

All India Aakash Test Series for Medical - 2021

TEST - 4 (Code-C)

Test Date : 29/12/2019

ANSWERS

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

HINTS & SOLUTIONS

[PHYSICS]

1. Answer (3)

Hint: Use $\vec{v} = \vec{\omega} \times \vec{r}$

Sol.: Angle between \vec{r} and $\vec{\omega}$ is 90°

Hence $v = r\omega$

$$\omega = \frac{v}{r} = \frac{4}{0.5}$$

$$= 8 \text{ rad/s}$$

2. Answer (2)

Hint: Use $\vec{\tau} = \vec{r} \times \vec{F}$

$$\text{Sol. : } \vec{\tau} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & 0 & 4 \\ 2 & -4 & -1 \end{vmatrix}$$

$$= \hat{i}(16) - \hat{j}(-2-8) + \hat{k}(-8)$$

$$= (16\hat{i} + 10\hat{j} - 8\hat{k}) \text{ N m}$$

3. Answer (1)

Hint: Moment of inertia $I = Mk^2$

$$\text{Sol. : } \text{Given } I = \frac{5MR^2}{2}$$

$$Mk^2 = \frac{5}{2}MR^2$$

$$k = \sqrt{\frac{5}{2}}R$$

4. Answer (4)

Hint: Use $\tau = I\alpha$ and $\alpha = \frac{d\omega}{dt} = \frac{d^2\theta}{dt^2}$

$$\text{Sol. : } \theta(t) = 2t^3 - 9t^2$$

$$\omega(t) = 6t^2 - 18t$$

$$\alpha(t) = 12t - 18$$

$$\therefore \tau = 0 \text{ when } \alpha = 0$$

$$\text{i.e. } 12t - 18 = 0$$

$$t = \frac{3}{2} \text{ s}$$

$$\omega\left(t = \frac{3}{2} \text{ s}\right) = 6 \times \left(\frac{3}{2}\right)^2 - 18 \times \frac{3}{2}$$

$$= \frac{27}{2} - \frac{54}{2} = \frac{-27}{2} = -13.5 \text{ rad/s}$$

5. Answer (3)

Hint: Moment of inertia depends on mass and effective distance from axis of rotation.

Sol.: From the figure shown, effective distance of mass is farthest from the axis 3.

6. Answer (3)

Hint: $\vec{L} = (\vec{r} \times \vec{p})$

Sol.: Angular momentum of the particle about origin will be same because perpendicular distance from origin remains same

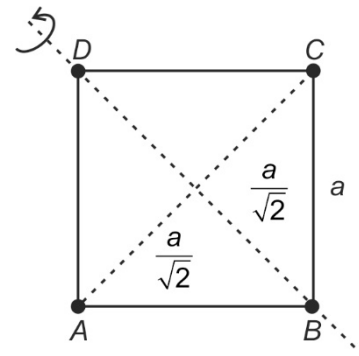
7. Answer (1)

Hint: $I = \sum m_i r_i^2$

Sol.: $I = I_A + I_B + I_C + I_D$

$$= m\left(\frac{a}{\sqrt{2}}\right)^2 + 0 + m\left(\frac{a}{\sqrt{2}}\right)^2 + 0$$

$$= ma^2$$



8. Answer (3)

Hint: Use $|\vec{A} \times \vec{B}| = AB \sin \theta$ and $|\vec{A} \cdot \vec{B}| = AB \cos \theta$

Sol.: Given $|\vec{A} \times \vec{B}| = \frac{1}{\sqrt{3}} \vec{A} \cdot \vec{B}$

$$AB \sin \theta = \frac{1}{\sqrt{3}} AB \cos \theta$$

$$\tan \theta = \frac{1}{\sqrt{3}}$$

$$\theta = 30^\circ$$

$$\text{Now, } |\vec{A} - \vec{B}| = \sqrt{A^2 + B^2 - 2AB \cos \theta}$$

$$= (A^2 + B^2 - AB\sqrt{3})^{\frac{1}{2}}$$

9. Answer (4)

Hint: In case of pure rolling $v = R\omega$

Sol.: $\vec{v}_A = \vec{v}_{cm} + \vec{r}\omega$

$$= v_{cm} + \frac{R\omega}{2}$$

$$= \frac{3}{2}v_{cm}$$

10. Answer (2)

Hint: Torque ($\vec{\tau}$) = $\frac{d\vec{L}}{dt}$

Sol.: If $\vec{\tau} = 0 \Rightarrow \frac{d\vec{L}}{dt} = 0$

$\vec{L} = \text{constant}$

11. Answer (2)

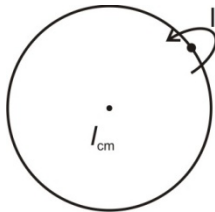
Hint: Parallel axis theorem

Sol.: $I = I_{cm} + md^2$

here $d = R$

$$I = mR^2 + mR^2$$

$$= 2mR^2$$



12. Answer (4)

Hint: Moment of inertia of ring about its axis is mR^2

Sol.: Mass of complete ring = M

$$\text{Mass of incomplete ring } (m) = M - \frac{M}{6} = \frac{5M}{6}$$

$$I_{\text{ring}} = mR^2 = \frac{5MR^2}{6}$$

13. Answer (3)

Hint: Use angular momentum $\vec{L} = \vec{r} \times \vec{p}$

$$\text{Sol.: } \vec{L} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ x & y & z \\ p_x & p_y & p_z \end{vmatrix}$$

$$= \hat{i}(yp_z - zp_y) - \hat{j}(xp_z - zp_x) + \hat{k}(xp_y - yp_x)$$

Hence, y component of $\vec{L} = zp_x - xp_z$

14. Answer (2)

Hint: Torque $\vec{\tau} = \sum (\vec{r}_i \times \vec{F}_i)$

Sol.: $\vec{\tau} = \vec{r}_A \times (-\vec{F}) + \vec{r}_B \times \vec{F}$

$$= -(\vec{r}_A - \vec{r}_B) \times \vec{F}$$

$$= \vec{F} \times (\vec{r}_A - \vec{r}_B)$$

15. Answer (1)

Hint: At equilibrium $\Sigma F = 0, \Sigma \tau = 0$

Sol.: $R_A + R_B = w + w_1$

$$= 60 + 100$$

$$R_A + R_B = 160 \text{ N} \quad \dots(1)$$

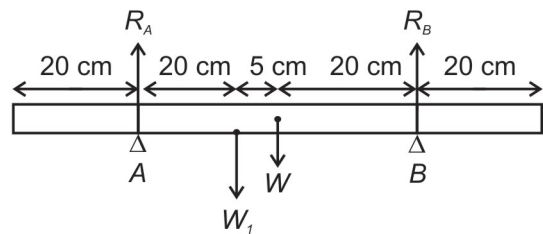
Take moment about A

$$\tau_A = 100 \times 0.2 + 60 \times 0.25 - R_B \times 0.5$$

$$35 - \frac{R_B}{2} = 0$$

$$R_B = 70 \text{ N}$$

$$R_A = 160 - 70 = 90 \text{ N}$$



16. Answer (4)

Hint: $n = \frac{\theta}{2\pi}$ and $\theta = \frac{1}{2}(\omega_0 + \omega)t$

Sol.: Given $\omega_0 = 1200 \text{ rpm} = 40\pi \text{ rad/s}$

$$\omega = 3120 \text{ rpm} = 104\pi \text{ rad/s}$$

$$\frac{1}{2}(40\pi + 104\pi) = 1152\pi$$

$$n = \frac{1152\pi}{2\pi} = 576 \text{ revolutions}$$

17. Answer (4)

Hint: $I = mk^2$ and $I = I_{cm} + md^2$

Sol.: $mk^2 = I_{cm} + md^2$

$$I_{cm} = m(k^2 - d^2)$$

$$mk'^2 = m(k^2 - d^2)$$

$$k' = \sqrt{k^2 - d^2} = \sqrt{10^2 - 6^2} = 8 \text{ cm}$$

18. Answer (1)

Hint: Use $T = \sqrt{\frac{2h}{g \sin^2 \theta} \left(1 + \frac{k^2}{R^2}\right)}$

Sol.:
$$\frac{T_{\text{sphere}}}{T_{\text{disc}}} = \sqrt{\frac{1 + \left(\frac{k}{R}\right)_{\text{sphere}}^2}{1 + \left(\frac{k}{R}\right)_{\text{disc}}^2}}$$

$$= \sqrt{\frac{1 + \frac{2}{5}}{1 + \frac{1}{2}}} = \sqrt{\frac{\frac{7}{5}}{\frac{3}{2}}} = \sqrt{\frac{14}{15}}$$

19. Answer (2)

Hint: $L = \frac{2}{5}mR^2\omega$ and $L \Rightarrow$ conserved

Sol.: $\% \frac{\Delta R}{R} = \frac{1}{3} \frac{\Delta V}{V} \times 100 = \frac{1}{3} \times 3 = 1\%$

Now, $\frac{\Delta L}{L} \times 100 = 2 \frac{\Delta R}{R} \times 100 + \frac{\Delta \omega}{\omega} \times 100 + \frac{\Delta m}{m} \times 100$

$0 = 2 \times 1\% + \frac{\Delta \omega}{\omega} \times 100 + 0$

$\frac{\Delta \omega}{\omega} \times 100 = -2\%$

20. Answer (1)

Hint: Use energy conservation

Sol.: $mgh = \frac{1}{2}I\omega^2$

$mg \frac{L}{2} \sin \theta = \frac{1}{2} \frac{mL^2}{3} \omega^2$

$\frac{3g}{L} \sin \theta = \omega^2$

$\omega = \sqrt{\frac{3g \sin \theta}{L}}$

21. Answer (1)

Hint: $r_{r.m.s} = \sqrt{\frac{r_1^2 + r_2^2 + r_3^2 + r_4^2 + r_5^2}{5}}$

Sol.: $I = \sum m_i r_i^2$

$= m(r_1^2 + r_2^2 + r_3^2 + r_4^2 + r_5^2)$

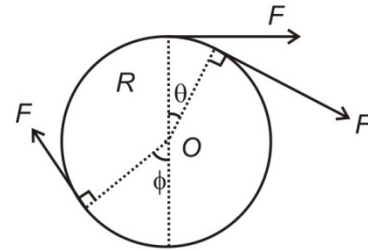
$= m(5r_{\text{rms}}^2) = 1 \times 5 \times 6^2 = 180 \text{ kg m}^2$

22. Answer (3)

Hint: Use $\vec{\tau} = \vec{r} \times \vec{F}$

Sol.: $\vec{\tau}_0 = \vec{R} \times \vec{F}_1 + \vec{R} \times \vec{F}_2 + \vec{R} \times \vec{F}_3$

$|\vec{\tau}_0| = 3FR$



23. Answer (1)

Hint: Use $v_{cm} = \sqrt{\frac{2gh}{1 + \frac{k^2}{R^2}}}$

Sol.: $v_{cm} = \sqrt{\frac{2gh}{1+1}} = \sqrt{gh}$

24. Answer (1)

Hint: $t = \sqrt{\frac{2h}{g \sin \theta} \left(1 + \frac{k^2}{R^2}\right)}$

Sol.: time $\propto \sqrt{1 + \frac{k^2}{R^2}}$

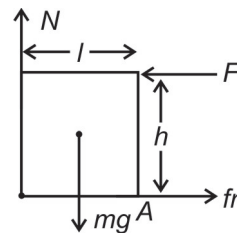
Hence, time to reach the bottom will be minimum for solid sphere and maximum for hollow cylinder.

25. Answer (3)

Hint: For rotational equilibrium $\Sigma \tau = 0$

Sol.: $\tau_A = F_{\text{min}} h - mg \cdot \frac{l}{2} = 0$

$F_{\text{min}} = \frac{mgl}{2h}$



26. Answer (1)

Hint: $\frac{1}{2}I_{cm}\omega^2 = \frac{40}{100} \left(\frac{1}{2}mv^2\right) = \frac{2}{5} \left(\frac{1}{2}mv^2\right)$

Sol.: $\frac{1}{2}I_{cm}\omega^2 = \frac{2}{5} \times \frac{1}{2}mv^2$

or, $I_{cm} \frac{v^2}{r^2} = \frac{2}{5}mv^2$

or, $I_{cm} = \frac{2}{5}mr^2$

so, body is solid sphere.

27. Answer (2)

Hint: $P_{\text{inst}} = \vec{\tau} \cdot \vec{\omega}$

Sol.: $P_{\text{ins}} = \tau \cdot \omega \cdot \cos \theta = 10 \times 30 \times \cos 0^\circ = 300 \text{ W}$

28. Answer (2)

Hint: Use angular conservation

Sol.: ($\because M = 2m$)

$$mu \frac{L}{2} = \frac{ML^2}{12} \times \omega$$

$$\omega = \frac{mu \frac{L}{2}}{\frac{2mL^2}{12}} = \frac{3u}{L}$$

29. Answer (1)

Hint: $t_{\text{roll}} = \sqrt{\frac{2h}{g \sin^2 \theta} \left(1 + \frac{k^2}{R^2}\right)}$

and $t_{\text{slide}} = \sqrt{\frac{2h}{g \sin^2 \theta}}$

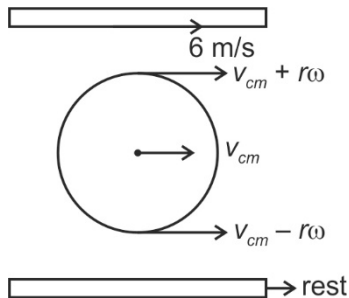
Sol.: $\frac{t_{\text{slide}}}{t_{\text{rolling}}} = \frac{1}{\sqrt{1 + \frac{k^2}{R^2}}}$

for ring $\frac{t_s}{t_r} = \frac{1}{\sqrt{1+1}} = \frac{1}{\sqrt{2}}$

30. Answer (1)

Hint: For pure rolling there should not be slipping at contact points.

Sol.: $v_{cm} + r\omega = 6$



$v_{cm} = r\omega$

$\Rightarrow v_{cm} = \frac{6}{2} = 3 \text{ m/s}$

31. Answer (4)

Hint & Sol.: Kepler's law of area is consequence of conservation of angular momentum

32. Answer (3)

Hint: $v_e = R_e \sqrt{\frac{4}{3} \pi \rho G}$

Sol.: $\frac{v_e}{v'_e} = \frac{R_e \sqrt{\rho}}{\frac{R_e}{2} \cdot \sqrt{2\rho}} = \frac{1}{\sqrt{2}}$

$v'_e = \frac{v_e}{\sqrt{2}}$

33. Answer (1)

Hint: $g = g_p - R\omega^2 \cos^2 \lambda$

Sol.: if $\omega = 0$ then value of g increases at all the places except at poles.

34. Answer (2)

Hint: $T^2 \propto R^3$

Sol.: $\frac{T_1}{T_2} = \left(\frac{R_1}{R_2}\right)^{\frac{3}{2}}$

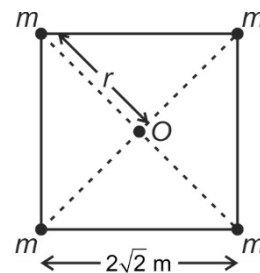
$\frac{6}{T} = \left(\frac{R}{4R}\right)^{\frac{3}{2}} = \left(\frac{1}{2}\right)^3$

$T = 48 \text{ h}$

35. Answer (4)

Hint: $V = \frac{-GM}{r}$

Sol.: $V_0 = V_1 + V_2 + V_3 + V_4$



$V_0 = \frac{-Gm}{r} \times 4$

$= -G \times \frac{2}{2} \times 4 = -4G$

36. Answer (4)

Hint: $g_{\text{depth}} = g_0 \left(1 - \frac{h}{R_e}\right)$

and $g_{\text{height}} = g_0 \left(1 - \frac{2h}{R_e}\right)$ (if $h \ll R_e$)

Sol.: For same value of depth and height, decrement in g is greater at height for $h \ll R_e$.

Hence $W_2 > W_1 > W_3$

37. Answer (2)

Hint: $v = \sqrt{\frac{GM}{(R+h)}}$

Sol.: Near earth surface

$$v = \sqrt{\frac{GM}{R}}$$

At altitude $8R$

$$v' = \sqrt{\frac{GM}{9R}} = \frac{1}{3}v = \frac{v}{3}$$

38. Answer (1)

Hint: Use energy conservation method

Sol.: $\frac{1}{2}mv^2 - \frac{GMm}{R} = -\frac{GMm}{16R} + 0$

$$\frac{1}{2}mv^2 = \frac{GMm}{R} \left(1 - \frac{1}{16}\right)$$

$$v^2 = \frac{15GM}{8R}$$

$$v = \sqrt{\frac{15GM}{8R}}$$

39. Answer (3)

Hint: Use $\vec{T} = -\frac{\partial V}{\partial x}\hat{i} - \frac{\partial V}{\partial y}\hat{j} - \frac{\partial V}{\partial z}\hat{k}$

Sol.: $V = -(x^2 + y^2 + z^2)$ J/kg

$$I_x = -\frac{\partial V}{\partial x} = +2x$$

$$I_y = -\frac{\partial V}{\partial y} = +2y$$

$$I_z = \frac{\partial V}{\partial z} = +2z$$

$$\vec{T} = I_x\hat{i} + I_y\hat{j} + I_z\hat{k} = 2x\hat{i} + 2y\hat{j} + 2z\hat{k}$$

$$\vec{T}(1, 1, 0) = (2\hat{i} + 2\hat{j}) \text{ N/kg}$$

40. Answer (2)

Hint: $V = -\frac{GM}{r}$ and $g = \frac{GM}{r^2}$

Sol.: $\frac{V}{g} = \frac{-\frac{GM}{r}}{\frac{GM}{r^2}} = -r$

$$\Rightarrow -r = \frac{-4.5 \times 10^7}{5.0}$$

$$\Rightarrow r = 9 \times 10^6 \text{ m} = 9000 \text{ km}$$

$$R + h = 9000$$

$$h = (9000 - 6000) \text{ km}$$

$$h = 3000 \text{ km}$$

41. Answer (1)

Hint & Sol.: When energy of the body planet system is positive then system becomes unbounded and body will escape out the planet.

42. Answer (2)

Hint: At height h ,

$$g = \frac{GM}{(R_e + h)^2}$$

Sol.: $g' = \frac{gR_e^2}{(R_e + h)^2}$

so, $mg' = \frac{120 \times R_e^2}{\left(\frac{3R_e}{2}\right)^2}$

$$W' = \frac{480}{9} = \frac{160}{3} \text{ N}$$

43. Answer (3)

Hint: Use $U = -\frac{GMm}{r}$

Sol.: $\Delta U = -\frac{GMm}{2R_e} - \left(-\frac{GMm}{R_e}\right) = \left(\frac{GM_e m}{2R_e}\right)$

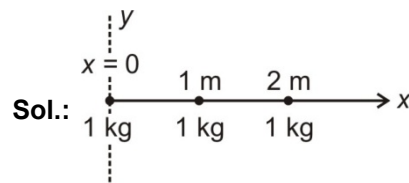
$$= \frac{mgR_e}{2} = 50gR_e$$

44. Answer (4)

Hint & Sol.: Gravitational field intensity due to a spherical shell is zero for $r < R$.

45. Answer (3)

Hint: Use principle of superposition, $\vec{F}_1 = \vec{F}_{12} + \vec{F}_{13}$



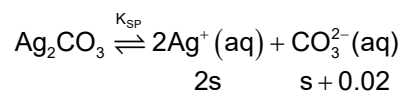
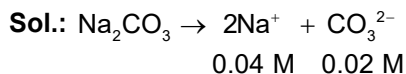
$$F_1 = Gm^2 \left(\frac{1}{1^2} + \frac{1}{2^2} \right)$$

Hence $F_1 = \frac{5G}{4}$

[CHEMISTRY]

46. Answer (4)

Hint: Due to common ion effect solubility decreases.



$$K_{sp} = [\text{Ag}^+]^2 [\text{CO}_3^{2-}] = (2s)^2 (s + 0.02)^1$$

$$\text{Since } 0.02 \gg s \Rightarrow s + 0.02 \approx 0.02$$

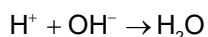
$$8 \times 10^{-12} = 4s^2 \times 0.02 \Rightarrow s = 10^{-5} \text{ M}$$

47. Answer (1)

Hint: H^+ ions are neutralized by OH^-

$$\text{Sol.: } \text{mmol of OH}^- = 40 \times \frac{1}{4} = 10$$

$$\text{mmol of H}^+ = \left(50 \times \frac{1}{5}\right) + \left(10 \times \frac{1}{2}\right) = 15$$



$$\text{(i) } 15 \quad 10 \quad -$$

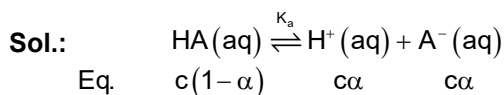
$$\text{(f) } 5 \quad 0$$

$$[\text{H}^+]_f = \frac{5 \text{ mmol}}{500 \text{ mL}} = 0.01 \text{ M}$$

$$\Rightarrow \text{pH} = -\log 0.01 = 2$$

48. Answer (1)

Hint: $\alpha = 0.40$, it is comparable to 1 (unity).

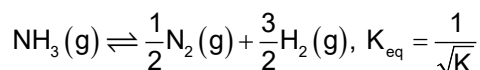
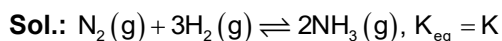


$$K_a = \frac{(c\alpha)(c\alpha)}{c(1-\alpha)} = \frac{c\alpha^2}{1-\alpha}$$

$$= \frac{0.2 \times (0.4)^2}{0.6} = 5.33 \times 10^{-2}$$

49. Answer (3)

Hint: Factor, with which reaction is multiplied, becomes the power of K



50. Answer (2)

Hint: An acidic buffer requires presence of a weak acid and its salt with strong base in the same solution.

Sol.: H_2SO_4 is a strong acid. Hence, $\text{NaHSO}_4 + \text{H}_2\text{SO}_4$ is not an acidic buffer.

51. Answer (4)

$$\text{Hint: } M = \frac{M_1V_1 + M_2V_2}{V_1 + V_2}$$

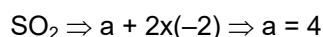
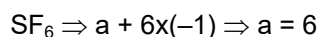
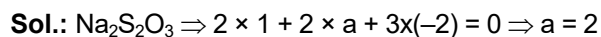
$$\text{Sol.: } [\text{H}^+] = \frac{0.01 \times 2 \times V + 0.1 \times V}{2V}$$

$$= \frac{0.02 + 0.1}{2} = 0.06 \text{ M}$$

$$\text{pH} = -\log[\text{H}^+] = -\log(0.06) = 1.22$$

52. Answer (3)

Hint: For neutral molecules, net charge = 0.



53. Answer (1)

$$\text{Hint: } \log \frac{K_2}{K_1} = \frac{\Delta H^\circ}{2.303R} \left(\frac{T_2 - T_1}{T_2 T_1} \right)$$

Sol.: Endothermic $\Leftrightarrow \Delta H^\circ > 0$

When T increases,

$$\Rightarrow \log \frac{K_2}{K_1} > 0 \Rightarrow K_2 > K_1$$

54. Answer (4)

Hint: Salt of strong acid and weak base will have lowest pH.

Sol.: NaBr : Salt of S.A. + S.B.

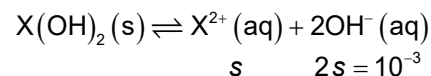
CH_3COONa : Salt of W.A + S.B.

$(\text{NH}_4)_2\text{SO}_4$: Salt of S.A. + W.B.

55. Answer (1)

Hint: $[\text{OH}^-] = 10^{-\text{pOH}}$

$$\text{Sol.: } \text{pOH} = 14 - 11 = 3 \Rightarrow [\text{OH}^-] = 10^{-3}$$



At equilibrium,

$$K_{sp} = [X^{2+}] [OH^-]^2 = \left(\frac{1}{2} \times 10^{-3}\right) (10^{-3})^2$$

$$K_{sp} = 5 \times 10^{-10}$$

56. Answer (2)

Hint: In SO_3 sulphur is in its maximum oxidation state, so it cannot act as a reducing agent.

57. Answer (2)

Hint: At equilibrium, rate of forward reaction is equal to rate of backward reaction.

58. Answer (3)

Hint: If $K_{eq} < 10^{-3}$ then extent of reaction is negligible

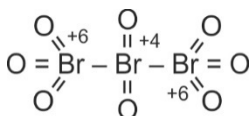
Sol.: At equilibrium, the system lies largely in the favour of reactants.

59. Answer (2)

$$\text{Hint: } pH = 7 + \frac{1}{2} (pK_a - pK_b)$$

60. Answer (4)

Hint: Structure of Br_3O_8 is



61. Answer (1)

Hint: $K_{a1} > K_{a2} > K_{a3}$

62. Answer (1)

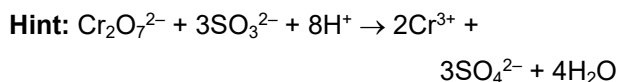
Hint: Lesser is the reduction potential, greater is the reducing power.

63. Answer (4)

Hint: Exothermic reaction favours at low temperature.

Sol.: Since $\Delta n_g < 0$, so high pressure favours the product formation.

64. Answer (3)



$$\text{Sol.: } \frac{n_{Cr_2O_7^{2-}}}{n_{SO_3^{2-}}} = \frac{1}{3} = \frac{\left(\frac{2}{3}\right)}{2}$$

65. Answer (4)

Hint: Addition of inert gas at constant volume does not affect the equilibrium.

66. Answer (3)

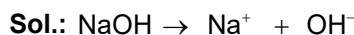
Hint: At equilibrium $K = Q$

$$\text{Sol.: } \Delta G = \Delta G^\circ + RT \ln Q$$

At equilibrium, $Q = K$, $\Delta G = 0$

67. Answer (1)

Hint: $pH = 14 - pOH$



$$0.1 \text{ M} \quad 0.1 \text{ M}$$

$$\Rightarrow pOH = -\log[OH^-] = -\log[0.1] = 1$$

$$\Rightarrow pH = 13$$

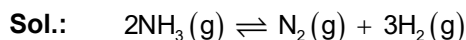
68. Answer (4)

Hint: Ag^+ forms complex with NH_3 .

Sol.: Common ion decreases the solubility of weak electrolyte so solubility of $AgCl$ will not change in presence of $NaNO_3$ as no ion is common.

69. Answer (2)

$$\text{Hint: } K_p = \frac{(P_{N_2})(P_{H_2})^3}{(P_{NH_3})^2}$$



$$\text{eq. } 1-x \quad \frac{x}{2} \quad \frac{3x}{2}, P_T$$

$$\text{Total moles at equilibrium} = 1-x + \frac{x}{2} + \frac{3x}{2} = 1+x$$

$$p_{NH_3} = \left(\frac{1-x}{1+x}\right) P_T, \quad p_{N_2} = \left(\frac{x}{2(1+x)}\right) P_T$$

$$p_{H_2} = \left(\frac{3x}{2(1+x)}\right) P_T$$

At eqbm,

$$K_p = \frac{(p_{N_2}) \cdot (p_{H_2})^3}{(p_{NH_3})^2} = \frac{\left(\frac{x}{2}\right)^1 \left(\frac{3x}{2}\right)^3}{(1-x)^2} \cdot \left(\frac{P_T}{1+x}\right)^{4-2}$$

$$= \frac{27x^4 P_T^2}{16}$$

$$[\because x \ll 1 \therefore 1-x = 1+x \approx 1]$$

70. Answer (1)

Hint: MnO_4^- acts as self indicator

71. Answer (3)

Hint: $K_P = K_C (RT)^{\Delta n_g}$ **Sol.:** • For $2NO_2(g) \rightleftharpoons 2NO(g) + O_2(g)$

$$\Delta n_g = (2+1) - 2 = 1$$

Hence, $K_P = K_C RT = K_C \times 0.0821 \times 300$

$$\Rightarrow K_P > K_C$$

• For $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$ K_C has no unit• For $2Ag_2O(s) \rightleftharpoons 4Ag(s) + O_2(g)$

$$K_P = p_{O_2}$$

• K_C or K_P is affected only by temperature

72. Answer (1)

Hint: $K_C = \frac{[XY_3][Y_2]}{[XY_5]}$ **Sol.:** $XY_5(g) \rightleftharpoons XY_3(g) + Y_2(g)$

initially 10 0 0

eqbm $10(1-\alpha)$ 10α 10α Total moles = $10(1 + \alpha)$

$$\text{At equilibrium, } K_C = \frac{\left(\frac{10\alpha}{2}\right)\left(\frac{10\alpha}{2}\right)}{\left\{\frac{10(1-\alpha)}{2}\right\}}$$

$$= 5 \times \frac{\alpha^2}{1-\alpha} = 1.33 \quad (\alpha = 0.4)$$

73. Answer (4)

Hint: Mixture of weak acid and its salt with strong base can form buffer solution.

74. Answer (1)

Hint: Salts of strong acid with strong base do not undergo salt hydrolysis.

75. Answer (4)

Hint: NH_3 reacts with H_2SO_4 , HCl and $HCOOH$ to form $(NH_4)_2SO_4$, NH_4Cl and $HCOONH_4$ respectively.**Sol.:**

Solution	Moles of H^+	pH
A. 2M H_2SO_4	4 mol	Least
B. 2M HCl	2 mol	More
C. 2 M $HCOOH$	Less than 2 moles	Maximum

76. Answer (4)

Hint: F cannot act as a reducing agent.

77. Answer (2)

Hint: Anionic hydrolysis takes place in of sodium salt of substituted benzoic acid.**Sol.:** $A^-(aq) + H_2O(l) \xrightleftharpoons{K_h} HA(aq) + OH^-(aq)$
eqbm $c(1-h)$ ch ch

$$\text{At equilibrium, } K_h = \frac{(ch)(ch)}{c(1-h)} = \frac{K_w}{K_a} = \frac{10^{-14}}{10^{-4}}$$

Assume, $h \ll 1$

$$K_h = \frac{(ch)^2}{c} \Rightarrow 10^{-10} = \frac{[HA]^2}{0.01}$$

$$\Rightarrow [HA] = 10^{-6} M$$

78. Answer (3)

Hint: Precipitation occurs when $K_{sp} < \text{Ionic product (IP)}$ **Sol.:** $NiS(s) \xrightleftharpoons{K_{sp}} Ni^{2+}(aq) + S^{2-}(aq)$

	K_{sp}	$K_{sp} < IP$
NiS	5×10^{-5}	Precipitation occurs second
CuS	6×10^{-36}	Yes, precipitation occurs first

79. Answer (2)

Hint: In a saturated solution, $K_{sp} = IP$ **Sol.:** $A_2SO_4(s) \rightleftharpoons 2A^+(aq) + SO_4^{2-}(aq)$
 $2x$ x

$$K_{sp} = (2x)^2 x^1 = 4x^3$$

$$\Rightarrow 8 \times 10^{-8} = 4x^3$$

$$\Rightarrow (2)^{1/3} \times 10^{-8/3} = x$$

$$[A^+] = 2x = 2^{4/3} \times 10^{-8/3}$$

80. Answer (2)

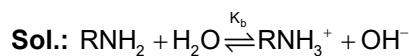
Hint: A Lewis base has the ability to donate an electron pair.

81. Answer (3)

Hint: Balance the atoms as well as charge.**Sol.:** $2MnO_4^- + 10I^- + 16H^+ \rightarrow 2Mn^{2+} + 5I_2 + 8H_2O$

82. Answer (2)

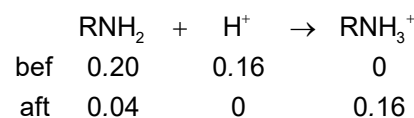
Hint: Comparable quantities of RNH_2 and RNH_3^+ lead to a basic buffer solution.



At equilibrium,

$$K_b = \frac{[\text{RNH}_3^+][\text{OH}^-]}{[\text{RNH}_2]} \quad \dots(1)$$

Also,



$$\text{From (1) : } K_b = \frac{[\text{RNH}_3^+][\text{OH}^-]}{[\text{RNH}_2]}$$

$$\Rightarrow 1 \times 10^{-5} = \frac{0.16}{0.04} [\text{OH}^-]$$

$$\Rightarrow [\text{OH}^-] = 2.5 \times 10^{-6} \text{ M}$$

83. Answer (1)

Hint: This is example of a basic buffer

Sol.: For a basic buffer,

$$\text{pOH} = \text{p}K_b + \log \frac{[\text{salt}]}{[\text{base}]}$$

$$\Rightarrow 5.8 = 4.8 + \log \frac{[\text{salt}]}{[\text{base}]}$$

$$\Rightarrow \frac{[\text{base}]}{[\text{salt}]} = 0.1$$

84. Answer (2)

Hint: Ionization of water is an endothermic process.

$$\text{Sol.: } \log \left(\frac{K_2}{K_1} \right) = \frac{\Delta H^\circ}{2.303R} \left(\frac{T_2 - T_1}{T_1 T_2} \right)$$

$$\therefore \text{pH} = \frac{\text{p}K_w}{2} \text{ for neutral water}$$

$$\Rightarrow \text{p}K_w = 15 \Rightarrow K_w = 10^{-15} < 10^{-14} \text{ at } 298 \text{ K}$$

Hence, temperature has decreased

85. Answer (4)

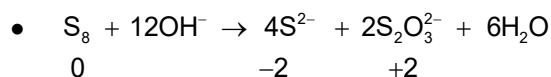
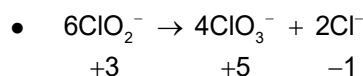
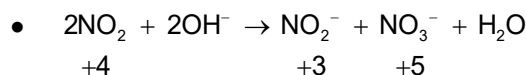
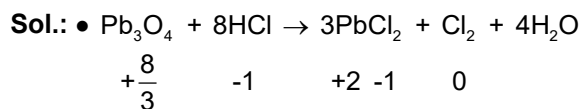
Hint: For a conjugate acid-base pair, $K_w = K_a K_b$

Sol.: $K_w = K_a \cdot K_b$

$$K_b = \frac{10^{-14}}{4 \times 10^{-10}} = 0.25 \times 10^{-4} = 2.5 \times 10^{-5}$$

86. Answer (3)

Hint: When an element in a particular oxidation state is simultaneously oxidized as well as reduced, such reaction is classified as disproportionation redox reaction



87. Answer (4)

Hint: Carbon suboxide is C_3O_2

Sol.: $\text{O} = \text{C} = \text{C} = \text{C} = \text{O}$

88. Answer (3)

Hint: Conjugate acid, base pair differ in one hydrogen atom.

Sol.: NH_3 and $\bar{\text{N}}\text{H}_2$ is a conjugate acid-base pair.

89. Answer (3)

Hint: Oxygen can form oxide, peroxide and superoxide.

90. Answer (1)

Hint: Lower the $\text{p}K_a$ value, more will be the acidic strength.

Sol.: $\text{p}K_a = -\log K_a = 4 - \log 1.8$

so, $\text{p}K_a < 4$

Hence, $\text{W}(\text{p}K_a = 3)$ will be stronger acid than formic acid.

[BIOLOGY]

91. Answer (4)
Hint: Most algae have haplontic life cycle while some others have haplodiplontic life cycle.
Sol.: *Polysiphonia* shows haplodiplontic life cycle while *Chlamydomonas* shows haplontic life cycle.
92. Answer (2)
Hint: All seed bearing plants show diplontic life cycle.
Sol.: Male and female gametophytes of both gymnosperms and angiosperms are reduced, dependent and limited to one or few cells.
93. Answer (3)
Hint: Embryo sac is the female gametophyte of angiosperms.
Sol.: Embryo sac is 7 celled 8 nucleated structure which has 3 celled egg apparatus, 3 antipodal cells and a central cell with two haploid polar nuclei.
94. Answer (1)
Sol.: Water potential of pure water at standard temperature which is not under any pressure is taken as zero.
95. Answer (3)
Hint: Coralloid roots are present in *Cycas*.
Sol.: Cyanobacteria which are in symbiosis with coralloid roots of *Cycas*, have the ability to fix nitrogen.
96. Answer (2)
Sol.: Double fertilisation is a unique feature of angiosperms.
97. Answer (3)
Hint: Gymnosperms have naked seeds.
Sol.: In gymnosperms ovary is absent, ovules are borne on megasporophylls which cluster to form female cones. Embryo sac is not the female gametophyte of gymnosperms. It is present in flowering plants only.
98. Answer (2)
Sol.: Absorption of water by seeds and dry wood is called imbibition.
99. Answer (1)
Hint: Seed bearing plants produce heterospores.
Sol.: Gymnosperms and angiosperms are heterosporous plants.
100. Answer (2)
Hint: Ferns belong to the class Pteropsida.
Sol.: *Adiantum*, a fern belongs to class pteropsida.
101. Answer (3)
Hint: Gametophytes of spermatophytes are reduced and dependent structures.
Sol.: In pteridophytes and bryophytes, gametophytes show independent and free living existence.
102. Answer (1)
Sol.: Endodermis is impervious to water because of the presence of casparian strips which are composed of suberin.
103. Answer (4)
Hint: Main plant body of pteridophytes is diploid.
Sol.: Main plant body of pteridophytes is sporophyte and it is differentiated into root, stem and leaves.
104. Answer (2)
Sol.: The figure is of *Equisetum*.
105. Answer (3)
Hint: Gnetales is the most advanced group of gymnosperms.
Sol.: *Ginkgo*, a living fossil, belongs to most primitive group of gymnosperms i.e. Ginkgoales.
106. Answer (2)
Hint: Surface tension represents a phenomenon which explains that water molecules are attracted to each other in liquid phase more than to water in gas phase.
Sol.: Transpiration → Water loss in form of vapour.
Adhesion → Attraction of water molecules to polar surface
Cohesion → Mutual attraction between water molecules.
107. Answer (3)
Sol.: Bryophytes are called amphibians of plant kingdom because they are land plants but still require water for their reproduction.
108. Answer (2)
Sol.: Events precursor to seed habit first appeared in heterosporous pteridophytes.

109. Answer (3)

Hint: Leafy stage of bryophytes is the gametophyte of mosses while capsule is a part of their sporophyte.

Sol.: Cells of leafy stage of mosses are haploid and cells of capsule are diploid. So if there are eleven chromosomes present in the cells of their leafy stage then in the cells of capsule there will be 22 chromosomes.

110. Answer (2)

Hint: Solute potential is lowering of water potential of a solution.

Sol.: Solute potential of any solution is always negative.

111. Answer (1)

Sol.: Rhizoids of mosses are multicellular and branched.

112. Answer (2)

Hint: Antheridia and archegonia are present in bryophytes and pteridophytes.

Sol. *Chlamydomonas* }
Volvox } Algae
Laminaria }

Marchantia }
Funaria } Bryophytes

Adiantum }
Dryopteris } Pteridophytes

Cycas – Gymnosperms

Both antheridia and archegonia are present in *Marchantia*, *Funaria*, *Adiantum* and *Dryopteris*.

113. Answer (4)

Hint: Mosses have great ecological importance in succession process.

Sol.: Mosses along with lichens are the first organisms to colonise rocks.

114. Answer (1)

Sol.: Calcium is an immobile element.

115. Answer (2)

Sol.: Peat used as fuel is obtained from *Sphagnum*.

116. Answer (1)

Sol.: Artificial classification is based on few observable morphological characters.

117. Answer (2)

Hint: Bentham and Hooker's classification system was a natural classification system.

Sol.: Artificial classification system was given by Linnaeus.

118. Answer (1)

Hint: Cytoplasmic streaming is the movement of cytoplasm.

Sol.: Cytoplasmic streaming can easily be observed in the cells of *Hydrilla* leaves by observing the movement of chloroplasts.

119. Answer (3)

Sol.: *Volvox* is a colonial and motile alga.

120. Answer (4)

Hint: Diplontic life cycle and oogamous reproduction are characteristic features of angiosperms.

Sol.: *Wolffia* being angiosperm show diplontic life cycle and oogamous reproduction. A brown alga, *Fucus* also have these features. *Ectocarpus* show haplodiplontic life cycle while *Spirogyra* show haplontic life cycle.

121. Answer (3)

Hint: Members of chlorophyceae produce motile asexual spores.

Sol.: Phaeophyceae members produce zoospores with two unequal, laterally attached flagella. In rhodophyceae, non-motile spores are produced.

122. Answer (4)

Hint: Passive transport occurs along the concentration gradient.

Sol.: In both simple diffusion and facilitated diffusion, movement of molecules occur along the concentration gradient.

123. Answer (3)

Sol.: *Chlamydomonas* is a unicellular green alga.

124. Answer (3)

Hint: Algin is obtained from brown algae.

Sol.: Carrageen is a phycocolloid obtained from red algae.

125. Answer (4)

Sol.: Red algae lack mobile stages in their life cycle.

126. Answer (1)

Hint: Macrophyllous leaves are present in ferns.

Sol.: *Adiantum*, *Pteris* and *Dryopteris* are ferns. *Lycopodium* belongs to class Lycopsidea and does not have macrophylls.

127. Answer (3)

Sol.: Photosynthetic pigments of brown algae are chlorophyll a and c.

128. Answer (4)

Hint: Both brown and red algae are found in marine habitat, have thalloid body and show sexual reproduction.

Sol.: Cell wall of red algae have polysulphated esters exclusively.

129. Answer (4)

Hint: Prothallus is the monoecious gametophyte of homosporous pteridophytes.

Sol.: Prothallus is inconspicuous, multicellular, haploid, photosynthetic and free living structure.

130. Answer (1)

Hint: Turgor pressure is due to the water content of the cell.

Sol.: Turgor pressure is the pressure of cytoplasm exerted on the cell wall of the cell.

131. Answer (2)

Sol.: Pollen grains in gymnosperms are carried to the opening of ovules by air current.

132. Answer (1)

Hint: Algae are non embryophytes.

Sol.: Embryo formation is observed in bryophytes, pteridophytes, gymnosperms and angiosperms.

133. Answer (1)

Hint: Transpiration leads to passive transport of water.

Sol.: Active absorption of minerals ions is not a function associated with transpiration.

134. Answer (4)

Hint: Loading and unloading of sucrose in phloem is active.

Sol.: Mass flow of sucrose in phloem does not require ATP i.e. passive process.

135. Answer (2)

Hint: Floridean starch is the stored food of red algae.

Sol.: *Porphyra* is a red alga.

136. Answer (4)

Hint: These are called sutures.

Sol.: Fibrous joints in cranium prevent any movement in skull bones.

137. Answer (2)

Hint: This bone helps constitute ribcage.

Sol.: Sternum is a single bone that interacts with ribs to form ribcage to protect lungs.

138. Answer (1)

Hint: Identify a cranial bone.

Sol.: Sphenoid is a single bone that interacts with all cranial bones.

139. Answer (1)

Hint: The number of phalanges in a human hand.

Sol.: There are 14 bones forming the human face. Total number of bones in adult human body is 206. The number of zygomatic bones and mandible is 2 and 1 respectively.

140. Answer (4)

Hint: The given structure is associated with pectoral girdle.

Sol.: Glenoid cavity is a depression in scapula associated with pectoral girdle. Acetabulum articulates with thigh bone.

141. Answer (4)

Hint: Joint permitting movement in only one plane.

Sol.: Hinge joints are synovial joints where convex end of one bone interacts with concave end of the other bone.

142. Answer (2)

Hint: This bone supports the weight of human head.

Sol.: The 9th and 10th pair of ribs are called vertebrochondral ribs. Each half of pectoral girdle comprises one clavicle and one scapula. The number of sacral vertebrae changes from 5 to 1 from foetus to adult stage.

143. Answer (3)

Hint: Tetany results from hypocalcemia.

Sol.: Ribs are bicephalic in man as they have two articulation surfaces on their dorsal end to interact with thoracic vertebrae.

144. Answer (3)

Hint: Locomotion results in displacement.

Sol.: Talking involves movement of muscles but the person does not essentially have to move from one place to another. Change in location occurs if a person walks, climbs and swims.

145. Answer (4)

Hint: The root word 'myo' indicates muscle.

Sol.: Muscular dystrophy is a disorder of muscular system.

146. Answer (1)

Hint: Identify a cartilaginous joint.

Sol.: Synovial joints offer maximum range of movement among which ball and socket joint permits movement in many planes. e.g., joint present between femur and acetabulum.

147. Answer (4)

Hint: This protein has three subunits.

Sol.: Binding of calcium to troponin 'C' subunit unmasks myosin binding site on actin by pulling filamentous tropomyosin away from the binding site.

148. Answer (1)

Hint: This results from inflammation of joints.

Sol.: The accumulation of uric acid crystals leading to inflammation of joints causes simple gout. Myasthenia gravis is a neuromuscular disorder affecting neuromuscular junctions while myelin sheath is damaged in multiple sclerosis.

149. Answer (4)

Hint: Muscle fibres and neurons respond to threshold stimulus.

Sol.: Contractility, extensibility and elasticity are properties exhibited by muscle cells (myocytes).

150. Answer (3)

Hint: Sarcomere is a feature of striated muscle fibres.

Sol.: Smooth/visceral muscle fibres are non striated and uninucleated. Syncytial appearance is a property of skeletal muscle fibres. Gap junctions are present in cardiac and smooth muscle fibres.

151. Answer (2)

Hint: Part of sarcomere with both myosin and actin filaments.

Sol.: A band / anisotropic band remains constant in dimension. The size of H zone, I band and sarcomere decreases during contraction.

152. Answer (2)

Hint: Red muscle fibres are rich in mitochondria.

Sol.: Red muscle fibres contain large quantities of myoglobin. Both type of fibres are unbranched and multinucleated.

153. Answer (4)

Hint: Amoeboid movement occurs in macrophages.

Sol.: Specialised cells in our body such as macrophages in tissues exhibit amoeboid movement through pseudopodia formation.

154. Answer (2)

Hint: Skeletal muscles are voluntary.

Sol.: 'I' represents skeletal muscle e.g., biceps. These muscle fibres are voluntary in nature and have striped appearance.

155. Answer (3)

Hint: This system involves neurotransmitters.

Sol.: Chemicals called neurotransmitters are released at synapses between neurons to facilitate signalling. Endocrine system requires hormones to provide chemical integration.

156. Answer (2)

Hint: This neurotransmitter is released at parasympathetic junctions.

Sol.: In Myasthenia gravis, the immune system produces antibodies that bind to and block receptors for acetylcholine.

157. Answer (1)

Hint: A transmembrane pump.

Sol.: Na^+/K^+ ATPase is the electrogenic transmembrane pump that throws 3 Na^+ ions from axoplasm into ECF in exchange for 2 K^+ ions at expense of one ATP.

158. Answer (3)

Hint: Hyperpolarised neurons have potential lesser than resting membrane potential.

Sol.: -70 mV is the general value of resting membrane potential for a neuron. -55 mV can be the value for threshold potential when a neuron is stimulated.

159. Answer (3)

Hint: Electroencephalogram is a test used to detect electrical activity of brain.

Sol.: EEG helps to evaluate nerve action potentials in the brain.

160. Answer (4)

Hint: All or none principle.

Sol.: Even suprathreshold stimulus evokes an action potential similar to threshold stimulus. Increase in temperature increases the speed of conduction. Diameter of nerve fibre is directly proportional to the transmission of nerve impulse.

161. Answer (4)

Hint: These are involuntary responses of CNS.

Sol.: Reflex actions are very rapid and automatic responses in which same kind of stimulus evokes a short lived response.

162. Answer (1)

Hint: It represents bundle of muscle fibres.

Sol.: Each muscle fibre is enclosed by endomysium. A bundle of muscle fibres is called fascicle which is protected by perimysium. Many bundles along with their blood supply are enclosed by sheath of collagen fibres called epimysium.

163. Answer (3)

Hint: Nissl's granules are involved in protein synthesis.

Sol.: Nissl's granules are combination of RER and ribosomes, hence called site of protein synthesis that are present in dendrites and cell body of neurons.

164. Answer (3)

Hint: Spindle formation is essential for cell division in most animal cells.

Sol.: Centrosome comprises a pair of centrioles that result in formation of spindle to facilitate cell division. Neuron is the structural and functional unit of neural tissue which lacks centrosome.

165. Answer (1)

Hint: This germ layer gives rise to epidermis.

Sol.: Calcium ions are essential for exocytosis of neurotransmitters. Neurons cannot produce stimuli, they respond to it. Somatic neural system relays impulses from CNS to skeletal muscles. Microglial cells of neural tissue are mesodermal in origin.

166. Answer (2)

Hint: A neuron has a cell membrane.

Sol.: Axolemma is the term for neuronal cell membrane in axon region. Schwann cells form myelin sheath in neurons of PNS. Oligodendrocytes form myelin sheath in neurons of CNS.

167. Answer (4)

Hint: A single process arises from the cell body and then bifurcates.

Sol.: Bipolar neurons characteristically found in neuro sensory epithelium of nose, eye and ear. Apolar neurons are found in cnidarians. Unipolar neurons are found usually in embryonic stage.

168. Answer (1)

Hint: Trained but involuntary response.

Sol.: Memory indicates prior exposure to a certain food which evokes a response. The other options listed are unconditioned reflexes / responses.

169. Answer (1)

Hint: Monosynaptic reflex.

Sol.: In this patellar reflex, a kicking response is seen. Motor end plate is the effector while muscle spindle is the receptor. Only two neurons are involved in knee jerk reflex.

170. Answer (3)

Hint: Hunger center also lies in this part of brain.

Sol.: Hypothalamus part of forebrain houses center for hunger, thirst, satiety and pleasure. Medulla oblongata harbours centers for controlling vomiting, respiration etc.

171. Answer (3)

Hint: It is present in forebrain.

Sol.: A bundle of axons is termed tract in CNS while it is called a nerve in PNS. Cerebral aqueduct and Crura cerebri are present in midbrain whereas vermis connects the two cerebellar hemispheres.

172. Answer (3)

Hint: Organ of sight.

Sol.: Optic nerve exits from the eye and relays information to forebrain.

173. Answer (1)

Hint: Sympathetic system operates dominantly in situation of fright / fear / flight.

Sol.: Sweat glands are not innervated by parasympathetic fibres. Pupillary constriction is a parasympathetic stimulus. Sympathetic stimulation results in bronchial dilation to facilitate breathing.

174. Answer (2)

Hint: The brain exits the skull through the largest foramen in skull.

Sol.: Foramen of Magendie and Luschka provide route for passage of CSF from metacoel into subarachnoid space.

175. Answer (1)

Hint: It is a part of limbic system.

Sol.: Hippocampus converts short term memory to long term. Amygdala is involved in expression of emotion e.g., rage.

176. Answer (2)

Hint: Ventral horn of the spinal cord.

Sol.: Grey matter of spinal cord is produced into posterior/dorsal horns that are sensory in function. Anterior/ventral horn is motor in nature.

177. Answer (2)

Hint: Arbor vitae.

Sol.: Cerebellum is a part of hindbrain.

178. Answer (2)

Hint: This part is major coordinating centre for sensory and motor signalling.

Sol.: Reticular activating system (RAS) is the gatekeeper of consciousness.

179. Answer (3)

Hint: Connexons/Gap junctions play a key part in these synapses.

Sol.: Electrical synapses are effective due to the presence of gap junctions. They do not involve the use of neurotransmitters and permit bidirectional flow of ions.

180. Answer (1)

Hint: Innermost meninx.

Sol.: Piamater is continuous with the surface of the brain. Duramater is the outermost meninx. Subdural space is the space present between duramater & arachnoid. Arachnoid and duramater do not follow all irregularities (gyri, sulci and fissures) of brain.



All India Aakash Test Series for Medical - 2021

TEST - 4 (Code-D)

Test Date : 29/12/2019

ANSWERS

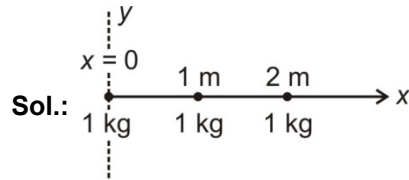
1. (3)	37. (4)	73. (4)	109. (2)	145. (3)
2. (4)	38. (3)	74. (1)	110. (1)	146. (3)
3. (3)	39. (1)	75. (1)	111. (2)	147. (1)
4. (2)	40. (3)	76. (4)	112. (1)	148. (1)
5. (1)	41. (3)	77. (2)	113. (4)	149. (4)
6. (2)	42. (4)	78. (3)	114. (2)	150. (2)
7. (3)	43. (1)	79. (2)	115. (1)	151. (1)
8. (1)	44. (2)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

HINTS & SOLUTIONS

[PHYSICS]

1. Answer (3)

Hint: Use principle of superposition, $\vec{F}_1 = \vec{F}_{12} + \vec{F}_{13}$



$$F_1 = Gm^2 \left(\frac{1}{1^2} + \frac{1}{2^2} \right)$$

Hence $F_1 = \frac{5G}{4}$

2. Answer (4)

Hint & Sol.: Gravitational field intensity due to a spherical shell is zero for $r < R$.

3. Answer (3)

Hint: Use $U = -\frac{GMm}{r}$

Sol.: $\Delta U = -\frac{GMm}{2R_e} - \left(-\frac{GMm}{R_e} \right) = \left(\frac{GM_e m}{2R_e} \right)$

$$= \frac{mgR_e}{2} = 50gR_e$$

4. Answer (2)

Hint: At height h ,

$$g = \frac{GM}{(R_e + h)^2}$$

Sol.: $g' = \frac{gR_e^2}{(R_e + h)^2}$

so, $mg' = \frac{120 \times R_e^2}{\left(\frac{3R_e}{2} \right)^2}$

$$W' = \frac{480}{9} = \frac{160}{3} \text{ N}$$

5. Answer (1)

Hint & Sol.: When energy of the body planet system is positive then system becomes unbounded and body will escape out the planet.

6. Answer (2)

Hint: $V = -\frac{GM}{r}$ and $g = \frac{GM}{r^2}$

Sol.: $\frac{V}{g} = \frac{-\frac{GM}{r}}{\frac{GM}{r^2}} = -r$

$$\Rightarrow -r = \frac{-4.5 \times 10^7}{5.0}$$

$$\Rightarrow r = 9 \times 10^6 \text{ m} = 9000 \text{ km}$$

$$R + h = 9000$$

$$h = (9000 - 6000) \text{ km}$$

$$h = 3000 \text{ km}$$

7. Answer (3)

Hint: Use $\vec{T} = -\frac{\partial V}{\partial x} \hat{i} - \frac{\partial V}{\partial y} \hat{j} - \frac{\partial V}{\partial z} \hat{k}$

Sol.: $V = -(x^2 + y^2 + z^2) \text{ J/kg}$

$$I_x = -\frac{\partial V}{\partial x} = +2x$$

$$I_y = -\frac{\partial V}{\partial y} = +2y$$

$$I_z = -\frac{\partial V}{\partial z} = +2z$$

$$\vec{T} = I_x \hat{i} + I_y \hat{j} + I_z \hat{k} = 2x\hat{i} + 2y\hat{j} + 2z\hat{k}$$

$$\vec{T}(1, 1, 0) = (2\hat{i} + 2\hat{j}) \text{ N/kg}$$

8. Answer (1)

Hint: Use energy conservation method

Sol.: $\frac{1}{2}mv^2 - \frac{GMm}{R} = -\frac{GMm}{16R} + 0$

$$\frac{1}{2}mv^2 = \frac{GMm}{R} \left(1 - \frac{1}{16} \right)$$

$$v^2 = \frac{15GM}{8R}$$

$$v = \sqrt{\frac{15GM}{8R}}$$

9. Answer (2)

Hint: $v = \sqrt{\frac{GM}{R+h}}$

Sol.: Near earth surface

$$v = \sqrt{\frac{GM}{R}}$$

At altitude $8R$

$$v' = \sqrt{\frac{GM}{9R}} = \frac{1}{3}v = \frac{v}{3}$$

10. Answer (4)

Hint: $g_{\text{depth}} = g_0 \left(1 - \frac{h}{R_e}\right)$

and $g_{\text{height}} = g_0 \left(1 - \frac{2h}{R_e}\right)$ (If $h \ll R_e$)

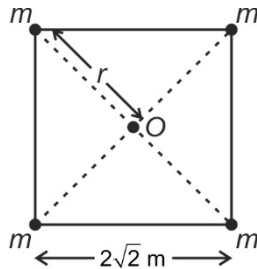
Sol.: For same value of depth and height, decrement in g is greater at height for $h \ll R_e$.

Hence $W_2 > W_1 > W_3$

11. Answer (4)

Hint: $V = \frac{-GM}{r}$

Sol.: $V_0 = V_1 + V_2 + V_3 + V_4$



$$V_0 = \frac{-Gm}{r} \times 4$$

$$= -G \times \frac{2}{2} \times 4 = -4G$$

12. Answer (2)

Hint: $T^2 \propto R^3$

Sol.: $\frac{T_1}{T_2} = \left(\frac{R_1}{R_2}\right)^{\frac{3}{2}}$

$$\frac{6}{T} = \left(\frac{R}{4R}\right)^{\frac{3}{2}} = \left(\frac{1}{2}\right)^{\frac{3}{2}}$$

$$T = 48 \text{ h}$$

13. Answer (1)

Hint: $g = g_p - R\omega^2 \cos^2 \lambda$

Sol.: if $\omega = 0$ then value of g increases at all the places except at poles.

14. Answer (3)

Hint: $v_e = R_e \sqrt{\frac{4}{3} \pi \rho G}$

Sol.: $\frac{v_e}{v'_e} = \frac{R_e \sqrt{\rho}}{\frac{R_e}{2} \cdot \sqrt{2\rho}} = \frac{1}{\sqrt{2}}$

$$v'_e = \frac{v_e}{\sqrt{2}}$$

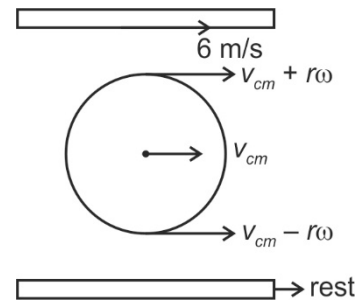
15. Answer (4)

Hint & Sol.: Kepler's law of area is consequence of conservation of angular momentum

16. Answer (1)

Hint: For pure rolling there should not be slipping at contact points.

Sol.: $v_{cm} + r\omega = 6$



$$v_{cm} = r\omega$$

$$\Rightarrow v_{cm} = \frac{6}{2} = 3 \text{ m/s}$$

17. Answer (1)

Hint: $t_{\text{roll}} = \sqrt{\frac{2h}{g \sin^2 \theta} \left(1 + \frac{k^2}{R^2}\right)}$

and $t_{\text{slide}} = \sqrt{\frac{2h}{g \sin^2 \theta}}$

Sol.: $\frac{t_{\text{slide}}}{t_{\text{rolling}}} = \frac{1}{\sqrt{1 + \frac{k^2}{R^2}}}$

for ring $\frac{t_s}{t_r} = \frac{1}{\sqrt{1+1}} = \frac{1}{\sqrt{2}}$

18. Answer (2)

Hint: Use angular conservation

Sol.: ($\because M = 2m$)

$$mu \frac{L}{2} = \frac{ML^2}{12} \times \omega$$

$$\omega = \frac{mu \frac{L}{2}}{\frac{2mL^2}{12}} = \frac{3u}{L}$$

19. Answer (2)

Hint: $P_{\text{inst}} = \vec{\tau} \cdot \vec{\omega}$

Sol.: $P_{\text{ins}} = \tau \cdot \omega \cdot \cos \theta = 10 \times 30 \times \cos 0^\circ = 300 \text{ W}$

20. Answer (1)

Hint: $\frac{1}{2} I_{\text{cm}} \omega^2 = \frac{40}{100} \left(\frac{1}{2} m v^2 \right) = \frac{2}{5} \left(\frac{1}{2} m v^2 \right)$

Sol.: $\frac{1}{2} I_{\text{cm}} \omega^2 = \frac{2}{5} \times \frac{1}{2} m v^2$

or, $I_{\text{cm}} \frac{v^2}{r^2} = \frac{2}{5} m v^2$

or, $I_{\text{cm}} = \frac{2}{5} m r^2$

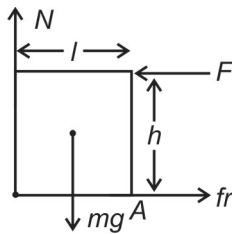
so, body is solid sphere.

21. Answer (3)

Hint: For rotational equilibrium $\Sigma \tau = 0$

Sol.: $\tau_A = F_{\text{min}} h - mg \cdot \frac{l}{2} = 0$

$F_{\text{min}} = \frac{mgl}{2h}$



22. Answer (1)

Hint: $t = \sqrt{\frac{2h}{g \sin \theta} \left(1 + \frac{k^2}{R^2} \right)}$

Sol.: time $\propto \sqrt{1 + \frac{k^2}{R^2}}$

Hence, time to reach the bottom will be minimum for solid sphere and maximum for hollow cylinder.

23. Answer (1)

Hint: Use $v_{\text{cm}} = \sqrt{\frac{2gh}{1 + \frac{k^2}{R^2}}}$

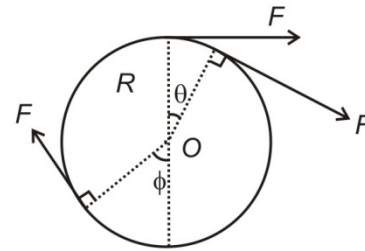
Sol.: $v_{\text{cm}} = \sqrt{\frac{2gh}{1+1}} = \sqrt{gh}$

24. Answer (3)

Hint: Use $\vec{\tau} = \vec{r} \times \vec{F}$

Sol.: $\vec{\tau}_0 = \vec{R} \times \vec{F}_1 + \vec{R} \times \vec{F}_2 + \vec{R} \times \vec{F}_3$

$|\vec{\tau}_0| = 3FR$



25. Answer (1)

Hint: $r_{\text{r.m.s}} = \sqrt{\frac{r_1^2 + r_2^2 + r_3^2 + r_4^2 + r_5^2}{5}}$

Sol.: $I = \Sigma m_i r_i^2$

$= m(r_1^2 + r_2^2 + r_3^2 + r_4^2 + r_5^2)$

$= m \cdot (5r_{\text{rms}}^2) = 1 \times 5 \times 6^2 = 180 \text{ kg m}^2$

26. Answer (1)

Hint: Use energy conservation

Sol.: $mgh = \frac{1}{2} I \omega^2$

$mg \frac{L}{2} \sin \theta = \frac{1}{2} \frac{mL^2}{3} \cdot \omega^2$

$\frac{3g}{L} \sin \theta = \omega^2$

$\omega = \sqrt{\frac{3g \sin \theta}{L}}$

27. Answer (2)

Hint: $L = \frac{2}{5} mR^2 \omega$ and $L \Rightarrow$ conserved

Sol.: $\% \frac{\Delta R}{R} = \frac{1}{3} \frac{\Delta V}{V} \times 100 = \frac{1}{3} \times 3 = 1\%$

Now, $\frac{\Delta L}{L} \times 100 = 2 \frac{\Delta R}{R} \times 100 + \frac{\Delta \omega}{\omega} \times 100 + \frac{\Delta m}{m} \times 100$

$0 = 2 \times 1\% + \frac{\Delta \omega}{\omega} \times 100 + 0$

$\frac{\Delta \omega}{\omega} \times 100 = -2\%$

28. Answer (1)

Hint: Use $T = \sqrt{\frac{2h}{g \sin^2 \theta} \left(1 + \frac{k^2}{R^2} \right)}$

$$\text{Sol.: } \frac{T_{\text{sphere}}}{T_{\text{disc}}} = \frac{\sqrt{1 + \left(\frac{k}{R}\right)_{\text{sphere}}^2}}{\sqrt{1 + \left(\frac{k}{R}\right)_{\text{disc}}^2}}$$

$$= \frac{\sqrt{1 + \frac{2}{5}}}{\sqrt{1 + \frac{1}{2}}} = \frac{\sqrt{\frac{7}{5}}}{\sqrt{\frac{3}{2}}} = \sqrt{\frac{14}{15}}$$

29. Answer (4)

Hint: $I = mk^2$ and $I = I_{cm} + md^2$

Sol.: $mk^2 = I_{cm} + md^2$

$$I_{cm} = m(k^2 - d^2)$$

$$mk^2 = m(k^2 - d^2)$$

$$k' = \sqrt{k^2 - d^2} = \sqrt{10^2 - 6^2} = 8 \text{ cm}$$

30. Answer (4)

Hint: $n = \frac{\theta}{2\pi}$ and $\theta = \frac{1}{2}(\omega_0 + \omega)t$

Sol.: Given $\omega_0 = 1200 \text{ rpm} = 40\pi \text{ rad/s}$

$$\omega = 3120 \text{ rpm} = 104\pi \text{ rad/s}$$

$$\frac{1}{2}(40\pi + 104\pi) = 1152\pi$$

$$n = \frac{1152\pi}{2\pi} = 576 \text{ revolutions}$$

31. Answer (1)

Hint: At equilibrium $\Sigma F = 0$, $\Sigma \tau = 0$

Sol.: $R_A + R_B = w + w_1$

$$= 60 + 100$$

$$R_A + R_B = 160 \text{ N} \quad \dots(1)$$

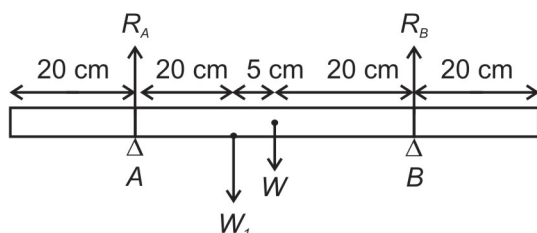
Take moment about A

$$\tau_A = 100 \times 0.2 + 60 \times 0.25 - R_B \times 0.5$$

$$35 - \frac{R_B}{2} = 0$$

$$R_B = 70 \text{ N}$$

$$R_A = 160 - 70 = 90 \text{ N}$$



32. Answer (2)

Hint: Torque $\vec{\tau} = \Sigma(\vec{r}_i \times \vec{F}_i)$

Sol.: $\vec{\tau} = \vec{r}_A \times (-\vec{F}) + \vec{r}_B \times \vec{F}$

$$= -(\vec{r}_A - \vec{r}_B) \times \vec{F}$$

$$= \vec{F} \times (\vec{r}_A - \vec{r}_B)$$

33. Answer (3)

Hint: Use angular momentum $\vec{L} = \vec{r} \times \vec{p}$

$$\text{Sol.: } \vec{L} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ x & y & z \\ p_x & p_y & p_z \end{vmatrix}$$

$$= \hat{i}(yp_z - zp_y) - \hat{j}(xp_z - zp_x) + \hat{k}(xp_y - yp_x)$$

Hence, y component of $\vec{L} = zp_x - xp_z$

34. Answer (4)

Hint: Moment of inertia of ring about its axis is mR^2

Sol.: Mass of complete ring = M

$$\text{Mass of incomplete ring (m)} = M - \frac{M}{6} = \frac{5M}{6}$$

$$I_{\text{ring}} = mR^2 = \frac{5MR^2}{6}$$

35. Answer (2)

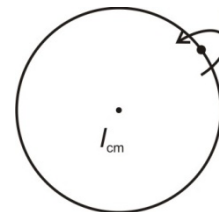
Hint: Parallel axis theorem

Sol.: $I = I_{cm} + md^2$

here $d = R$

$$I = mR^2 + mR^2$$

$$= 2mR^2$$



36. Answer (2)

Hint: Torque ($\vec{\tau}$) = $\frac{d\vec{L}}{dt}$

Sol.: If $\vec{\tau} = 0 \Rightarrow \frac{d\vec{L}}{dt} = 0$

$$\vec{L} = \text{constant}$$

37. Answer (4)

Hint: In case of pure rolling $v = R\omega$

Sol.: $\vec{v}_A = \vec{v}_{cm} + \vec{r}\omega$

$$= v_{cm} + \frac{R\omega}{2}$$

$$= \frac{3}{2}v_{cm}$$

38. Answer (3)

Hint: Use $|\vec{A} \times \vec{B}| = AB \sin \theta$ and $|\vec{A} \cdot \vec{B}| = AB \cos \theta$

Sol.: Given $|\vec{A} \times \vec{B}| = \frac{1}{\sqrt{3}} \vec{A} \cdot \vec{B}$

$$AB \sin \theta = \frac{1}{\sqrt{3}} AB \cos \theta$$

$$\tan \theta = \frac{1}{\sqrt{3}}$$

$$\theta = 30^\circ$$

Now, $|\vec{A} - \vec{B}| = \sqrt{A^2 + B^2 - 2AB \cos \theta}$

$$= (A^2 + B^2 - AB\sqrt{3})^{\frac{1}{2}}$$

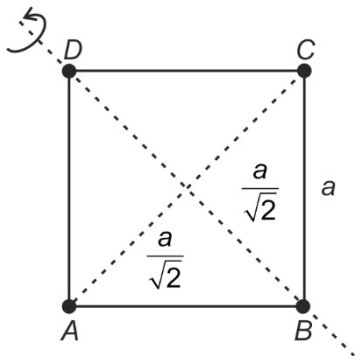
39. Answer (1)

Hint: $I = \sum m_i r_i^2$

Sol.: $I = I_A + I_B + I_C + I_D$

$$= m \left(\frac{a}{\sqrt{2}} \right)^2 + 0 + m \left(\frac{a}{\sqrt{2}} \right)^2 + 0$$

$$= ma^2$$



40. Answer (3)

Hint: $\vec{L} = (\vec{r} \times \vec{p})$

Sol.: Angular momentum of the particle about origin will be same because perpendicular distance from origin remains same

41. Answer (3)

Hint: Moment of inertia depends on mass and effective distance from axis of rotation.

Sol.: From the figure shown, effective distance of mass is farthest from the axis 3.

42. Answer (4)

Hint: Use $\tau = I\alpha$ and $\alpha = \frac{d\omega}{dt} = \frac{d^2\theta}{dt^2}$

Sol.: $\theta(t) = 2t^3 - 9t^2$

$$\omega(t) = 6t^2 - 18t$$

$$\alpha(t) = 12t - 18$$

$$\because \tau = 0 \text{ when } \alpha = 0$$

$$\text{i.e. } 12t - 18 = 0$$

$$t = \frac{3}{2} \text{ s}$$

$$\omega \left(t = \frac{3}{2} \text{ s} \right) = 6 \times \left(\frac{3}{2} \right)^2 - 18 \times \frac{3}{2}$$

$$= \frac{27}{2} - \frac{54}{2} = \frac{-27}{2} = -13.5 \text{ rad/s}$$

43. Answer (1)

Hint: Moment of inertia $I = Mk^2$

Sol.: Given $I = \frac{5MR^2}{2}$

$$Mk^2 = \frac{5}{2}MR^2$$

$$k = \sqrt{\frac{5}{2}}R$$

44. Answer (2)

Hint: Use $\vec{\tau} = \vec{r} \times \vec{F}$

Sol.: $\vec{\tau} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & 0 & 4 \\ 2 & -4 & -1 \end{vmatrix}$

$$= \hat{i}(16) - \hat{j}(-2-8) + \hat{k}(-8)$$

$$= (16\hat{i} + 10\hat{j} - 8\hat{k}) \text{ N m}$$

45. Answer (3)

Hint: Use $\vec{v} = \vec{\omega} \times \vec{r}$

Sol.: Angle between \vec{r} and $\vec{\omega}$ is 90°

Hence $v = r\omega$

$$\omega = \frac{v}{r} = \frac{4}{0.5}$$

$$= 8 \text{ rad/s}$$

[CHEMISTRY]

46. Answer (1)

Hint: Lower the pK_a value, more will be the acidic strength.**Sol.:** $pK_a = -\log K_a = 4 - \log 1.8$ so, $pK_a < 4$ Hence, $W(pK_a = 3)$ will be stronger acid than formic acid.

47. Answer (3)

Hint: Oxygen can form oxide, peroxide and superoxide.

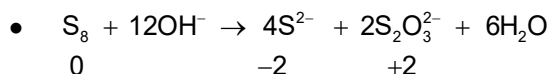
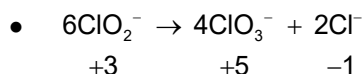
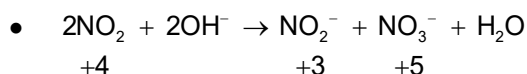
48. Answer (3)

Hint: Conjugate acid, base pair differ in one hydrogen atom.**Sol.:** NH_3 and $\bar{N}H_2$ is a conjugate acid-base pair.

49. Answer (4)

Hint: Carbon suboxide is C_3O_2 **Sol.:** $O = C = C = C = O$

50. Answer (3)

Hint: When an element in a particular oxidation state is simultaneously oxidized as well as reduced, such reaction is classified as disproportionation redox reaction**Sol.:** $\bullet Pb_3O_4 + 8HCl \rightarrow 3PbCl_2 + Cl_2 + 4H_2O$ 

51. Answer (4)

Hint: For a conjugate acid-base pair, $K_w = K_a K_b$ **Sol.:** $K_w = K_a \cdot K_b$

$$K_b = \frac{10^{-14}}{4 \times 10^{-10}} = 0.25 \times 10^{-4} = 2.5 \times 10^{-5}$$

52. Answer (2)

Hint: Ionization of water is an endothermic process.

$$\text{Sol.} \log \left(\frac{K_2}{K_1} \right) = \frac{\Delta H^\circ}{2.303R} \left(\frac{T_2 - T_1}{T_1 T_2} \right)$$

$$\therefore pH = \frac{pK_w}{2} \text{ for neutral water}$$

$$\Rightarrow pK_w = 15 \Rightarrow K_w = 10^{-15} < 10^{-14} \text{ at } 298 \text{ K}$$

Hence, temperature has decreased

53. Answer (1)

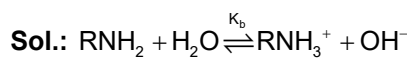
Hint: This is example of a basic buffer**Sol.:** For a basic buffer,

$$pOH = pK_b + \log \frac{[\text{salt}]}{[\text{base}]}$$

$$\Rightarrow 5.8 = 4.8 + \log \frac{[\text{salt}]}{[\text{base}]}$$

$$\Rightarrow \frac{[\text{base}]}{[\text{salt}]} = 0.1$$

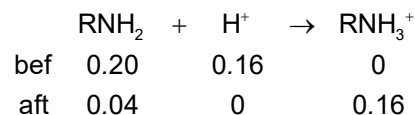
54. Answer (2)

Hint: Comparable quantities of RNH_2 and RNH_3^+ lead to a basic buffer solution.

At equilibrium,

$$K_b = \frac{[RNH_3^+][OH^-]}{[RNH_2]} \quad \dots(1)$$

Also,



$$\text{From (1): } K_b = \frac{[RNH_3^+][OH^-]}{[RNH_2]}$$

$$\Rightarrow 1 \times 10^{-5} = \frac{0.16}{0.04} [OH^-]$$

$$\Rightarrow [OH^-] = 2.5 \times 10^{-6} \text{ M}$$

55. Answer (3)

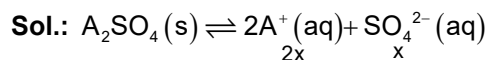
Hint: Balance the atoms as well as charge.

56. Answer (2)

Hint: A Lewis base has the ability to donate an electron pair.

57. Answer (2)

Hint: In a saturated solution, $K_{sp} = IP$



$$K_{sp} = (2x)^2x^1 = 4x^3$$

$$\Rightarrow 8 \times 10^{-8} = 4x^3$$

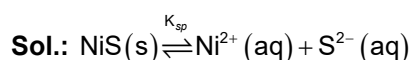
$$\Rightarrow (2)^{1/3} \times 10^{-8/3} = x$$

$$[A^+] = 2x = 2^{4/3} \times 10^{-8/3}$$

58. Answer (3)

Hint: Precipitation occurs when

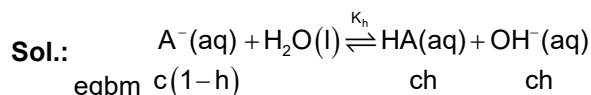
$K_{sp} < \text{Ionic product (IP)}$



	K_{sp}	$K_{sp} < IP$
NiS	5×10^{-5}	Precipitation occurs second
CuS	6×10^{-36}	Yes, precipitation occurs first

59. Answer (2)

Hint: Anionic hydrolysis takes place in of sodium salt of substituted benzoic acid.



$$\text{At equilibrium, } K_h = \frac{(ch)(ch)}{c(1-h)} = \frac{K_w}{K_a} = \frac{10^{-14}}{10^{-4}}$$

Assume, $h \ll 1$

$$K_h = \frac{(ch)^2}{c} \Rightarrow 10^{-10} = \frac{[HA]^2}{0.01}$$

$$\Rightarrow [HA] = 10^{-6} M$$

60. Answer (4)

Hint: F cannot act as a reducing agent.

61. Answer (4)

Hint: NH_3 reacts with H_2SO_4 , HCl and $HCOOH$ to form $(NH_4)_2SO_4$, NH_4Cl and $HCOONH_4$ respectively.

Sol.:

Solution	Moles of H^+	pH
A. 2M H_2SO_4	4 mol	Least
B. 2M HCl	2 mol	More
C. 2 M $HCOOH$	Less than 2 moles	Maximum

62. Answer (1)

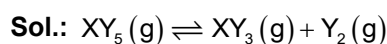
Hint: Salts of strong acid with strong base do not undergo salt hydrolysis.

63. Answer (4)

Hint: Mixture of weak acid and its salt with strong base can form buffer solution.

64. Answer (1)

$$\text{Hint: } K_c = \frac{[XY_3][Y_2]}{[XY_5]}$$



$$\begin{array}{cccc} \text{initially} & 10 & 0 & 0 \\ \text{eqbm} & 10(1-\alpha) & 10\alpha & 10\alpha \end{array}$$

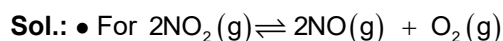
$$\text{Total moles} = 10(1 + \alpha)$$

$$\text{At equilibrium, } K_c = \frac{\left(\frac{10\alpha}{2}\right)\left(\frac{10\alpha}{2}\right)}{\left[\frac{10(1-\alpha)}{2}\right]}$$

$$= 5 \times \frac{\alpha^2}{1-\alpha} = 1.33 \quad (\alpha = 0.4)$$

65. Answer (3)

$$\text{Hint: } K_p = K_c (RT)^{\Delta n_g}$$



$$\Delta n_g = (2+1) - 2 = 1$$

$$\text{Hence, } K_p = K_c RT = K_c \times 0.0821 \times 300$$

$$\Rightarrow K_p > K_c$$

- For $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$ K_c has no unit

- For $2Ag_2O(s) \rightleftharpoons 4Ag(s) + O_2(g)$

$$K_p = p_{O_2}$$

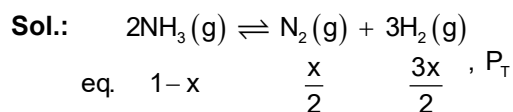
- K_c or K_p is affected only by temperature

66. Answer (1)

Hint: MnO_4^- acts as self indicator

67. Answer (2)

Hint:
$$K_p = \frac{(P_{\text{N}_2})(P_{\text{H}_2})^3}{(P_{\text{NH}_3})^2}$$



Total moles at equilibrium = $1-x + \frac{x}{2} + \frac{3x}{2} = 1+x$

$$P_{\text{NH}_3} = \left(\frac{1-x}{1+x}\right)P_T, \quad P_{\text{N}_2} = \left(\frac{x}{2(1+x)}\right)P_T$$

$$P_{\text{H}_2} = \left(\frac{3x}{2(1+x)}\right)P_T$$

At eqbm,

$$K_p = \frac{(P_{\text{N}_2}) \cdot (P_{\text{H}_2})^3}{(P_{\text{NH}_3})^2} = \frac{\left(\frac{x}{2}\right)^1 \left(\frac{3x}{2}\right)^3}{(1-x)^2} \cdot \left(\frac{P_T}{1+x}\right)^{4-2}$$

$$= \frac{27x^4 P_T^2}{16}$$

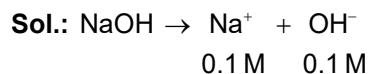
$$[\because x \ll 1 \therefore 1-x = 1+x \approx 1]$$

68. Answer (4)

Hint: Ag^+ forms complex with NH_3 .

Sol.: Common ion decreases the solubility of weak electrolyte so solubility of AgCl will not change in presence of NaNO_3 as no ion is common.

69. Answer (1)

Hint: $\text{pH} = 14 - \text{pOH}$


$$\Rightarrow \text{pOH} = -\log[\text{OH}^-] = -\log[0.1] = 1$$

$$\Rightarrow \text{pH} = 13$$

70. Answer (3)

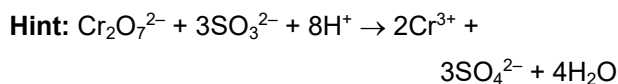
Hint: At equilibrium $K = Q$
Sol.: $\Delta G = \Delta G^\circ + RT \ln Q$

 At equilibrium, $Q = K, \Delta G = 0$

71. Answer (4)

Hint: Addition of inert gas at constant volume does not affect the equilibrium.

72. Answer (3)



Sol.:
$$\frac{n_{\text{Cr}_2\text{O}_7^{2-}}}{n_{\text{SO}_3^{2-}}} = \frac{1}{3} = \frac{\left(\frac{2}{3}\right)}{2}$$

73. Answer (4)

Hint: Exothermic reaction favours at low temperature.

Sol.: Since $\Delta n_g < 0$, so high pressure favours the product formation.

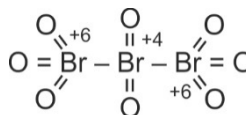
74. Answer (1)

Hint: Lesser is the reduction potential, greater is the reducing power.

75. Answer (1)

Hint: $K_{a_1} > K_{a_2} > K_{a_3}$

76. Answer (4)

Hint: Structure of Br_3O_8 is

Sol.: $\text{BrO}^- \quad \text{BrO}_3^- \quad \text{BrO}_4^-$

$+1 \quad +5 \quad +7$

77. Answer (2)

Hint: $\text{pH} = 7 + \frac{1}{2} (\text{p}K_a - \text{p}K_b)$

78. Answer (3)

Hint: If $K_{\text{eq}} < 10^{-3}$ then extent of reaction is negligible

Sol.: At equilibrium, the system lies largely in the favour of reactants.

79. Answer (2)

Hint: At equilibrium, rate of forward reaction is equal to rate of backward reaction.

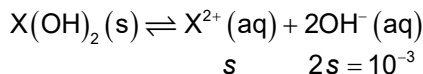
80. Answer (2)

Hint: In SO_3 sulphur is in its maximum oxidation state, so it cannot act as a reducing agent.

81. Answer (1)

Hint: $[\text{OH}^-] = 10^{-\text{pOH}}$

Sol.: $\text{pOH} = 14 - 11 = 3 \Rightarrow [\text{OH}^-] = 10^{-3}$



At equilibrium,

$$K_{sp} = [\text{X}^{2+}][\text{OH}^-]^2 = \left(\frac{1}{2} \times 10^{-3}\right)(10^{-3})^2$$

$$K_{sp} = 5 \times 10^{-10}$$

82. Answer (4)

Hint: Salt of strong acid and weak base will have lowest pH.

Sol.: NaBr : Salt of S.A. + S.B.

CH₃COONa : Salt of W.A + S.B.

(NH₄)₂SO₄ : Salt of S.A. + W.B.

83. Answer (1)

Hint: $\log \frac{K_2}{K_1} = \frac{\Delta H^\circ}{2.303R} \left(\frac{T_2 - T_1}{T_2 T_1} \right)$

Sol.: Endothermic $\Leftrightarrow \Delta H^\circ > 0$

When T increases,

$$\Rightarrow \log \frac{K_2}{K_1} > 0 \Rightarrow K_2 > K_1$$

84. Answer (3)

Hint: For neutral molecules, net charge = 0.

Sol.: $\text{Na}_2\text{S}_2\text{O}_3 \Rightarrow 2 \times 1 + 2 \times a + 3x(-2) = 0 \Rightarrow a = 2$

$\text{SF}_6 \Rightarrow a + 6x(-1) \Rightarrow a = 6$

$\text{SO}_2 \Rightarrow a + 2x(-2) \Rightarrow a = 4$

85. Answer (4)

Hint: $M = \frac{M_1V_1 + M_2V_2}{V_1 + V_2}$

Sol.: $[\text{H}^+] = \frac{0.01 \times 2 \times V + 0.1 \times V}{2V}$

$$= \frac{0.02 + 0.1}{2} = 0.06 \text{ M}$$

$$\text{pH} = -\log[\text{H}^+] = -\log(0.06) = 1.22$$

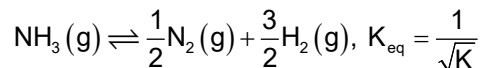
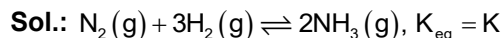
86. Answer (2)

Hint: An acidic buffer requires presence of a weak acid and its salt with strong base in the same solution.

Sol.: H₂SO₄ is a strong acid. Hence, NaHSO₄ + H₂SO₄ is not an acidic buffer.

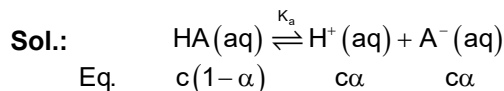
87. Answer (3)

Hint: Factor, with which reaction is multiplied, becomes the power of K



88. Answer (1)

Hint: $\alpha = 0.40$, it is comparable to 1 (unity).



$$K_a = \frac{(c\alpha)(c\alpha)}{c(1-\alpha)} = \frac{c\alpha^2}{1-\alpha}$$

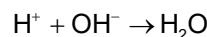
$$= \frac{0.2 \times (0.4)^2}{0.6} = 5.33 \times 10^{-2}$$

89. Answer (1)

Hint: H⁺ ions are neutralized by OH⁻

Sol.: mmol of OH⁻ = $40 \times \frac{1}{4} = 10$

$$\text{mmol of H}^+ = \left(50 \times \frac{1}{5}\right) + \left(10 \times \frac{1}{2}\right) = 15$$



(i) 15 10 -

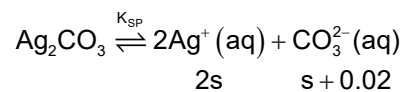
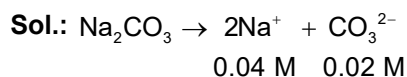
(f) 5 0

$$[\text{H}^+]_f = \frac{5 \text{ mmol}}{500 \text{ mL}} = 0.01 \text{ M}$$

$$\Rightarrow \text{pH} = -\log 0.01 = 2$$

90. Answer (4)

Hint: Due to common ion effect solubility decreases.



$$K_{sp} = [\text{Ag}^+]^2 [\text{CO}_3^{2-}] = (2s)^2 (s + 0.02)^1$$

Since $0.02 \gg s \Rightarrow s + 0.02 \approx 0.02$

$$8 \times 10^{-12} = 4s^2 \times 0.02 \Rightarrow s = 10^{-5} \text{ M}$$

[BIOLOGY]

91. Answer (2)
Hint: Floridean starch is the stored food of red algae.
Sol.: *Porphyra* is a red alga.
92. Answer (4)
Hint: Loading and unloading of sucrose in phloem is active.
Sol.: Mass flow of sucrose in phloem does not require ATP i.e. passive process.
93. Answer (1)
Hint: Transpiration leads to passive transport of water.
Sol.: Active absorption of minerals ions is not a function associated with transpiration.
94. Answer (1)
Hint: Algae are non embryophytes.
Sol.: Embryo formation is observed in bryophytes, pteridophytes, gymnosperms and angiosperms.
95. Answer (2)
Sol.: Pollen grains in gymnosperms are carried to the opening of ovules by air current.
96. Answer (1)
Hint: Turgor pressure is due to the water content of the cell.
Sol.: Turgor pressure is the pressure of cytoplasm exerted on the cell wall of the cell.
97. Answer (4)
Hint: Prothallus is the monoecious gametophyte of homosporous pteridophytes.
Sol.: Prothallus is inconspicuous, multicellular, haploid, photosynthetic and free living structure.
98. Answer (4)
Hint: Both brown and red algae are found in marine habitat, have thalloid body and show sexual reproduction.
Sol.: Cell wall of red algae have polysulphated esters exclusively.
99. Answer (3)
Sol.: Photosynthetic pigments of brown algae are chlorophyll a and c.
100. Answer (1)
Hint: Macrophyllous leaves are present in ferns.
Sol.: *Adiantum*, *Pteris* and *Dryopteris* are ferns. *Lycopodium* belongs to class Lycopsidea and does not have macrophylls.
101. Answer (4)
Sol.: Red algae lack mobile stages in their life cycle.
102. Answer (3)
Hint: Algin is obtained from brown algae.
Sol.: Carrageen is a phycocolloid obtained from red algae.
103. Answer (3)
Sol.: *Chlamydomonas* is a unicellular green alga.
104. Answer (4)
Hint: Passive transport occurs along the concentration gradient.
Sol.: In both simple diffusion and facilitated diffusion, movement of molecules occur along the concentration gradient.
105. Answer (3)
Hint: Members of chlorophyceae produce motile asexual spores.
Sol.: Phaeophyceae members produce zoospores with two unequal, laterally attached flagella. In rhodophyceae, non-motile spores are produced.
106. Answer (4)
Hint: Diplontic life cycle and oogamous reproduction are characteristic features of angiosperms.
Sol.: *Wolffia* being angiosperm show diplontic life cycle and oogamous reproduction. A brown alga, *Fucus* also have these features. *Ectocarpus* show haplodiplontic life cycle while *Spirogyra* show haplontic life cycle.
107. Answer (3)
Sol.: *Volvox* is a colonial and motile alga.
108. Answer (1)
Hint: Cytoplasmic streaming is the movement of cytoplasm.
Sol.: Cytoplasmic streaming can easily be observed in the cells of *Hydrilla* leaves by observing the movement of chloroplasts.

109. Answer (2)

Hint: Bentham and Hooker's classification system was a natural classification system.

Sol.: Artificial classification system was given by Linnaeus.

110. Answer (1)

Sol.: Artificial classification is based on few observable morphological characters.

111. Answer (2)

Sol.: Peat used as fuel is obtained from *Sphagnum*.

112. Answer (1)

Sol.: Calcium is an immobile element.

113. Answer (4)

Hint: Mosses have great ecological importance in succession process.

Sol.: Mosses along with lichens are the first organisms to colonise rocks.

114. Answer (2)

Hint: Antheridia and archegonia are present in bryophytes and pteridophytes.

Sol. *Chlamydomonas* }
Volvox } Algae
Laminaria }

Marchantia }
Funaria } Bryophytes

Adiantum }
Dryopteris } Pteridophytes

Cycas – Gymnosperms

Both antheridia and archegonia are present in *Marchantia*, *Funaria*, *Adiantum* and *Dryopteris*.

115. Answer (1)

Sol.: Rhizoids of mosses are multicellular and branched.

116. Answer (2)

Hint: Solute potential is lowering of water potential of a solution.

Sol.: Solute potential of any solution is always negative.

117. Answer (3)

Hint: Leafy stage of bryophytes is the gametophyte of mosses while capsule is a part of their sporophyte.

Sol.: Cells of leafy stage of mosses are haploid and cells of capsule are diploid. So if there are eleven chromosomes present in the cells of their leafy stage then in the cells of capsule there will be 22 chromosomes.

118. Answer (2)

Sol.: Events precursor to seed habit first appeared in heterosporous pteridophytes.

119. Answer (3)

Sol.: Bryophytes are called amphibians of plant kingdom because they are land plants but still require water for their reproduction.

120. Answer (2)

Hint: Surface tension represents a phenomenon which explains that water molecules are attracted to each other in liquid phase more than to water in gas phase.

Sol.: Transpiration → Water loss in form of vapour.

Adhesion → Attraction of water molecules to polar surface

Cohesion → Mutual attraction between water molecules.

121. Answer (3)

Hint: Gnetales is the most advanced group of gymnosperms.

Sol.: *Ginkgo*, a living fossil, belongs to most primitive group of gymnosperms i.e. Ginkgoales.

122. Answer (2)

Sol.: The figure is of *Equisetum*.

123. Answer (4)

Hint: Main plant body of pteridophytes is diploid.

Sol.: Main plant body of pteridophytes is sporophyte and it is differentiated into root, stem and leaves.

124. Answer (1)

Sol.: Endodermis is impervious to water because of the presence of casparian strips which are composed of suberin.

125. Answer (3)

Hint: Gametophytes of spermatophytes are reduced and dependent structures.

Sol.: In pteridophytes and bryophytes, gametophytes show independent and free living existence.

126. Answer (2)

Hint: Ferns belong to the class Pteropsida.

Sol.: *Adiantum*, a fern belongs to class pteropsida.

127. Answer (1)

Hint: Seed bearing plants produce heterospores.

Sol.: Gymnosperms and angiosperms are heterosporous plants.

128. Answer (2)

Sol.: Absorption of water by seeds and dry wood is called imbibition.

129. Answer (3)

Hint: Gymnosperms have naked seeds.

Sol.: In gymnosperms ovary is absent, ovules are borne on megasporophylls which cluster to form female cones. Embryo sac is not the female gametophyte of gymnosperms. It is present in flowering plants only.

130. Answer (2)

Sol.: Double fertilisation is a unique feature of angiosperms.

131. Answer (3)

Hint: Coralloid roots are present in *Cycas*.

Sol.: Cyanobacteria which are in symbiosis with coralloid roots of *Cycas*, have the ability to fix nitrogen.

132. Answer (1)

Sol.: Water potential of pure water at standard temperature which is not under any pressure is taken as zero.

133. Answer (3)

Hint: Embryo sac is the female gametophyte of angiosperms.

Sol.: Embryo sac is 7 celled 8 nucleated structure which has 3 celled egg apparatus, 3 antipodal cells and a central cell with two haploid polar nuclei.

134. Answer (2)

Hint: All seed bearing plants show diplontic life cycle.

Sol.: Male and female gametophytes of both gymnosperms and angiosperms are reduced, dependent and limited to one or few cells.

135. Answer (4)

Hint: Most algae have haplontic life cycle while some others have haplodiplontic life cycle.

Sol.: *Polysiphonia* shows haplodiplontic life cycle while *Chlamydomonas* shows haplontic life cycle.

136. Answer (1)

Hint: Innermost meninx.

Sol.: Pia mater is continuous with the surface of the brain. Duramater is the outermost meninx.

Subdural space is the space present between duramater & arachnoid. Arachnoid and duramater do not follow all irregularities (gyri, sulci and fissures) of brain.

137. Answer (3)

Hint: Connexons/Gap junctions play a key part in these synapses.

Sol.: Electrical synapses are effective due to the presence of gap junctions. They do not involve the use of neurotransmitters and permit bidirectional flow of ions.

138. Answer (2)

Hint: This part is major coordinating centre for sensory and motor signalling.

Sol.: Reticular activating system (RAS) is the gatekeeper of consciousness.

139. Answer (2)

Hint: Arbor vitae.

Sol.: Cerebellum is a part of hindbrain.

140. Answer (2)

Hint: Ventral horn of the spinal cord.

Sol.: Grey matter of spinal cord is produced into posterior/dorsal horns that are sensory in function. Anterior/ventral horn is motor in nature.

141. Answer (1)

Hint: It is a part of limbic system.

Sol.: Hippocampus converts short term memory to long term. Amygdala is involved in expression of emotion e.g., rage.

142. Answer (2)

Hint: The brain exits the skull through the largest foramen in skull.

Sol.: Foramen of Magendie and Luschka provide route for passage of CSF from metacoel into subarachnoid space.

143. Answer (1)

Hint: Sympathetic system operates dominantly in situation of fright / fear / flight.

Sol.: Sweat glands are not innervated by parasympathetic fibres. Pupillary constriction is a parasympathetic stimulus. Sympathetic stimulation results in bronchial dilation to facilitate breathing.

144. Answer (3)

Hint: Organ of sight.

Sol.: Optic nerve exits from the eye and relays information to forebrain.

145. Answer (3)

Hint: It is present in forebrain.

Sol.: A bundle of axons is termed tract in CNS while it is called a nerve in PNS. Cerebral aqueduct and Crura cerebri are present in midbrain whereas vermis connects the two cerebellar hemispheres.

146. Answer (3)

Hint: Hunger center also lies in this part of brain.

Sol.: Hypothalamus part of forebrain houses center for hunger, thirst, satiety and pleasure. Medulla oblongata harbours centers for controlling vomiting, respiration etc.

147. Answer (1)

Hint: Monosynaptic reflex.

Sol.: In this patellar reflex, a kicking response is seen. Motor end plate is the effector while muscle spindle is the receptor. Only two neurons are involved in knee jerk reflex.

148. Answer (1)

Hint: Trained but involuntary response.

Sol.: Memory indicates prior exposure to a certain food which evokes a response. The other options listed are unconditioned reflexes / responses.

149. Answer (4)

Hint: A single process arises from the cell body and then bifurcates.

Sol.: Bipolar neurons characteristically found in neuro sensory epithelium of nose, eye and ear. Apolar neurons are found in cnidarians. Unipolar neurons are found usually in embryonic stage.

150. Answer (2)

Hint: A neuron has a cell membrane.

Sol.: Axolemma is the term for neuronal cell membrane in axon region. Schwann cells form myelin sheath in neurons of PNS. Oligodendrocytes form myelin sheath in neurons of CNS.

151. Answer (1)

Hint: This germ layer gives rise to epidermis.

Sol.: Calcium ions are essential for exocytosis of neurotransmitters. Neurons cannot produce stimuli, they respond to it. Somatic neural system relays impulses from CNS to skeletal muscles. Microglial cells of neural tissue are mesodermal in origin.

152. Answer (3)

Hint: Spindle formation is essential for cell division in most animal cells.

Sol.: Centrosome comprises a pair of centrioles that result in formation of spindle to facilitate cell division. Neuron is the structural and functional unit of neural tissue which lacks centrosome.

153. Answer (3)

Hint: Nissl's granules are involved in protein synthesis.

Sol.: Nissl's granules are combination of RER and ribosomes, hence called site of protein synthesis that are present in dendrites and cell body of neurons.

154. Answer (1)

Hint: It represents bundle of muscle fibres.

Sol.: Each muscle fibre is enclosed by endomysium. A bundle of muscle fibres is called fascicle which is protected by perimysium. Many bundles along with their blood supply are enclosed by sheath of collagen fibres called epimysium.

155. Answer (4)

Hint: These are involuntary responses of CNS.

Sol.: Reflex actions are very rapid and automatic responses in which same kind of stimulus evokes a short lived response.

156. Answer (4)

Hint: All or none principle.

Sol.: Even suprathreshold stimulus evokes an action potential similar to threshold stimulus. Increase in temperature increases the speed of conduction. Diameter of nerve fibre is directly proportional to the transmission of nerve impulse.

157. Answer (3)

Hint: Electroencephalogram is a test used to detect electrical activity of brain.

Sol.: EEG helps to evaluate nerve action potentials in the brain.

158. Answer (3)

Hint: Hyperpolarised neurons have potential lesser than resting membrane potential.

Sol.: -70 mV is the general value of resting membrane potential for a neuron. -55 mV can be the value for threshold potential when a neuron is stimulated.

159. Answer (1)

Hint: A transmembrane pump.

Sol.: Na^+/K^+ ATPase is the electrogenic transmembrane pump that throws 3 Na^+ ions from axoplasm into ECF in exchange for 2 K^+ ions at expense of one ATP.

160. Answer (2)

Hint: This neurotransmitter is released at parasympathetic junctions.

Sol.: In Myasthenia gravis, the immune system produces antibodies that bind to and block receptors for acetylcholine.

161. Answer (3)

Hint: This system involves neurotransmitters.

Sol.: Chemicals called neurotransmitters are released at synapses between neurons to facilitate signalling. Endocrine system requires hormones to provide chemical integration.

162. Answer (2)

Hint: Skeletal muscles are voluntary.

Sol.: 'I' represents skeletal muscle e.g., biceps. These muscle fibres are voluntary in nature and have striped appearance.

163. Answer (4)

Hint: Amoeboid movement occurs in macrophages.

Sol.: Specialised cells in our body such as macrophages in tissues exhibit amoeboid movement through pseudopodia formation.

164. Answer (2)

Hint: Red muscle fibres are rich in mitochondria.

Sol.: Red muscle fibres contain large quantities of myoglobin. Both type of fibres are unbranched and multinucleated.

165. Answer (2)

Hint: Part of sarcomere with both myosin and actin filaments.

Sol.: A band / anisotropic band remains constant in dimension. The size of H zone, I band and sarcomere decreases during contraction.

166. Answer (3)

Hint: Sarcomere is a feature of striated muscle fibres.

Sol.: Smooth/visceral muscle fibres are non striated and uninucleated. Syncytial appearance is a property of skeletal muscle fibres. Gap junctions are present in cardiac and smooth muscle fibres.

167. Answer (4)

Hint: Muscle fibres and neurons respond to threshold stimulus.

Sol.: Contractility, extensibility and elasticity are properties exhibited by muscle cells (myocytes).

168. Answer (1)

Hint: This results from inflammation of joints.

Sol.: The accumulation of uric acid crystals leading to inflammation of joints causes simple gout. Myasthenia gravis is a neuromuscular disorder affecting neuromuscular junctions while myelin sheath is damaged in multiple sclerosis.

169. Answer (4)

Hint: This protein has three subunits.

Sol.: Binding of calcium to troponin 'C' subunit unmasks myosin binding site on actin by pulling filamentous tropomyosin away from the binding site.

170. Answer (1)

Hint: Identify a cartilaginous joint.

Sol.: Synovial joints offer maximum range of movement among which ball and socket joint permits movement in many planes. e.g., joint present between femur and acetabulum.

171. Answer (4)

Hint: The root word 'myo' indicates muscle.

Sol.: Muscular dystrophy is a disorder of muscular system.

172. Answer (3)

Hint: Locomotion results in displacement.

Sol.: Talking involves movement of muscles but the person does not essentially have to move from one place to another. Change in location occurs if a person walks, climbs and swims.

173. Answer (3)

Hint: Tetany results from hypocalcemia.

Sol.: Ribs are bicephalic in man as they have two articulation surfaces on their dorsal end to interact with thoracic vertebrae.

174. Answer (2)

Hint: This bone supports the weight of human head.

Sol.: The 9th and 10th pair of ribs are called vertebrochondral ribs. Each half of pectoral girdle comprises one clavicle and one scapula. The number of sacral vertebrae changes from 5 to 1 from foetus to adult stage.

175. Answer (4)

Hint: Joint permitting movement in only one plane.

Sol.: Hinge joints are synovial joints where convex end of one bone interacts with concave end of the other bone.

176. Answer (4)

Hint: The given structure is associated with pectoral girdle.

Sol.: Glenoid cavity is a depression in scapula associated with pectoral girdle. Acetabulum articulates with thigh bone.

177. Answer (1)

Hint: The number of phalanges in a human hand.

Sol.: There are 14 bones forming the human face. Total number of bones in adult human body is 206. The number of zygomatic bones and mandible is 2 and 1 respectively.

178. Answer (1)

Hint: Identify a cranial bone.

Sol.: Sphenoid is a single bone that interacts with all cranial bones.

179. Answer (2)

Hint: This bone helps constitute ribcage.

Sol.: Sternum is a single bone that interacts with ribs to form ribcage to protect lungs.

180. Answer (4)

Hint: These are called sutures.

Sol.: Fibrous joints in cranium prevent any movement in skull bones.

