प्रा. मोटेगावकर सरांचे

RCC

NEET : 2022 **PCB Test : 2** **Time : 03 Hours**

Question Booklet Version		Roll Number						Question Booklet Sr. No.
11	(Write this number on your Answer Sheet)	0						

This is to certify that, the entries of RCC-2022 Roll No. and Answer Sheet No. have been correctly written and verified.

Candidate's Signature

Solutions

Invigilator's Signature

NTA UPDATED QUESTION PAPER PATTERN

Sr. No.	Subject(s)	Section(s)	No. Of Question(s)	Mark(s)* *(Each Question Carries 04 (Four Marks))	Type Of Question(s)
1.	PHYSICS	SECTION A	35	140	MCQ (Multiple Choice Questions)
		SECTION B	15	40	
2.	CHEMISTRY	SECTION A	35	140	
		SECTION B	15	40	
3.	BOTONY	SECTION A	35	140	
		SECTION B	15	40	
4.	ZOOLOGY	SECTION A	35	140	
		SECTION B	15	40	
		TOTAL MARKS		720	

Note: ■ Correct option marked will be given (4) Marks and incorrect option marked will be minus one (-1) mark. Unattempted/Unonswered Questions will be given no marks.

■ Section B will have 15 questions, out of these 15 Questions, candidates can choose to attempt any10 Questions.

• *Test Syllabus* •

Physics : $(11^{th} + 12^{th})$ Complete Syllabus

Chemistry : $(11^{th} + 12^{th})$ Complete Syllabus

Biology : $(11^{th} + 12^{th})$ Complete Syllabus

Section 'A' : Physics

Section 'A'

1. If frequency F, velocity V, and density D are considered fundamental units, the dimensional formula for momentum will be

1) DVF^2
2) DV^2F^{-1}
3) $D^2V^2F^2$
4) DV^4F^{-3}

Sol. (4) : Momentum, $p = pv = mv = MLT^{-1} = ML^{-1}$

2. The dimensional formula for a physical quantity x is $[M^{-1}L^3T^{-2}]$. The errors in measuring the quantities M,L, and T, respectively, are 2%, 3% and 4%respectively, then the maximum error in measuring heat will be

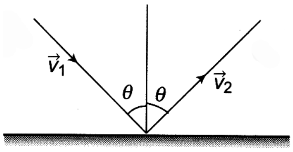
1) 9
2) 10
3) 14
4) 19

Sol. (4) : $X = M^{-1}L^3T^{-2}$

$$\frac{\Delta X}{X} = \frac{\Delta M}{M} + 3\frac{\Delta L}{L} + 2\frac{\Delta T}{T}$$

$$= 2 + 3\times 3 + 2\times 4 = 19$$

3. An object of m kg with speed of v m/s strikes a wall at an angle θ and rebounds at the same speed and same angle. The magnitude of the change in momentum of the object will be



1) 2 mv cos θ
2) 2 mv sin θ
3) 0
4) 2 mv

Sol. (1)

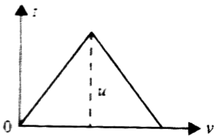
$\vec P_1 = mv\sin\theta\,\hat i - mv\cos\theta\,\hat j$

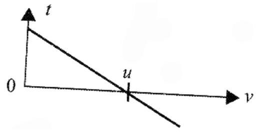
and $\vec P_2 = mv\sin\theta\,\hat i + mv\cos\theta\,\hat j$

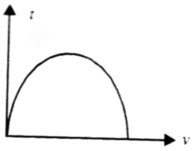
So change in momentum

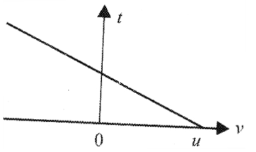
$\Delta\vec P = \vec P_2 - \vec P_1 = 2mv\cos\theta\,\hat j, |\Delta\vec P| = 2mv\cos\theta$

4. An object is thrown up vertically. The velocity-time graph for the motion of the particle

1) 

2) 

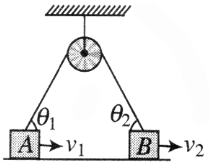
3) 

4) 

Sol. (4)

At $t = 0$, velocity is positive and maximum. As the particle goes up, velocity decreases and becomes zero at the highest point. When the particle starts coming down, velocity increases in the negative direction.

5. In figure, blocks A and B move with velocities v_1 and v_2 along horizontal direction. Find the ratio of v_1/v_2.



1) $\dfrac{\sin\theta_1}{\sin\theta_2}$
2) $\dfrac{\sin\theta_2}{\sin\theta_1}$
3) $\dfrac{\cos\theta_2}{\cos\theta_1}$
4) $\dfrac{\cos\theta_1}{\cos\theta_2}$

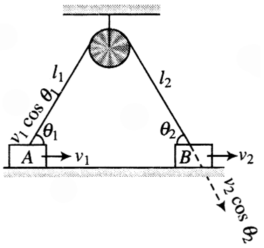
Sol. (3)

From figure $l_1 + l_2 = C$

or $\dfrac{dl_1}{dt} + \dfrac{dl_2}{dt} = 0$

$-v_1\cos\theta_1 + v_2\cos\theta_2 = 0$

or $\dfrac{v_1}{v_2} = \dfrac{\cos\theta_2}{\cos\theta_1}$



6. When rubber-band is stretched by a distance x, it exerts a restroing force of magnitude $F = ax + bx^2$, where a and b are constant. The work done in stretching the unstretched rubber band by L is,

1) $\dfrac{aL^2}{2} + \dfrac{bL^3}{3}$
2) $\dfrac{1}{2}\left(\dfrac{aL^2}{2} + \dfrac{bL^3}{3}\right)$
3) $aL^2 + bL^3$
4) $\dfrac{1}{2}\left(aL^2 + bL^3\right)$

Sol. (1) Restoring force on rubber-band, $F = ax + bx^2$

Work done in stretching the rubber-band by a small amount dx,

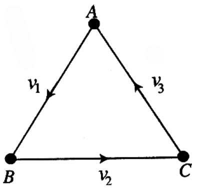
$dW = Fdx$

Net work done in stretching the rubber-band by L is

$$W = \int dW = \int_0^L Fdx = \int_0^L (ax + bx^2)dx$$

$$\Rightarrow W = \left[a\frac{x^2}{2} + b\frac{x^3}{3}\right]_0^L = \frac{aL^2}{2} + \frac{bL^3}{3}$$

7. Three particle of equal masses are placed at the corners of an equilateral triangle as shown in the figure. Now particle A starts with a velocity v_1 towards line AB, particle B starts with a velocity v_2 towards line BC and particle C starts with velocity v_3 towards line CA. The displacemet of CM of three particle A, B and C after time t will be (given $v_1 = v_2 = v_3$)



1) Zero
2) $\frac{v_1+v_2+v_3}{3}t$
3) $\frac{v_1+\frac{\sqrt{3}}{2}v_2+\frac{v_3}{2}}{3}t$
4) $\frac{v_1+v_2+v_3}{4}t$

Sol. (1) : Conceptual

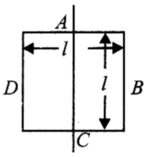
8. Four identical rods are joined end to end form a square. The mass of each rod is M. The moment of inertia of the square about the median line is

1) $\frac{Ml^2}{3}$
2) $\frac{Ml^2}{4}$
3) $\frac{Ml^2}{6}$
4) $\frac{2ml^2}{3}$

Sol. (4) : $I_{\text{median line}} = I_A + I_B + I_C + I_D$

$$= 2 \times \frac{Ml^2}{12} + 2M\left(\frac{l}{2}\right)^2$$

$$= \frac{Ml^2}{6} + \frac{Ml^2}{2} = \frac{2}{3}Ml^2$$



9. If the radius of the earth decreases by 10%, the mass remaining unchanged, what will happen to the acceleration due to gravity?

1) Decrease by 19%
2) Increase by 19%
3) Decrease by more than 19%
4) Increase by more than 19%

Sol. (4) : $g = \frac{GM}{R^2}$

$$g' = \frac{Gm}{\left(\frac{90}{100}R\right)^2} = \frac{100}{81}\frac{GM}{R^2}$$

From Eqs. (i) and (ii),

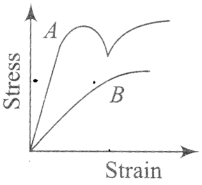
$$g' = \frac{100}{81}g \Rightarrow \frac{g'}{g} = \frac{100}{81}$$

$$\frac{g'}{g} - 1 = \frac{100}{81} - 1$$

$$\therefore \quad \Delta g = \frac{19}{81}g = 23\% \text{ of } g$$

So increase is more than 19% of g.

10. The diagram shows stress vs. strain curve for the materials A and B, from the curves we infer that



1) A is brittle but B is ductile
2) A is ductile and B is brittle
3) Both A and B are ductile
4) Both A and B are brittle

Sol. (2)

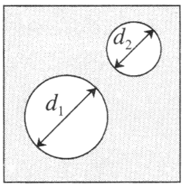
In ductile materials, yield point exists while in brittle material, failure would occur without yielding.

11. A spherical liquid drop of radius r is divided into eight equla droplets. If the surface tension is T, then the work done in this process will be

1) 2π R^2T
2) 3π R^2T
3) 4π R^2T
4) 2π RT^2

Sol. (3) : Conceptual

12. Two holes of unequal diameters d_1 and d_2 ($d_1 < d_2$) are cut in a metal sheet. If the sheet is heated



1) Both d_1 and d_2 will decrease
2) Both d_1 and d_2 will increase
3) d_1 will increase, d_2 will decrease
4) d_1 will decrease, d_2 will increase

Sol. (2)

If the sheet is heated then both d_1 and d_2 will increase since the thermal expansion of isotropic solid is similar to true photographic enlargement.

13. Two liquids A and B are at 32°C and 24°C. When mixed in equal masses the temperature of the mixture is found to be 28°C. Their specific heats ae in the ratio of

1) 3 : 2
2) 2 : 3
3) 1 : 1
4) 4 :3

Sol. (3) : Heat lost by A = Heat gained by B

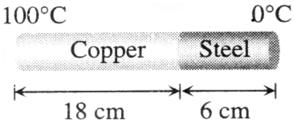
$$\Rightarrow \quad m_A \times c_A \times (T_A - T) = m_B \times c_B \times (T - T_B)$$

Since $m_A = m_B$ and temperature of the mixture $(T) = 28°C$

$$\therefore \quad c_A \times (32-28) = c_B \times (28-24)$$

$$\Rightarrow \quad \frac{c_A}{c_B} = 1:1$$

14. The coefficient of thermal conductivity of copper is nine times that of steel. In the composite cylindrical bar shown in figure, what will be the temperature at the junction of copper and steel ?



1) 75°C
2) 67°C
3) 33°C
4) 25°C

Sol. (1)

$K_1 = 9K_2, l_1 = 18 \text{ cm}, l_2 = 6 \text{ cm}, \theta_1 = 100{}_{\circ}\text{C}, \theta_2 = 0{}_{\circ}\text{C}$

$$\text{Temperature of the junction } \theta = \frac{\frac{K_1}{l_1}\theta_1 + \frac{K_2}{l_2}\theta_2}{\frac{K_1}{l_1} + \frac{K_2}{l_2}}$$

$$\Rightarrow \quad \theta = \frac{\frac{9K_2}{18}100 + \frac{K_2}{6}\times 0}{\frac{9K_2}{18} + \frac{K_2}{6}} = \frac{50+0}{8/12} = 75°\text{C}$$

15. Energy of all molecules of a monoatomic gas having a volume v and pressure P is 3/2 PV. The total translational kinetic energy of all molecules of a diatomic gas at the same volume and pressure is

1) 1/2 PV
2) 3/2 PV
3) 5/2 PV
4) 3 PV

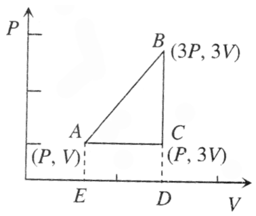
Sol. (2)

16. The pressure P, volume V and temperature T of gas in the jar A and the other gas in the jar B at pressure 2P, volume V/4 and temperature 2T, then the ratio of the number of molecules in the jar A and B will be

1) 1 : 1
2) 1 : 2
3) 2 : 1
4) 4 : 1

Sol. (4)

17. An ideal gas is taken around ABCA as shown in the above P–V diagram. The work done during a cycle is



1) 2PV
2) PV
3) 1/2 PV
4) Zero

Sol. (1) : Conceptual

18. A particle is moving in a circle with uniform speed. Its motion is

1) Not periodic
2) Periodic and simple harmonic
3) Periodic but not simple harmonic
4) None of the above

Sol. (1) : Conceptual

19. As the expression is involving sine fuction, which of the following equations does not represent a simple harmonic motion?

1) $y = a \sin \omega t$
2) $y = a \cos \omega t$
3) $y = a \sin \omega t + b \cos \omega t$4) $y = a \tan \omega t$

Sol. (4) : Conceptual

20. When a source moves away from a stationary observer, the frequency is 6/7 times the original frequency. Given: speed of sound = 330 m/s. The speed of the source is

1) 40 m/s
2) 55 m/s
3) 330 m/s
4) 165 m/s

Sol. (2) : Conceptual

21. A closed organ pipe has a frequency 'n'. If its length is doubled and radius is halved, its frequency nearly becomes.

1) Halved
2) Doubled
3) Trebled
4) Quadrupled

Sol. (1) : Conceptual

22. Two sphere of radii a and b respectively are charged and joined by a wire. The ratio of electric field of the spheres is

1) a/b
2) b/a
3) a^2/b^2
4) b^2/a^2

Sol. (2) Joined by a wire means they are at the same

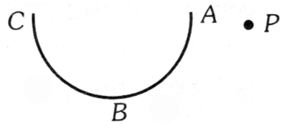
For same potential $\frac{kQ_1}{a_1} = \frac{kQ_2}{a_2} \Rightarrow \frac{Q_1}{Q_2} = \frac{a}{b}$

Further, the electric field at the surface of

having radius R and charge Q is $\frac{kQ}{R^2}$

$$\therefore \frac{E_1}{E_2} = \frac{kQ_1/a^2}{kQ_2/b^2} = \frac{Q_1}{Q_2} \times \frac{b^2}{a^2} = \frac{b}{a}$$

23. In the following diagram the work done in moving a point charge from point P to point A, B and C is respectively as W_A, W_B and W_C, then



1) $W_A = W_B = W_C$
2) $W_A = W_B = W_C = 0$
3) $W_A > W_B > W_C$
4) $W_A < W_B < W_C$

Sol. (2): According to the figure, there is no other charge. A single charge when moved in a space of no field, does not experience any force. No work is done.

$W_A = W_B = W_C = 0$

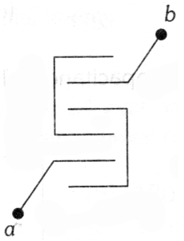
24. If there are n capacitors in parallel connected to V volt source, then the energy stored is equal to

1) CV
2) $\frac{1}{2}$ nCV^2
3) CV^2
4) $\frac{1}{2n}$ CV^2

Sol. (2)

$$U = \frac{1}{2} C_{eq} V^2 = \frac{1}{2}(nC)V^2$$

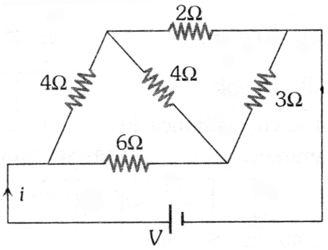
25. Plates of area A are arranged as shown. The distance between each plate is d, the net capacitance is



1) $\frac{\varepsilon_0 A}{d}$
2) $\frac{7\varepsilon_0 A}{d}$
3) $\frac{6\varepsilon_0 A}{d}$
4) $\frac{5\varepsilon_0 A}{d}$

Sol. (1)

26. For the network shown in the figure the value of the current *i* is



1) $\frac{9V}{35}$
2) $\frac{5V}{18}$
3) $\frac{5V}{9}$
4) $\frac{18V}{9}$

Sol. (2) :

The given network is a balanced Wheatstone bri

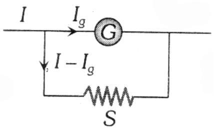
equivalent resistance will be $R = \frac{18}{5}\Omega$

So current from the battery $i = \frac{V}{R} = \frac{V}{18/5} = \frac{5V}{18}$

27. The range of a voltmetr of resistance 500 Ω is 10 V. The resistance to be connected to convert it into an ammeter of range 10 A is

1) 1 Ω in parallel
2) 1 Ω is series
3) 0.1 Ω n parallel
4) 0.1 Ω in series

Sol. (1) :



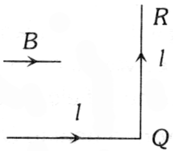
G and S are in parallel

$I_g G = (I - I_g)S$

and $I_g = \frac{10}{500} = \frac{1}{50}$

from (i) and (ii), $S = 1\Omega$.

28. A wire PQR is bent a shown in figure and is placed in a region of uniform magnetic field B. The length PQ = QR= *l*. A current I ampere flows through the wire as shown. The magnitude of the force on PQ and QR will be



1) BI*l*, 0
2) 2BI*l*, 0
3) 0, BI*l*
4) 0, 0

Sol. (3) : Conceptual

29. Which of the following relations is correct in magnetism

1) $I^2 = V^2 + H^2$
2) $I = V + H$
3) $V = I^2 + H^2$
4) $V^2 = I + H$

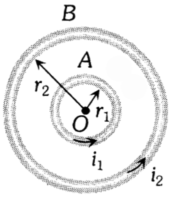
Sol. (1) : Conceptual

30. A transformer rated at 10 kW is used to connect a 5 kV transmission line to a 240 V circuit. The ratio of turns in the windings of a transformer

1) 5
2) 20.8
3) 104
4) 40

Sol. (2) : Conceptual

31. A and B are two concentric circular conductors of centre O and carrying currents i_1 and i_2 as shown in the adjacent figure. If ratio of their radii is 1 : 2 and ratio of the flux densities at O due to A and B is 1 : 3 then the value of i_1/i_2 is



1) 1/6
2) 1/4
3) 1/3
4) 1/2

Sol. (1)

32. In an AC series circuit, the instantaneous current is maximum when he instantaneous voltage is maximum. The circuit element connected to the source will be

1) Pure inductor
2) Pure capacitor
3) Pure resistor
4) Combination of capacitor and an inductor

Sol. (3)

The circuit element connected to the AC source will be pure resistor. In pure resistive AC circuit, voltage and current are in the same phase.

33. In Millikan's oil drop experiment, an oil drop of mass 16 x 10^{-6} kg is balanced by an electric field of 10^{6} V/m. The charge in coulomb on the drop, assuming g = 10 m/s^2 is

1) 6.2 x 10^{-11}
2) 16 x 10^{-9}
3) 16 x 10^{-11}
4) 16 x 10^{-13}

Sol. (3) : $eE = mg \Rightarrow e = \frac{mg}{E} = \frac{16\times10^{-6}\times10}{10^{6}} = 16\times10^{-11}\,C.$

34. The Time of revolution of an electron around a nucleus of charge Ze in nth Bohr orbit is directly proportional to

1) n
2) $\frac{n^3}{Z^2}$
3) $\frac{n^2}{Z}$
4) $\frac{Z}{n}$

Sol. (2)

(b) $T = \frac{2\pi r}{\upsilon}$; r = radius of n^{th} orbit $= \frac{n^2h^2}{\pi mZe^2}$

υ = speed of e^- in n^{th} orbit $= \frac{ze^2}{2\varepsilon_0 nh}$

$\therefore\ T = \frac{4\varepsilon_0^2 n^3 h^3}{mZ^2e^4} \Rightarrow T \propto \frac{n^3}{Z^2}$

35. Radioactive material 'A' has decay constant '8 λ' and material 'B' has decay constant 'λ' Initially they have same number of nuclei. After what time, the ratio of number of nuclei of material 'B' to that 'A' will be $\frac{1}{e}$

1) $\frac{1}{\lambda}$
2) $\frac{1}{7\lambda}$
3) $\frac{1}{8\lambda}$
4) $\frac{1}{9\lambda}$

Sol. (2) : $N_A = N_0 e^{-8\lambda t}$ $N_B = N_0 e^{-\lambda t}$

This N_B will always be greater than N_A

Assuming $\frac{N_A}{N_B} = \frac{1}{e} = e^{-7\lambda t}$

$\Rightarrow 7\lambda t = 1$

$\therefore t = \frac{1}{7\lambda}$

Section 'B'

36. If n$_e$ and υ_d be the number of electrons and drift velocity in a semiconductor. When the temperature is increased

1) n$_e$ increases and υ_d decreases
2) n$_e$ decreases and υ_d increases
3) Both n$_e$ and υ_d increases
4) Both n$_e$ and υ_d decreases

Sol. (1) : Because $\upsilon_d = \frac{i}{(n_e)eA}$

37. The forward biased diode connection is

1) 

2) 

3) 

4) 

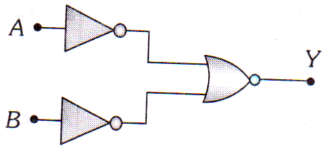
Sol. (1) : For forward bias $V_P > V_N$.

38. For a transistor, in a common emitter arrangement, the alternating current gain β is given by

1) $\beta = \left(\frac{\Delta I_C}{\Delta I_B}\right)_{V_C}$
2) $\beta = \left(\frac{\Delta I_B}{\Delta I_C}\right)_{V_C}$
3) $\beta = \left(\frac{\Delta I_C}{\Delta I_E}\right)_{V_C}$
4) $\beta = \left(\frac{\Delta I_E}{\Delta I_C}\right)_{V_C}$

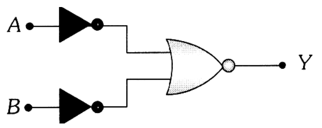
Sol. (1) : Conceptual

39. Which logic gate is represented by the following combination of logic gates



1) OR
2) NAND
3) AND
4) NOR

Sol. (3) :



$$Y = \overline{\overline{A} + \overline{B}}$$

According to De morgan's theorem

$$Y = \overline{\overline{A} + \overline{B}} = \overline{\overline{A}}.\overline{\overline{B}} = A.B$$

This is the output equation of 'AND' gate.

40. To get three images of a single object, one should have two plane mirrors at an angle of

1) 30° 2) 60°
3) 90° 4) 150°

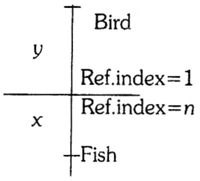
Sol. (3) : $n = \left(\frac{360}{\theta} - 1\right) \Rightarrow 3 = \left(\frac{360}{\theta} - 1\right) \Rightarrow \theta = 90^\circ$

41. A fish in water (refractive index n) looks at a bird vertically above in the air.If y is the height of the bird and x is the depth of the fish from the surface, then the distance of the bird as estimated by the fish is

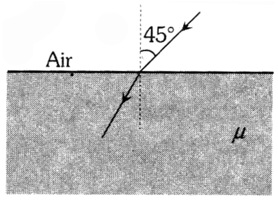
1) $x + y\left(1 + \frac{1}{n}\right)$ 2) $y + x\left(1 - \frac{1}{n}\right)$

3) $x + y\left(1 - \frac{1}{n}\right)$ 4) $x + ny$

Sol. (4) : The apparent distance of the surface of water for the fish =x.



42. In the figure shown, for an angle of incidence 45°, at the top surface, what is the minimum refractive index needed for total internal reflection at vertical face



1) $\frac{\sqrt{2}+1}{2}$ 2) $\sqrt{\frac{3}{2}}$

3) $\sqrt{\frac{1}{2}}$ 4) $\sqrt{2}+1$

Sol. (2) :

At point A, by Snell's law

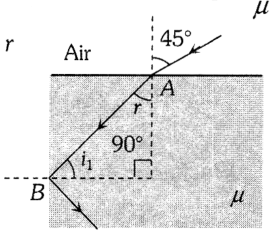
$$\mu = \frac{\sin 45}{\sin r} \Rightarrow \sin r = \frac{1}{\mu\sqrt{2}} \qquad \text{... (i)}$$

At point B, for total internal reflection $\sin i_1 = \frac{1}{\mu}$

From figure, $i_1 = 90 - r$

$\therefore \sin(90^\circ - r) = \frac{1}{\mu}$

$\Rightarrow \cos r = \frac{1}{\mu}$ ... (ii)



Now $\cos r = \sqrt{1 - \sin^2 r} = \sqrt{1 - \frac{1}{2\mu^2}}$

$$= \sqrt{\frac{2\mu^2 - 1}{2\mu^2}} \qquad \text{... (iii)}$$

From equation (ii) and (iii), $\frac{1}{\mu} = \sqrt{\frac{2\mu^2 - 1}{2\mu^2}}$

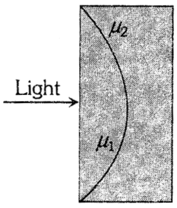
Squaring both side and then solving, we get $\mu = \sqrt{\frac{3}{2}}$

43. A plano convex lens fits exactly into a plano concave lens. Their plane surfaces are parallel to each other. If lenses are made of different materials of reftractive indices μ_1 and μ_2 and R is the radius of curvature of the curved surface of the lenses, then the focal length of combination is

1) $\frac{2R}{(\mu_2 - \mu_1)}$ 2) $\frac{R}{2(\mu_2 - \mu_1)}$

3) $\frac{R}{2(\mu_1 - \mu_2)}$ 4) $\frac{R}{(\mu_1 - \mu_2)}$

Sol. (4) :



Equivalent focal length is given by $\frac{1}{f_{eq}} = \frac{1}{f_1} + \frac{1}{f_2}$

$$\frac{1}{f_{eq}} = (\mu_1 - 1)\left(\frac{1}{\infty} - \frac{1}{-R}\right) + (\mu_2 - 1)\left(\frac{1}{-R} - \frac{1}{\infty}\right)$$

$$\Rightarrow f_{eq} = \frac{R}{\mu_1 - \mu_2}.$$

44. The refracting angle of a prism 'A', and refractive index of the material of the prism is cot (A/2). The angle of minimum deviation is

1) 180° – 2A
2) 90° – A
3) 180° + 2A
4) 180° – 3A

Sol. (1)

$$\mu = \frac{\sin\left(\frac{\delta_m + A}{2}\right)}{\sin(A/2)}$$

$$\cot A/2 = \frac{\sin\left(\frac{A+\delta_m}{2}\right)}{\sin A/2} = \frac{\cos(A/2)}{\sin(A/2)}$$

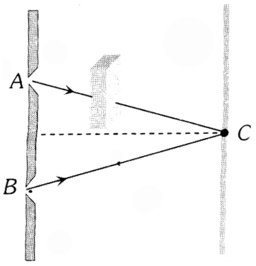
$$Sin\left(\frac{\delta_m + A}{2}\right) = \sin(90°+A/2) \Rightarrow \delta_{\min} = 180°-2A$$

45. The focal lengths of the objective and of the eye-piece of a compound microscope are f_o and f_e respectively. If L is the tube length and D, the least distance of distinct vision, then its angular magnification, when the image is formed at infinity, is

1) $\left(1-\frac{L}{f_0}\right)\left(\frac{D}{f_0}\right)$
2) $\left(1+\frac{L}{f_0}\right)\left(\frac{D}{f_e}\right)$
3) $\frac{L}{f_o}\left(\frac{D}{f_e}\right)$
4) $\frac{L}{f_o}\left(1+\frac{D}{f_e}\right)$

Sol. (3)

46. In Young's experiment, monochromatic light is used to illuminate the two slits A and B. Interference fringes are observed on a screen placed in front of the slits. Now if a thin glass plate is placed normally in the path of the beam coming from the slit.



1) The fringes will disappear
2) The fringe width will increase
3) The fringe width will decrease
4) There will be no change in the fringe width but the pattern shifts

Sol. (4) : In the presence of thin glass plate, the fringe pattern shifts, but no change in fringe width occurs.

47. The box of a pin hole camera, of length L, has hole of radius a. It is assumed that when the hole is illuminated by a parallel beam of light of wavelength λ the spread of the spot (obtained on the opposite wall of the camera) is the sum of its geometrical spread and the spread due to diffraction. The spot would then have its minimum size (say b_{min}) when

1) $a = \sqrt{\lambda L}$ and $b_{min} = \left(\frac{2\lambda^2}{L}\right)$
2) $a = \sqrt{\lambda L}$ and $b_{min} = \sqrt{4\lambda L}$
3) $a = \frac{\lambda^2}{L}$ and $b_{min} = \sqrt{4\lambda L}$
4) $a = \frac{\lambda^2}{L}$ and $b_{min} = \left(\frac{2\lambda^2}{L}\right)$

Sol. (2) : $b \rightarrow$ radius of spot

$$b = a + \frac{\lambda L}{a}$$

geometrical spread + spread due to diffraction

$$\frac{db}{da} = 0$$

$$\Rightarrow 1 - \frac{\lambda}{a^2}L = 0$$

$$\Rightarrow a^2 = L\lambda \Rightarrow a = \sqrt{L\lambda}$$

$$b_{\min.} = \sqrt{L\lambda} + \frac{\lambda L}{\sqrt{L\lambda}}$$

$$b_{\min.} = 2\sqrt{L\lambda}$$

$$b_{\min.} = \sqrt{4L\lambda}.$$

48. When the angle of incidence on a material is 60°, the reflected light is completely polarized. The velocity of the refracted ray inside the material is (in ms^{-1})

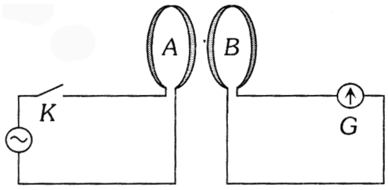
1) 3×10^8
2) $\left(\frac{3}{\sqrt{2}}\right)\times 10^8$
3) $\sqrt{3}\times 10^8$
4) 0.5×10^8

Sol. (3)

From Brewster's law $\mu = \tan i_p \Rightarrow \frac{c}{v} = \tan 60° = \sqrt{3}$

$$\Rightarrow v = \frac{c}{\sqrt{3}} = \frac{3\times 10^8}{\sqrt{3}} = \sqrt{3}\times 10^8 \ m/s.$$

49. **The diagram below shows two coils A and B placed parallel to each other at a very small distance. Coil *A* is connected to an ac supply. *G* is a very sensitive galvanometer. When the key is closed**



1) Constant deflection will be observed in the galvanometer for 50 Hz supply
2) Visible small variations will be observed in he galvanometer for 50 Hz input
3) Oscillations in the galvanometer may be observed when the input ac voltage has a frequency of 1 to 2 Hz
4) No variation will be observed in the galvanometer even when the input ac voltage is 1 or 2

Sol. (3) : At low frequency of 1 to 2 *Hz*, oscillations may be observed as our eyes will be able to detect it.

50. **The wing span of an aeroplane is 20 metre. It is flying in a field, where the vertical component of magnetic field of earth is 5 x 10^{-5} tesla, with velocity 360 km/h. The potential difference produced between the blades will be**

1) 0.10 V
2) 0.15 V
3) 0.20 V
4) 0.30 V

Sol. (1) : $e = Bvl = 5\times10^{-5}\times\frac{360\times1000}{3600}\times20 = 0.1V$.

Section 'B' : Chemistry

Section 'A'

51. If 0.5 mol of $CaBr_2$ is mixed with 0.2 mol of K_3PO_4 then the maximum number of moles of $Ca_3(PO_4)_2$ obtained will be ***[XIth Part-I N.B. 20]***

1) 0.5 2) 0.2
3) 0.7 4) 0.1

Sol. (4) $3CaBr_2 + 2K_3PO_4 \longrightarrow Ca_3(PO_4)_2 + 6KBr$

$\frac{0.5}{3} = 0.16$ $\frac{0.2}{2} = 0.1$

$\therefore$ K_3PO_4 is L.R.

2 mole $K_3PO_4 \equiv$ 1 mole $Ca_3(PO_4)_2$

0.2 mole $K_3PO_4 \equiv$? $\boxed{0.1 \text{ mole}}$

52. Which orbital notation does not have spherical nodes ? ***[XIth Part-I N.B. 57]***

1) n = 2, l = 0 2) n = 2, l = 1
3) n = 3, l = 0 4) n = 4, l = 2

Sol. (2) Spherical nodes $= n - l - 1$
$= 2 - 1 - 1 = 0$

53. Which of the following statement is not correct ***[XIth Part-I N.B. 35]***

1) Isotones are atoms of different elements having same number of neutrons
2) Isobars are atom of different elements having same number of nucleons
3) Isotopes are atom of different elements having same number of protons
4) Isotones and isobars are atom of different elements

Sol. (3) Isotopes are the atoms of same element having same atomic number but different mass number.

54. Among the elements Ca, Mg, P and Cl the order of increasing atomic radii is ***[XIth Part-I N.B. 86]***

1) Mg < Ca < Cl < P
2) Cl < P < Mg < Ca
3) P < Cl < Ca < Mg
4) Ca < Mg < P < Cl

Sol. (2) Left to right in a period atomic radius decreases and from top to bottom increases.

$\underset{\overset{\wedge}{Ca}}{Na \quad Mg} > \quad > P > Cl$

$\therefore$ Ca > Mg > P > Cl.

55. Among the following which one is a wrong statement ? ***[XIth Part-I N.B. 115]***

1) SeF_4 and CH_4 have same shape
2) I_3^+ has bent geometry
3) PH_5 and BiI_5 do not exist
4) $p\pi$-$d\pi$ bonds are present in SO_2

Sol. (1) SeF_4 has see saw shape & CH_4 has tetrahedral shape.

56. The hybridisation of the central atom will change when ***[XIth Part-I N.B. 122]***

1) NH_3 combines with H^+
2) BF_3 combines with F^-
3) NH_3 form NH_2^-
4) H_2O combines with H^+

Sol. (2)
1) $\underset{sp^3}{NH_3} + H^+ \longrightarrow \underset{sp^3}{NH_4^+}$
2) $\underset{sp^2}{BF_3} + F^- \longrightarrow \underset{sp^3}{BF_4^-}$
3) $\underset{sp^3}{NH_3} \longrightarrow \underset{sp^3}{NH_2^-} + H^+$
4) $\underset{sp^3}{H_2O} + H^+ \longrightarrow \underset{sp^3}{H_3O^+}$

57. Which is correct about real gas ***[XIth Part-I N.B. 151]***

1) Pressure of real gas is higher than ideal gas
2) Volume of real gas is lower than ideal gas
3) Real gas follow ideal gas equation at very low pressure and high temperature
4) Real gas behaves as ideal gas at high pressure and low temperature

Sol. (3) Real gas shows ideal behaviour when intermolecular forces are nigligible, i.e., at low P and high T.

58. For the reaction P → Q, $\Delta H = +10$ cal mol^{-1} an $\Delta S = -20$ kJ mol^{-1}. This reaction is

[XIth Part-I N.B. 122]

1) Non-spontaneous at all temperature
2) Non-spontaneous at low temperature
3) Non-spontaneous at high temperature
4) Spontaneous at high temperature

Sol. (1) When ΔH is +ve & ΔS is –ve
then ΔG is +ve at all T.

59. Work done during the combustion of one mole of CH_4 in bomb calorimeter is

[XIth Part-I N.B. 170]

1) zero
2) –101 J
3) –24.2 J
4) –1 J

Sol. (1) In a bomb calorimeter
$\Delta V = 0$ so $W = 0$

60. 3 mole of reactant A and one mole of reactant B are mixed in a vessel of volume 1 litre. The reaction taking place is A + B $\rightleftharpoons$ 2C. If 1.5 mol of C is formed at equilibrium, the value of K_c is

[XIth Part-I N.B. 199]

1) 0.12
2) 0.50
3) 4.00
4) 0.25

Sol. (3)

$$\begin{array}{llll} & A & + \; B & \rightleftharpoons 2C \\ t=0 & 3 & 1 & - \\ t=eq & 3-x & 1-x & 2x = 1.5 \end{array}$$

$\therefore x = 0.75$

$\therefore [A] = 3-x = 2.25$
$[B] = 1-x = 0.25$
$[C] = 1.5$

$$\therefore K_{eq} = \frac{[C]^2}{[A][B]}$$

$$= \frac{\cancel{(1.5)^2}}{\cancel{(2.25)}(0.25)} = 4$$

61. For a given solution pH = 6.9 at 60°C where $K_w = 10^{-12}$. The solution is *[XIth Part-I N.B. 217]*

1) Acidic
2) Basic
3) Neutral
4) Unpredictable

Sol. (2) $K_w = 10^{-12} \Rightarrow pK_w = 12$
$pH + pOH = pK_w = 12$
$\therefore$ when $pH < 6 \Rightarrow$ acidic
$> 6 \Rightarrow$ Basic
$= 6 \Rightarrow$ Neutral

62. Which of the following in the correct order of solubilities of IIA group sulphates

[XIth Part-II N.B. 309]

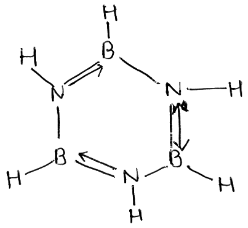
1) $BeSO_4 > MgSO_4 > CaSO_4 > BaSO_4$
2) $BeSO_4 > BaSO_4 > CaSO_4 > MgSO_4$
3) $BaSO_4 > CaSO_4 > MgSO_4 > BeSO_4$
4) $BeSO_4 > CaSO_4 > MgSO_4 > BaSO_4$

Sol. (1) Solubility of alkaline earth metal sulphate decreases down th group.

63. For Inorganic benzene ($B_3N_3H_6$) which one is wrong ***[XIth Part-II N.B. 321]***

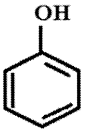
1) Only 6 (sp^2–sp^2) σ bonds and 3 pπ–pπ coordinate bonds
2) 12 (sp^2–sp^2) σ bonds and 3 pπ–pπ coordinate bonds
3) 6 (sp^2–sp^2) σ bonds and 6 (sp^2–s) σ bonds
4) 6 (sp^2–sp^2) σ bonds and 6 (sp^2–s) σ bonds and 3 pπ–pπ coordinate bonds

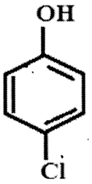
Sol. (2)

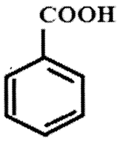


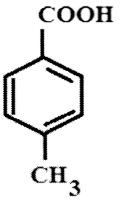
Hyb^n of both B & N is sp^2
$\therefore$ 12 σ bonds & 3 π bonds

64. The correct acidity order of the following is

I.


II.


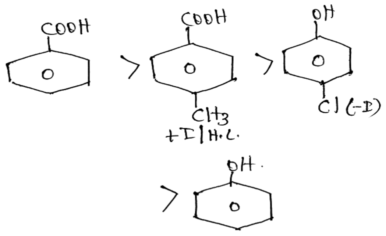
III.


IV.


[XIth Part-II N.B. 337]

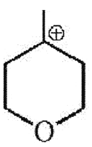
1) III > IV > II > I
2) IV > III > I > II
3) II > I > IV > III
4) I > III > II > IV

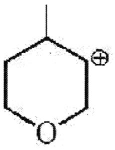
Sol. (1)

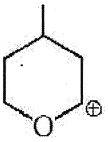


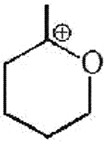
Acidic strength ⇒ –COOH > –OH.

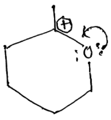
65. Most stable carbocation among the following is *[XIth Part-II N.B. 355]*

1) 

2) 

3) 

4) 

Sol. (4) 
→ +M. effect.
and
5 α H's.
(Hyperconjugation)

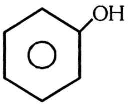
66. Which of the following alkane cannot be made in good yield by wurtz reaction? *[XIIth Part-II N.B. 311]*

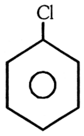
1) propane
2) n-butane
3) n-hexane
4) 2,3-dimethyl butane

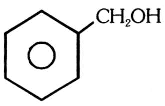
Sol. (1) wurtz reaction preferred for the preparation of Symmetrical alkanes.

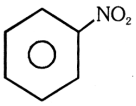
$H_3C-CH_2-CH_3$ → Unsymmetrical alkane.
n-propane

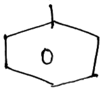
67. Which one of the following is most reactive towards ESR? *[XIIth Part-II N.B. 337]*

1) 

2) 

3) 

4) 

Sol. (1) 
O–H → ERG (+M)
→ Ring with more e^- density.
so, Undergoes ESR easily.

68. Which of the following is not an air pollutant? *[XIth Part-II N.B. 407]*

1) N_2
2) N_2O
3) K_2CO_3
4) Rb_2CO_3

Sol. (1) N_2 is not an air pollutant.

69. The solubility of a gas in liquid generally increases with :

1) Increases in temperature
2) Reduction in gaseous pressure
3) Decrease in temperature and increase of gaseous pressure
4) Amount of liquid taken

Sol. (3) Solubility of gas $\propto \frac{P}{T}$

70. 2 m aqueous solution of an electrolyte x_3y_2 is 25% ionized. The boiling point of the solution is (K_b for H_2O = 0.52 K kg/mol) *[XIIth Part-I N.B. 359]*

1) 375.08 K
2) 374.04 K
3) 377.12 K
4) 373.25 K

Sol. (1)

$$\alpha = \frac{i-1}{n-1}$$

$$0{\cdot}25 = \frac{i-1}{5-1} \Rightarrow i = 2$$

$$\Delta T_b = i K_b m$$

$$= 2 \times 0{\cdot}52 \times 2 = 2{\cdot}08$$

$$\therefore \Delta T_b = T_b - T_b^0$$

$$2{\cdot}08 = T_b - 373$$

$$T_b = 375{\cdot}08 \text{ K}$$

71. Which is manufactured by electrolysis of fused NaCl *[XIIth Part-I N.B. 85]*

1) $NaClO_3$
2) NaClO
3) NaOH
4) Na

Sol. (4) fused or molten NaCl contains only Na^+ & Cl^-

At cathode: $Na^+ + e^- \longrightarrow Na_{(s)}$

72. The unit of rate constant of an elementary reaction depends upon the *[XIIth Part-I N.B. 104]*

1) temperature of the reaction
2) concentration of reactant
3) activation energy of the reaction
4) Molecularity of the reaction

Sol. (4) In elementary reactions,
order = molecularity
and the units of rate
constant depends upon the
order of reaction.

73. For a reaction for which the activation energies of the forward and reverse directions are equal in value then : ***[XIIth Part-I N.B. 114]***

1) $\Delta G = 0$
2) $\Delta H = 0$
3) $\Delta S = 0$
4) The order is zero

Sol. (2) When $\Delta H = 0$, reactants
and products have same
energy. so no activation
energy is required.

74. When $FeCl_3$ solution is added to NaOH a negatively charged sol is obtained. It is due to the ***[XIIth Part-I N.B. 143]***

1) Presence of basic group
2) Preferential adsorption of OH^- ions
3) Self dissociation
4) Electron capture by sol particles

Sol. (2) It is a fact

75. When SO_2 is passed through a solution of H_2S in water : ***[XIIth Part-I N.B. 193]***

1) Sulphuric acid is formed
2) A clear solution is formed
3) A sulphur is precipitated
4) No change observed

Sol. (3) $SO_{2(g)} + 2H_2S_{(aq)} \longrightarrow 2H_2O + 3S\downarrow$

76. Cl_2 gas is obtained by various reactions but not by ***[XIIth Part-I N.B. 202]***

1) $KMnO_4 + \text{conc. HCl} \xrightarrow{\Delta}$
2) $KCl + K_2Cr_2O_7 + \text{conc. } H_2SO_4 \xrightarrow{\Delta}$
3) $MnO_2 + \text{conc. HCl} \xrightarrow{\Delta}$
4) $KCl + F_2 \xrightarrow{\Delta}$

Sol. (2) $K_2Cr_2O_7 + KCl + H_2SO_4 \longrightarrow CrO_2Cl_2 + K_2SO_4 + H_2O$

77. Which of the following contains S–O–S linkage? ***[XIIth Part-I N.B. 194]***

1) $H_2S_2O_7$
2) $H_2S_2O_6$
3) $H_2S_2O_5$
4) $H_2S_2O_8$

Sol. (1) $H_2S_2O_7 \Rightarrow$ pyrosulphuric acid / oleum
contains S–O–S linkage.

78. Correct statement for 3d-series is : ***[XIIth Part-I N.B. 222]***

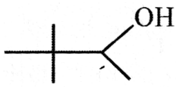
1) Sc shows stable +3 oxidation state
2) Zn has minimum I.E.
3) Melting point of Mn > Melting point of Cr
4) Sc shows stable +2 oxidation state

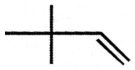
Sol. (1) Sc shows +3 stable
oxidation state because
it acquire stable
configuration of Ar.

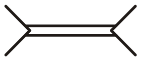
79. The hybridisation state of Nickel in $[Ni(CO)_4]$, $[Ni(CN)_4]^{-2}$ and $[NiCl_4]^{-2}$ are respectively ***[XIIth Part-I N.B. 255]***

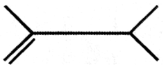
1) sp^3, sp^3, dsp^2
2) dsp^2, sp^3, sp^3
3) sp^3, dsp^2, dsp^2
4) sp^3, dsp^2, sp^3

Sol. (4) $Ni(CO)_4 \Rightarrow sp^3$
$[Ni(CN)_4]^{2-} \Rightarrow dsp^2$
$[NiCl_4]^{2-} \Rightarrow sp^3$

80.  $\xrightarrow[\Delta]{\text{conc. } H_2SO_4}$ **Major product** ***[XIIth Part-I N.B. 339]***

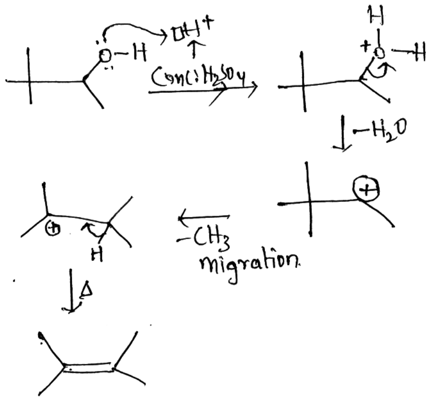
1) 

2) 

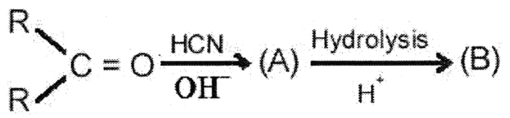
3) 

4) None of these

Sol. (2)



81.



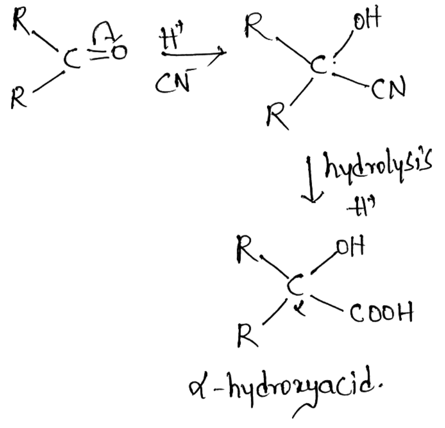
$$R_2C{=}O \xrightarrow[OH^-]{HCN} (A) \xrightarrow[H^+]{Hydrolysis} (B)$$

Compound (B) in the above reaction is

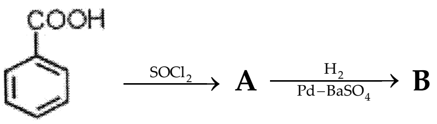
[XIIth Part-II N.B. 367]

1) α-hydroxy acid
2) α-amino acid
3) α-amino alkanol
4) α-amino-β-hydroxy acid

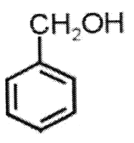
Sol. (1)

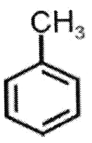


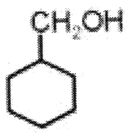
82. Consider the following reaction

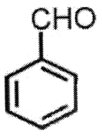


[XIIth Part-II N.B. 382]

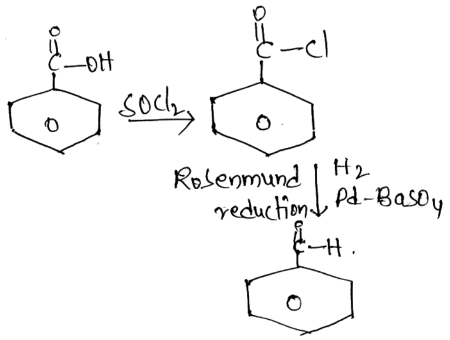
1) 

2) 

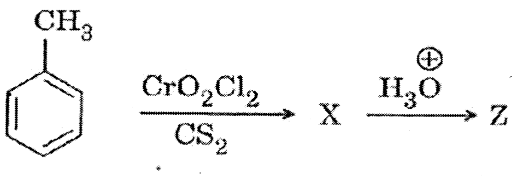
3) 

4) 

Sol. (4)



83. In the following reaction

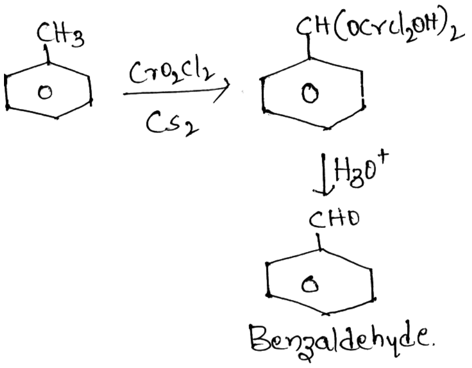


The compound Z is *[XIIth Part-II N.B. 363]*

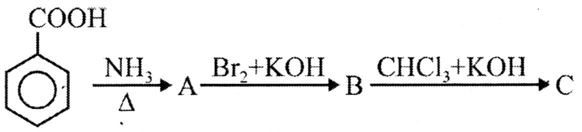
1) Benzoic acid
2) benzaldehyde
3) acetophenone
4) benzene

Etard reaction.

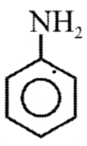
Sol. (2)

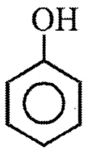


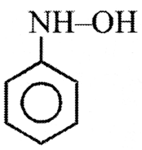
84.



Product C is : *[XIIth Part-II N.B. 394]*

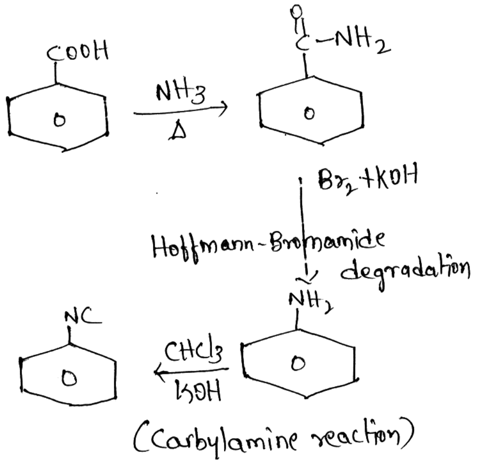
1) 

2) 

3) 

4) 

Sol. (4)



85. Which of the following set consists only of essential amino acids ? ***[XIIth Part-II N.B. 421]***

1) Alanine, Tyrosine, Cystine
2) Leucine, Lysine, Tryptophan
3) Alanine, Glutamine, Lycine
4) Leucine, Proline, Glycine

Sol. (2) Fact.

Section 'B'

86. In which of the following pair both species have comparable bond order. ***[XIth Part-I N.B. 129]***

1) $O_2[AsF_6]$, BaO_2, [O–O bond order]
2) C_2, CaC_2[C–C bond order]
3) C_2H_2, CaC_2[C–C bond order]
4) CaC_2, N_2^{-2}[C–C and N–N bond order]

Sol. (3) In $C_2H_2 \Rightarrow HC\equiv CH$

$CaC_2 \Rightarrow Ca^{2+}(C\equiv C)^{2-}$

87. The molar solubility of a sparingly soluble salt (in mol L^{-1}) M_2X_3 is S. The corresponding solubility product is K_{sp}. S is given in terms of K_{sp} as ***[XIth Part-I N.B. 229]***

1) $\left[\frac{K_{sp}}{27}\right]^{1/3}$
2) $\left[\frac{K_{sp}}{108}\right]^{1/5}$
3) $\sqrt{K_{sp}}$
4) $\left[\frac{K_{sp}}{256}\right]^{1/6}$

Sol. (2)

$$K_{sp} = x^x y^y s^{x+y}$$
$$= 2^2 3^3 s^{2+3}$$
$$= 108 s^5$$
$$\therefore \quad s = \sqrt[5]{\frac{K_{sp}}{108}}$$

88. For the redox reaction

$xMnO_4^- + yH_2C_2O_4 + zH^+ \rightarrow mMn^{2+} + nCO_2 + pH_2O$

The value of x, y, m and n ***[XIth Part-II N.B. 274]***

1) 10, 2, 5, 2
2) 2, 5, 2, 10
3) 6, 4, 2, 5
4) 3, 5, 2, 10

Sol. (2) As MnO_4^- converting to Mn^{2+}, x must be equal to m

$\therefore$ $x = 2$

$y = 2$

$m = 2$

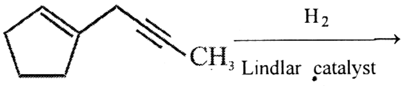
$n = 10$

89. In paper chromatography ***[XIth Part-II N.B. 362]***

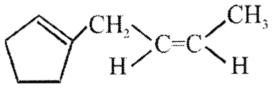
1) Moving phase is liquid and stationary phase is solid
2) Moving phase is liquid and stationary phase is liquid
3) Moving phase is solid and stationary phase is solid
4) Moving phase is solid and stationary phase is liquid

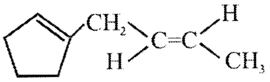
Sol. (2) It is a fact

90.

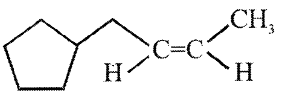


[XIth Part-II N.B. 387]

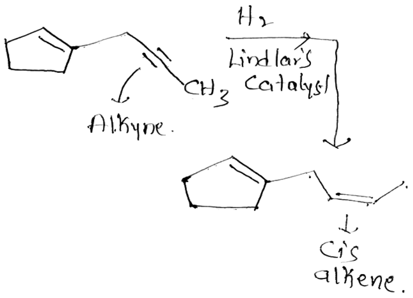
1) 

2) 

3) 

4) 

Sol. (1)



91. The 8 : 8 type packing is present in which of the following ? ***[XIIth Part-I N.B. 18]***

1) NaCl
2) CaF_2
3) CsCl
4) KCl

Sol. (3) In CsCl, C.N. of Cs^+ is 8 and of Cl^- is 8.

92. The reduction potential of hydrogen half cell will be negative if ***[XIIth Part-I N.B. 70]***

1) $P_{(H_2)}$ = 1 atm and $[H^+]$ = 2M
2) $P_{(H_2)}$ = 1 atm and $[H^+]$ = 1M
3) $P_{(H_2)}$ = 2 atm and $[H^+]$ = 1M
4) $P_{(H_2)}$ = 2 atm and $[H^+]$ = 2M

Sol. (3) $E_{el} = E^\circ_{el} - \frac{0.0591}{n} \log Q$

$$2H^+ + 2e^- \longrightarrow H_{2(g)}$$

$$Q = \frac{P_{H_2}}{[H^+]^2} \quad \& \quad E^\circ_{el} = 0$$

$$E_{el} = 0 - \frac{0.0591}{2} \log \frac{2}{1^2}$$

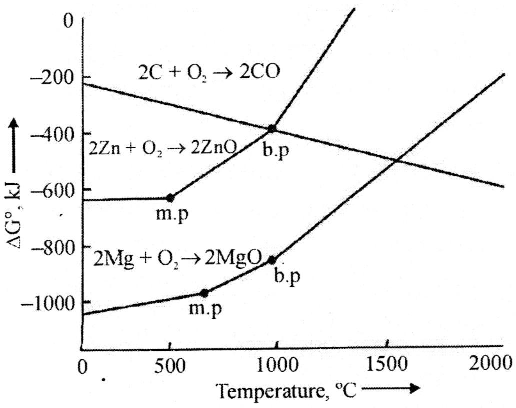
$$= -0.0591 \log 2$$

$$= -0.0591 \times 0.3010$$

$$= \text{Negative}$$

93. To make the following reduction process spontaneous, temperature should be:

ZnO + C → Zn + CO



1) 1000°C
2) > 1000°C
3) <500°C
4) < 1000°C

Sol. (2) In the Ellingham diagram, the curve which lies below act as a red agent. Above 1000°C, the curve of ZnO lies above CO as shown in the graph. So, above this temperature the difference between free energies of both will be negative and reaction will be spontaneous.

94. Which of the following complex compounds will exhibit highest paramagnetic behaviour ***[XIIth Part-I N.B. 256]***

1) $[Zn(NH_3)_6]^{2+}$
2) $[Ti(NH_3)_6]^{3+}$
3) $[Cr(NH_3)_6]^{3+}$
4) $[Co(NH_3)_6]^{3+}$

Sol. (3) $Zn^{2+} = 3d^{10} \Rightarrow$ zero Unpaired e^-

$Ti^{3+} = 3d^1 \Rightarrow$ 1 Unpaired e^-

$Cr^{3+} = 3d^3 \Rightarrow$ 3 Unpaired e^-

$Co^{3+} = 3d^6$ in SFL

$$\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}\boxed{}\boxed{}$$

no unpaired e^-

95. Which of the following has longest C–O bond length ? (Free C–O bond length in CO is 1.128 Å) ***[XIIth Part-I N.B. 262]***

1) $[Ni(CO)_4]$
2) $[Co(CO)_4]^-$
3) $[Fe(CO)_4]^{2-}$
4) $[Mn(CO)_6]^+$

Sol. (2) Longest C−O bond length

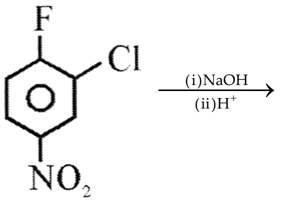
$\Rightarrow$ weakest C−O bond

$\Rightarrow$ strongest M−C bond

Strength of M−C bond $\propto$ e^- richness of M

In $[Co(CO)_4]^-$, Co is in −1 state, most e^- rich.

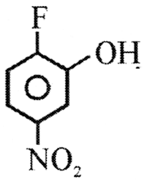
96.



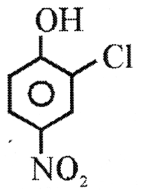
Product

[XIIth Part-II N.B. 313]

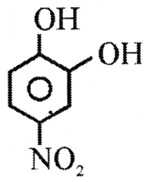
1)



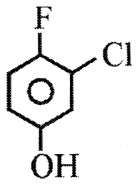
2)



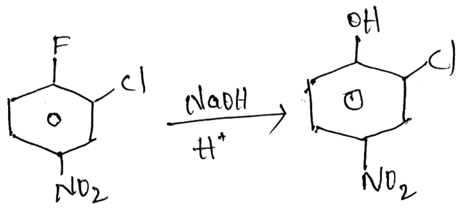
3)



4)

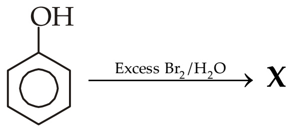


Sol. (2)



Here, leaving group ability
−F > −Cl.

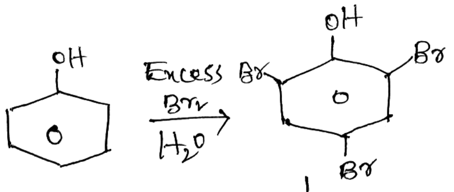
97. In the following reaction sequence predict the wrong statement about "X" or its formation



[XIIth Part-II N.B. 342]

1) It is a white precipitate
2) It is an addition compound
3) It is a tribromo derivative
4) It is a test for Phenol

Sol. (2)



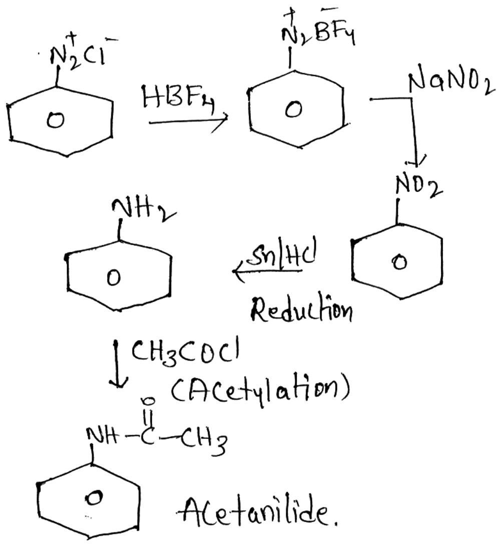
↓
This is not addition product.

98. $C_6H_5N_2{}^+Cl^- \xrightarrow[\text{ii) NaNO}_2]{\text{i) HBF}_4} A \xrightarrow{\text{Sn/HCl}} B \xrightarrow{CH_3COCl} C$

'C' is *[XIIth Part-II N.B. 401]*

1) Acetanilide
2) N-phenyl benzamide
3) N-phenyl methanamide
4) N-phenyl benzene carboxamide

Sol. (1)



99. Which of the following is a condensation polymer ? *[XIIth Part-II N.B. 437]*

1) Polythene
2) LDPE
3) Nylon-6,6
4) Teflon

Sol. (3) Adipic acid + Hexamethylenediamine
↓ Condensation polymerisation
Nylon-6,6.

100. The artificial sweetener containing chlorine that has the appearance and taste as that of sugar and is stable at cooking temperature is

[XIIth Part-II N.B. 458]

1) aspartame
2) saccharin
3) sucralose
4) alitame

Sol. (3) Fact.

Section 'C' : Botany

Section-A

101. Taxonomic key is one of the taxonomic tools in the identification and classification of plants and animals. It is used in the preparation of [NCERT Exemplar]

1) Monographs
2) Flora
3) More than one correct option
4) None of these

Ans.(3)

102. An association between roots of higher plants and fungi is called [NCERT Exemplar]

1) Lichen
2) Fern
3) Mycorrhiza
4) BGA

Ans.(3)

103. A dikaryon is formed when [NCERT Exemplar]

1) Meiosis is arrested
2) The two haploid cells do not fuse immediately
3) Cytoplasm does not fuse
4) None of the above

Ans.(2)

104. Plants of this group are diploid and well adopted to extreme conditions. They grow bearing sporophylls in compact structures called cones. The group in reference is [NCERT Exemplar]

1) Monocots
2) Dicots
3) Pteridophytes
4) Gymnosperms

Ans.(4)

105. If the diploid number of a flowering plant is 36. What would be the chromosome number in its endosperm [NCERT Exemplar]

1) 36
2) 18
3) 54
4) 72

Ans.(3)

106. Roots developed from parts of the plant other than radicle are called [NCERT Exemplar]

1) Taproots
2) Fibrous roots
3) Adventitious roots
4) Nodular roots

Ans.(3)

107. Many pulses of daily use belong to one of the families below [NCERT Exemplar]

1) Solanaceae
2) Fabaceae
3) Liliaceae
4) Poceae

Ans.(2)

108. Cells of this tissue are living and show angular wall thickening. They also provide mechanical support. The tissue is [NCERT Exemplar]

1) Xylem
2) Sclerenchyma
3) Collenchyma
4) Epidermis

Ans.(3)

109. How many shoot apical meristems are likely to be present in a twig of a plant possessing 4 branches and 26 leaves [NCERT Exemplar]

1) 26
2) 1
3) 5
4) 30

Ans.(3)

110. An aminoacid under certain conditions have both positive and negative charges simultaneously in the same molecule. Such a form of aminoacid is called [NCERT Exemplar]

1) Acidic form
2) Basic form
3) Aromatic form
4) Zwitterionic form

Ans.(4)

111. Mycorrhiza is a symbiotic association of fungus with root system which helps in

A) Absorption of water
B) Mineral nutrition
C) Translocation
D) Gaseous exchange

[NCERT Exemplar]

1) Only A
2) Only B
3) both A and B
4) both B and C

Ans.(3)

112. Which one of the following symptoms is not due to manganese toxicity in plants? [NCERT Exemplar]

1) Calcium translocation in shoot apex is inhibited
2) Deficiency in both Iron and Nitrogen is induced
3) Appearance of brown spot surrounded by chlorotic veins
4) None of the above

Ans.(2)

113. Reaction carried out by N_2 fixing microbes include [NCERT Exemplar]

a) $2NH_3 + 3O_2 \rightarrow 2NO_2^- + 2H^+ + 2H_2O$(i)

b) $2NO_2^- + O_2 \rightarrow 2NO_3$ - (ii)

Which of the following statements about these equations is not true

1) step (i) is carried out by Nitrosomonas or Nitrococcus
2) step (ii) is carried out by Nitrobacter
3) both steps (i) and (ii) can be called nitrification
4) bacteria carrying out these steps are usually photoautotrophs

Ans.(4)

114. Energy required for ATP synthesis in PSII comes from [NCERT Exemplar]

1) Proton gradient
2) Electron gradient
3) Reduction of glucose
4) Oxidation of glucose

Ans.(1)

115. Splitting of water is associated with [NCERT Exemplar]

1) Photosystem-I
2) Lumen of thylakoid
3) Both Photosystem I and II
4) Inner surface of thylakoid membrane

Ans.(4)

116. Which of the following exhibits the highest rate of respiration? [NCERT Exemplar]

1) Growing shoot apex
2) Germinating seed
3) Root tip
4) Leaf bud

Ans.(2)

117. Coconut water contains

1) ABA
2) Auxin
3) Cytokinin
4) Gibberellin

Ans.(3)

118. Match the following: [NCERT Exemplar]

A) IAA	**i. Herring sperm DNA**
B) ABA	**ii. Bolting**
C) Ethylene	**iii. Stomatal closure**
D) GA	**iv. Weed-free lawns**
E) Cytokinins	**v. Ripening of fruits**

1) A – iv, B – iii, C – v, D – ii, E – i
2) A – v, B – iii, C – iv, D – ii, E – i
3) A – iv, B – i, C – iv, D – iii, E – ii
4) A – v, B – iii, C – ii, D – i, E - iv

Ans.(1)

119. The male gametes of rice plant have 12 chromosomes in their nucleus. The chromosome number in the female gamete, zygote and the cells of the seedling will be, respectively, [NCERT Exemplar]

1) 12, 24, 12
2) 24, 12, 12
3) 12, 24, 24
4) 24, 12, 24.

Ans.(3)

120. From the statements given below choose the option that are true for a typical female gametophyte of a flowering plant:

i. It is 8-nucleate and 7-celled at maturity

ii. It is free-nuclear during the development

iii. It is situated inside the integument but outside the nucellus

iv. It has an egg apparatus situated at the chalazal end [NCERT Exemplar]

1) i and iv,
2) ii and iii
3) i & ii
4) ii & iv

Ans.(3)

121. From among the situations given below, choose the one that prevents both autogamy and geitonogamy. [NCERT Exemplar]

1) Monoecious plant bearing unisexual flowers
2) Dioecious plant bearing only male or female flowers
3) Monoecious plant with bisexual flowers
4) Dioecious plant with bisexual flowers

Ans.(2)

122. Occasionally, a single gene may express more than one effect. The phenomenon is called: [NCERT Exemplar]

1) multiple allelism
2) mosaicism
3) pleiotropy
4) polygeny

Ans.(3)

123. In a certain taxon of insects some have 17 chromosomes and the others have 18 chromosomes. The 17 and 18 chromosome-bearing organisms are: [NCERT Exemplar]

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

Ans.(1)

124. It is said that Mendel proposed that the factor controlling any character is discrete and independent. This proposition was based on the: [NCERT Exemplar]

1) results of F_3 generation of a cross.
2) observations that the offspring of a cross made between the plants having two contrasting characters shows only one character without any blending.
3) self pollination of F_1 offsprings
4) cross pollination of parental generations

Ans.(2)

125. DNA is a polymer of nucleotides which are linked to each other by 3′–5′ phosphodiester bond. To prevent polymerisation of nucleotides, which of the following modifications would you choose? [NCERT Exemplar]

1) Replace purine with pyrimidines
2) Remove/Replace 3′ OH group in deoxy ribose
3) Remove/Replace 2′ OH group with some other group in deoxy ribose
4) More than one correct option

Ans.(2)

126. Discontinuous synthesis of DNA occurs in one strand, because: [NCERT Exemplar]

1) DNA molecule being synthesised is very long
2) DNA dependent DNA polymearse catalyses polymerisation only in one direction ($5' \rightarrow 3'$)
3) it is a more efficient process
4) DNA ligase has to have a role

Ans.(2)

127. Control of gene expression takes place at the level of: [NCERT Exemplar]

1) DNA-replication
2) Transcription
3) Translation
4) None of the above

Ans.(2)

128. Autecology is the: [NCERT Exemplar]

1) Relation of a population to its environment
2) Relation of an individual to its environment
3) Relation of a community to its environment
4) Relation of a biome to its environment

Ans.(2)

129. Ecotone is: [NCERT Exemplar]

1) A polluted area
2) The bottom of a lake
3) A zone of transition between two communities [i.e. zone of overlapping]
4) A zone of developing community

Ans.(3)

130. Approximately how much of the solar energy that falls on the leaves of a plant is converted to chemical energy by photosynthesis? [NCERT Exemplar]

1) Less than 1%
2) 2-10%
3) 30%
4) 50%

Ans.(2)

131. How much of the net primary productivity of a terrestrial ecosystem is eaten and digested by herbivores? [NCERT Exemplar]

1) 1%
2) 10%
3) 40%
4) 90%

Ans.(2)

132. Which one of the following is an endangered plant species of India? [NCERT Exemplar]

1) *Rauwolfia serpentina*
2) Santalum album (Sandal wood)
3) *Cycas beddonei*
4) All of these

Ans.(4)

133. What is common to *Lantana, Eichhornia* and African catfish? [NCERT Exemplar]

1) All are endangered species of India
2) All are key stone species.
3) All are mammals found in India
4) All the species are neither threatened nor indigenous species of India

Ans.(4)

134. According to the Central Pollution Control Board, particles that are responsible for causing great harm to human health are of diameter: [NCERT Exemplar]

1) 2.50 micrometers
2) 5.00 micrometers
3) 10.00 micrometers
4) 7.5 micrometers

Ans.(1)

135. Which of the following material takes the longest time for biodegradation? [NCERT Exemplar]

1) Cotton
2) Paper
3) Bone
4) Jute

Ans.(3)

Section-B

136. Naked cytoplasm, multinucleated and saprophytic are the characteristics of [NCERT Exemplar]

1) Monera
2) Protista
3) Fungi
4) Slime molds

Ans.(4)

137. A Prothallus is [NCERT Exemplar]

1) A structure in pteridophytes formed before the thallus develops
2) A sporophytic free living structure formed in pteridophytes
3) A gametophyte free living structure formed in pteridophytes
4) A primitive structure formed after fertilization in pteridophytes

Ans.(3)

138. Which of the following plants is used to extract the blue dye? [NCERT Exemplar]

1) *Trifolium*
2) *Indigofera*
3) *Lupin*
4) *Cassia*

Ans.(2)

139. Phellogen and Phellem respectively denote [NCERT Exemplar]

1) Cork and cork cambium
2) Cork cambium and cork
3) Secondary cortex and cork
4) Cork and secondary cortex

Ans.(2)

140. A homopolymer has only one type of building block called monomer repeated 'n' number of times. A heteropolymer has more than one type of monomer. Proteins are heteropolymers usually made of [NCERT Exemplar]

1) 20 types of monomers
2) 40 types of monomers
3) 30 types of monomers
4) only one type of monomer

Ans.(1)

141. Match the followings and choose the correct option [NCERT Exemplar]

Column I	**Column II**
A) Leaves	**i. Anti-transpirant**
B) Seed	**ii. Transpiration**
C) Roots	**iii. Negative osmotic potential**
D) Aspirin	**iv. Imbibition**
E) Plasmolyzed cell	**v. Absorbtion**

1) A-ii, B-iv, C-v, D-i E-iii
2) A-iii, B-ii, C-iv, D-i E-v
3) A-i, B-ii, C-iii, D-iv E-v
4) A-v, B-iv, C-iii, D-ii E-i

Ans.(1)

142. The enzyme that is not found in a C_3 plant is [NCERT Exemplar]

1) RuBP Carboxylase
2) PEP Carboxylase
3) NADP reductase
4) ATP synthase

Ans.(2)

143. Phosphorylation of glucose during glycolysis is catalysed by [NCERT Exemplar]

1) Phosphoglucomutase
2) Phosphoglucoisomerase
3) Hexokinase
4) Phosphorylase

Ans.(3)

144. A dicotyledonous plant bears flowers but never produces fruits and seeds. The most probable cause for the above situation is: [NCERT Exemplar]

1) Plant is dioecious and bears only pistillate flowers
2) Plant is dioecious and bears both pistillate and staminate flowers
3) Plant is monoecious
4) Plant is dioecious and bears only staminate flowers.

Ans.(4)

145. A Across between two tall plants resulted in offspring having few dwarf plants. What would be the genotypes of both the parents? [NCERT Exemplar]

1) TT and Tt
2) Tt and Tt
3) TT and TT
4) Tt and tt

Ans.(2)

146. The net electric charge on DNA and histones is: [NCERT Exemplar]

1) both positive

2) both negative

3) negative and positive, respectively

4) zero

Ans.(3)

147. Ecological niche is: [NCERT Exemplar]

1) the surface area of the ocean

2) an ecologically adapted zone

3) the physical position and functional role of a species within the community

4) formed of all plants and animals living at the bottom of a lake

Ans.(3)

148. An inverted pyramid of biomass can be found in which ecosystem? [NCERT Exemplar]

1) Forest
2) Marine
3) Grass land
4) Tundra

Ans.(2)

149. The extinction of passenger pigeon was due to: [NCERT Exemplar]

1) Increased number of predatory birds.

2) Over exploitation by humans.

3) Non-availability of the food

4) Bird flu virus infection.

Ans.(2)

150. Among the following which one causes more indoor chemical pollution? [NCERT Exemplar]

1) burning coal
2) burning cooking gas
3) burning mosquito coil
4) room spray

Ans.(1)

Section 'D' : Zoology

Section-A

151. Which one of the following sets of animals share a four chambered heart? [NCERT Exemplar]

1) Amphibian, Reptiles, Birds
2) Crocodiles, Birds, Mammals
3) Crocodiles, Lizards, Turtles
4) Lizards, Mammals, Birds

Ans.(2)

152. Which of the following pairs of animals has non glandular skin [NCERT Exemplar]

1) Snake and Frog
2) Chameleon and Turtle
3) Frog and Pigeon
4) Crocodile and Tiger

Ans.(2)

153. Which one of the following types of cell is involved in making of the inner walls of blood vessels? [NCERT Exemplar]

1) Cuboidal epithelium
2) Columnar epithelium
3) Squamous epithelium
4) Stratified epithelium

Ans.(3)

154. Match the following and choose the correct option [NCERT Exemplar]

Column-I	Column-II
A) Adipose tissue	i. Nose
B) Stratified epithelium	ii. Blood
C) Hyaline cartilage	iii. Skin
D) Fluid connective tissue	iv. Fat storage

1) A-i, B-ii, C-iii, D-iv
2) A-iv, B-iii, C-i, D-ii
3) A-iii, B-i, C-iv, D-ii
4) A-ii, B-i, C-iv, D-iii

Ans.(2)

155. Which of the following statements is not true for plasma membrane? [NCERT Exemplar]

1) It is present in both plant and animal cell
2) Lipid is present as a bilayer in it
3) Proteins are present integrated as well as loosely associated with the lipid bilayer
4) Carbohydrate is never found in it

Ans.(4)

156. The stain used to visualise mitochondria is [NCERT Exemplar]

1) Fast green
2) Safranin
3) Acetocarmine
4) Janus green

Ans.(4)

157. A bivalent of meiosis-I consists of [NCERT Exemplar]

1) Two chromatids and one centromere
2) Two chromatids and two centromere
3) Four chromatids and two centromere
4) Four chromatids and four centromere

Ans.(3)

158. Select the correct statement about G_1 phase [NCERT Exemplar]

1) Cell is metabolically inactive
2) DNA in the cell does not replicate
3) It is not a phase of synthesis of macromolecules
4) Cell stops growing

Ans.(2)

159. Which of the following is not true of intestinal villi? [NCERT Exemplar]

1) They possess microvilli
2) They increase the surface area
3) They are supplied with capillaries and the lacteal vessels
4) They only participate in digestion of fats

Ans.(4)

160. Hepato-pancreatic duct opens into the duodenum and carries [NCERT Exemplar]

1) Bile
2) Pancreatic juice
3) Both bile & pancreatic juice
4) Saliva

Ans.(3)

161. CO_2 dissociates from carbaminohaemoglobin when [NCERT Exemplar]

1) pCO_2 is high & pO_2 is low
2) pO_2 is high and pCO_2 is low
3) pCO_2 and pO_2 are equal
4) None of the above

Ans.(2)

162. Which among the followings is correct during each cardiac cycle? [NCERT Exemplar]

1) The volume of blood pumped out by the Rt and Lt ventricles is same.
2) The volume of blood pumped out by the Rt and Lt ventricles is different
3) The volume of blood received by each atrium is different
4) The volume of blood received by the aorta and pulmonary artery is different

Ans.(1)

163. Mark the pair of substances among the following which is essential for coagulation of blood. [NCERT Exemplar]

1) Heparin and calcium ions
2) Calcium ions and platelet factors
3) Oxalates and citrates
4) Platelet factors and heparin

Ans.(2)

164. Chemicals which are released at the synaptic junction are called [NCERT Exemplar]

1) Hormones 2) Neurotransmitters
3) Cerebrospinal fluid 4) Lymph

Ans.(2)

165. Potential difference across resting membrane is negatively charged. This is due to differential distribution of the following ions [NCERT Exemplar]

1) Na^+ and K^+ ions 2) CO^{3++} and Cl^- ions
3) Ca^{++} and Mg^{++} ions 4) Ca^{+4} and Cl^- ions

Ans.(1)

166. Select the right match of endocrine gland and their hormone among the options given below [NCERT Exemplar]

A) Pineal	**i. Epinephrine**
B) Thyroid	**ii. Melatonin**
C) Ovary	**iii. Estrogen**
D) Adrenal medulla	**iv. Tetraiodothyronine**

1) A-iv, B-ii, C-iii, D-i
2) A-ii, B-iv, C-i, D-iii
3) A-iv, B-ii, C-i, D-iii
4) A-ii, B-iv, C-iii, D-i

Ans.(4)

167. In the mechanism of action of a protein hormone, one of the second messengers is [NCERT Exemplar]

1) Cyclic AMP 2) Insulin
3) T_3 4) Gastrin

Ans.(1)

168. Filtration of the blood takes place at [NCERT Exemplar]

1) PCT 2) DCT
3) Collecting ducts 4) Malpighian body

Ans.(4)

169. A large quantity of one of the following is removed from our body by lungs. [NCERT Exemplar]

1) CO_2 only 2) H_2O only
3) CO_2 and H_2O 4) ammonia

Ans.(3)

170. Match the terms given in Column I with their physiological processes given in Column II and choose the correct answer [NCERT Exemplar]

Column I	**Column II**
A) Proximal convoluted tubule	**i. Formation of concenterated urine**
B) Distal convoluted tubule	**ii. Filtration of blood**
C) Henle's loop	**iii. Reabsorption of 70-80% of electrolytes**
D) Counter-current	**iv. Ionic balance mechanism**
E) Renal corpuscle	**v. Maintenance of concentration gradient in medulla**

1) A-iii, B-v, C-iii, D-ii, E-i
2) A-iii, B-iv, C-i, D-v, E-ii
3) A-i, B-iii, C-ii, D-v, E-iv
4) A-iii, B-i, C-iv, D-v, E-ii

Ans.(2)

171. Match the following and mark the correct option [NCERT Exemplar]

Column-I	Column-II
A) Fast muscle fibres	i. Myoglobin
B) Slow muscle fibres	ii. Lactic acid
C) Actin filament	iii. Contractile unit
D) Sarcomere	iv. I-band

1) A-i, B-ii, C-iv, D-iii 2) A-ii, B-i, C-iii, D-iv
3) A-ii, B-i, C-iv, D-iii 4) A-iii, B-ii, C-iv, D-i

Ans.(3)

172. Which one of the following is not a disorder of bone? [NCERT Exemplar]

1) Arthritis 2) Osteoporosis
3) Rickets 4) Atherosclerosis

Ans.(4)

173. Mature Graafian follicle is generally present in the ovary of a healthy human female around [NCERT Exemplar]

1) 5 – 8 day of menstrual cycle
2) 11 – 17 day of menstrual cycle
3) 18 – 23 day of menstrual cycle
4) 24 – 28 day of menstrual cycle

Ans.(2)

174. Acrosomal reaction of the sperm occurs due to: [NCERT Exemplar]

1) Its contact with zona pellucida of the ova
2) Reactions within the uterine environment of the female
3) Reactions within the epididymal environment of the male
4) Androgens produced in the uterus

Ans.(1)

175. The method of directly injecting a sperm into ovum in assisted by reproductive technology is called: [NCERT Exemplar]

1) GIFT 2) ZIFT
3) ICSI 4) ET

Ans.(3)

176. Sterilisation techniques are generally fool proof methods of contraception with least side effects. Yet, this is the last option for the couples because: [NCERT Exemplar]

i. It is almost irreversible
ii. Of the misconception that it will reduce sexual urge/drive
iii. It is a surgical procedure
iv. Of lack of sufficient facilities in many parts of the country

Choose the correct option:

1) i and iii 2) ii and iii
3) ii and iv 4) i, ii, iii and iv

Ans.(4)

177. Which of the following is used as an atmospheric pollution indicator? [NCERT Exemplar]

1) Lepidoptera 2) Lichens
3) Lycopersicon 4) Lycopodium

Ans.(2)

178. The bones of forelimbs of whale, bat, cheetah and man are similar in structure, because: [NCERT Exemplar]

1) one organism has given rise to another
2) they share a common ancestor
3) they perform the same function
4) the have biochemical similarities

Ans.(2)

179. The term 'Health' is defined in many ways. The most accurate definition of the health would be: [NCERT Exemplar]

1) health is the state of body and mind in a balanced condition
2) health is the reflection of a smiling face
3) health is a state of complete physical, mental and social well-being
4) health is the symbol of economic prosperity.

Ans.(3)

180. The disease chikunguniya is transmitted by: [NCERT Exemplar]

1) house flies 2) Aedes mosquitoes
3) cockroach 4) female Anopheles

Ans.(2)

181. Several South Indian states raise 2-3 crops of rice annually. The agronomic feature that makes this possible is because of [NCERT Exemplar]

1) shorter rice plant
2) better irrigation facilities
3) early yielding rice variety
4) disease resistant rice variety.

Ans.(3)

182. The primary treatment of waste water involves the removal of: [NCERT Exemplar]

1) dissolved impurities 2) stable particles
3) toxic substances 4) harmful bacteria.

Ans.(2)

183. What would happen if oxygen availability to activated sludge flocs is reduced? [NCERT Exemplar]

1) It will slow down the rate of degradation of organic matter
2) The center of flocs will become anoxic, which would cause death of bacteria and eventually breakage of flocs.
3) Flocs would increase in size as anaerobic bacteria would grow around flocs.
4) Protozoa would grow in large numbers.

Ans.(2)

184. Rising of dough is due to: [NCERT Exemplar]

1) Multiplication of yeast
2) Production of CO_2
3) Emulsification
4) Hydrolysis of wheat flour starch into sugars.

Ans.(2)

185. Significance of 'heat shock' method in bacterial transformation is to facilitate: [NCERT Exemplar]

1) Binding of DNA to the cell wall
2) Uptake of DNA through membrane transport proteins
3) Uptake of DNA through transient pores in the bacterial cell wall
4) Expression of antibiotic resistance gene

Ans.(3)

Section-B

186. α -1 antitrypsin is: [NCERT Exemplar]

1) An antacid
2) An enzyme
3) Used to treat arthritis
4) Used to treat emphysema

Ans.(4)

187. Given below are types of cells present in some animals. Which of the following cells can differentiate to perform different functions? [NCERT Exemplar]

1) Choanocytes
2) Interstitial cells
3) Gastrodermal cells
4) Nematocytes

Ans.(2)

188. Plastid differs from mitochondria on the basis of one of the following features. Mark the right answer. [NCERT Exemplar]

1) Presence of two layers of membrane
2) Presence of ribosome
3) Presence of thylakoids
4) Presence of DNA

Ans.(3)

189. Muscles with characteristic striations and involuntary are [NCERT Exemplar]

1) Muscles in the wall of alimentary canal
2) Muscles of the heart
3) Muscles assisting locomotion
4) Muscles of the eyelids

Ans.(2)

190. Seminal plasma, the fluid part of semen, is contributed by. [NCERT Exemplar]

i. Seminal vesicle
ii. Prostate
iii. Urethra
iv. Bulbourethral gland

1) i and ii 2) i, ii and iv
3) ii, iii and iv 4) i and iv

Ans.(2)

191. Which one of the following combination would a sugarcane farmer look for in the sugarcane crop? [NCERT Exemplar]

1) Thick stem, long internodes, high sugar content and disease resistant
2) Thick stem, high sugar content and profuse flowering
3) Thick stem, short internodes, high sugar content, disease resistant
4) Thick stem, low sugar, conten, disease resistant

Ans.(1)

192. Match the following list of bacteria and their commercially important products:

Bacterium	**Product**
(i) ***Aspergillus niger***	**(a) Lactic acid**
(ii) ***Acetobacter aceti***	**(b) Butyric acid**
(iii) ***Clostridium butylicum***	**(c) Acetic acid**
(iv) ***Lactobacillus***	**(d) Citric acid**

Choose the correct match: [NCERT Exemplar]

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

Ans.(3)

193. An enzyme catalysing the removal of nucleotides from the ends of DNA is:

[NCERT Exemplar]

1) endonuclease 2) exonuclease
3) DNA ligase 4) Hind - II

Ans.(2)

194. A gland not associated with the alimentary canal is [NCERT Exemplar]

1) Pancreas 2) Adrenal
3) Liver 4) Salivary glands

Ans.(2)

195. A person breathes in some volume of air by forced inspiration after having a forced expiration. This quantity of air taken in is

[NCERT Exemplar]

1) Total lung capacity 2) Tidal volume
3) Vital capacity 4) Inspiratory capacity

Ans.(3)

196. The cardiac impulse is initiated and conducted further upto ventricle. The correct sequence of conduction of impulse is

[NCERT Exemplar]

1) SA Node, AV Node, Purkinje fiber, AV Bundle
2) SA Node, Purkinje fiber, A V Node, AV Bundle
3) SA Node, AV Node, AV Bundle, Purkinje fiber
4) SA Node, Purkinje fiber, AV Bundle, AV Node

Ans.(3)

197. Resting membrane potential is maintained by

[NCERT Exemplar]

1) Hormones 2) Neurotransmitters
3) Ion pumps 4) None of the above

Ans.(3)

198. Which of the following hormones is not secreted by anterior pit. [NCERT Exemplar]

1) Growth hormone
2) Follicle stimulating hormone
3) Oxytocin
4) Adrenocorticotrophic hormone

Ans.(3)

199. Analogous organs arise due to: [NCERT Exemplar]

1) divergent evolution 2) artificial selection
3) genetic drift 4) convergent evolution

Ans.(4)

200. Antibodies present in colostrum which protect the new born from certain diseases is of [NCERT Exemplar]

1) Ig G type 2) Ig A type
3) Ig D type 4) Ig E type

Ans.(2)