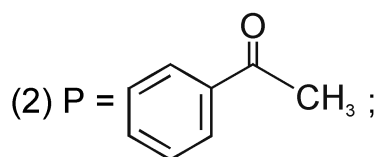
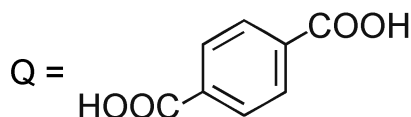
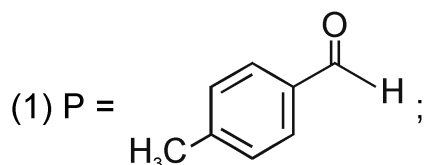
Sol. FLOT : $\Delta U = Q + w$

$Q = +500$ J heat is absorbed by the system

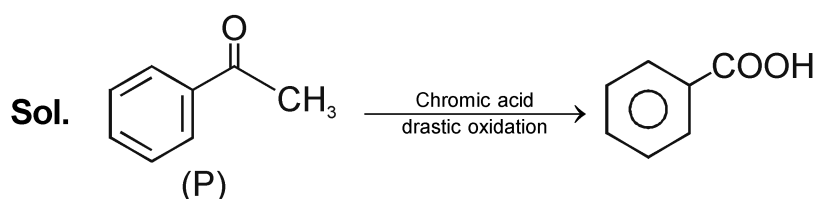
$w = -200$ J work is done by the system

$$\Delta U = 500 - 200 = 300 \text{ J}$$

63. Compound P (C_8H_8O) gives a red orange precipitate with 2,4-DNP reagent and it does not reduce Fehling's reagent. On drastic oxidation with chromic acid, P gives an aromatic product Q that produces effervescence on treating with aq. $NaHCO_3$. Compounds P and Q, respectively, are -



Ans. (2)



('P' Does not reduce fehling solution & give 2,4-DNP test)

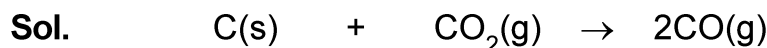
Correct answer (2)



66. When 1 dm³ of CO₂ gas is passed over hot coke, the volume of gaseous mixture after complete reaction at STP becomes 1.4 dm³. The composition of the gaseous mixture at STP is -

- (1) 0.6 dm³ of CO, 0.8 dm³ of CO₂ (2) 0.8 dm³ of CO, 0.8 dm³ of CO₂
 (3) 0.6 dm³ of CO, 0.4 dm³ of CO₂ (4) 0.8 dm³ of CO, 0.6 dm³ of CO₂

Ans. (4)



Hot coke

$$\begin{array}{r} V_i \\ V_f \end{array} \quad \begin{array}{ccc} - & 1 & \\ - & 1-x & 2x \end{array}$$

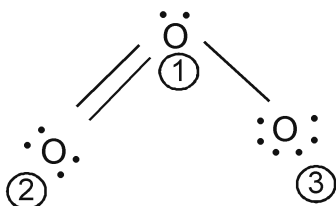
$$1 - x + 2x = 1.4$$

$$x = 0.4$$

$$\Rightarrow V_{\text{CO}_2} = 1 - x = 1 - 0.4 = 0.6 \text{ dm}^3$$

$$V_{\text{CO}} = 2x = 2 \times 0.4 = 0.8 \text{ dm}^3$$

67. The **correct** formal charges on oxygen atoms numbered 2, 1 and 3 respectively are -



- (1) 0, 0, 0, (2) -1, 0, +1 (3) +1, 0, -1 (4) 0, +1, -1

Ans. (4)



$$\begin{array}{ccc} 2 & 1 & 3 \end{array}$$

$$\text{F.C} \Rightarrow \begin{array}{ccc} 0 & +1 & -1 \end{array}$$

68. Match List I with List II -

List-I (Order of reaction)

- A. Zero order
 B. First order
 C. Second order
 D. Third order

List-II (Unit of rate constant)

- I. mol⁻¹ L s⁻¹
 II. mol⁻² L² s⁻¹
 III. s⁻¹
 IV. mol L⁻¹ s⁻¹

Choose the **correct** answer from the options given below -

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

Ans. (2)

Sol. Unit of rate constant = (mol)¹⁻ⁿ (L)ⁿ⁻¹ time⁻¹

∴ n ⇒ order of reaction



69. The correct order of increasing metallic character of Na, Be, P, Mg and Si is -

- (1) Be < Si < P < Mg < Na (2) P < Si < Na < Mg < Be
 (3) P < Si < Be < Mg < Na (4) P < Mg < Be < Si < Na

Ans. (3)

Sol. $\underbrace{\text{P}}_{\text{Non metal}} < \underbrace{\text{Si}}_{\text{Metalloid}} < \underbrace{\text{Be} < \text{Mg} < \text{Na}}_{\text{Metals}}$

70. The number of hydrogen atom present in 5.4 g of urea is -

(Given : Molar mass of urea : 60 g mol⁻¹, N_A : 6.022 × 10²³ particles mol⁻¹)

- (1) 2.168 × 10²² (2) 2.168 × 10²³ (3) 1.084 × 10²² (4) 1.084 × 10²³

Ans. (2)

Sol. 5.4 gm urea

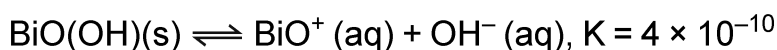
NH₂CONH₂ (Urea) molar mass 60 gm/mole

$$n_{\text{urea}} = \frac{5.4}{60}$$

$$n_{\text{H}} = \frac{5.4}{60} \times 4$$

$$\text{No. of H atom} = \frac{5.4}{60} \times 4 \times 6.022 \times 10^{23} = 2.168 \times 10^{23}$$

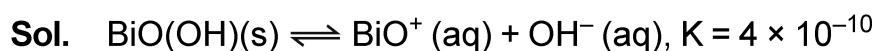
71. In a qualitative analysis, Bi³⁺ is detected by appearance of precipitate of BiO(OH)(s). Calculate pH when the following equilibrium exists at 298 K -



(Given : log 2 = 0.3010)

- (1) 4.699 (2) 5.286 (3) 8.714 (4) 9.301

Ans. (4)



S S

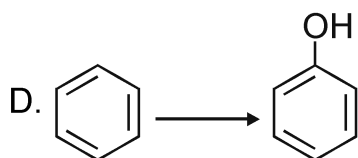
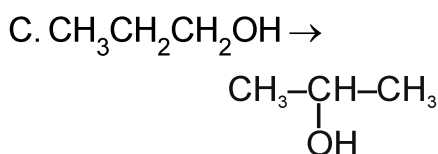
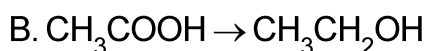
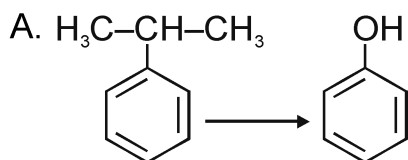
$$K = [\text{BiO}^+][\text{OH}^-]$$

$$4 \times 10^{-10} = S^2 \Rightarrow S = 2 \times 10^{-5}$$

$$[\text{OH}^-] = 2 \times 10^{-5} \Rightarrow \text{pOH} = 4.7; \text{pH} = 9.3$$



72. Match List I with List II -

List-I**List-II.**

I. (i) oleum;

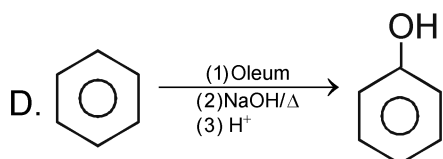
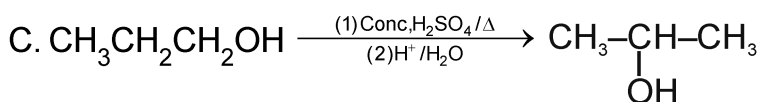
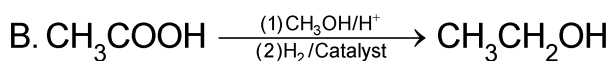
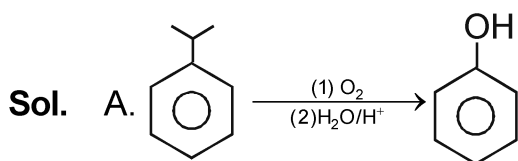
(ii) NaOH , Δ ;(iii) H^+ II. (i) O_2 ;(ii) $\text{H}_2\text{O}/\text{H}^+$ III. (i) CH_3OH , H^+ ;(ii) H_2 , catalystIV. (i) conc. H_2SO_4 , Δ ;(ii) $\text{H}^+/\text{H}_2\text{O}$ Choose the **correct** answer from the options given below -

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

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

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

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

Ans. (3)**MATRIX NEET**

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73. A bulb is rated at 150 watt, converting 8% energy into light. If energy of one photon is 4.42×10^{-19} J, how many photons are emitted by the bulb per second ?

- (1) 27.2×10^{19} (2) 4.06×10^{19} (3) 1.35×10^{19} (4) 2.71×10^{19}

Ans. (4)

Sol. Light energy emitted by the bulb per second = Power \times time \times % light

$$= 150 \times 1\text{sec.} \times \frac{8}{100} = 12 \text{ J}$$

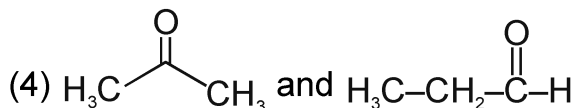
Total energy = Number of photon \times energy of 1 photon

$$12 \text{ J} = n \times 4.42 \times 10^{-19}$$

$$n = 2.71 \times 10^{19}$$

74. The pair of molecules that are metamers among the following is -

- (1) $\text{CH}_3\text{OCH}_2\text{CH}_2\text{CH}_3$ and $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$
(2) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$ and $\text{CH}_3-\text{CH}(\text{OH})-\text{CH}_3$
(3) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$ and $(\text{CH}_3)_2\text{CHCH}_2\text{CH}_3$

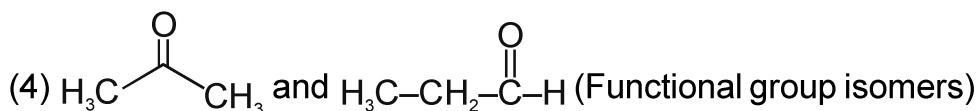


Ans. (1)

Sol. (1) $\text{CH}_3\text{OCH}_2\text{CH}_2\text{CH}_3$ and $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$ (metamers)

(2) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$ and $\text{CH}_3-\text{CH}(\text{OH})-\text{CH}_3$ (Position isomers)

(3) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$ and $(\text{CH}_3)_2\text{CHCH}_2\text{CH}_3$ (Chain isomers)



Correct answer (1)



77. The functional group that can be identified through phthalein dye test is -

- (1) Carboxylic acid (2) Alcohol (3) Aldehyde (4) Phenolic

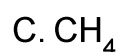
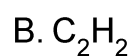
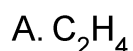
Ans. (4)

Sol. Phthalein dye test is used for phenolic group.

Correct answer (4)

78. Match List I with List II -

List-I



List-II

I. 3 σ bonds, 2 π bonds

II. 3 σ bonds, one lone pair

III. 4 σ bonds

IV. 5 σ bonds, 1 π bond.

Choose the **correct** answer from the options given below -

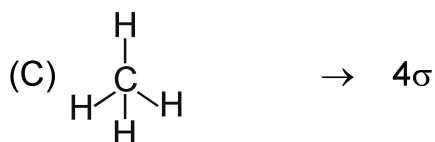
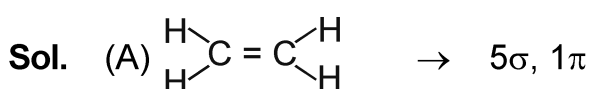
(1) A-IV, B-I, C-III, D-II

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

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

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

Ans. (1)





79. A solution of copper sulphate is electrolysed for 10 minutes with a current of 1.5 amperes. The mass of copper deposited at cathode is -

(Given : Molar mass of Cu = 63 g mol⁻¹ ; 1 F = 96487 C mol⁻¹)

- (1) 0.2938 g (2) 0.5876 g (3) 2.4036 g (4) 1.7018 g

Ans. (1)

Sol. $w_{\text{Cu}} = \frac{E}{96487} \times I \times t$

$$= \frac{63/2}{96487} \times 1.5 \times (10 \times 60 \text{ sec})$$
$$= 0.2938 \text{ gm}$$

80. Match List I with List II -

List-I

(Quantum Numbers)

'n' 'l'

A. 2 1

B. 4 0

C. 5 3

D. 3 2

List-II

(Orbital)

I. 3d

II. 2p

III. 4s

IV. 5f

Choose the **correct** answer from the options given below -

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

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

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

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

Ans. (3)

Sol.

	n	l
(A)	2	1 ⇒ 2p
(B)	4	0 ⇒ 4s
(C)	5	3 ⇒ 5f
(D)	3	2 ⇒ 3d

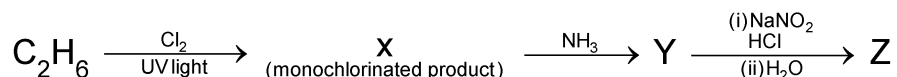
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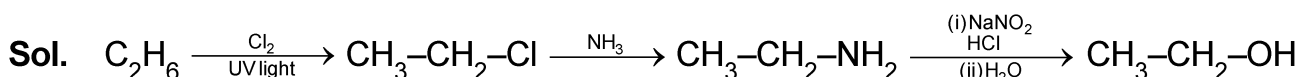


81. The major product z formed in the following sequence of reactions is -



- (1) $\text{C}_2\text{H}_5\text{-N=N-OH}$ (2) $\text{C}_2\text{H}_5\text{OH}$ (3) $\text{C}_2\text{H}_5\text{NO}_2$ (4) $\text{C}_2\text{H}_5\text{NH}_2$

Ans. (2)

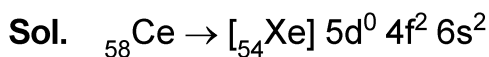


Correct answer (2)

82. Although +3 oxidation state is most common in lanthanoids, cerium still shows +4 oxidation state because -

- (1) After losing one more electron, it acquires $4f^{14}$ electronic configuration.
(2) Its nearest inert gas is Radon.
(3) After losing one more electron, it acquires $4f^0$ electronic configuration.
(4) Its atomic number is 61.

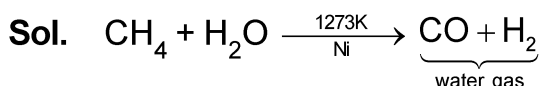
Ans. (3)



83. Methane reacts with steam at 1273 K in the presence of nickel catalyst to form -

- (1) CO and H_2
(2) CO and H_2O
(3) CO_2 and H_2
(4) CO_2 and H_2O

Ans. (1)





84. Identify the **incorrect** statement from the following -

- (1) Oxygen exhibits only -2 oxidation state.
- (2) The order of catenation property of Group 14 elements is $C \gg Si > Ge \approx Sn$.
- (3) Carbon has the ability to form $p\pi-p\pi$ multiple bond with itself.
- (4) ECl_3 ($E = B$ and Al) is a monomer when $E = B$ and a dimer when $E = Al$.

Ans. (1)

Sol. $O \rightarrow -2, -1, +1, +2$
 $H_2O \quad H_2O_2 \quad O_2F_2 \quad OF_2$

85. Phenolphthalein is used as an indicator for the titration of sodium hydroxide solution against a standard solution of oxalic acid. The colour change that is observed at an alkaline pH close to the equivalence point during this titration is -

- (1) pink to colourless
- (2) pinkish red to yellow
- (3) colourless to pink
- (4) yellow to pinkish red

Ans. (3)

Sol. Phenolphthalein turns from colourless to pink in a basic solution.

86. Identify the **incorrect** statement from the following -

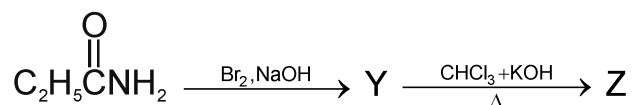
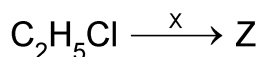
- (1) The largest and the smallest species among Mg , Mg^{2+} , Al and Al^{3+} are Al and Mg^{2+} , respectively.
- (2) The IUPAC name of the element with atomic number 107 is Unnilseptium.
- (3) The similarity in behaviour of Li with Mg is referred to as 'diagonal relationship'.
- (4) The oxidation state and covalency of Al in $[AlCl(H_2O)_5]^{2+}$ are 3 and 6 respectively.

Ans. (1)

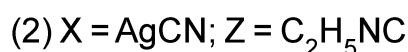
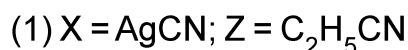
Sol. Largest $\rightarrow Mg$
Smallest $\rightarrow Al^{3+}$



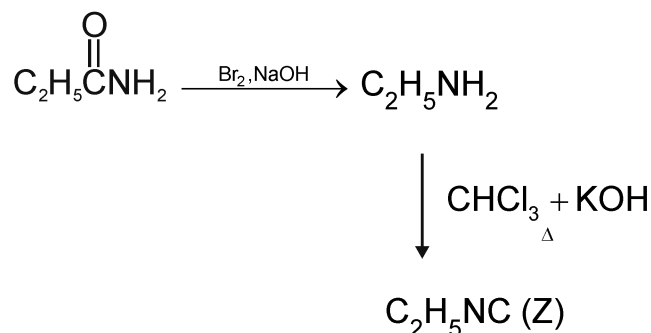
87. The following two reactions give the same foul smelling product Z.



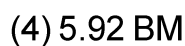
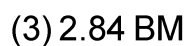
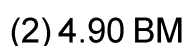
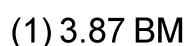
X and Z, respectively, are -



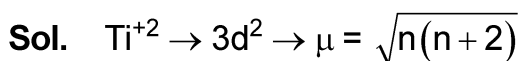
Ans. (2)



88. The calculated 'spin-only' magnetic moment of Ti²⁺ (3d²) is -



Ans. (3)



$$\mu = \sqrt{2(2+2)} = \sqrt{8}$$

$$\mu = 2.84 \text{ BM}$$

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91. Match List I with List II :

List-I

- A. Genetically modified organism
- B. Thermostable DNA polymerase
- C. Ti plasmid
- D. pBR322

List-II

- I. *Agrobacterium tumefaciens*
- II. Bt cotton
- III. *Thermus aquaticus*
- IV. *Escherichia coli*

Choose the **correct** answer from the options given below :

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

Ans. (2)

Sol. A-II, B-III, C-I, D-IV

92. Exploring molecular, genetic and species-level diversity for products of economic importance is called :

- (1) Bioprospecting
- (2) Biofortification
- (3) Biomagnification
- (4) Bioremediation

Ans. (1)

Sol. Exploring molecular, genetic and species-level diversity for products of economic importance is called Bioprospecting



93. Which of the following statements are **true** with reference to the sex-determination in honeybees?

- A. An offspring formed from the union of a sperm and an egg, develops as a female (queen or worker).
- B. An unfertilized egg develops as a male by parthenogenesis.
- C. A male has half the number of chromosomes than that of a female.
- D. Males produce sperms by meiosis.
- E. Honeybees have a haplodiploid sex-determination system.

Choose the **correct** answer from the options given below :

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

Ans. (1)

Sol. Honeybee have haploid diploid sex-determination system. Here males are haploid and females (Queen and Worker) are diploid.

Male honeybee is formed by unfertilised egg through parthenogenesis and female honeybee is formed by union of male and female gamete.

94. Match List-I with List-II :

List-I

(Growth Regulator)

- A. 2,4-D
- B. GA_3
- C. Kinetin
- D. ABA

List-II

(Function/Effect)

- I. Brewing industry
- II. Stimulation of stomatal closure
- III. Herbicide
- IV. Nutrient mobilisation

Choose the correct answer from the options given below :

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

Ans. (4)

Sol. A-III, B-I, C-IV, D-II



95. In racemose inflorescence, _____ :
- (1) the growth is limited
 - (2) flowers are solitary
 - (3) flowers are borne in an acropetal succession
 - (4) the main axis terminates in a flower

Ans. (3)

Sol. In racemose inflorescence the main axis do not terminate into flower and new flowers are born in acropetal succession.

96. Since the origin and diversification of life on Earth, there have been five episodes of mass extinction of species. How is the sixth extinction, which is in progress, different from the previous episodes?

- (1) The current species extinction rates are far lower than those in previous episodes.
- (2) The present species extinction rates are 100 to 1000 times faster than in the pre-human times.
- (3) The present net species extinction rate is zero.
- (4) The current species extinction rate is nearly 10 times faster than that in previous episodes.

Ans. (2)

Sol. The present species extinction rates are 100 to 1000 times faster than in the pre-human times.

97. Alpha-helix is found in which level of protein structure ?

- (1) Secondary structure
- (2) Primary structure
- (3) Tertiary structure
- (4) Quaternary structure

Ans. (1)

98. The enzyme required for carboxylation in the Calvin cycle is :

- (1) PEP carboxylase
- (2) RuBP carboxylase - oxygenase
- (3) Carboxypeptidase
- (4) Hexokinase

Ans. (2)

Sol. The enzyme required for carboxylation in the Calvin cycle is RuBP carboxylase - oxygenase

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102. Match List I with List II :

List-I**(Phase of cell cycle)**A. G₁ phase

B. S phase

C. G₂ phase

D. M phase

List-II**(Activity)**

I. Actual cell division occurs

II. Cell is metabolically active and continuously grows but does not replicate its DNA

III. Synthesis of DNA occurs and the amount of DNA per cell doubles

IV. Proteins are synthesized while cell growth continues

Choose the **correct** answer from the options given below :

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

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

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

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

Ans. (4)**Sol.** A-II, B-III, C-IV, D-I

103. $2(C_{51}H_{98}O_6) + 145 O_2 \rightarrow CO_2 + 98 H_2O + \text{energy}$

The Respiratory Quotient (RQ) of a biomolecule used for respiration, as per the above equation, would be :

(1) Less than 0.5

(2) Between 1.25 and 2

(3) 1.0

(4) Between 0.5 and 0.95

Ans. (4)**Sol.** Between 0.5 and 0.95

104. Which one of the following is **not** a characteristic of plant cells in the phase of elongation ?

(1) New cell wall deposition

(2) Cell enlargement

(3) Large conspicuous nuclei

(4) Increased vacuolation

Ans. (3)

Sol. Large conspicuous nuclei is a characteristic feature of plant cell in the meristematic phase whereas other three are characteristic of plant cell in the phase of elongation.



105. Arrange the following steps of somatic hybridisation in a **correct** sequence.

- A. Digestion of cell walls.
- B. Isolation of naked protoplasts.
- C. Fusion of protoplasts to get hybrid protoplast.
- D. Isolation of single cells from two different varieties of plants.
- E. Growing of hybrid protoplast to form a new plant.

Choose the **correct** answer from the options given below :

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

Ans. (4)

Sol. D, A, B, C, E

106. Match List-I with List-II :

List-I

- A. Conjunctive tissue
- B. Casparian strips
- C. Subsidiary cells
- D. Starch sheath

List-II

- I. Specialised cells in the vicinity of guard cells
- II. Endodermal cells rich in starch
- III. Tissue between xylem and phloem
- IV. Endodermal cells with suberin deposition

Choose the **correct** answer from the options given below :

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

Ans. (2)

Sol. A-III, B-IV, C-I, D-II

107. In angiosperms, root hairs arise from which one of the following regions of the root ?

- (1) The region of elongation (2) The region of meristematic activity
- (3) The region of maturation (4) The root cap zone

Ans. (3)

Sol. In angiosperms, root hairs arise from the region of maturation.

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108. Which of the following floral formula is the **correct** floral formula of Solanaceae family?

$$(1) \oplus \overset{\uparrow}{\underset{\downarrow}{\text{K}}}_{(5)} \overset{\uparrow}{\underset{\downarrow}{\text{C}}}_{(5)} \overset{\uparrow}{\underset{\downarrow}{\text{A}}}_5 \overset{\uparrow}{\underset{\downarrow}{\text{G}}}_{(2)}$$

$$(2) \oplus \overset{\uparrow}{\underset{\downarrow}{\text{K}}}_5 \overset{\uparrow}{\underset{\downarrow}{\text{C}}}_5 \overset{\uparrow}{\underset{\downarrow}{\text{A}}}_5 \overset{\uparrow}{\underset{\downarrow}{\text{G}}}_{(2)}$$

$$(3) \oplus \overset{\uparrow}{\underset{\downarrow}{\text{K}}}_{(5)} \overset{\uparrow}{\underset{\downarrow}{\text{C}}}_{(5)} \overset{\uparrow}{\underset{\downarrow}{\text{A}}}_5 \overset{\uparrow}{\underset{\downarrow}{\text{G}}}_{(2)}$$

$$(4) \oplus \overset{\uparrow}{\underset{\downarrow}{\text{K}}}_5 \overset{\uparrow}{\underset{\downarrow}{\text{C}}}_{(5)} \overset{\uparrow}{\underset{\downarrow}{\text{A}}}_5 \overset{\uparrow}{\underset{\downarrow}{\text{G}}}_{(2)}$$

Ans. (3)

Sol. $\oplus \overset{\uparrow}{\underset{\downarrow}{\text{K}}}_{(5)} \overset{\uparrow}{\underset{\downarrow}{\text{C}}}_{(5)} \overset{\uparrow}{\underset{\downarrow}{\text{A}}}_5 \overset{\uparrow}{\underset{\downarrow}{\text{G}}}_{(2)}$

109. Which one of the following is a triploid cell ?

(1) Synergid

(2) Primary endosperm cell

(3) Central cell

(4) Zygote

Ans. (2)

Sol. Synergid

→ n

Primary endosperm cell

→ 3n

Central cell

→ n + n

Zygote

→ 2n

110. Match List I with List II

List-I

List-II

A. Decomposition

I. Accumulation of dark coloured amorphous colloidal substance

B. Detritus

II. Release of inorganic nutrients by the activity of microbes in soil

C. Mineralisation

III. Breaking down of complex organic matter into inorganic substances

D. Humification

IV. Dead remains of plants and animals including fecal matter

Choose the **correct** answer from the options given below :

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

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

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

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

Ans. (4)

Sol. A-III, B-IV, C-II, D-I

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111. The main criteria used for Five Kingdom Classification proposed by R.H. Whittaker (1969) included :

- A. Cell structure
- B. Body organization
- C. Presence of flagellum
- D. Reproduction
- E. Phylogenetic relationships

Choose the **correct** answer from the options given below :

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

Ans. (4)

Sol. The main criteria used for Five Kingdom Classification proposed by R.H. Whittaker (1969) included : Cell structure, Body organization, Reproduction and Phylogenetic relationships

112. "The Evil Quartet" of biodiversity loss includes which of the following ?

- (1) Over-exploitation; Alien species invasions; Soil pollution; Co-extinctions
- (2) Habitat loss and fragmentation; Air pollution; Water pollution; Co-extinctions
- (3) Habitats loss and fragmentation; over-exploitation; Alien species invasions; Co-extinctions
- (4) Over-exploitation; Alien species invasions; Air pollution; Co-extinctions

Ans. (3)

Sol. "The Evil Quartet" of biodiversity loss includes habitats loss and fragmentation; over-exploitation; Alien species invasions; Co-extinctions.

113. Arrange the following steps of DNA fingerprinting in a **correct** sequence.

- A. Isolation of DNA and its digestion by restriction endonucleases.
- B. Hybridisation using a labelled VNTR probe.
- C. Transferring of separated DNA fragments to synthetic membranes.
- D. Detection of hybridised DNA fragments by autoradiography.
- E. Separation of DNA fragments by electrophoresis.

Choose the **correct** answer from the options given below :

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

Ans. (4)

Sol. A, E, C, B, D



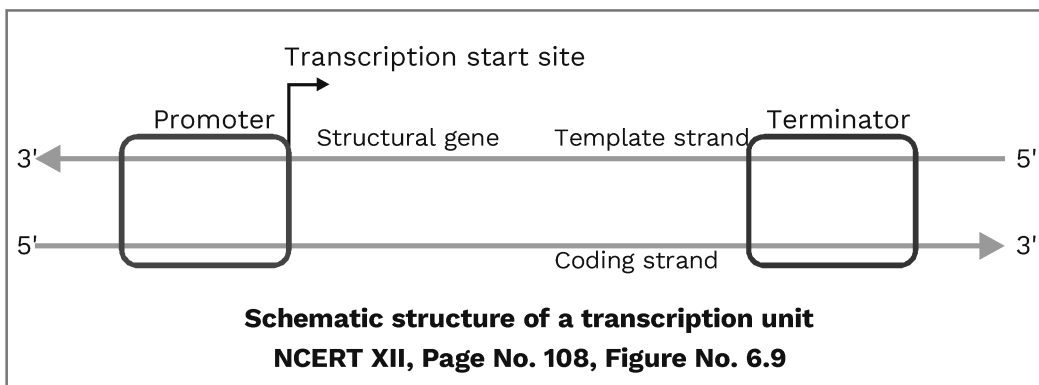
114. Which of the following statements are **correct** with reference to a transcription unit ?
- A. A transcription unit in DNA is defined primarily by three regions : promoter, structural gene and terminator.
 - B. The promoter is said to be located towards the 5'-end of the structural gene.
 - C. The promoter is a DNA sequence that provides binding site for RNA polymerase.
 - D. The promoter defines the template and coding strands.
 - E. The terminator is located towards the 3'-end of the coding strand and it defines the end of the process of transcription."

Choose the **correct** answer from the options given below:

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

Ans. (2)

Sol. A, B, C, D and E



115. Which one of the following types of pollination brings genetically different types of pollen grains to the stigma?
- (1) Geitonogamy
 - (2) Xenogamy
 - (3) Cleistogamy
 - (4) Autogamy

Ans. (2)

Sol. Xenogamy brings genetically different types of pollen grains to the stigma.

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116. Which of the following is an *in-situ* conservation method?

- (1) Seed Banks (2) Sacred Groves
(3) Botanical Gardens (4) Wildlife Safari parks

Ans. (2)

Sol. Sacred Groves

117. Heterophyllous development in response to environment is an example of which of the following phenomena ?

- (1) Redifferentiation (2) Dedifferentiation
(3) Elasticity (4) Plasticity

Ans. (4)

Sol. Plasticity

118. Match List-I with List-II :

List-I

- A. Productivity
B. Net primary productivity
C. Gross primary productivity
D. Secondary productivity

List-II

- I. Gross primary productivity minus respiration losses
II. Rate of formation of new organic matter by consumers
III. Rate of biomass production
IV. Rate of production of organic matter during photosynthesis

Choose the **correct** answer from the options given below :

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

Ans. (3)

Sol. A-III, B-I, C-IV, D-II



119. Which of the following statements are **correct** regarding amino acids?

- A. They are substituted methanes. B. Serine is an aromatic amino acid.
C. Valine is a neutral amino acid. D. Lysine is an acidic amino acid.

Choose the **correct** answer from the options given below :

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

Ans. (4)

Sol. B. Serine is a non-aromatic alcoholic amino acid characterised by the presence of hydroxymethyl ($-\text{CH}_2\text{OH}$) side chain.

D. Lysine is a basic amino acid.

120. In which one of the following, the ovules are **not** enclosed by an ovary wall and remain exposed ?

- (1) *Pinus* (2) *Wolffia* (3) *Funaria* (4) *Selaginella*

Ans. (1)

Sol. Gymnosperms have ovules which are not enclosed by an ovary wall and remain exposed eg : *Pinus*

121. Which of the following statements are **correct** with reference to packaging of DNA helix ?

- A. Histones are organized to form a unit of eight molecules called histone octamer.
B. Histones are negatively charged basic proteins.
C. Histones are rich in the basic amino acid residues - lysine and arginine.
D. The positively charged DNA is wrapped around the histone octamer to form nucleosome.
E. The packaging of chromatin at higher levels requires an additional set of proteins called non-histone chromosomal proteins.

Choose the **correct** answer from the options given below :

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

Ans. (4)

Sol. A, C and E only



122. Match List I with List II

List-I**(Placentation)**

- A. Marginal
- B. Axile
- C. Parietal
- D. Basal

List-II**(Example)**

- I. Mustard
- II. Pea
- III. Marigold
- IV. Lemon

Choose the **correct** answer from the options given below :

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

Ans. (1)

Sol. A-II, B-IV, C-I, D-III

123. Which one of the following is the site for active ribosomal RNA synthesis?

- (1) Nucleolus
- (2) Kinetochore
- (3) Centrosome
- (4) Chromatin

Ans. (1)

Sol. Site for active ribosomal RNA synthesis is Nucleolus.

124. The main function of bulliform cells in grasses is:

- (1) to perform photosynthesis.
- (2) to minimize water loss during water stress.
- (3) to make the leaf impermeable to fungal spores.
- (4) to transport water.

Ans. (2)

Sol. The main function of bulliform cells in grasses is to minimize water loss during water stress

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125. Which of the following statements are **correct**?

- A. The Amazon rainforest being cut and cleared for cultivation of soyabeans is an example of habitat loss.
- B. Steller's sea cow and passenger pigeon became extinct due to over-exploitation by humans.
- C. The Nile perch introduced into Lake Victoria in East Africa helped in population growth of cichlid fish in the lake.
- D. Water hyacinth is an invasive species.
- E. When a species becomes extinct, the plant and animal species associated with it are not affected.

Choose the **correct** answer from the options given below :

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

Ans. (1)

Sol. A, B and D only

126. Which one of the following statements is **not** true about the universal rules of binomial nomenclature ?

- (1) The first word in the biological name represents the specific epithet, while the second component denotes the genus.
- (2) The specific epithet in the biological name starts with a small letter.
- (3) Both the words in a biological name, when handwritten, are separately underlined or printed in italics.
- (4) Biological names are generally in Latin.

Ans. (1)

Sol. The first word in the biological name represents the genus, while the second component denotes the specific epithet.



127. Which one of the following disorders is caused by the substitution of Glutamic acid (Glu) by Valine (Val) at the sixth position of the beta globin chain of the haemoglobin molecule ?

- (1) Phenylketonuria (2) Haemophilia
(3) Sickle-cell anaemia (4) Thalassemia

Ans. (3)

Sol. Sickle-cell anaemia

128. Find the statement(s) about **incorrect** photosynthesis from the following :

- A. The water splitting complex is associated with PS I.
B. C_4 plants use the C_3 pathway of CO_2 fixation as the main biosynthetic pathway.
C. In C_4 plants, photorespiration does not occur.
D. C_3 plants exhibit 'Kranz' anatomy.
E. ATP synthesis in chloroplast occurs through chemiosmosis.

Choose the answer from the options given below :

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

Ans. (4)

Sol. A and D only

The correct version of A and D statement is as following :

- A. The water splitting complex is associated with PS-II.
D. C_4 plants exhibit 'Kranz' anatomy.

129. Match List I with List II :

List I

- A. Trypsin
B. Morphine
C. Concanavalin A
D. Collagen

List II

- I. Intercellular ground substance
II. Lectin
III. Enzyme
IV. Alkaloid

Choose the **correct** answer from the options given below :

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

Ans. (1)

Sol. A-III, B-IV, C-II, D-I

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130. Identify the **correct** statements about biomolecules :

- A. Lipids are generally water soluble.
- B. Proteins are polypeptides.
- C. Polysaccharides are long chains of sugars.
- D. Adenine and guanine are substituted pyrimidines.
- E. Almost all enzymes are proteins.

Choose the **correct** answer from the options given below :

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

Ans. (3)

Sol. A. Lipids are hydrophobic and generally insoluble in water.

D. Adenine and guanine are purine while cytosine, thymine and uracil are pyrimidines.

131. Match List I with List II:

List I

- A. Incomplete dominance
- B. Co-dominance
- C. Pleiotropy
- D. Polygenic inheritance

List II

- I. Human skin colour
- II. Inheritance of flower colour in *Antirrhinum* sp.
- III. Phenylketonuria disease in humans
- IV. ABO blood groups

Choose the **correct** answer from the options given below:

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

Ans. (3)

Sol. A-II, B-IV, C-III, D-I



132. Identify the **correct** sequence of steps in each cycle of Polymerase Chain Reaction :

- (1) Denaturation → Extension → Annealing
- (2) Denaturation → Annealing → Extension
- (3) Annealing → Denaturation → Extension
- (4) Extension → Annealing → Denaturation

Ans. (2)

133. How many ATP and NADPH molecules are required to make one molecule of glucose through the Calvin pathway ?

- (1) 12 ATP and 18 NADPH
- (2) 18 ATP and 12 NADPH
- (3) 6 ATP and 12 NADPH
- (4) 24 ATP and 18 NADPH

Ans. (2)

Sol. To make one molecule of glucose through the Calvin pathway 18 ATP and 12 NADPH are required.

134. Match List I with List II :

List I

(Process)

- A. Glycolysis
- B. ETS
- C. Accumulation of protons
- D. Krebs' cycle

List II

(Location)

- I. Inner membrane mitochondrial
- II. Mitochondrial matrix
- III. Cytoplasm
- IV. Intermembrane space

Choose the **correct** answer from the options given below :

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

Ans. (4)

Sol. A-III, B-I, C-IV, D-II

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135. Which of the following statements are **correct** with respect to DNA separation, isolation and visualization ?

- A. The cutting of DNA is done by molecular scissors.
- B. The DNA fragments separate according to their size in an agarose gel, upon electrophoresis.
- C. The separated DNA fragments can be seen without staining when exposed to UV light.
- D. The separated DNA fragments, when stained with ethidium bromide, can be seen in visible light.

Choose the **correct** answer from the options given below :

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

Ans. (1)

Sol. C. DNA is not naturally visible under UV light, it requires a specific fluorescent stain (like Ethidium bromide) to be seen.

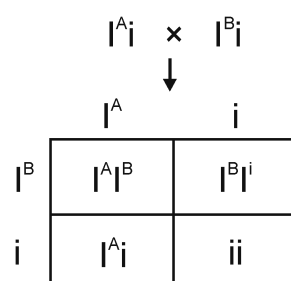
D. The separated DNA fragments, when stained with ethidium bromide, can be seen in UV light.

136. What is the probability of having children with 'O' blood group, where both mother and father are heterozygous for 'A' and 'B' blood group, respectively?

- (1) 0%
- (2) 50%
- (3) 25%
- (4) 75%

Ans. (3)

Sol.





137. Match List I with List II :

List I

- A. Molluscs
- B. Reptiles
- C. Adult amphibians
- D. Amoeba

List II

- I. Pulmonary respiration only
- II. Branchial respiration
- III. Cellular respiration
- IV. Pulmonary and Cutaneous respiration

Choose the **correct** answer from the options given below :

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

Ans. (4)

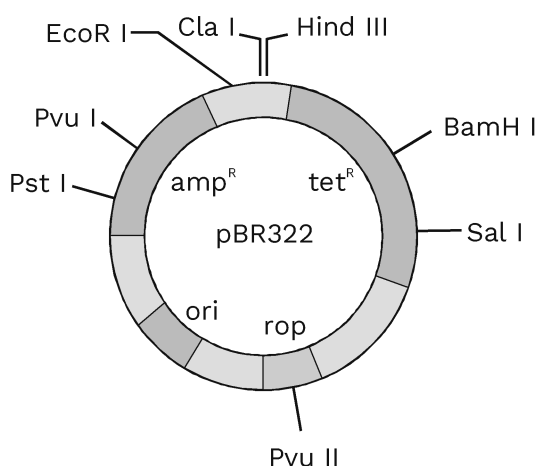
Sol. A-II, B-I, C-IV, D-III

138. Insertion of a foreign DNA at BamHI site in an *E. coli* cloning vector pBR322 results in the loss of antibiotic resistance towards :

- (1) Ampicillin and tetracycline
- (2) Ampicillin
- (3) Tetracycline
- (4) Gentamycin

Ans. (3)

Sol. BamH I recognition site is located within tetracyclin resistance gene.





139. What is the reason behind production of large holes in 'Swiss Cheese'?

- (1) The production of large amount of CO_2 and H_2 by *Trichoderma polysporum*
- (2) The production of large amount of CO_2 and H_2 by lactic acid bacteria called *Lactobacillus*
- (3) The production of large amount of CO_2 by *Propionibacterium sharmanii*
- (4) The production of large amount of CO_2 by *Clostridium butylicum*

Ans. (3)

140. Which of the following is **not** an example of convergent evolution ?

- (1) Fore limbs of whales and bats
- (2) Flippers of penguins and dolphins
- (3) Eyes of octopuses and mammals
- (4) Wings of butterflies and birds

Ans. (1)

Sol. Fore limbs of whales and bats are homologous organs representing divergent evolution.

141. Non-membrane bound cell organelles found in both prokaryotic and eukaryotic cells are _____.

- (1) Lysosomes
- (2) Centrosomes
- (3) Mitochondria
- (4) Ribosomes

Ans. (4)

Sol. Non-membrane bound cell organelles found in both prokaryotic and eukaryotic cells are Ribosomes.

142. Ecological pyramids represent the relationship between the organisms at different trophic levels and they are generally inverted for :

- (1) Pyramid of number in grassland
- (2) Pyramid of energy in pond ecosystem
- (3) Pyramid of biomass in grassland
- (4) Pyramid of biomass in sea

Ans. (4)

Sol. Pyramid of biomass in sea is generally inverted.



143. Arrange the following events occurring in Renin-Angiotensin mechanism in the **correct** order :

- A. Increase in blood pressure and Glomerular filtration rate.
- B. Reabsorption of Na^+ and water from distal parts of tubule due to Aldosterone.
- C. Fall in Glomerular filtration rate.
- D. Vasoconstriction by Angiotensin II and release of Aldosterone.
- E. Renin converts Angiotensinogen into Angiotensin I, followed by Angiotensin II.

Choose the **correct** answer from the options given below :

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

Ans. (4)

144. Choose the **correct** statements regarding population interactions between two species :

- A. In both parasitism and commensalism, only one species benefits and the other species is harmed.
- B. Both species benefit in mutualism.
- C. Both species benefit in commensalism.
- D. In parasitism, only one species benefits and the other species is harmed.
- E. In amensalism, one species is harmed and the other is unaffected.

Choose the **correct** answer from the options given below :

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

Ans. (3)

145. In which animal do haploid cells divide mitotically to produce gametes ?

- (1) Male honeybees (2) Male grasshopper
(3) Male earthworms (4) Male frogs

Ans. (1)

Sol. Male honeybees are haploid and produced gametes through mitotic division.



146. In humans, respiration occurs in the following steps. Arrange these steps in the **correct** order :

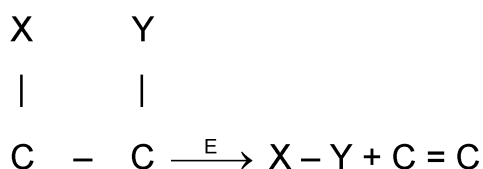
- A. Diffusion of O₂ and CO₂ between blood and tissues.
- B. Diffusion of O₂ and CO₂ across alveolar membrane.
- C. Pulmonary ventilation by which atmospheric air is drawn in and CO₂ rich alveolar air is released out.
- D. Cellular respiration.
- E. Transport of gases by the blood.

Choose the **correct** answer from the options given below :

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

Ans. (3)

147. The following reaction depicts the activity of a particular class of enzymes :



(Substrate) (Product) (Product)

Identify the enzyme class 'E' from the following options :

- (1) Isomerases
- (2) Ligases
- (3) Transferases
- (4) Lyases

Ans. (4)



148. Match List I with List II :

List I**(Bioactive molecules)**

A. Streptokinase

B. Statins

C. Lipases

D. Cyclosporin A

List II**(Importance)**

I. Immunosuppressive agent

II. Removal of clots from the blood vessels

III. Blood cholesterol-lowering agent

IV. Detergent formulations

Choose the **correct** answer from the options given below :

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

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

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

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

Ans. (3)**Sol.** A-II, B-III, C-IV, D-I

149. Which of the following equations depicts Verhulst-Pearl logistic population growth ?

(1)
$$\frac{dN}{dt} = rN \left(\frac{K - N}{K} \right)$$

(2)
$$\frac{dN}{dt} = rN \left(\frac{K}{K - N} \right)$$

(3)
$$\frac{dN}{dt} = rN \left(\frac{K - N}{N} \right)$$

(4)
$$\frac{dN}{dt} = rN \left(\frac{K + N}{K} \right)$$

Ans. (1)

Sol.
$$\frac{dN}{dt} = rN \left(\frac{K - N}{K} \right)$$

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150. Arrange the following cell layers/structures around the female gamete, from outer to inner side :

- A. Zona pellucida
- B. Perivitelline space
- C. Corona radiata
- D. Plasma membrane of ovum

Choose the **correct** answer from the options given below :

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

Ans. (4)

- Sol.**
1. Corona radiata (C) - The outermost layer of follicular cells.
 2. Zona pellucida (A) - A thick, transparent glycoprotein membrane.
 3. Perivitelline space (B) - The fluid filled space between Zona pellucida and the plasma membrane of ovum
 4. Plasma membrane of ovum (D) - The innermost membrane of the egg cell.

151. Which one of the following is an appropriate example of 'sexual deceit' ?

- (1) Sea anemone and clown fish
- (2) *Ophrys* and bumblebee
- (3) Female wasp and fig
- (4) Cuckoo and crow

Ans. (2)

Sol. Sexual deceit is present between *Ophrys* and bumblebee



152. Match List I with List II related to muscular/skeletal system :

List I

- A. Tetany
- B. Arthritis
- C. Myasthenia gravis
- D. Muscular dystrophy

List II

- I. Inflammation of joints
- II. Autoimmune disorder affecting neuromuscular junction
- III. Wild contraction in muscle due to low Ca^{++} in body fluid
- IV. Progressive degeneration of skeletal muscle

Choose the **correct** answer from the options given below :

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

Ans. (2)

Sol. A-III, B-I, C-II, D-IV

153. Select the **correct** statements regarding cell membrane in eukaryotic cell.

- A. Membrane of human RBCS has approximately 52% protein.
- B. Major phospholipids are arranged in a bilayer.
- C. Extensions of the plasma membrane into the cell form mesosomes.
- D. Tails towards the inner part of lipids are hydrophobic and thus protected from aqueous medium.
- E. Glycocalyx is present on the outer surface of the plasma membrane.

Choose the **correct** answer from the options given below :

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

Ans. (3)

Sol. A, B and D only



154. Choose the **correct** statements regarding cell organelles and their inclusions :

- A. The endomembrane system includes Golgi endoplasmic reticulum and complex, mitochondria.
- B. Rough endoplasmic reticulum bears ribosomes on its surface.
- C. Both mitochondria and plastids have circular DNA.
- D. A network of microtubules, microfilaments and intermediate filaments present in the cytoplasm is called cytoskeleton.
- E. Mitochondrion is a single membrane-bound structure.

Choose the **correct** answer from the options given below :

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

Ans. (4)

Sol. B, C and D only

155. The toxin proteins isolated from *Bacillus thuringiensis*, coded by which of the following genes would control cotton bollworms and corn borer, respectively?

- (1) *cryIAc* and *cryIIAb*
- (2) *cryIAc* and *cryIIIAb*
- (3) *cryIAc* and *cryIAb*
- (4) *cryIIAb* and *cryIAc*

Ans. (3)

Sol. Cotton bollworms : Controlled by proteins encoded by the genes *cryIAc* and *cryIIAb*

Corn borer : Controlled by proteins encoded by the genes *cryIAb*

156. The JGA (Juxta Glomerular Apparatus) is a special sensitive region formed by cellular modifications in _____ related to the same nephron.

- (1) Proximal convoluted tubule and efferent renal arteriole
- (2) Distal convoluted tubule and efferent renal arteriole
- (3) Distal convoluted tubule and afferent renal arteriole
- (4) Proximal convoluted tubule and afferent renal arteriole

Ans. (3)

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157. Choose the **correct** statements, regarding frog's anatomy :

- A. Hepatic portal system is the special venous connection between liver and intestine.
- B. There are twelve pairs of cranial nerves arising from the brain.
- C. The ureters and oviducts open separately into the cloaca in female frogs.
- D. Hind-brain consists of cerebellum, medulla oblongata and optic lobes.
- E. Sinus venosus joins the right atrium of heart.

Choose the **correct** answer from the options given below:

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

Ans. (4)

Sol. B. There are ten pairs of cranial nerves arising from the brain.

D. Hind-brain consists of cerebellum, medulla oblongata while optic lobes are part of midbrain.

158. Match List I with List II :

List I

List II

A. Cortisol

I. Stimulates the formation of alveoli in mammary glands

B. Aldosterone

II. Produces anti-inflammatory reactions

C. Cholecystikin

III. Stimulates reabsorption of Na^+ and water from renal tubule

D. Progesterone

IV. Stimulates secretion of pancreatic enzymes and bile juice

Choose the **correct** answer from the options given below :

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

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

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

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

Ans. (1)

Sol. A-II, B-III, C-IV, D-I

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159. The sixth mutant codon of beta globin gene causing polymerization of Haemoglobin and change in RBC shape is _____ .

- (1) CAG (2) AUG (3) GUG (4) GAG

Ans. (3)

Sol. The sixth mutant codon of beta globin gene causing polymerization of Haemoglobin and change in RBC shape is GUG .

160. Male frogs can be distinguished from female frogs due to the presence of :

- A. Bulging eyes
- B. Vocal sacs
- C. Webbed digits in feet
- D. Copulatory pad on first digit of fore limbs
- E. Olive green-coloured skin with dark irregular spots

Choose the **correct** answer from the options given below :

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

Ans. (3)

Sol. Vocal sacs and copulatory pad on first digit of fore limbs are unique to male frogs while bulging eyes, webbed digits in feet and olive green-coloured skin with dark irregular spots are found in both.

161. The human protein named α -1 antitrypsin, obtained from transgenic animals, is used for the treatment of _____ .

- (1) Alzheimer's disease
- (2) Rheumatoid arthritis
- (3) Emphysema
- (4) Cystic fibrosis

Ans. (3)



162. Match List I with List II :

List I (Drug)

A. Nicotine

B. Morphine

C. Heroin

D. Cocaine

List-II (Effect)

I. Causes sense of euphoria and increased energy

II. Stimulates adrenal gland to release catecholamines into blood circulation

III. Effective sedative and painkiller

IV. A depressant; slows down body function

Choose the **correct** answer from the options given below :

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

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

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

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

Ans. (4)

Sol. A-II, B-III, C-IV, D-I

163. The WBC count of a person's blood sample is 8000/cu.mm. How many eosinophils and lymphocytes would be in the same blood sample approximately?

(1) 300– 500 / cu.mm and 500 – 700/cu.mm, respectively

(2) 300– 500 / cu.mm and 1200 – 1500/cu.mm, respectively

(3) 100– 120 / cu.mm and 160 – 200/cu.mm, respectively

(4) 160– 240 / cu.mm and 1600 – 2000/cu.mm, respectively

Ans. (4)

Sol. Eosinophils - 2-3% of total WBCs.

Lymphocytes - 20-25% of total WBCs.



164. Match List I with List II with respect to chronology of evolution of life forms :

List I

- A. About 65 mya
- B. About 500 mya
- C. About 350 mya
- D. About 320 mya

List II

- I. Jawless fish probably evolved
- II. The dinosaurs suddenly disappeared from the earth
- III. Seaweeds and few plants probably existed
- IV. Invertebrates were formed and became active

Choose the **correct** answer from the options given below :

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

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

Ans. (3)

Sol. A-II, B-IV, C-I, D-III

165. Match List I with List II :

List I

- A. Progestasert
- B. Multiload 375
- C. Diaphragm
- D. Saheli

List II

- I. Barrier made of rubber used by females
- II. Oral contraceptive
- III. Hormone releasing IUD
- IV. Copper releasing IUD

Choose the **correct** answer from the options given below :

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

Ans. (4)

Sol. A-III, B-IV, C-I, D-II



166. The following are the stages of life cycle of Plasmodium. Arrange the stages in the proper order.

- A. The parasites reproduce asexually in RBCs, bursting the cells,
- B. The parasites reproduce asexually in liver cells, bursting the cells and releasing into blood.
- C. Gametocytes develop in RBCs.
- D. Sporozoites reach the liver through the blood.
- E. Female mosquito injects sporozoites into humans during bite.

Choose the **correct** answer from the options given below :

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

Ans. (3)

167. Match List I with List II related to embryonic development at various months of pregnancy:

List I**List II**

- | | |
|---|---------------------------|
| A. The foetus movement starts and hair appears on the head | I. 24 weeks of pregnancy |
| B. The foetus develops limbs and digits | II. 20 weeks of pregnancy |
| C. The foetus develops external genital organs | III. 8 weeks of pregnancy |
| D. The foetus body is covered with fine hair; eyelids separate and eyelashes are formed | IV. 12 weeks of pregnancy |

Choose the **correct** answer from the options given below :

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

Ans. (2)

Sol. A-II, B-III, C-IV, D-I

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171. Choose the correct statements regarding muscle contraction.

- A. A motor neuron carries a signal sent by the Central Nervous System (CNS) to the sarcolemma of the muscle fibre.
- B. The neural signal generates an action potential which causes the release of Ca^{++} into sarcoplasm.
- C. Increase in Ca^{++} inactivates the actin for breaking cross bridges.
- D. Actin binds to the myosin head to form a cross bridge.
- E. Shortening of sarcomere takes place, by pulling actin filaments towards the centre of 'A' band.

Choose the **correct** answer from the options given below :

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

Ans. (4)

Sol. C. Increase in Ca^{++} activates the actin for breaking cross bridges by binding to troponin.

172. Choose the **correct** statement regarding GIFT to overcome infertility :

- (1) Ova collected from a female donor are transferred to the uterus of an infertile female.
- (2) Early embryos with up to 8 blastomeres are transferred into the fallopian tube of an infertile female.
- (3) Early embryos with up to 8 blastomeres are transferred to the uterus of an infertile female.
- (4) It is the transfer of an ovum collected from a donor into the fallopian tube of another female who cannot produce ovum but can provide suitable environment for fertilization and development.

Ans. (4)



173. Which of the following statements are correct with reference to human endoskeleton?

- A. Human skull is monocondylic.
- B. The joint between any two adjoining vertebrae is a cartilaginous joint.
- C. In human beings, the number of cervical vertebrae is seven.
- D. All ribs except the last 2 pairs are bicephalic.
- E. The occipital bone of skull is articulated with atlas vertebra.

Choose the **correct** answer from the options given below:

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

Ans. (2)

Sol. A. Human skull is dicondylic i.e. it have two occipital condyles that articulates with first vertebra (Atlas).

D. In humans, all 12 pairs of ribs are bicephalic.

174. Spermatogonia undergo a series of cell divisions to produce sperms. Select the correct statements from the following :

- A. Spermatogonia always undergo meiotic cell division.
- B. Primary spermatocytes divide mitotically to produce secondary spermatocytes.
- C. Secondary spermatocytes, through their second meiotic division, produce haploid spermatids.
- D. Spermatids produce spermatozoa through mitosis.
- E. Spermatids transform into spermatozoa by spermiogenesis.

Choose the **correct** answer from the options given below :

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

Ans. (2)

Sol. A. Spermatogonia primarily undergo mitotic cell division to increase their numbers.

B. Primary spermatocytes undergo meiosis-I to produce secondary spermatocytes.

D. Spermatids produce spermatozoa through spermiogenesis.



175. Select the **incorrect** statements with reference to Rh grouping.
- A. Erythroblastosis foetalis is a condition observed having foetus with Rh-ve blood and mother with Rh +ve blood.
 - B. Rh antigen is observed on RBCs in the majority of human beings.
 - C. Before blood transfusion, Rh group should also be matched.
 - D. Rh incompatibility is observed when a pregnant mother is Rh^{-ve} and the foetus is Rh^{+ve}.
 - E. Erythroblastosis foetalis can be avoided by administering anti-Rh antibodies to the mother immediately after the delivery of the second child.

Choose the answer from the options given below :

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

Ans. (3)

- Sol.** A. Erythroblastosis foetalis is a condition observed when the mother is Rh-ve and foetus is Rh +ve.
- B. Approximately 80% of humans are Rh +ve.
- E. Anti-Rh antibodies must be administered to the mother immediately after the delivery of the first child to prevent Erythroblastosis foetalis.

176. Select the set of fishes which belong to the class Osteichthyes :

- (1) Saw fish, Fighting fish and Dog fish (2) Devil fish, Cuttlefish and Hagfish
(3) Starfish, Hagfish and Cuttlefish (4) Flying fish, Angel fish and Fighting fish

Ans. (4)

177. In a population of a grasshopper species, the chromosome number of some members is 23 and some other members possess 24 chromosomes.

The 23 and 24 chromosome-bearing members in this species are _____.

- (1) females and males, respectively (2) males and females, respectively
(3) all males (4) all females

Ans. (2)

- Sol.** Grasshopper species shows XO type of sex determination where, the male grasshopper has only one X chromosome (e.g. XO) where as female grasshopper has two X chromosomes (e.g. XX).



178. Evolution of human appears parallel to the progressive development of brain and language skills. As such, the evolution of individual species in the sequence of their appearance is :

- (1) Ramapithecus → Homo habilis → Homo erectus → Neanderthal → Homo sapiens
- (2) Neanderthal → Ramapithecus → Homo habilis → Homo erectus → Homo sapiens
- (3) Homo habilis → Homo erectus → Ramapithecus → Neanderthal → Homo sapiens
- (4) Homo sapiens → Ramapithecus → Homo habilis → Neanderthal → Homo erectus

Ans. (1)

179. The specific receptors for neurotransmitters in a synapse are present on _____ .

- (1) Pre-synaptic membrane
- (2) Post-synaptic membrane
- (3) Myelin sheath
- (4) Schwann cell

Ans. (2)

180. Match List I with List II :

List I

(Respiratory Volume)

- A. ERV (Expiratory Reserve Volume)
- B. RV (Residual Volume)
- C. IRV (Inspiratory Reserve Volume)
- D. TV (Tidal Volume)

List II

(Capacity in mL)

- I. 2500-3000 mL
- II. 500 mL
- III. 1000-1100 mL
- IV. 1100-1200 mL

Choose the **correct** answer from the options given below :

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

Ans. (1)

Sol. A-III, B-IV, C-I, D-II