04/04/2024

Phase-I
CODE-A

CF

Aakash
Medical | IIT-JEE | Foundations

Corporate Office: Aakash Tower, 8, Pusa Road, New Delhi-110005, Ph.011-47623456

FINAL TEST SERIES for NEET-2024

MM : 720 **Test - 5** **Time : 3 Hrs. 20 Mins.**

Answers

1. (4)	41. (4)	81. (1)	121. (4)	161. (2)
2. (4)	42. (2)	82. (4)	122. (3)	162. (4)
3. (1)	43. (3)	83. (2)	123. (2)	163. (1)
4. (3)	44. (2)	84. (2)	124. (3)	164. (3)
5. (4)	45. (1)	85. (3)	125. (3)	165. (3)
6. (3)	46. (1)	86. (1)	126. (3)	166. (4)
7. (4)	47. (4)	87. (3)	127. (4)	167. (2)
8. (1)	48. (3)	88. (4)	128. (1)	168. (1)
9. (1)	49. (1)	89. (1)	129. (2)	169. (2)
10. (2)	50. (1)	90. (1)	130. (3)	170. (4)
11. (1)	51. (1)	91. (2)	131. (3)	171. (2)
12. (1)	52. (4)	92. (1)	132. (4)	172. (4)
13. (3)	53. (2)	93. (2)	133. (3)	173. (4)
14. (4)	54. (2)	94. (4)	134. (4)	174. (2)
15. (4)	55. (1)	95. (2)	135. (4)	175. (3)
16. (2)	56. (4)	96. (2)	136. (1)	176. (1)
17. (1)	57. (2)	97. (2)	137. (4)	177. (4)
18. (1)	58. (3)	98. (2)	138. (2)	178. (1)
19. (2)	59. (3)	99. (4)	139. (4)	179. (2)
20. (2)	60. (2)	100. (1)	140. (1)	180. (2)
21. (3)	61. (4)	101. (2)	141. (3)	181. (2)
22. (3)	62. (2)	102. (1)	142. (4)	182. (4)
23. (3)	63. (3)	103. (4)	143. (3)	183. (1)
24. (2)	64. (4)	104. (3)	144. (2)	184. (1)
25. (3)	65. (4)	105. (4)	145. (3)	185. (3)
26. (3)	66. (4)	106. (3)	146. (1)	186. (3)
27. (2)	67. (2)	107. (2)	147. (2)	187. (1)
28. (1)	68. (1)	108. (3)	148. (3)	188. (1)
29. (3)	69. (3)	109. (1)	149. (2)	189. (4)
30. (4)	70. (2)	110. (3)	150. (3)	190. (1)
31. (3)	71. (2)	111. (4)	151. (3)	191. (3)
32. (2)	72. (2)	112. (4)	152. (1)	192. (2)
33. (3)	73. (1)	113. (2)	153. (4)	193. (4)
34. (3)	74. (2)	114. (1)	154. (2)	194. (3)
35. (3)	75. (4)	115. (3)	155. (4)	195. (3)
36. (3)	76. (3)	116. (1)	156. (1)	196. (2)
37. (3)	77. (4)	117. (3)	157. (4)	197. (2)
38. (4)	78. (4)	118. (3)	158. (2)	198. (2)
39. (1)	79. (4)	119. (2)	159. (4)	199. (2)
40. (3)	80. (2)	120. (1)	160. (2)	200. (2)

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FINAL TEST SERIES for NEET-2024

MM : 720 **Test - 5** **Time : 3 Hrs. 20 Mins.**

Answers and Solutions

PHYSICS

SECTION - A

1. Answer (4)

$\vec{E} = \frac{-K\vec{p}}{d^3}\hat{i}$

$\vec{F} = \frac{-K\vec{p}q}{d^3}\hat{j}$

2. Answer (4)

$Q_1' = \frac{Q}{2}$

$Q_2' = \frac{1}{2}\left(Q + \frac{Q}{2}\right) = \frac{3Q}{4}$

$F' = \frac{k\left(\frac{Q}{2}\right)\left(\frac{3}{4}Q\right)}{d^2} = \frac{3}{8}\frac{kQ^2}{d^2}$

$= \frac{3F}{8}$

3. Answer (1)

$\frac{kq}{x^2} = \frac{k4q}{(30+x)^2}$

$4x^2 = (30 + x)^2$

$2x = 30 + x$

$x = 30$ cm

4. Answer (3)

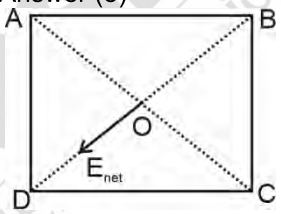
$E = \frac{-dV}{dr}$

$E = 0 \Rightarrow dV = 0$

5. Answer (4)

$\phi = \oint \vec{E} \cdot \vec{ds} = \frac{Q_{enclosed}}{\varepsilon_0}$

6. Answer (3)



7. Answer (4)
On disturbing from its unstable equilibrium dipole does not return to its original positions and torque is acting along the direction of disturbance.

8. Answer (1)

$U = \frac{1}{2}\varepsilon_0 E^2$

$E = \frac{Q}{A\varepsilon_0}$

$= \frac{1}{2}\varepsilon_0 \frac{Q^2}{A^2\varepsilon_0^2} = \frac{1}{2}\frac{Q^2}{\varepsilon_0 A^2}$

9. Answer (1)

$\frac{kQ}{r} = 10\text{ V}$

$\frac{kQ}{2r} = \frac{10\text{ V}}{2} = 5\text{ V}$

10. Answer (2)

$V_C = \frac{kq_1}{4} + \frac{kq_2}{5}$

$V_D = \frac{kq_1}{4} + \frac{kq_2}{1}$

$\Delta U = q_0[V_D - V_C]$

$= q_0\left[\frac{kq_2}{1} - \frac{kq_2}{5}\right]$

$= kq_2q_0 \times \frac{4}{5} = 9\times10^9 \times 2\times10^{-6} \times 3\times10^{-6} \times \frac{4}{5}$

= 43.3 × 10^{-3} J

11. Answer (1)

$U = \frac{kQ_1Q_2}{r}$

$U = \frac{k(-Q)\left(-\frac{Q}{2}\right)}{2d}$

$U = \frac{kQ^2}{4d}$

12. Answer (1)

$U_1 = \frac{1}{2}CV^2$

$U_2 = \frac{1}{2}3\,CV^2$

$\therefore \quad \frac{U_1}{U_2} = \frac{1}{3}$

13. Answer (3)

16 – 8 = (4 + 2) V

$V = \frac{8}{6}\text{ V} = \frac{4}{3}\text{ V}$

14. Answer (4)

$E_1 = \frac{kQ}{R^2}$

$E_2 = \frac{k(3Q)}{(2R)^2}$

$\frac{E_1}{E_2} = \frac{4}{3}$

15. Answer (4)

For every symmetric elements there will be equal and opposite forces.

16. Answer (2)

Electric field strength is greater where crowded field lines exist.

17. Answer (1)

$|\Delta V| = Ed\cos60°$

$= E\times2\times\frac{1}{2}$

Work done = $q\Delta V$

$10^{-6} \times 2 \times [E] = 4 \times 10^{-3}$ J

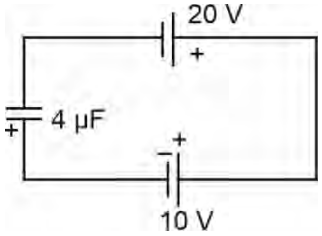
E = 2000 N/C

18. Answer (1)

$40C_1 = 120C_2$

$\frac{C_1}{C_2} = 3$

19. Answer (2)



$(20-10) = \frac{q}{4}\times10^6$

q = 40 μC

20. Answer (2)

$E = \frac{1}{2}\times C\times V^2$

$= \frac{1}{2}\times20\times10^{-6}\times(10^3)^2 = 10$ J

21. Answer (3)

$\frac{1}{C_s} = \frac{1}{3} + \frac{1}{9} + \frac{1}{18}$

$\Rightarrow \quad C_s = 2\ \mu F$

$C_p = 3 + 9 + 18 = 30\ \mu F$

$\frac{C_p}{C_s} = \frac{30}{2} = 15$

22. Answer (3)

$C = \frac{\varepsilon_0 A}{d}$

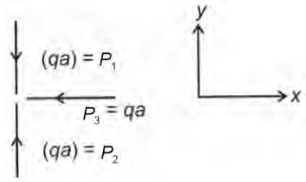
$C' = \frac{K\varepsilon_0 A}{\frac{d}{2}} = 2K\times C = 2\times6\times8\ \text{pF} = 96\ \text{pF}$

23. Answer (3)

$\vec{E}_1 = \frac{2k\vec{p}}{r^3},\ \vec{E}_2 = -\frac{k\vec{p}}{r^3}$

$\therefore \quad \vec{E}_1 \times \vec{E}_2 = 0$ (fields antiparallel)

24. Answer (2)



P_1 cancels P_2, net is P_3

$\vec{P} = \vec{P}_3 = qa(-\hat{i}) = -qa\hat{i}$

25. Answer (3)

$q = ne$

$$n = \frac{q}{e} = \frac{2\times10^{-9}}{1.6\times10^{-19}} = 1.25\times10^{10}$$

26. Answer (3)

By symmetry 8 cubes are required to enclose the given charge.

$$8\phi_c = \frac{q}{\varepsilon_0}$$

$$\therefore \quad \phi_c = \frac{1}{8}\times\frac{q}{\varepsilon_0} = \frac{1}{8}\times\frac{8.85\times10^{-12}}{8.85\times10^{-12}}$$

$$\phi_c = \frac{1}{8}\,\text{N m}^2\,\text{C}^{-1}$$

27. Answer (2)

$V_A - V_C = -E\,dr\cos 90° = 0$

28. Answer (1)

$$E = -\frac{dV}{dx} = -\frac{d}{dx}(5x^2 + 10x - 9) = -10x - 10$$

at $x = 1$

$E = -10 - 10 = -20$ V/m

29. Answer (3)

$V = \frac{kq}{R}$ at centre.

At a distance 30 cm away from surface

$$V' = \frac{kq}{r} = \frac{kq}{R+3R} = \frac{kq}{4R} = \frac{V}{4}$$

30. Answer (4)

$$V = \frac{kp}{r^2}\cos\theta$$

V_{min} : $\theta = 180°$

V_{max} : $\theta = 0°$

31. Answer (3)

Number of capacitors in a row for voltage satisfaction $= \frac{1000}{250} = 4$

Capacity of one row = $\frac{8}{4} = 2\ \mu$F

Total capacity = capacity of a row × number of rows

$8 = 2 \times N$

$\therefore$ Number of capacitors = 4 × 4 = 16

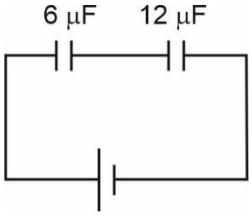
32. Answer (2)

$C_{eq} = 10\ \mu$F

$\Rightarrow$ Q = (10 μF) (30 V)

= 300 μC

33. Answer (3)



Effective capacitance in series

$C = 4\ \mu$F

Maximum charge that can be stored by 6 μF

= 6 × 200 = 1200 μC.

Maximum charge that can be stored by 12 μC

= 12 × 200= 2400 μC.

$q_6 < q_{12}$

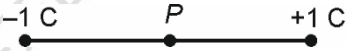
So maximum charge given to series combination = 1200 μC.

$$V_{max} = \frac{q}{C} = \frac{1200}{4} = 300\ \text{V}$$

34. Answer (3)

Capacitance depends on dimensions of capacitor.

35. Answer (3)



$$E_p = \frac{K(1)}{\left(\frac{5}{100}\right)^2} + \frac{K(1)}{\left(\frac{5}{100}\right)^2}$$

$$= \frac{9\times10^9\times2\times10^4}{25}$$

= 72 × 10^{11} N/C

SECTION - B

36. Answer (3)

Electric field inside a charged conducting shell is zero and hence potential inside it remains constant.

37. Answer (3)

Field inside any conductor is zero

38. Answer (4)

Surface charge density is more at point where radius is less.

At the intersection of equipotential surfaces two direction of field will exist and that is not possible.

39. Answer (1)

$C' = 2C$

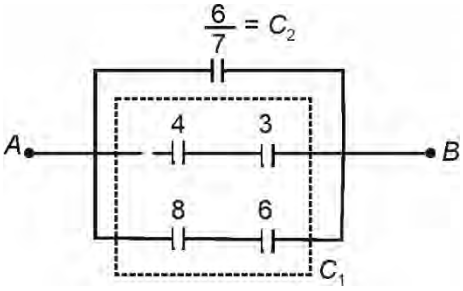
$Q' = 2CV = 2Q$

$V' = V$ = constant

$$F' = \frac{Q'^2}{2A\varepsilon_0} = \frac{4Q^2}{2A\varepsilon_0} = 4F$$

$$U' = \frac{1}{2}KCV^2$$

40. Answer (3)



$$C_1 = \frac{12}{7}\,\mu F + \frac{48}{14}\,\mu F$$

$$= \left(\frac{24+48}{14}\right)\mu F$$

$$= \frac{36}{7}\,\mu F$$

$C_{eq} = C_1 + C_2$

$$= \left(\frac{36}{7} + \frac{6}{7}\right)\mu F$$

$$= \frac{42}{7}\,\mu F$$

$= 6\ \mu F$

41. Answer (4)

$W_{ext} = \Delta U = q\Delta V$

$100 = -2C[x + 10]$

$-50 - 10 = x$

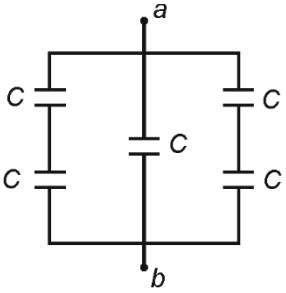
$x = -60$ V

42. Answer (2)

$$E = \frac{-dV}{dx} = -\left(-\frac{10}{10}\right) \text{ V/m}$$

= 1 V/m

43. Answer (3)



$C_{eq} = 2C$

$Q = 2CV$

44. Answer (2)

$$\phi = \frac{q_{in}}{\varepsilon_0}$$

Due to symmetry, flux through one face $= \frac{\phi}{6}$

$$\therefore \quad \phi' = \frac{q}{6\varepsilon_0}$$

45. Answer (1)

$U = -PE\cos\theta$, for unstable equilibrium $\theta = 180°$

$U = -PE\cos 180° = PE$

46. Answer (1)

Maximum extension of spring = x

$$\frac{1}{2}Kx^2 = qEx$$

$$x = \frac{2qE}{K}$$

Extension in equilibrium $x' = \frac{qE}{K}$

Amplitude of oscillation $A = x - x' = \frac{qE}{K}$

47. Answer (4)

Electric field inside a conducting charged shell is zero, hence there will no force on a charge placed inside it.

48. Answer (3)

$$[\varepsilon_0] = \left[\frac{q_1q_2}{Fr^2}\right] = \frac{A^2T^2}{MLT^{-2}L^2}$$

$= [M^{-1}L^{-3}T^4A^2]$

49. Answer (1)

Total charge = 0, and distance of each charge from C is same.

Hence potential = 0

Also, due to symmetrical arrangement of charges net electric field will be zero a the centre.

50. Answer (1)

Electric field lines are always perpendicular to equipotential surface.

CHEMISTRY

SECTION-A

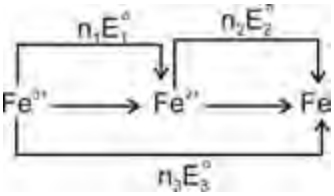
51. Answer (1)

$$\text{Molarity} = \frac{n_{C_6H_{12}O_6}}{\text{Volume}_{\text{sol.}}\ (\text{in L})}$$

$$= \frac{9 \times 1000}{180 \times 250}$$ [Molar mass$_{C_6H_{12}O_6}$ = 180 g mol^{-1}]

= 0.2 M

52. Answer (4)



$\because \Delta G_3^o = \Delta G_1^o + \Delta G_2^o$

$\Rightarrow n_3E_3^o = n_1E_1^o + n_2E_2^o \left(\because \Delta G^o = -nFE^o\right)$

$\Rightarrow 3 \times (-0.04) = \left(1 \times E^o_{Fe^{3+}/Fe^{2+}}\right) + (2 \times -0.44)$

$\Rightarrow 0.88 - 0.12 = E^o_{Fe^{3+}/Fe^{2+}}$

$\Rightarrow E^o_{Fe^{3+}/Fe^{2+}} = 0.76\,V$

53. Answer (2)

With the increase in temperature molecules having energy greater than activation energy increases.

54. Answer (2)

$$t = \frac{2.303}{k}\log\frac{[A]_o}{[A]_t}$$

$$t = \frac{2.303}{2.303 \times 10^{-2}}\log\frac{100}{10} = 10^2$$

t = 100 s

55. Answer (1)

Lesser the reduction potential, more will be the reducing power.

E°_{RP} : $B^+/B > A^+/A > C^+/C$

Reducing power : C > A > B

56. Answer (4)

Vapour pressure is an intensive property therefore independent of surface area of solvent.

57. Answer (2)

$$\wedge_m = \frac{k \times 1000}{c} = \frac{5 \times 10^{-5} \times 1000}{1.0 \times 10^{-3}} = 50\ S\ cm^2\ mol^{-1}$$

$$\alpha = \frac{\wedge_m}{\wedge_{m_\infty}} = \frac{50}{400} = 0.125$$

58. Answer (3)

In water,

$$CH_3COOH \rightleftharpoons CH_3COO^- + H^+, \quad i > 1$$

In benzene,

$$2CH_3COOH \rightleftharpoons (CH_3COOH)_2, \quad i < 1$$

59. Answer (3)

Rate $= Z_{AB}e^{-E_a/RT}$

Z_{AB} = collision frequency

60. Answer (2)

Intermolecular hydrogen bonding between phenolic proton and lone pair on nitrogen atom of aniline is stronger than the respective intermolecular hydrogen bonding between similar molecules.

61. Answer (4)

According to Arrhenius equation,

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

ln k versus $\frac{1}{T}$ gives, intercept = ln A

$$\text{Slope} = \frac{-E_a}{R}$$ and

62. Answer (2)

$$2H^+(aq) + 2e^- \rightarrow H_2(g)$$

$$E = E^o - \frac{0.0591}{2}\log\left(\frac{P_{H_2}}{\left[H^+\right]^2}\right)$$

$$= -\frac{0.0591}{2}\log\left(\frac{1}{\left[H^+\right]^2}\right)$$ = = 0.0591 log $[H^+]$

= –0.0591 × 4 = – 0.24 V

63. Answer (3)

In Leclanche cell, Zn container acts as anode and the cathode is carbon (graphite).

64. Answer (4)

In collision theory proper orientation of reactant molecules lead to bond formation whereas improper orientation makes them bounce back.

65. Answer (4)

- Ethanolic acid undergoes dimerization in benzene, So, observed colligative property is less than calculated colligative property.
- An dilution, dissociation increases so i increases.

66. Answer (4)

A small amount of catalyst can catalyse a large amount of reactants.

67. Answer (2)

π = CRT = $\frac{3.42\times1000}{342\times100}\times0.082\times300$ = 2.46 atm

68. Answer (1)

Reactions with molecularity three are very rare and slow to proceed.

69. Answer (3)

Unit of k for n^{th} order reaction: $\left(\frac{mol}{L}\right)^{1-n}$ sec^{-1}

$\therefore$ For zero order reaction, n = 0

Unit of k = mol L^{-1} s^{-1}

70. Answer (2)

For 1st order reaction, rate = k [A]

As concentration of A increases, rate of reaction will increase.

71. Answer (2)

Rate = $k[A]^{n_1}[B]^{n_2}$

$1.02\times10^{-2} = k[0.01]^{n_1}[0.02]^{n_2}$ ...(1)

$1.02\times10^{-2} = k[0.01]^{n_1}[0.04]^{n_2}$ ...(2)

$2.04\times10^{-2} = K[0.02]^{n_1}[0.04]^{n_2}$ ...(3)

Applying eq(1)/eq(2), $1=\left(\frac{1}{4}\right)^{n_2} \Rightarrow n_2 = 0$

Applying eq(2)/eq(3), $\frac{1}{2}=\left(\frac{1}{2}\right)^{n_1} \Rightarrow n_1 = 1$

$\therefore$ Overall order of reaction = 0 + 1 = 1

72. Answer (2)

Ion	Na^+	K^+	Ca^{2+}	Mg^{2+}
$\lambda^\circ(Scm^2\ mol^{-1})$	50.1	73.1	119	106

73. Answer (1)

Anode: $2H_2O \rightarrow 4H^+ + O_2 + 4e^-$

1mol 4F

Number of Faraday used $=\frac{1\times9.65\times60}{96500}=0.006$

Moles of O_2 obtained $=\frac{1}{4}\times0.006$

$\therefore$ Volume of O_2 obtained at STP

$=\frac{1}{4}\times0.006\times22.4$ L

= 0.0336 L = 33.6 mL

74. Answer (2)

Cell constant = $=\frac{l}{a}$, unit $centimeter^{-1}$

75. Answer (4)

Alkaline phosphate and alkaline chromate solution are used as antirust solution which prevents availability of H^+ ions.

76. Answer (3)

Molal depression constant depends upon the nature of the solvent, not on the molality of solution.

77. Answer (4)

For $Mg_3(PO_4)_2$, i = 5

For $Al(OH)_3$, i = 4

For $SrCl_2$, i = 3

For $[Co(NH_3)_6]\ Cl_3$, i = 4

For $K_4[Fe(CN)_6]$, i = 5

78. Answer (4)

During electrolysis of dilute H_2SO_4, at anode

$2H_2O(\ell) \rightarrow O_2(g) + 4H^+ + 4e^-$

During electrolysis of higher concentration of H_2SO_4 at anode

$2SO_4^{2-}(aq) \rightarrow S_2O_8^{2-}(aq) + 2e^-$.

79. Answer (4)

	A(g) $\rightarrow$	B(g) +	2C(g)
(i)	p°	0	0
(t)	p° – x	x	2x

$\therefore$ p = p° – x + x + 2x = p° + 2x

$\therefore$ $x=\frac{p-p^\circ}{2}$

$\therefore$ $k=\frac{2.303}{t}\log\frac{p^\circ}{p^\circ-x}$

$=\frac{2.303}{t}\log\frac{p^\circ}{p^\circ-\left(\frac{p-p^\circ}{2}\right)}$

$k=\frac{2.303}{t}\log\frac{2p^\circ}{3p^\circ-p}$

80. Answer (2)

$\lambda_m^\circ\left(Ca^{2+}\right)+2\lambda_m^\circ(OH^-)=x$ ...(1)

$\lambda_m^\circ\left(Ca^{2+}\right)+2\lambda_m^\circ(NO_3^-)=y$ ...(2)

$\lambda_m^\circ\left(NH_4^+\right)+\lambda_m^\circ(NO_3^-)=z$ ...(3)

Applying eq (1) $\times\frac{1}{2}$ – eq (2) $\times\frac{1}{2}$ + eq (3), we get

$\lambda_m^\circ\left(NH_4^+\right)+\lambda_m^\circ(OH^-)=\frac{x}{2}-\frac{y}{2}+z$

81. Answer (1)

$\Delta G_{cell}^\circ=-nE_{cell}^\circ F$

If $E_{cell}^\circ>0$, $\Delta G_{cell}^\circ<0$

and $\Delta G^\circ = -2.303\ RT \log K_{eq}$

If $\Delta G^\circ < 0$, $K_{eq} > 1$

82. Answer (4)

$\chi_{solute}=\frac{n_{solute}}{n_{solute}+n_{solvent}}=\frac{1}{1+\frac{1000}{18}}=\frac{1}{1+55.55}$

= 0.017

83. Answer (2)

$P_T=P_A^\circ\chi_A+P_B^\circ\chi_B$

$175=P_A^\circ\chi_A+P_B^\circ(1-\chi_A)$

$175=100\chi_A+200-200\chi_A$

$\chi_A=\frac{25}{100}=0.25$

Now, $y_A=\frac{P_A}{P_{Total}}=\frac{100\times0.25}{175}$ = 0.14

84. Answer (2)

$2A \rightarrow 3B$

$\therefore \frac{-1}{2}\frac{d[A]}{dt}=\frac{+1}{3}\frac{d[B]}{dt}$ $\qquad$ $\therefore \frac{d[B]}{dt}=\frac{3}{2}\frac{-[A]}{dt}$

85. Answer (3)

$t_{1/2}=\frac{0.693}{k}=\frac{0.693}{0.693}=1\,min.$

$[A]_t=20\times\left(\frac{1}{2}\right)^{\frac{4}{1}}$ = 1.25 mol

Rate = k [A] = 0.693 × 1.25 mol min^{-1}

SECTION-B

86. Answer (1)

$\because\ \Delta T_f = im\ K_f$

- For $CaCl_2$, $\Delta T_f = 3 \times 0.3\ K_f = 0.9\ K_f$
- For NaCl, $\Delta T_f = 2 \times 0.2\ K_f = 0.4\ K_f$
- For $K_4[Fe(CN)_6]$, $\Delta T_f = 5 \times 0.1\ K_f = 0.5\ K_f$
- For urea, $\Delta T_f = 1 \times 0.4\ K_f = 0.4\ K_f$

87. Answer (3)

Degree of dissociation $(\alpha)=\frac{\Lambda_m}{\Lambda_m^\circ}=\frac{24}{480}$

= 0.05

	HA	$\rightleftharpoons$	H^+	+	A^-
(i)	C		0		0
(f)	C – Cα		Cα		Cα

$\therefore\ K_a=\frac{[H^+][A^-]}{[HA]}=\frac{C\alpha^2}{1-\alpha}\simeq C\alpha^2$

$K_a = 10^{-2} \times (0.05)^2 = 2.5 \times 10^{-5}$

88. Answer (4)

On dilution, number of ions per unit volume decreases, hence conduct decreases on dilution.

89. Answer (1)

Rate = $k[A][B]^2=k\left(\frac{n_A}{v}\right)\left(\frac{n_B}{v}\right)^2$; volume is doubled so, concentration is halved hence rate becomes $\frac{1}{8}$th times.

90. Answer (1)

The solvent molecules will flow through the membrane from pure solvent to the solution. The process of flow of the solvent is called osmosis.

91. Answer (2)

$\pi = iCRT=\frac{3\times\left(\frac{20}{164}\right)\times0.0821\times273}{100\times10^{-3}}$ atm

= 82 atm

92. Answer (1)

Solubility of gas increases with decrease of temperature as it is an exothermic process.

93. Answer (2)

$\kappa=\frac{1}{77}$

$\Lambda_m=\frac{\kappa\times1000}{C}=\frac{1000}{77\times0.1}\simeq130\ Scm^2\ mol^{-1}$

94. Answer (4)

	A	$\rightarrow$	2B
(i)	100 mm		–
(t = 10 min)	(100 – x) mm		2x mm

$p_f = 100 + x = 150$ $\qquad$ $\therefore$ x = 50

$\frac{\Delta p_B}{\Delta t}=\frac{2x}{10}=\frac{100}{10}=10\ mm\ Hg\ min^{-1}$

95. Answer (2)

$K_f=\frac{R\times M_1\times T_f^{\circ 2}}{1000\times\Delta_{fus}H}$

96. Answer (2)

$$\chi_{CH_3OH} = \frac{n_{CH_3OH}}{n_{CH_3OH} + n_{H_2O}}$$

$$= \frac{64/32}{64/32 + 36/18} = \frac{2}{2+2} = 0.5$$

97. Answer (2)

$$\frac{k_{80}}{k_{40}} = \frac{k_{50}}{k_{40}} \times \frac{k_{60}}{k_{50}} \times \frac{k_{70}}{k_{60}} \times \frac{k_{80}}{k_{70}} = (2)^4 = 16 \text{ times}$$

98. Answer (2)

$E^o_{oxd} = -E^o_{red}$

Higher the reduction potential, lower will be the reducing power of halide and lower is the reduction potential weaker will be the oxidising power of the halogen.

$E^o_{red}(V)$

99. Answer (4)

Mass%, ppm, mole fraction and molality are independent of temperature because these terms are calculated using mass which is independent of temperature.

100. Answer (1)

(A) $Zn(s)\left|Zn^{2+}(aq)\right|\left|Cu^{2}(aq)\right|Cu(s)$

$E^o = E^o_{Cu^{2+}/Cu} - E^o_{Zn^{2+}/Zn}$

$= 0.34 - (-0.76) = 1.1$ V

(B) $Ni(s)\left|N_i^{2+}(aq)\right|\left|Cu^{2+}(aq)\right|Cu(s)$

$E^o = E^o_{Cu^{2+}/Cu} - E^o_{Ni^{2+}/Ni}$

$= 0.34 - (-0.25) = 0.59$ V

(C) $Cu(s)\left|Cu^{2+}(aq)\right|\left|Ag^{+}(aq)\right|Ag(s)$

$E^o = E^o_{Ag^{2+}/Ag} - E^o_{Cu^{2+}/Cu}$

$= 0.80 - 0.34 = 0.46$ V

(D) $Zn(s)\left|Zn^{2+}(aq)\right|\left|Ag^{ss+}(aq)\right|Ag(s)$

$E^o = E^o_{Ag^{2+}/Ag} - E^o_{Zn^{2+}/Zn}$

$= 0.80 - (-0.76) = 1.56$ V

BOTANY

SECTION - A

101. Answer (2)
Papaya is a dioecious plant. In dioecious plants only xenogamy is possible.

102. Answer (1)
Hilum represents the junction between ovule and funicle.

103. Answer (4)
The innermost wall layer of anther is tapetum. It is polyploid in nature.

104. Answer (3)
If the seeds collected from hybrids are sown, the plants in the progeny will segregate and do not maintain hybrid characters.

105. Answer (4)
Maize show wind-pollination. Wind-pollinated plants do not show presence of nectaries.

106. Answer (3)
Double fertilisation includes syngamy and triple fusion. Triple fusion is fusion of one male gamete with two polar nuclei.

107. Answer (2)
Tapetum nourishes the developing pollen grains.

108. Answer (3)
Sporopollenin can withstand high temperature and can't be degraded by any enzyme. Sporopollenin is present in exine (outer layer of sporoderm) of pollen grain.

109. Answer (1)
Egg apparatus is 3-celled structure because it contains two synergids and one egg cell.

110. Answer (3)
The generative cell of pollen grain divides mitotically to give rise to two male gametes.

111. Answer (4)
In a majority of flowering plants, monosporic embryo sac development is observed because out of four, only one megaspore remains functional and rest three degenerate.

112. Answer (4)
Secondary nucleus is diploid that is,
2n = 20
therefore, PEC (3n) = 30
Polar nuclei (n) = 10
Coleorhiza (2n) = 20
Aleurone layer (3n) = 30

113. Answer (2)
In geitonogamy, transfer of pollen grains occurs from the anther to the stigma of another flower of the same plant. It is functionally cross-pollination involving a pollinating agent.

114. Answer (1)

A few flowering plants such as some species of Asteraceae and grasses have evolved a special mechanism to produce seed without fertilisation called apomixis.

115. Answer (3)

Calyx and corolla are non-essential sterile whorls. Androecium and gynoecium are essential and fertile whorls.

116. Answer (1)

Co-operative cells or synergids are characterised by the presence of filiform apparatus at the micropylar tip.

117. Answer (3)

Cells of nucellus and integument in flowering plants are diploid. Therefore, embryo developed from these cells would be diploid.

118. Answer (3)

Transfer of pollen grains on stigma is known as pollination. Pollination is not a part of pollen-pistil interaction.

119. Answer (2)

Synthesis of ABA is stimulated by drought, water logging and other adverse environment conditions. It acts antagonist to GAs and is known as Anti GA.

120. Answer (1)

Cytokinin and auxin, both shows their synergistic effect on cell division.

121. Answer (4)

Not all aquatic plants use water for pollination. Pollination does not guarantee the transfer of the right type of pollen.

122. Answer (3)

Aquatic plants such as water hyacinth and water lily are pollinated by insects or wind as in most of the land plants.

123. Answer (2)

Auxin – Present in root and shoot apices

Cytokinin – Adventitious shoot formation

Gibberellin – Seed germination

Abscisic acid – Induce dormancy

124. Answer (3)

Violaxanthin is the precursor of abscisic acid.

125. Answer (3)

In arithmetic growth cells divide mitotically and only one daughter cell keeps on continuous division whereas other cells undergo differentiation and become mature. Generally, growth is accompanied by metabolic processes (both anabolic and catabolic) that occur at the expense of energy.

126. Answer (3)

GA_3 was one of the first gibberellins to be discovered and most intensively studied.

127. Answer (4)

Ethylene is used to initiate flowering and for synchronising fruit set in pineapples.

128. Answer (1)

The stimulus for vernalisation is perceived by the mature stem apex, or by the embryo of the seed but not by the leaves as in photoperiodism.

129. Answer (2)

The lateral meristems, vascular cambium and cork-cambium appear later in life and helps in secondary growth of the plant.

130. Answer (3)

Cytokinins are modified purines and not acidic in nature.

131. Answer (3)

Cytokinin helps in hedge-making. Zeatin was isolated from corn-kernels and coconut milk.

132. Answer (4)

Ethylene is a simple gaseous PGR. It induces flowering in mango.

133. Answer (3)

Ethylene and auxin both can be used to increase yield of pineapple as they help to promote flowering.

134. Answer (4)

Bean shows epigeal seed germination in which hypocotyl grows first and cotyledons comes out of soil.

135. Answer (4)

Ethylene may involve in growth inhibiting as well as growth promoting activities.

SECTION - B

136. Answer (1)

In dicot embryo, the cylindrical portion below the level of cotyledon is called hypocotyl.

137. Answer (4)

In wheat endosperm may persist in mature seed.

138. Answer (2)

Anther contain microsporangia that forms pollen sacs, which on maturity become filled with pollen grains.

139. Answer (4)

In meristematic phase of growth, the cells show continuous cell division.

140. Answer (1)

Linear growth curve is shown by roots elongating at a constant rate.

141. Answer (3)

Stored pollen can be used as pollen banks, in crop breeding programmes.

Pollen tablets and syrups are used as food supplements and are available in the markets, in western countries.

142. Answer (4)

In sea grasses pollination takes place inside water.

In *Vallisneria* pollination takes place on the surface of water.

In water hyacinth and water lily flowers emerge above the water level and are pollinated by insects or wind.

143. Answer (3)

In wheat, paddy and mango etc. there is single ovule but in papaya, water melon, orchids etc. there are many ovules in an ovary.

144. Answer (2)

Bees are the dominant pollinating agents.

145. Answer (3)

Majority of insect pollinated flowers are large, colorful, fragrant and rich in nectar. They also possess sticky pollen grains.

Large feathery stigma, tassels, well-exposed stamens are the features of wind-pollinated flowers.

146. Answer (1)

In the typical stamen, the proximal end of the filament is attached to the thalamus or petal of the flower.

147. Answer (2)

To form a tracheary element, the cells would lose their protoplasm. They develop a very strong, elastic lignocellulosic secondary cell wall to carry water to long distances.

148. Answer (3)

The relative growth rate of the plant

$$= \frac{\text{Growth per unit time}}{\text{Initial size}} \times 100$$

149. Answer (2)

The site of perception of light/dark is leaves.

150. Answer (3)

Tomato is a day neutral plant and it does not show any correlation between exposure to light duration and induction of flowering response.

ZOOLOGY

SECTION - A

151. Answer (3)

Each fallopian tube extends from the periphery of each ovary to the uterus, the part closer to ovary is infundibulum and it has finger like projections called fimbriae. The infundibulum leads to a wider ampulla and then to the last part of oviduct called isthmus which joins the uterus.

152. Answer (1)

Catecholamines stimulate the breakdown of glycogen resulting in an increased concentration of glucose in the blood.

153. Answer (4)

The secretions of bulbourethral glands help in the lubrication of the penis.

154. Answer (2)

Embryo with 8-16 celled stage is called morula. The blastocyst becomes embedded in the endometrium of the uterus. This is called implantation and it leads to pregnancy.

155. Answer (4)

MSH is melanocyte stimulating hormone. It acts on the melanocytes and regulates pigmentation of the skin.

156. Answer (1)

Acromegaly is a disorder caused due to hypersecretion of growth hormone.

157. Answer (4)

Estrogen, progesterone, cortisol, *etc* are steroidal in nature while catecholamines and thyroxine are amino acid derivatives and iodothyronines respectively.

158. Answer (2)

The secondary oocyte forms a new membrane called zona pellucida.

During fertilisation, a sperm comes in contact with the zona pellucida layer of the ovum and induces changes in the membrane that blocks the entry of additional sperms.

159. Answer (4)

Hypothalamus is the source gland for GnRH.

160. Answer (2)

The wall of uterus has three layers of tissues. The external thin membranous perimetrium, middle thick layer of smooth muscle, myometrium and the inner glandular layer called endometrium.

161. Answer (2)

The part of adenohypophysis *i.e.*, pars intermedia secretes only one hormone called Melanocyte

Stimulating Hormone (MSH). MSH acts on the melanocytes (melanin containing cells) and regulates pigmentation of the skin.

162. Answer (4)

Hypothyroidism, during pregnancy causes defective development and maturation of the growing baby leading to stunted growth (cretinism), mental retardation, low IQ.

Protrusion of eyeballs is the characteristic feature of Graves' disease.

163. Answer (1)

The reproductive cycle in the female primates is known as menstrual cycle and is controlled by estrogen and progesterone from ovary, FSH and LH from pituitary gland and GnRH from hypothalamus.

164. Answer (3)

High levels of LH triggers the ovulation. Colostrum contains readymade antibodies and nutrients.

The membranous cover of the ovum at ovulation is called corona radiata.

165. Answer (3)

Each seminiferous tubule is lined on its inside by two types of cells called spermatogonia and Sertoli cells.

166. Answer (4)

Androgenic steroids are secreted from zona reticularis layer of adrenal cortex.

167. Answer (2)

Releasing and inhibiting hormones from hypothalamus reach the pituitary gland through a portal circulatory system and regulate the functions of the anterior pituitary. The posterior pituitary is under the direct neural regulation of the hypothalamus.

168. Answer (1)

In adult humans, each testis is oval in shape with a length of about 4 to 5 cm and width of about 2 to 3 cm.

169. Answer (2)

In luteal phase of menstrual cycle, endometrium is maintained because of high level of progesterone.

170. Answer (4)

From one primary spermatocyte two secondary spermatocytes are formed. For this one meiotic division takes place.

So, for 10 secondary spermatocytes, 5 primary spermatocytes are required.

171. Answer (2)

Formation of heart	–	After one month of gestation
First movement of foetus	–	During 5th month of gestation
Most of the organs system are formed	–	End of 1st trimester of pregnancy
Eyelashes are formed	–	By end of about 168 days of gestation

172. Answer (4)

Some hormones are also involved in conduction of nerve impulses across synapse.

173. Answer (4)

Gastrin – Stimulates secretion of HCl and pepsinogen

GIP – Inhibits gastric motility

Secretin – Acts on the exocrine pancreas and stimulates secretion of H_2O and HCO_3^-

174. Answer (2)

Ovary, adrenal gland and kidney consist of a central medullary region surrounded by a cortical region.

175. Answer (3)

Pars distalis produces six trophic hormones, namely GH, PRL, TSH, ACTH, LH and FSH. Pineal gland is located on the dorsal side of the forebrain.

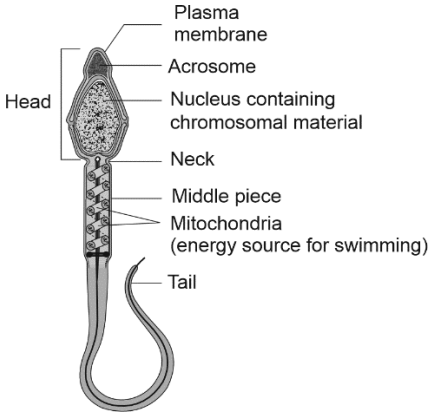
176. Answer (1)

The glandular tissue of each breast is divided into 15-20 mammary lobes.

177. Answer (4)

hPL is present only during pregnancy and released by placenta.

178. Answer (1)



179. Answer (2)

Parturition is induced by a complex neuro-endocrine mechanism. The signals for parturition originate from the fully developed foetus and the placenta which induce mild uterine contractions called foetal ejection reflex.

180. Answer (2)

Second messengers are cyclic AMP, IP_3, Ca^{+2} that regulate cellular metabolism.

181. Answer (2)

Oxytocin is a hypothalamic hormone and is a peptide hormone.

182. Answer (4)

Insulin is a hypoglycemic hormone, acts mainly on hepatocytes and adipocytes and enhances cellular glucose uptake and utilisation. It also stimulates the formation of glycogen from glucose (glycogenesis) in the target cells.

183. Answer (1)

The thymus gland secretes thymosins which play a major role in the differentiation of T-lymphocytes, and provides cell-mediated immunity.

184. Answer (1)

Estrogen is a steroidal hormone and has intracellular receptors.

185. Answer (3)

Insulin is a peptide hormone, which plays a major role in the regulation of glucose homeostasis. Insulin acts mainly on hepatocytes and adipocytes (cells of adipose tissue), and enhances cellular glucose uptake and utilisation.

SECTION - B

186. Answer (3)

Immediately after implantation, the inner cell mass (embryo) differentiates into an outer layer called ectoderm and an inner layer called endoderm. A mesoderm soon appears between the ectoderm and the endoderm.

187. Answer (1)

The correct pathway of transport of sperms passing through a human male body is:

Seminiferous tubules $\rightarrow$ Rete testis $\rightarrow$ Vasa efferentia $\rightarrow$ Epididymis $\rightarrow$ Vas deferens $\rightarrow$ Ejaculatory duct $\rightarrow$ Urethra

188. Answer (1)

Corpus luteum and placenta are temporary endocrine glands.

189. Answer (4)

Endorphins – Neuropeptides

Noradrenaline – Biogenic amines

Growth hormone – Protein

Thyroxine – Iodinated amine

190. Answer (1)

Cortisol suppresses the immune response.

191. Answer (3)

Rapid secretion of LH leading to its maximum level during the mid-cycle called LH surge induces rupture of Graafian follicle and thereby the release of ovum.

192. Answer (2)

Uremia : Accumulation of urea in blood

Diuresis : Excess of urination

Glycosuria : Presence of glucose in blood

Ketonuria : Presence of ketone bodies in urine

193. Answer (4)

Thyrocalcitonin is a hypocalcemic hormone.

194. Answer (3)

(1)	Aldosterone	Mineralocorticoid
(2)	Cortisol	Glucocorticoid
(3)	Insulin	β-cells of pancreas
(4)	Glucagon	α-cells of pancreas

195. Answer (3)

In spermatogenesis, formation of sperms occurs.

196. Answer (2)

In humans, four parathyroid glands are present on the back side of the thyroid gland.

PTH increases the Ca^{+2} levels in the blood. PTH acts on bones and stimulates the process of bone resorption. PTH also stimulates the reabsorption of Ca^{+2} by the renal tubules and increases Ca^{+2} absorption from the digested food.

197. Answer (2)

Male pronucleus fuses with pronucleus of mature ovum (ootid) and is called karyogamy.

198. Answer (2)

For normal fertility, at least 60% sperms must have normal shape and size and at least 40% of them must show vigorous motility.

199. Answer (2)

Menstrual, proliferative and secretory phase are the three phases of uterine cycle.

200. Answer (2)

Hormone estrogen is responsible for high pitch of voice in females.

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