All India Aakash Test Series for NEET-2024

TEST-5 (Code-C)

Test Date : 12/02/2023

ANSWERS

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

HINTS & SOLUTIONS

[PHYSICS]

SECTION - A

1. Answer (4)

Hint & Sol.: Given all gases are greenhouse gases.

2. Answer (1)

Hint: $\lambda_m T$ = Constant

Sol.: Since $(\lambda_m)_A < (\lambda_m)_B < (\lambda_m)_C$

$\Rightarrow T_A > T_B > T_C$

3. Answer (2)

Hint & Sol.: Convection is the mode of heat transfer by actual motion of matter.

4. Answer (2)

Hint: Heat resistance = $\frac{L}{KA}$

Sol.: In series, $R = R_1 + R_2 + R_3$

$$\Rightarrow \frac{3L}{K_{eff}A} = \frac{L}{KA} + \frac{L}{2KA} + \frac{L}{3KA}$$

$$\Rightarrow \frac{3}{K_{eff}} = \frac{1}{K} + \frac{1}{2K} + \frac{1}{3K}$$

$$\Rightarrow K_{eff} = \frac{18}{11}K$$

5. Answer (3)

Hint: $-\frac{dT}{dt} = k(T - T_0)$

From Newton's law of cooling.

Sol.: $\frac{5}{10} = k(32.5 - 20)$

and $\frac{5}{t} = k(27.5 - 20)$

$$\Rightarrow \frac{t}{10} = \frac{12.5}{7.5}$$

$$\Rightarrow t = \frac{50}{3} \text{ minutes} \approx 17 \text{ minutes}$$

6. Answer (1)

Hint: From symmetry

$$T = \frac{T_1 + T_2 + T_3 + T_4}{4}$$

Sol.: $T = \frac{20 + 40 + 60 + 80}{4}$

$= 50°C$

7. Answer (2)

Hint: $\frac{dQ}{dt} = \sigma e A T^4$

Sol.: For same mass, hollow sphere has more surface area. Thus, it looses more heat.

8. Answer (2)

Hint: $l = l_0(1 + \alpha \Delta T)$

Sol.: $L_{steel} = l_0(1 - \alpha_S T)$

$l_{Brass} = l_0(1 - \alpha_B T)$

(Where T is temperature difference)

Since, $\alpha_B > \alpha_S$

$\Rightarrow l_{Brass} < l_{steel}$

Hence, brass will be on concave side.

9. Answer (1)

Hint: $P \propto T^4$, λT = constant

Sol.: $\lambda \propto T^{-1}$

$\Rightarrow T \propto \lambda^{-1}$

$\Rightarrow \lambda \propto P^{-1/4}$

10. Answer (2)

Hint: $\frac{T - L.P.}{U.P. - L.P.} = \text{Constant}$

Sol.: $\frac{T - (-20)}{80 + (20)} = \frac{50 - 0}{100 - 0}$

$\Rightarrow T = 30°C$

11. Answer (4)

Hint: $\Delta l = l \alpha \Delta T$

Sol.: $\Delta l_{eff} = \Delta l_1 + \Delta l_2$

$(l_1 + l_2)\alpha_{eff} \Delta T = l_1 \alpha_1 \Delta T + l_2 \alpha_2 \Delta T$

$$\Rightarrow \alpha_{eff} = \frac{l_1\alpha_1 + l_2\alpha_2}{l_1 + l_2}$$

12. Answer (1)

Hint: $a + r + t = 1$

Sol.: $r = 1 - \frac{1}{6} - \frac{1}{3} = \frac{1}{2}$

13. Answer (1)

Hint: $\Delta t \propto \left(x_2^2 - x_1^2\right)$

Sol.: $40 = k(3^2 - 2^2)$

and $t = k(4^2 - 3^2)$

$\Rightarrow t = 56$ h

14. Answer (3)

Hint: Wein's displacement law, $\lambda_m T$ = Constant

Sol.: $\lambda T = \lambda'(2T)$

$\Rightarrow \lambda' = \frac{\lambda}{2}$

15. Answer (4)

Hint: $Y\alpha\Delta T$ = Thermal stress

Sol.: Thermal stress = $Y\alpha T$

16. Answer (3)

Hint: Apparent change in volume = $V(\gamma_1 - \gamma_2)\Delta T$

Sol.: $(998 - 1000) = 1000\,(r - \delta)\Delta T$

$\frac{-2}{1000\Delta T} = r - \delta$

Since, $\Delta T > 0$

$\Rightarrow r < \delta$

17. Answer (3)

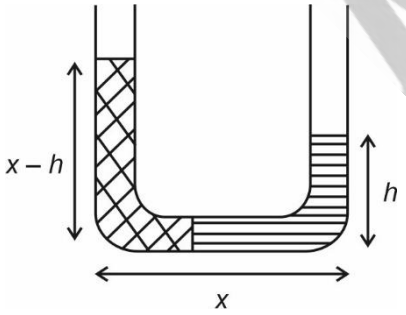
Hint: Pascal's law

Sol.: The change in pressure will be transmitted throughout the liquid without diminishing.

18. Answer (1)

Hint: $P = \rho gh$

Sol.:



$\rho g(x - h) = 2\rho gh$

$\rho gx = 3\rho gh$

$\Rightarrow h = \frac{x}{3}$ and other is $\frac{2x}{3}$

19. Answer (2)

Hint: Pascal's law

Sol.: Increase in pressure = $\frac{10\text{ N}}{10\text{ cm}^2}$

Extra force on bottom = $(\Delta P)80\text{ cm}^2$

$= \frac{10}{10} \times 80$

= 80 N

20. Answer (2)

Hint: Buoyant force = $\rho_{liquid}\, V_{immersed}\, g$

Sol.: Net force experienced by

Ball = Buoyant force – Weight of ball

$= \rho \times g \times V - \frac{\rho}{2} \times g \times V$

And Net force = ma

$\frac{\rho}{2} \times V \times a = \rho \times g \times V - \frac{\rho g V}{2}$

$a = g$

21. Answer (4)

Hint: Buoyant force = $\rho V_i g$

Sol.: F_B = Weight

$\Rightarrow \rho_c \times g \times [10 \times 2 \times 6] = \rho_l \times g \times [10 \times 2 \times 4]$

$\Rightarrow \frac{\rho_c}{\rho_l} = \frac{4}{6} = \frac{2}{3}$

22. Answer (1)

Hint: Equation of continuity

Sol.: $A_1v_1 + A_2v_2 = A_3v_3$

$\Rightarrow 2v_1 + v_2 = v_3$

$\Rightarrow v_3 = 30$ m/s

23. Answer (2)

Hint & Sol.: Barometer is used to measure absolute atmospheric pressure at any place.

24. Answer (2)

Hint: $v_T = \frac{2}{9}\frac{r^2 g}{\eta}(\sigma - \rho)$

Sol.: $v_T \propto r^2$

$\Rightarrow \frac{v}{v_0} = \left(\frac{r}{R}\right)^2$

$\Rightarrow v = \frac{v_0}{16}$ $\qquad (R = n^{1/3}r)$

25. Answer (2)

Hint: $v = v_T(1 - e^{-kt})$

Sol.: at $t = 0$, $v = 0$

at $t = \infty$, $v = v_T$

$\therefore$ For same increment in speed, time taken will be more as speed increases.

$\Rightarrow t_2 - t_1 > t_1$

$\Rightarrow t_2 > 2t_1$

26. Answer (3)

Hint: $\Delta S.E. = (n^{1/3} - 1)4\pi R^2 T$

Sol.: $E = 4\pi R^2 T$

$\Delta S.E. = (8^{1/3} - 1)4\pi R^2 T$

$= 4\pi R^2 T$

$\Rightarrow \Delta S.E. = E$

27. Answer (4)

Hint & Sol.: If water contact angle is larger than 90°, the solid surface is considered hydrophobic.

28. Answer (2)

Hint: $h = \dfrac{2T\cos\theta}{\rho g r}$

Sol.: $h \propto \cos\theta$

$\Rightarrow \dfrac{h'}{h} = \dfrac{\cos 0^\circ}{\cos 60^\circ}$

$\Rightarrow h' = 2h$

29. Answer (1)

Hint: Work = $T\Delta S$

Sol.: $W = T(S_1 - S_2)$

$= 0.07\left(\dfrac{15-10}{10^4}\right)\times 2$ [Film has dual surface]

$= 0.7 \times 10^{-4}$ J

30. Answer (1)

Hint: $\Delta l = \dfrac{FL}{AY}$

Sol.: $Y = \dfrac{FL}{A\Delta l}$

$\Rightarrow Y = \dfrac{10^3 \times 1}{2\times 10^{-6}\times 10^{-3}}$

$= 0.5 \times 10^{12}$ Pa $= 500 \times 10^9$ Pa

31. Answer (3)

Hint: $B = \dfrac{P}{\left(\dfrac{-\Delta V}{V}\right)}; \dfrac{\Delta V}{V} = \dfrac{3}{2}\dfrac{\Delta A}{A}$

Sol.: $B = \dfrac{P}{\left(\dfrac{-3}{2}\dfrac{\Delta A}{A}\right)}$

$\Rightarrow \dfrac{\Delta A}{A} = -\dfrac{2P}{3B}$

32. Answer (4)

Hint & Sol.: Breaking stress of material does not depend on its dimensions.

33. Answer (1)

Hint: Slope of stress v/s strain graph gives Young's modulus.

Sol.: Slope of strain v/s stress graph = $\dfrac{1}{Y}$

$\Rightarrow \dfrac{\tan 37^\circ}{\tan 45^\circ} = \dfrac{Y_A}{Y_B}$

$\Rightarrow \dfrac{Y_A}{Y_B} = \dfrac{3}{4}$

34. Answer (4)

Sol. & Hint: Shearing strain is a dimensionless quantity.

35. Answer (1)

Hint: $\dfrac{U}{\text{Volume}} = \dfrac{1}{2}\text{strain}^2 Y$

Sol.: Area, $A = \dfrac{m}{\delta l}$

$\text{Strain}\dfrac{\Delta l}{l} = \dfrac{F}{AY}$

$\Rightarrow \dfrac{U}{\text{Volume}} = \dfrac{1}{2}\left(\dfrac{F\delta l}{mY}\right)^2 Y$

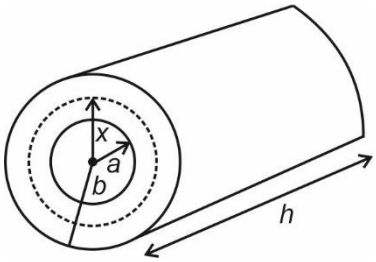
$= \dfrac{F^2\delta^2 l^2}{2m^2 Y}$

SECTION - B

36. Answer (2)

Hint: For radial flow in cylinder, the resistance is proportional to $\ln\left(\dfrac{b}{a}\right)$

Sol.:



$dR = \dfrac{dx}{k2\pi xh}$

$\Rightarrow R = \dfrac{1}{2\pi kh}\ln\left(\dfrac{b}{a}\right)$

$\Rightarrow$ Resistance between r to $1.5r$ is more than resistance between $1.5r$ to $2r$.

Hence, temperature drop between r to $1.5\,r$ is more than temperature drop between $1.5r$ to $2r$.

37. Answer (1)

Hint: $Q_{Fusion} = ml_F$; $Q_{vaporisation} = ml_v$; $Q = ms\Delta T$

Sol.: From 2 g of steam to loose heat and come to 0°C water.

$Q_1 = 2(540) + 2(1)(100) = 1280$ cal

Heat absorbed by ice to melt

$Q_2 = 16(80) = 1280$ cal

As $Q_1 = Q_2$; final temperature is 0°C and we will have 18 g water.

38. Answer (2)

Hint: $Q = \int msdT$

Sol.: $Q_1 = \int_{T}^{2T} msdT$ ...(1)

and $Q_2 = \int_{2T}^{3T} msdT$ ...(2)

since 's' is decreasing with temperature therefore, $Q_1 > Q_2$.

39. Answer (2)

Hint: Equation of continuity.

Sol.: $A_1v_1 = A_2v_2$

$\therefore v \propto \frac{1}{A}$

40. Answer (2)

Hint: Steel has positive coefficient of areal expansion.

Sol.: Hole will expand as molecules move away from each other due to increase in kinetic energy.

41. Answer (4)

Hint: Solar constant $S = \sigma\left(\frac{R}{r}\right)^2 T^4$

Sol.: $S \propto T^4$

$\Rightarrow \frac{S_2}{S_1} = \left(\frac{1}{2}\right)^4$

$\Rightarrow S_2 = \frac{S}{16}$

42. Answer (1)

Hint: $l = l_0(1 + \alpha\Delta T)$

Sol.: $l_1 = l_0(1 + \alpha T)$

$\Rightarrow l_0\alpha T = l_1 - l_0$

and; $l_2 = l_0(1 + \alpha 2T)$

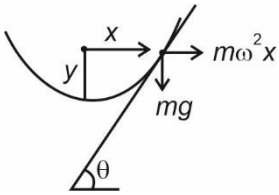
$\Rightarrow l_2 = l_0 + 2(l_1 - l_0)$

$\Rightarrow l_2 = 2l_1 - l_0$

43. Answer (3)

Hint: $h = \frac{\omega^2 x^2}{2g}$

Sol.:



From geometry,

$\tan\theta = \frac{m\omega^2 x}{mg}$

$\Rightarrow \frac{dy}{dx} = \frac{m\omega^2 x}{mg}$

$\Rightarrow y = \frac{\omega^2 x^2}{2g}$ (Equation of parabola)

44. Answer (2)

Hint: $\Delta P = \rho gh$

Sol.: $h = 10$ m and $\rho = 10^3$ kgm^{-3}

$P = P_{atm} + \rho gh = 1.01 \times 10^5 + 10^3 \times 10 \times 10$

$= 2.01 \times 10^5$ Pa

$= 2$ atm

45. Answer (1)

Hint: $P = \rho gh$

Sol.: $\rho_3 2xg = \rho_1 2xg + \rho_2 xg$

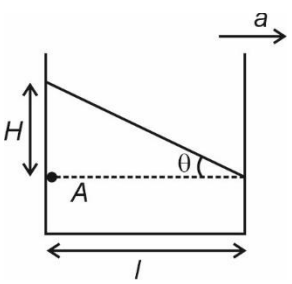
$\Rightarrow 2\rho_3 = 2\rho_1 + \rho_2$

$\Rightarrow \rho_3 = \frac{2\rho_1 + \rho_2}{2}$

46. Answer (1)

Hint: Pressure increases in the direction opposite to acceleration of container.

Sol.:



$P_A = P_0 + \rho gH = P_0 + \rho al$

$\Rightarrow \rho gH = \rho al$

$$\Rightarrow \frac{H}{I}=\frac{a}{g}$$

$$\Rightarrow \theta=\tan^{-1}\left(\frac{a}{g}\right)$$

47. Answer (3)

Hint & Sol.: Coefficient of viscosity is ratio of shearing stress to strain rate.

$$\eta=\frac{\left(\frac{F}{A}\right)}{\left(\frac{dv}{dy}\right)}$$

48. Answer (4)

Hint: $\Delta l=\frac{Fl}{AY}$

Sol.: $\Delta l = \Delta l_1 + \Delta l_2$

$$=\frac{2F\frac{l}{2}}{AY}+\frac{F\frac{l}{2}}{AY}$$

$$=\frac{3}{2}\frac{Fl}{AY}$$

49. Answer (3)

Hint: In series, $\Delta l_{eq} = \Delta l_1 + \Delta l_2 + \Delta l_3$

Sol.: $\frac{Fl_{eq}}{AY_{eq}}=\frac{Fl_1}{AY_1}+\frac{Fl_2}{AY_2}+\frac{Fl_3}{AY_3}$

$$\frac{l_1+l_2+l_3}{Y_{eq}}=\frac{l_1}{Y_1}+\frac{l_2}{Y_2}+\frac{l_3}{Y_3}$$

$$Y_{eq}=\frac{Y_1Y_2Y_3\left(l_1+l_2+l_3\right)}{l_1Y_2Y_3+l_2Y_1Y_3+l_3Y_1Y_2}$$

50. Answer (2)

Hint: Normal stress = $\frac{F_\perp}{\text{Area}}$

Sol.: Normal stress = $\frac{F\cos\theta}{(b)\left(\frac{h}{\cos\theta}\right)}=\frac{F\cos^2\theta}{bh}$

[CHEMISTRY]

SECTION - A

51. Answer (2)

Hint: Electronegativity is a measure of the ability of an atom in a chemical compound to attract shared electrons to itself.

Sol.:

Element	EN
B	2.0
Al	1.5
Ga	1.6
In	1.7

52. Answer (2)

Hint: Atomic size of aluminium is greater than gallium.

Sol.:

Element	IE (kJmol^{-1})	Atomic radius (pm)
B	801	88
Al	577	143
Ga	579	135

Because of larger size of aluminium, its ionisation enthalpy is lower than gallium.

53. Answer (4)

Hint: Acidic strength is inversely proportional to back-bonding.

Sol.: Lewis acidic strength will increase as $BF_3 < BCl_3 < BBr_3 < BI_3$ back-bonding decrease from BF_3 to BI_3.

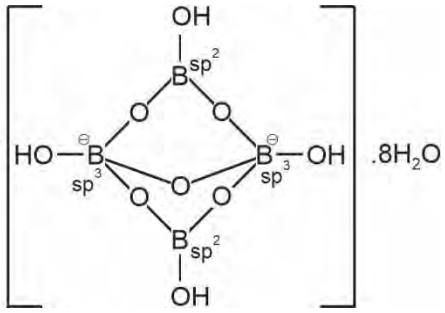
54. Answer (1)

Hint: $\underset{sp^3}{NH_3}+\underset{sp^2}{BF_3}\longrightarrow[\underset{sp^3}{NH_3}\rightarrow\underset{sp^3}{BF_3}]$

Sol.: Hybridization of 'N' is same as sp^3.

55. Answer (4)

Hint: The formula of borax is $Na_2\left[B_4O_5(OH)_4\right].8H_2O$

Sol.: 

56. Answer (3)

Hint: Amphoteric oxide can react with both acid and base.

Sol.:

Oxide	Chemical nature
B_2O_3	Acidic
SiO_2	Acidic
Al_2O_3	Amphoteric
BaO	Basic

57. Answer (2)

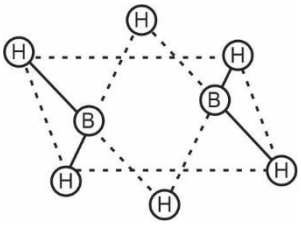
Hint: H_3BO_3 on heating undergoes dehydration.

Sol.: $H_3BO_3 \xrightarrow{100^\circ C} \underset{[A]}{HBO_2} \xrightarrow{\text{further heating}} \underset{[B]}{B_2O_3}$

58. Answer (4)

Hint: B_2H_6 contains four terminal bonds and two bridging bonds.

Sol.: B_2H_6 is a non-planar compound.



Structure of B_2H_6

59. Answer (3)

Hint: Stability of lower oxidation state increases down the group.

Sol.: Due to inert pair effect, +1 oxidation state stability in group 13 elements increases on moving down the group.

60. Answer (4)

Hint: Aluminium dissolves in aqueous mineral acids and aqueous alkalies.

Sol.: Concentrated HNO_3 renders Al passive by forming a protective oxide layer on the surface of Al.

61. Answer (3)

Hint: Down the group, the size increases and tendency to show catenation decreases

Sol.: Catenation: $C >> Si > Ge \simeq Sn$. Pb does not show catenation.

62. Answer (1)

Hint: $Be(OH)_2$ reacts with both acid and alkali.

Sol.: $Be(OH)_2$ is amphoteric in nature whereas all other hydroxides of alkaline earth metals are basic in nature.

63. Answer (3)

Hint: Thermal stability of Group I hydride decreases on going down the group.

Sol.: As bond strength of M – H decreases on going down the group, the thermal stability decreases Thermal stability order:

LiH > NaH > KH > RbH > CsH.

64. Answer (3)

Hint: Species containing unpaired electrons are paramagnetic in nature.

Sol.: KO_2 contains O_2^- which is having one unpaired electron in π^*2p_x molecular orbital.

65. Answer (4)

Hint: Number of five-membered rings present in Buckminsterfullerene is 12.

Sol.: Number of six-membered rings present in Buckminsterfullerene is 20.

66. Answer (2)

Hint & Sol.: ZSM-5 is a type of zeolite which is used to convert alcohols directly into gasoline.

67. Answer (1)

Hint: The thermal stability increases with increasing cationic size.

Sol.: The stability of group I carbonates increases down the group as the electropositive character increases.

68. Answer (4)

Hint: Among alkali metal chlorides, only LiCl can form hydrates.

Sol.: LiCl crystallises as a hydrate, $LiCl{\cdot}2H_2O$.

69. Answer (3)

Hint: Solvay process is use to prepare sodium carbonate.

Sol.: NH_4Cl is obtained as one of the products.

$NH_4HCO_3 + NaCl \rightarrow NH_4Cl + NaHCO_3$

70. Answer (2)

Hint: NaOH is commercially prepared by Castner-$NaHCO_3$ Kellner cell.

Sol.: In Castner-Kellner cell, mercury is used as cathode and carbon as anode.

71. Answer (2)

Hint: Alkaline earth metal chlorides generally exist in hydrated form.

Sol.: In alkali metal chlorides, except Li, all other elements do not exist in hydrated salt.

72. Answer (3)

Hint: Smaller the ion more is the extent of hydration.

Sol.:

Metal	Hydration enthalpy kJ mol^{-1}
Li	–506
Na	–406
K	–330
Rb	–310
Cs	–276

73. Answer (2)

Hint: Negative reduction potential of Li^+/Li is maximum in alkali metals.

Sol.: Potassium is lighter than sodium

Metal	Density (gml^{-1})
Na	0.97
K	0.86

74. Answer (2)

Hint: Alkali metals form various oxides on reaction with air.

Sol.: Lithium forms monoxide, sodium forms peroxide and other alkali metals form superoxides.

75. Answer (3)

Hint: Peroxide on hydrolysis gives H_2O_2 as one of the products.

Sol.: $Li_2O_2 + H_2O \rightarrow LiOH + H_2O_2$

76. Answer (4)

Hint: Metals of group 7, 8 and 9 do not form metallic hydrides.

Sol.: Iron (Fe) belongs to group 8 and it does not form metallic hydride.

77. Answer (2)

Hint: Electron-precise compounds have the required number of electrons to write their conventional Lewis structures.

Sol.: CH_4 : Electron-precise hydride

NH_3, H_2O : Electron-rich hydrides

BH_3 : Electron-deficient hydride

78. Answer (4)

Hint and Sol:

Property	H_2O	D_2O
Dielectric constant (C^2/Nm^2)	78.39	78.06
Boiling point (K)	373	374.4
Viscosity (centipoise)	0.89	1.1
Enthalpy of vaporisation at 373 K (kJ mol^{-1})	40.66	41.61

79. Answer (4)

Hint and Sol.: In $CuSO_4 \cdot 5H_2O$, four H_2O molecules form coordinate bonds and one H_2O molecule is hydrogen-bonded.

80. Answer (2)

Hint: Rb gives red-violet colour to the flame test.

Sol.:

Li — Crimson red

Na — Yellow

K — Violet

Rb — Red violet

81. Answer (3)

Hint & Sol.: Lithium shows anomalous behaviour.

Sol.: $4LiNO_3 \xrightarrow{\Delta} 2Li_2O + 4NO_2 + O_2$

82. Answer (1)

Hint: More is the extent of hydration, less will be the ionic mobility of ions in aqueous medium.

Sol.: The hydration of alkaline earth metal ions decreases with increase in ionic sizes

$Be^{2+} > Mg^{2+} > Ca^{2+} > Sr^{2+}$

Ionic mobility is

$Be^{2+}(aq) < Mg^{2+}(aq) < Ca^{2+}(aq) < Sr^{2+}(aq)$

83. Answer (2)

Hint: Acid-base reaction takes place.

Sol.: $2NH_4Cl + Ca(OH)_2 \rightarrow 2NH_3 + CaCl_2 + H_2O$

84. Answer (2)

Hint: Number of neutrons (N) = A – Z

Sol.:

Isotopes	^3_1T	^2_1D	^1_1H
No. of neutrons	2	1	0

85. Answer (3)

Hint: If central atom has vacant orbital, the species gets easily hydrolysed.

Sol.: Silicon (Si) in $SiCl_4$ has vacant *d* orbital, hence it is hydrolysed easily while C of CCl_4 does not have vacant orbital.

SECTION - B

86. Answer (2)

Hint: Permanent hardness of water is due to the presence of soluble salts of Mg and Ca in the form of chloride and sulphate.

Sol.: Clark's method can only remove temporary hardness of water.

87. Answer (3)

Hint: Ammoniated electrons absorb light in visible region.

Sol.: The blue colour of the solution is due to the formation of ammoniated electron, which absorb light in the visible region.

88. Answer (3)

Hint and Sol.: $Na_2CO_3 \cdot 10H_2O$ is washing soda.

89. Answer (3)

Hint: Steric hindrance decreases the stability of compounds.

Sol.: $[SiCl_6]^{2-}$ does not exist because six large chloride ions cannot be accommodated around small-sized Si^{4+} ion.

90. Answer (1)

Hint: In first step, methyl substituted chlorosilane is formed.

Sol.:

$$2CH_3Cl + Si \xrightarrow[570\ K]{\text{Cu powder}} \underset{[A]}{(CH_3)_2SiCl_2} \xrightarrow{2H_2O} \underset{[B]}{(CH_3)_2Si(OH)_2}$$

91. Answer (3)

Hint: CaC_2 has acetylide linkage.

Sol.: $CaC_2 + 2D_2O \rightarrow C_2D_2 + Ca(OD)_2$

92. Answer (3)

Hint & Sol.: $CO(g) + 2H_2(g) \xrightarrow[\text{Catalyst}]{\text{Cobalt}} CH_3OH(l)$

93. Answer (1)

Hint: Smaller is the size of cation, more is the polarising power.

Sol.: Order of ionic size: $Ca^{2+} > Mg^{2+} > Be^{2+}$ smaller is the size of cation, more is the polarising power and more is the covalent character.

94. Answer (3)

Hint: Smaller is the size of cation, greater is the hydration enthalpy.

Sol.: As the hydration enthalpy decreases down the group, solubility of group 2 element sulphates decreases too.

Order : $BaSO_4 < SrSO_4 < CaSO_4 < MgSO_4$.

95. Answer (1)

Hint: More is the lattice enthalpy more will be the melting point.

Sol.: Lattice enthalpy order:

NaF > NaCl > NaBr > NaI

Hence, NaF has the highest melting point.

96. Answer (1)

Hint: Electrolysis of acidified water using platinum electrode is commercial method of preparation of hydrogen.

Sol.: In laboratory, dihydrogen is prepared by the reaction of granulated zinc with dilute HCl or dilute sulphuric acid.

97. Answer (3)

Hint: Syngas is also called water gas.

Sol.: Syngas is a mixture of CO and H_2.

98. Answer (1)

Hint: Volume strength = 11.2 × Molarity

Sol.: Percentage strength $= \frac{10 \times 34}{11.2 \times 10} = 3\%$

99. Answer (3)

Hint & Sol.:

- Calcium plays important role in neuromuscular functions and cell membrane integrity.
- Potassium ions are the most abundant cations with cell fluids, where they activate many enzymes. Potassium participates in the oxidation of glucose to produce ATP.
- Magnesium (Mg) is used as the cofactor for all enzymes that utilise ATP in phosphate transfer.
- Calcium is majorly present in bones and teeth.

100. Answer (3)

Hint: One B atom and one N atom together have the same number of valence electron as two C atoms.

Sol.: $(BN)_x$ is known as inorganic graphite as it has layer type structure similar to graphite.

[BOTANY]

SECTION - A

101. Answer (1)

Hint: Micronutrients become toxic when their concentration exceeds 10 mmol/kg of dry matter in plants.

Sol.: Manganese (Mn) is a micronutrient. Mg, Ca and S are macronutrients.

102. Answer (4)

Hint: A macronutrient which is immobile in plants is required for synthesis of cell wall.

Sol.: Calcium is required for synthesis of cell wall in plants.

103. Answer (4)

Hint: Sulphur is not found in DNA and RNA.

Sol.: Ribonucleotides are basic units of RNA. They do not have sulphur.

104. Answer (3)

Hint: Zn^{2+} is an activator of alcohol dehydrogenase.

Sol.: Mg^{2+} is an activator for both RuBisCO and PEPCase.

105. Answer (4)

Hint: Micronutrients becomes toxic in slight excess.

Sol.: Manganese (Mn) is a micronutrient. Its deficiency causes grey spots in oats. It is required for photolysis of water.

106. Answer (4)

Hint: Deficiency symptoms of immobile elements first appear in young tissues.

Sol.: In plants, calcium is immobile element. N, P and K are mobile elements.

107. Answer (2)

Hint: A component of nitrate reductase is a trace element.

Sol.: Molybdenum (Mo) is component of nitrogenase and nitrate reductase is a trace element.

108. Answer (1)

Hint: Nitrogenase converts atmospheric nitrogen to ammonia.

Sol.: Nitrogenase enzyme is present in some prokaryotes. It is not found in eukaryotes.

109. Answer (1)

Hint: Nitrifying bacteria are autotrophs.

Sol.: They obtain their energy from oxidising chemicals. They carry out nitrification.

110. Answer (1)

Hint: Nitrification is conversion of NH_3 to nitrate.

Sol.: $NH_3 \rightarrow NO_2^- \rightarrow NO_3^-$

Above conversion is called nitrification which is carried out by nitrifying bacteria.

111. Answer (4)

Hint: Leghaemoglobin is pink-coloured pigment which helps nitrogenase to function.

Sol.: Leghaemoglobin scavenges oxygen. Only in the absence of oxygen, nitrogenase is active.

112. Answer (2)

Hint: A macronutrient maintains the structure of ribosome.

Sol.: Mg^{2+} is essential to maintain ribosome structure.

113. Answer (3)

Hint: Macronutrients are required more than trace elements.

Sol.: C, H, N, P, K and S are macronutrients.

114. Answer (1)

Hint: *Anabaena* and *Nostoc* are autotrophic organisms.

Sol.: *Rhizobium* and *Azotobacter* are heterotrophic but *Rhizobium* fixes N_2 in a symbiotic association.

Azotobacter fixes N_2 in free living state.

115. Answer (2)

Hint: Denitrification is carried out by rod-shaped bacteria.

Sol.: *Thiobacillus* carries out denitrification, which is conversion of soil NO_3^- to gaseous N_2.

116. Answer (2)

Hint: This element helps in opening and closing of stomata.

Sol.: Potassium (K) helps in maintaining anion-cation balance in cells.

117. Answer (2)

Sol.: T.W. Engelmann described the first action spectrum of photosynthesis.

118. Answer (1)

Hint: During photorespiration, one molecule of PGA and one molecule of phosphoglycolate is formed.

Sol.: PGA is a 3C compound and phosphoglycolate is a 2C compound.

119. Answer (4)

Hint: Sugars are produced during dark reaction.

Sol.: Glucose is formed during dark reaction. O_2, ATP and NADPH are formed during light reaction.

120. Answer (1)

Hint: PS II is associated with Oxygen-Evolving Complex (OEC).

Sol.: PS II is associated with splitting of water. It is found on grana lamellae.

121. Answer (4)

Hint: Calvin cycle occurs during day-time in CAM plants.

Sol.: In all C_3, C_4, and CAM plants, Calvin cycle occurs.

122. Answer (2)

Hint: Primary CO_2 acceptor in sugarcane is PEP.

Sol.: PEP is a 3C molecule.

123. Answer (4)

Hint: In C_3 plants, to fix one CO_2 molecule two NADPH are required.

Sol.: In C_4 plants also two NADPH molecules are required to fix one CO_2 molecule. So there is no difference in numbers of NADPH molecules.

124. Answer (4)

Hint: In C_4 plants, primary CO_2 fixation occurs in mesophyll cells.

Sol.: In C_4 plants, second fixation of CO_2 takes place in bundle sheath cells. So double carboxylation takes place in C_4 plants.

125. Answer (3)

Hint: Carboxylation is the most crucial step of the Calvin cycle.

Sol.: Regeneration step of Calvin cycle requires one ATP for phosphorylation to form RuBP.

126. Answer (4)

Hint: In C_4 plants, bundle sheath cells have agranal chloroplasts.

Sol.: They are thick walled. They fix CO_2 via the Calvin cycle.

127. Answer (1)

Sol.: Dark reaction occurs in stroma of the chloroplast.

128. Answer (4)

Hint: C_4 plants lack photorespiration.

Sol.: They have CO_2 concentrating mechanism in bundle sheath cells.

129. Answer (3)

Hint: CAM plants grow in arid regions.

Sol.: Wheat is a C_3 plant. *Opuntia*, pineapple and *Sedum* are CAM plants.

130. Answer (4)

Hint: Light is a limiting factor for shade plants.

Sol.: Light rarely becomes limiting factor except for shade plants.

131. Answer (4)

Hint: Plants showing Kranz anatomy are C_4 plants.

Sol.: C_4 plants perform C_3 cycle in bundle sheath cells.

132. Answer (4)

Hint: Transportation of malic acid to bundle sheath cells takes place in the C_4 pathway.

Sol.: There is no transportation of OAA to bundle sheath cells in C_3 cycle.

133. Answer (2)

Hint: Oxygen is evolved during non-cyclic photophosphorylation.

Sol.: Water (H_2O) is electron donor to PS II.

134. Answer (1)

Hint: Plastocyanin (PC) transfers the electrons to PS I.

Sol.: PC transfers the electrons from Cyt b_6f to PS I.

135. Answer (3)

Hint: The most abundant enzyme on the earth is RuBisCO.

Sol.: RuBisCO can carry out photorespiration when O_2 concentration is higher.

SECTION - B

136. Answer (3)

Hint: Regeneration of PEP during the C_4 pathway requires ATP.

Sol.: In leaves of C_4 plants, malic acid is formed in mesophyll cells.

137. Answer (3)

Hint: Red drop is seen beyond red light.

Sol.: Sharp decline in quantum yield is seen at wavelengths greater than 680 nm. This is called red drop.

138. Answer (4)

Hint: Tomato is a C_3 plant. It shows the CO_2 fertilisation effect.

Sol.: Light saturation for CO_2 fixation occurs at 10% of full sunlight.

139. Answer (2)

Hint: C_4 plants lack oxygenase activity of RuBisCO.

Sol.: The C_4 plants do not show photorespiration.

140. Answer (2)

Hint: In photorespiration, three cell organelles are involved. These are chloroplast, mitochondria and peroxisome.

Sol.: Mitochondria releases CO_2 and chloroplast fixes it.

141. Answer (4)

Hint: Z-scheme is non-cyclic photophosphorylation.

Sol.: Outer membrane is not involved in Z-scheme of light reaction.

142. Answer (1)

Hint: It is coloured plastid.

Sol.: In chloroplast, O_2 is consumed during photorespiration.

143. Answer (2)

Hint: Photosynthesis is least in green light.

Sol.: In red light, photosynthesis is higher.

144. Answer (2)

Hint: Reductive amination does not involve transfer of amino group.

Sol.: NH_4^+ is assimilated to form amino acids in reductive amination.

145. Answer (3)

Hint: Conversion of nitrogen into ammonia is nitrogen fixation.

Sol.: Dead plants and animals release N_2 which is converted to NH_3 by the process called ammonification.

146. Answer (2)

Hint: *Frankia* and *Rhizobium* are heterotrophic organisms.

Sol.: *Frankia* is filamentous which fixes N_2 in non-legumes symbiotically.

Bacillus and *Clostridium* are free-living nitrogen fixers.

147. Answer (1)

Hint: Nitrate reductase is found in plants too.

Sol.: Nitrate reductase is a flavoprotein and contains Mo. It reduces nitrate to nitrite.

148. Answer (3)

Hint: Toxic concentration of elements decreases the fresh weight of the plant.

Sol.: Toxic concentration of elements decreases the dry weight by 10%.

149. Answer (3)

Hint: It is an immobile element.

Sol.: Calcium is a constituent of middle lamella.

150. Answer (1)

Hint: Two of them are macronutrients and one is micronutrient.

Sol.: N, S and Mo deficiency cause late flowering in plants.

[ZOOLOGY]

SECTION - A

151. Answer (3)

Hint: Pars nervosa is also known as posterior pituitary.

Sol.: Pars nervosa (neurohypophysis) stores and releases two hormones called oxytocin and vasopressin, which are actually synthesized within the hypothalamus.

GnRH from hypothalamus stimulates the release of gonadotrophins (LH and FSH) from anterior pituitary.

Pars intermedia secretes MSH.

152. Answer (2)

Hint: Highly vascular layer of the eyeball.

Sol.: Photoreceptor cells are not present in blind spot.

The external layer is composed of a dense connective tissue and is called the sclera. The anterior portion of this layer is called the cornea. The middle layer, choroid, contains many blood vessels and looks bluish in colour.

153. Answer (1)

Hint: Thinned out portion of the retina.

Sol.: The space between the

- Cornea and the lens – Aqueous chamber
- Lens and retina – Vitreous chamber

Fovea is the central pit present on macula lutea. It is the thinned out portion of retina where only cones are densely packed.

154. Answer (2)

Hint: Twilight vision

Sol.: The day light (photopic) vision and colour vision are functions of cones and the twilight (scotopic) vision is the function of the rods. In the human eye, there are three types of cones which possess their own characteristic photopigments that respond to red, green and blue lights.

155. Answer (2)

Hint: Ear ossicles are in middle ear.

Sol.: The inner ear contains a complex system called vestibular apparatus, located above the cochlea. The vestibular apparatus is composed of three semi-circular canals and the otolith.

The middle ear contains three ossicles called malleus, incus and stapes which increase the efficiency of transmission of sound waves to the inner ear.

156. Answer (4)

Hint: Involved in hearing and balancing

Sol.: The fluid-filled inner ear is called the labyrinth, and the coiled portion of the labyrinth is called cochlea. The membranes constituting cochlea *i.e.*, the Reissner's and basilar, divide the surrounding perilymph-filled bony labyrinth into an upper scala vestibuli and a lower scala tympani.

157. Answer (2)

Hint: Ear converts sound waves into neural impulses.

Sol.: Direction of sound waves during mechanism of hearing:- Ear drum $\rightarrow$ Ear ossicles $\rightarrow$ Oval window $\rightarrow$ Cochlear fluids $\rightarrow$ Basilar membrane $\rightarrow$ Auditory nerve

The impulses are transmitted by the afferent fibres *via* auditory nerves to the auditory cortex of the brain. The Eustachian tube connects the middle ear cavity with the pharynx, which helps in equalising the pressures on either sides of the ear drum.

158. Answer (2)

Hint: Impulses are transmitted by the afferent fibres *via* auditory nerves.

Sol.: Visual nerve impulses are transmitted by the optic nerves to the visual cortex area.

Olfactory bulbs are the extensions of the brain's limbic system.

Organ of Corti is a structure located on the basilar membrane and is involved in hearing mechanism.

159. Answer (2)

Hint: Equals to the number of days in a week

Sol.: Anatomically, the ear can be divided into three major sections called the outer ear, the middle ear and the inner ear.

The fluid-filled inner ear called labyrinth, consists of two parts *i.e.*, the bony and the membranous labyrinth. The vestibular apparatus is composed of three semi-circular canals and the otolith (macula is the sensory part of saccule and utricle).

The swollen base of semi-circular canal is called ampulla, which contains a projecting ridge called crista ampullaris which has hair cells. It acts as the sensory receptor for sensing the change in the positions of head or body.

160. Answer (3)

Hint: Membranous labyrinth –Endolymph

Sol.: The bony labyrinth is a series of channels. The space within the cochlea called scala media is filled with endolymph. The membranes constituting cochlea, the Reissner's and basilar, divide the surrounding perilymph filled bony labyrinth into an upper scala vestibuli and a lower scala tympani.

161. Answer (4)

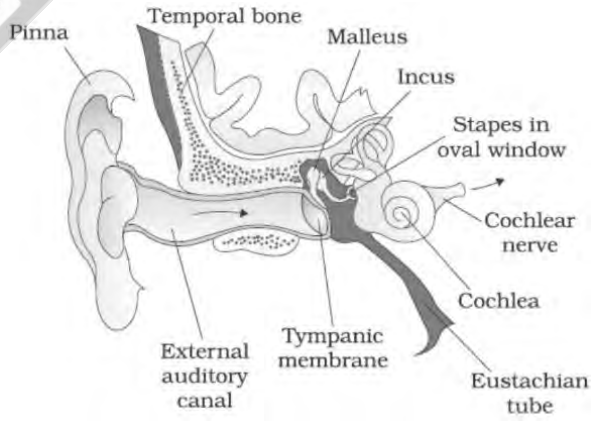
Hint: One of the characteristics of mammals

Sol.: The pinna collects the vibrations in the air which produce sound. There are very fine hair and wax-secreting glands in the skin of pinna and the meatus.

162. Answer (1)

Hint: Ear ossicles

Sol.: The ear performs two sensory functions; hearing and maintenance of body balance.



163. Answer (3)

Hint: Characterised by exopthalmos

Sol.: Iodine is essential for the normal rate of hormone synthesis in the thyroid. Exopthalmic goitre is a form of hyperthyroidism, characterised by enlargement of the thyroid gland, protrusion of

the eyeballs, increased BMR and weight loss, also called Graves' disease.

Dwarfism, diabetes insipidus and simple goitre are the disorders that occur due to hyposecretion of their respective glands.

164. Answer (2)

Hint: Made up of three layers

Sol.: The external auditory meatus leads inwards and extends upto the tympanic membrane (the eardrum). The tympanic membrane is composed of connective tissues covered with skin outside and with mucus membrane inside.

165. Answer (4)

Hint: GnRH acts on gonadotrophs

Sol.: GnRH secreted by hypothalamus acts on anterior pituitary to release gonadotrophins *i.e.,* LH and FSH.

166. Answer (4)

Hint: Present in nose

Sol.: Olfactory receptors are made up of olfactory epithelium that consists of three kinds of cells.

The chemical senses of gustation (taste) and olfactory (smell) are functionally similar and interrelated.

Statoreceptors are the receptors that sense changes in equilibrium and orientation of the body.

Auditory receptors are associated with hearing.

167. Answer (4)

Hint: Identify a steroid hormone.

Sol.: Steroid hormones and iodothyronines interact with intracellular receptors and mostly regulate gene expression or chromosome function by the interaction of hormone-receptor complex with the genome.

Insulin, FSH and adrenaline interact with membrane-bound receptors and generate second messengers.

168. Answer (2)

Hint: Present on anterior part of the kidney

Sol.: Aldosterone is produced by zona glomerulosa that acts mainly at the renal tubules and stimulates the reabsorption of Na^+, water, *etc*. The adrenal cortex secretes many hormones, commonly called corticoids like glucocorticoids, mineralocorticoids, *etc*.

Glucocorticoids are produced by the zona fasciculata layer.

Sex corticoids are produced by the zona reticularis layer.

Cortisol is the main glucocorticoid.

169. Answer (4)

Hint: Collip's hormone

Sol.: Along with TCT (Thyrocalcitonin-proteinaceous hormone from thyroid gland), PTH (a hypercalcemic hormone) plays a significant role in calcium balance in the body.

Aldosterone mainly helps in the maintenance of electrolytes, body fluid volume, osmotic pressure and blood pressure. GnRH stimulates the pituitary synthesis and release of gonadotrophins.

170. Answer (4)

Hint: First discovered hormone

Sol.: Gastrin, secretin and CCK are secreted by gastro-intestinal tract.

Gastrin	–	Stimulates the secretion of HCl and pepsinogen
CCK	–	Stimulates the secretion of pancreatic enzymes and bile juice
ANF	–	Causes dilation of blood vessels

171. Answer (3)

Hint: Catecholamines

Sol.: Catecholamines are also called emergency hormones. Catecholamines increase the heart beat, the strength of heart contraction, pupillary dilation, sweating and the rate of respiration.

172. Answer (1)

Hint: The choroid is situated in between sclera and retina.

Sol.: The choroid layer is thin over the posterior two-thirds of the eyeball. At the posterior pole of the eye lateral to the blind spot, there is a yellowish pigmented spot called macula lutea.

Hypothalamus is the basal part of diencephalon, forebrain.

173. Answer (3)

Hint: Hormone from unorganised endocrine organ

Sol.: Some of the hormones are secreted by some tissues which are not endocrine glands. Secretin acts on the exocrine pancreas and stimulates secretion of water and bicarbonate ions. Gastrin acts on the gastric glands and stimulates the secretion of hydrochloric acid and pepsinogen.

Thymosin is secreted by thymus gland and melatonin is secreted by pineal gland.

174. Answer (2)

Hint: Sex hormone

Sol.: The stromal or interstitial cells produce a group of hormones called androgens, mainly testosterone. Androgens regulate the development, maturation and functions of the male accessory sex organs. Progesterone is secreted by corpus luteum. Erythropoietin is secreted from JG cells of the kidney.

175. Answer (2)

Hint: Intracellular receptors

Sol.: Hormones which interact with intracellular receptors, mostly regulate gene expression or chromosome function by the interaction of hormone-receptor complex with the genome. These hormones are steroid hormones and iodothyronines.

176. Answer (4)

Hint: Part of inner ear filled with perilymph

Sol.: The coiled portion of the labyrinth is called cochlea. The scala tympani terminates at the round window which opens to the middle ear.

177. Answer (1)

Hint: Macula senses the changes in the position of head in relation to the force of gravity.

Sol.: The saccule and utricle contain a projecting ridge called macula. Ampulla contains a projecting ridge called crista ampullaris which has hair cells.

178. Answer (1)

Hint: Gustation means the sense of taste

Sol.:

a.	Gustatory receptors	iii	Taste buds on tongue
b.	Insulin	iv	Protein hormone
c.	Stapes	i	Ear ossicle
d.	Epinephrine	ii	Amino-acid derivative

179. Answer (1)

Hint: Only cones are present

Sol.: Macula lutea is situated at the posterior pole of the eye lateral to blind spot. Fovea is the point where the visual acuity (resolution) is the greatest.

180. Answer (4)

Hint: Hypothalamus is supreme commander of the endocrine system.

Sol.: The secretion of endocrine glands are called hormones. As the nerve fibres do not innervate all cells of the body and the cellular functions need to be continuously regulated; a special kind of co-ordination and integration has to be provided. This function is carried out by hormones.

181. Answer (1)

Hint: *Hydra* is an invertebrate.

Sol.: Invertebrates possess very simple endocrine systems with few hormones whereas a large number of chemicals act as hormones and provide coordination in the vertebrates. Hormones are also secreted by some tissues which are not endocrine glands.

182. Answer (1)

Hint: Characterised by the presence of nephrons

Sol.: Pituitary, pineal, thyroid, adrenal, pancreas, parathyroid, thymus and gonads are organised endocrine bodies.

Hormones are also secreted by some tissues which are not endocrine glands *e.g.,* GIT, liver, kidneys, heart, *etc*.

183. Answer (4)

Hint: Part of forebrain

Sol.: Hypothalamus contains several groups of neurosecretory cells called nuclei which produce hormones *i.e.*, releasing hormones and inhibiting hormones.

Releasing hormones stimulate secretion of pituitary hormones. Pituitary gland is attached to the hypothalamus by a stalk and is divided anatomically into adenohypophysis and neurohypophysis.

184. Answer (3)

Hint: Secreted by atrial wall

Sol.: The atrial wall of our heart secretes a very important peptide hormone called Atrial Natriuretic Factor (ANF) which decreases blood pressure.

Endocrine cells present in different parts of the GIT secrete four major peptide hormones namely gastrin, secretin, CCK and GIP.

185. Answer (3)

Hint: Hypercalcemic hormone

Sol.: The secretion of PTH is regulated by the circulating levels of calcium ions. PTH increases the Ca^{2+} levels in the blood. PTH also stimulates reabsorption of Ca^{2+} by the renal tubules and increases Ca^{2+} absorption from the digested food, so it is a hypercalcemic hormone.

Thyrocalcitonin is a hypocalcemic hormone.

Cortisol is the main glucocorticoid that stimulates gluconeogenesis, lipolysis and proteolysis.

SECTION - B

186. Answer (2)

Hint: The membranous canals are suspended in the perilymph of the bony canals.

Sol.:

a.	Tectorial membrane	iii.	Above the rows of the hair cells (in cochlea)
b.	Membranous labyrinth	ii.	Suspended in perilymph
c.	Vestibular apparatus	i.	Maintenance of balance of body

187. Answer (1)

Hint: Window of middle ear and labyrinth

Sol.: Organ of Corti is located on the basilar membrane. At the base of the cochlea, the scala vestibuli ends at the oval window, while scala tympani terminates at the round window which opens to the middle ear.

188. Answer (1)

Hint: Regulate expression of emotional reactions

Sol.: Olfactory bulbs are a pair of broad bean-sized organs, which are extensions of the limbic system in the brain. Medulla oblongata and cerebellum are the parts of hindbrain.

Pons consists of fibre tracts that interconnect different regions of the brain.

189. Answer (3)

Hint: Related to light adaptation

Sol.: When we move from the dark into bright light, both rods and cones are stimulated and large amount of the photopigments are broken down instantaneously, producing a flood of signals resulting in the glare.

Dark adaptation occurs when we move to dark area.

190. Answer (2)

Hint: Glycogenesis

Sol.: The β-cells of islets of Langerhans produce insulin. Insulin stimulates conversion of glucose to glycogen and is antagonistic to glucagon. Glucagon acts mainly on the liver cells and stimulates glycogenolysis resulting in an increased blood sugar (hyperglycemia).

191. Answer (2)

Hint: Hypothyroidism

Sol.: Over secretion of GH stimulates abnormal growth of the body leading to gigantism. Hypothyroidism during pregnancy causes defective development and maturation of the growing baby leading to stunted growth (cretinism). Deficiency of iodine in our diet results in hypothyroidism and enlargement of the thyroid gland, commonly called goitre.

192. Answer (3)

Hint: Diabetes insipidus

Sol.: Oxytocin and vasopressin are actually synthesized by hypothalamus. Hyposecretion of insulin causes diabetes mellitus.

193. Answer (3)

Hint: Identify steroid hormones

Sol.: The receptors present inside the target cell are called intracellular receptors. Steroid hormones and iodothyronines interact with intracellular receptors.

Cortisol and androgens are steroid hormones.

194. Answer (2)

Hint: Stored in sarcoplasmic reticulum

Sol.: Target tissue metabolism and hence physiological functions are regulated by hormones. Secondary messengers like cAMP, IP_3 and Ca^{2+} in turn regulate cellular metabolism.

195. Answer (2)

Hint: Hormone secreted by testis

Sol.:

(i) **Peptide, polypeptide, protein hormones** (*e.g.,* insulin, glucagon, pituitary hormones, hypothalamic hormones, *etc.*)

(ii) **Steroids** (*e.g.,* cortisol, testosterone, estradiol and progesterone)

(iii) **Iodothyronines** (thyroid hormones)

(iv) **Amino-acid derivatives** (*e.g.,* epinephrine).

196. Answer (4)

Hint: ANF is atrial natriuretic factor

Sol.: GIP inhibits gastric secretion and motility and is secreted by endocrine cells present in gastro-intestinal tract.

197. Answer (4)

Hint: Image formation is the last step

Sol.: The light rays in visible wavelength focussed on the retina through the cornea and lens generate potentials (impulses) in rods and cones. The photosensitive compound (photopigment) in the human eye is composed of **opsin** (a protein) and **retinal** (an aldehyde of vitamin A). Light induces dissociation of the retinal from opsin resulting in changes in the structure of the opsin. This causes membrane permeability changes. As a result, potential differences are generated in the photoreceptor cells. This produces a signal that generates action potentials in the ganglion cells through the bipolar cells. These action potentials (impulses) are transmitted by the optic nerves to the **visual cortex** area of the brain, where the neural impulses are analysed and the image formed on the retina is recognised based on earlier memory and experience.

198. Answer (4)

Hint: Cones are responsible for photopic vision.

Sol.: The day light (photopic) vision and colour vision are functions of cones and the twilight (scotopic) vision is the function of the rods. In the human eye, there are three types of cones which possess their own characteristic photopigments that respond to red, green and blue lights.

199. Answer (2)

Hint: Erythropoiesis

Sol.: CCK acts on both pancreas and gall bladder, ANF decreases blood pressure and both adrenaline and nor-adrenaline are collectively known as catecholamines.

200. Answer (1)

Hint: Identify the function of oxytocin

Sol.: Oxytocin stimulates the contraction of smooth muscles of the uterus. Thymosins play a major role in the differentiation of T lymphocytes. Thyroxine plays an important role in the regulation of the BMR.

These hormones also support the process of RBC formation, controlling the metabolism of carbohydrates, proteins and fats.

❑ ❑ ❑

All India Aakash Test Series for NEET-2024

TEST-5 (Code-D)

Test Date : 12/02/2023

ANSWERS

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

HINTS & SOLUTIONS

[PHYSICS]

SECTION - A

1. Answer (1)

Hint: $\frac{U}{\text{Volume}} = \frac{1}{2}\text{strain}^2 Y$

Sol.: Area, $A = \frac{m}{\delta l}$

$\text{Strain}\frac{\Delta l}{l} = \frac{F}{AY}$

$\Rightarrow \frac{U}{\text{Volume}} = \frac{1}{2}\left(\frac{F\delta l}{mY}\right)^2 Y$

$= \frac{F^2\delta^2 l^2}{2m^2 Y}$

2. Answer (4)

Sol. & Hint: Shearing strain is a dimensionless quantity.

3. Answer (1)

Hint: Slope of stress v/s strain graph gives Young's modulus.

Sol.: Slope of strain v/s stress graph = $\frac{1}{Y}$

$\Rightarrow \frac{\tan 37^\circ}{\tan 45^\circ} = \frac{Y_A}{Y_B}$

$\Rightarrow \frac{Y_A}{Y_B} = \frac{3}{4}$

4. Answer (4)

Hint & Sol.: Breaking stress of material does not depend on its dimensions.

5. Answer (3)

Hint: $B = \frac{P}{\left(\frac{-\Delta V}{V}\right)}; \frac{\Delta V}{V} = \frac{3}{2}\frac{\Delta A}{A}$

Sol.: $B = \frac{P}{\left(\frac{-3}{2}\frac{\Delta A}{A}\right)}$

$\Rightarrow \frac{\Delta A}{A} = -\frac{2P}{3B}$

6. Answer (1)

Hint: $\Delta l = \frac{FL}{AY}$

Sol.: $Y = \frac{FL}{A\Delta l}$

$\Rightarrow Y = \frac{10^3 \times 1}{2\times 10^{-6}\times 10^{-3}}$

$= 0.5 \times 10^{12}$ Pa $= 500 \times 10^9$ Pa

7. Answer (1)

Hint: Work = $T\Delta S$

Sol.: $W = T(S_1 - S_2)$

$= 0.07\left(\frac{15-10}{10^4}\right)\times 2$ [Film has dual surface]

$= 0.7 \times 10^{-4}$ J

8. Answer (2)

Hint: $h = \frac{2T\cos\theta}{\rho g r}$

Sol.: $h \propto \cos\theta$

$\Rightarrow \frac{h'}{h} = \frac{\cos 0^\circ}{\cos 60^\circ}$

$\Rightarrow h' = 2h$

9. Answer (4)

Hint & Sol.: If water contact angle is larger than 90°, the solid surface is considered hydrophobic.

10. Answer (3)

Hint: $\Delta S.E. = (n^{1/3} - 1)4\pi R^2 T$

Sol.: $E = 4\pi R^2 T$

$\Delta S.E. = (8^{1/3} - 1)4\pi R^2 T$

$= 4\pi R^2 T$

$\Rightarrow \Delta S.E. = E$

11. Answer (2)

Hint: $v = v_T(1 - e^{-kt})$

Sol.: at $t = 0$, $v = 0$

at $t = \infty$, $v = v_T$

$\therefore$ For same increment in speed, time taken will be more as speed increases.

$\Rightarrow t_2 - t_1 > t_1$

$\Rightarrow t_2 > 2t_1$

12. Answer (2)

Hint: $v_T = \frac{2}{9}\frac{r^2 g}{\eta}(\sigma - \rho)$

Sol.: $v_T \propto r^2$

$$\Rightarrow \frac{v}{v_0} = \left(\frac{r}{R}\right)^2$$

$$\Rightarrow v = \frac{v_0}{16} \qquad (R = n^{1/3}r)$$

13. Answer (2)

Hint & Sol.: Barometer is used to measure absolute atmospheric pressure at any place.

14. Answer (1)

Hint: Equation of continuity

Sol.: $A_1v_1 + A_2v_2 = A_3v_3$

$\Rightarrow 2v_1 + v_2 = v_3$

$\Rightarrow v_3 = 30$ m/s

15. Answer (4)

Hint: Buoyant force = $\rho V_i g$

Sol.: F_B = Weight

$\Rightarrow \rho_c \times g \times [10 \times 2 \times 6] = \rho_l \times g \times [10 \times 2 \times 4]$

$$\Rightarrow \frac{\rho_c}{\rho_l} = \frac{4}{6} = \frac{2}{3}$$

16. Answer (2)

Hint: Buoyant force = $\rho_{liquid}\ V_{immersed}\ g$

Sol.: Net force experienced by

Ball = Buoyant force – Weight of ball

$$= \rho \times g \times V - \frac{\rho}{2} \times g \times V$$

And Net force = ma

$$\frac{\rho}{2} \times V \times a = \rho \times g \times V - \frac{\rho g V}{2}$$

$a = g$

17. Answer (2)

Hint: Pascal's law

Sol.: Increase in pressure = $\frac{10\text{ N}}{10\text{ cm}^2}$

Extra force on bottom = $(\Delta P)80\text{ cm}^2$

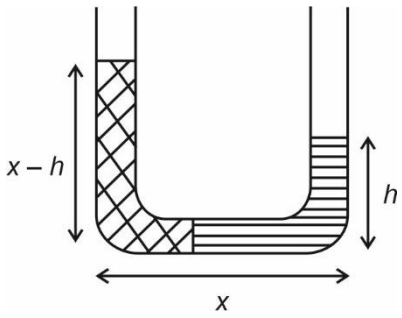
$$= \frac{10}{10} \times 80$$

= 80 N

18. Answer (1)

Hint: $P = \rho gh$

Sol.:



$\rho g(x - h) = 2\rho gh$

$\rho gx = 3\rho gh$

$$\Rightarrow h = \frac{x}{3} \text{ and other is } \frac{2x}{3}$$

19. Answer (3)

Hint: Pascal's law

Sol.: The change in pressure will be transmitted throughout the liquid without diminishing.

20. Answer (3)

Hint: Apparent change in volume = $V(\gamma_1 - \gamma_2)\Delta T$

Sol.: $(998 - 1000) = 1000\,(r - \delta)\Delta T$

$$\frac{-2}{1000\,\Delta T} = r - \delta$$

Since, $\Delta T > 0$

$\Rightarrow r < \delta$

21. Answer (4)

Hint: $Y\alpha\Delta T$ = Thermal stress

Sol.: Thermal stress = $Y\alpha T$

22. Answer (3)

Hint: Wein's displacement law, $\lambda_m T$ = Constant

Sol.: $\lambda T = \lambda'(2T)$

$$\Rightarrow \lambda' = \frac{\lambda}{2}$$

23. Answer (1)

Hint: $\Delta t \propto \left(x_2^2 - x_1^2\right)$

Sol.: $40 = k(3^2 - 2^2)$

and $t = k(4^2 - 3^2)$

$\Rightarrow t = 56$ h

24. Answer (1)

Hint: $a + r + t = 1$

Sol.: $r = 1 - \frac{1}{6} - \frac{1}{3} = \frac{1}{2}$

25. Answer (4)

Hint: $\Delta l = l\alpha\Delta T$

Sol.: $\Delta l_{eff} = \Delta l_1 + \Delta l_2$

$(l_1 + l_2)\alpha_{eff}\Delta T = l_1\alpha_1\Delta T + l_2\alpha_2\Delta T$

$\Rightarrow \alpha_{eff} = \dfrac{l_1\alpha_1 + l_2\alpha_2}{l_1 + l_2}$

26. Answer (2)

Hint: $\dfrac{T - L.P.}{U.P. - L.P.} = \text{Constant}$

Sol.: $\dfrac{T-(-20)}{80+(20)} = \dfrac{50-0}{100-0}$

$\Rightarrow T = 30°C$

27. Answer (1)

Hint: $P \propto T^4$, λT = constant

Sol.: $\lambda \propto T^{-1}$

$\Rightarrow T \propto \lambda^{-1}$

$\Rightarrow \lambda \propto P^{-1/4}$

28. Answer (2)

Hint: $l = l_0(1 + \alpha\Delta T)$

Sol.: $L_{steel} = l_0(1 - \alpha_S T)$

$l_{Brass} = l_0(1 - \alpha_B T)$

(Where T is temperature difference)

Since, $\alpha_B > \alpha_S$

$\Rightarrow l_{Brass} < l_{steel}$

Hence, brass will be on concave side.

29. Answer (2)

Hint: $\dfrac{dQ}{dt} = \sigma e A T^4$

Sol.: For same mass, hollow sphere has more surface area. Thus, it looses more heat.

30. Answer (1)

Hint: From symmetry

$T = \dfrac{T_1 + T_2 + T_3 + T_4}{4}$

Sol.: $T = \dfrac{20 + 40 + 60 + 80}{4}$

$= 50°C$

31. Answer (3)

Hint: $-\dfrac{dT}{dt} = k(T - T_0)$

From Newton's law of cooling.

Sol.: $\dfrac{5}{10} = k(32.5 - 20)$

and $\dfrac{5}{t} = k(27.5 - 20)$

$\Rightarrow \dfrac{t}{10} = \dfrac{12.5}{7.5}$

$\Rightarrow t = \dfrac{50}{3}$ minutes $\approx$ 17 minutes

32. Answer (2)

Hint: Heat resistance = $\dfrac{L}{KA}$

Sol.: In series, $R = R_1 + R_2 + R_3$

$\Rightarrow \dfrac{3L}{K_{eff}A} = \dfrac{L}{KA} + \dfrac{L}{2KA} + \dfrac{L}{3KA}$

$\Rightarrow \dfrac{3}{K_{eff}} = \dfrac{1}{K} + \dfrac{1}{2K} + \dfrac{1}{3K}$

$\Rightarrow K_{eff} = \dfrac{18}{11}K$

33. Answer (2)

Hint & Sol.: Convection is the mode of heat transfer by actual motion of matter.

34. Answer (1)

Hint: $\lambda_m T$ = Constant

Sol.: Since $(\lambda_m)_A < (\lambda_m)_B < (\lambda_m)_C$

$\Rightarrow T_A > T_B > T_C$

35. Answer (4)

Hint & Sol.: Given all gases are greenhouse gases.

SECTION - B

36. Answer (2)

Hint: Normal stress = $\dfrac{F_\perp}{\text{Area}}$

Sol.: Normal stress = $\dfrac{F\cos\theta}{(b)\left(\dfrac{h}{\cos\theta}\right)} = \dfrac{F\cos^2\theta}{bh}$

37. Answer (3)

Hint: In series, $\Delta l_{eq} = \Delta l_1 + \Delta l_2 + \Delta l_3$

Sol.: $\dfrac{Fl_{eq}}{AY_{eq}} = \dfrac{Fl_1}{AY_1} + \dfrac{Fl_2}{AY_2} + \dfrac{Fl_3}{AY_3}$

$\dfrac{l_1 + l_2 + l_3}{Y_{eq}} = \dfrac{l_1}{Y_1} + \dfrac{l_2}{Y_2} + \dfrac{l_3}{Y_3}$

$Y_{eq} = \dfrac{Y_1Y_2Y_3(l_1 + l_2 + l_3)}{l_1Y_2Y_3 + l_2Y_1Y_3 + l_3Y_1Y_2}$

38. Answer (4)

Hint: $\Delta l = \frac{Fl}{AY}$

Sol.: $\Delta l = \Delta l_1 + \Delta l_2$

$= \frac{2F\frac{l}{2}}{AY} + \frac{F\frac{l}{2}}{AY}$

$= \frac{3}{2}\frac{Fl}{AY}$

39. Answer (3)

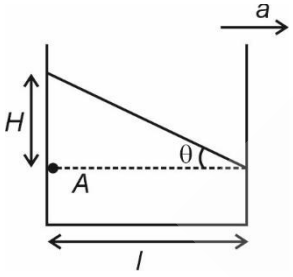
Hint & Sol.: Coefficient of viscosity is ratio of shearing stress to strain rate.

$$\eta = \frac{\left(\frac{F}{A}\right)}{\left(\frac{dv}{dy}\right)}$$

40. Answer (1)

Hint: Pressure increases in the direction opposite to acceleration of container.

Sol.:



$P_A = P_0 + \rho gH = P_0 + \rho al$

$\Rightarrow \rho gH = \rho al$

$\Rightarrow \frac{H}{l} = \frac{a}{g}$

$\Rightarrow \theta = \tan^{-1}\left(\frac{a}{g}\right)$

41. Answer (1)

Hint: $P = \rho gh$

Sol.: $\rho_3 2xg = \rho_1 2xg + \rho_2 xg$

$\Rightarrow 2\rho_3 = 2\rho_1 + \rho_2$

$\Rightarrow \rho_3 = \frac{2\rho_1 + \rho_2}{2}$

42. Answer (2)

Hint: $\Delta P = \rho gh$

Sol.: $h = 10$ m and $\rho = 10^3$ kgm^{-3}

$P = P_{atm} + \rho gh = 1.01 \times 10^5 + 10^3 \times 10 \times 10$

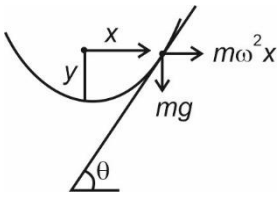
$= 2.01 \times 10^5$ Pa

$= 2$ atm

43. Answer (3)

Hint: $h = \frac{\omega^2 x^2}{2g}$

Sol.:



From geometry,

$\tan\theta = \frac{m\omega^2 x}{mg}$

$\Rightarrow \frac{dy}{dx} = \frac{m\omega^2 x}{mg}$

$\Rightarrow y = \frac{\omega^2 x^2}{2g}$ (Equation of parabola)

44. Answer (1)

Hint: $l = l_0(1 + \alpha\Delta T)$

Sol.: $l_1 = l_0(1 + \alpha T)$

$\Rightarrow l_0\alpha T = l_1 - l_0$

and; $l_2 = l_0(1 + \alpha 2T)$

$\Rightarrow l_2 = l_0 + 2(l_1 - l_0)$

$\Rightarrow l_2 = 2l_1 - l_0$

45. Answer (4)

Hint: Solar constant $S = \sigma\left(\frac{R}{r}\right)^2 T^4$

Sol.: $S \propto T^4$

$\Rightarrow \frac{S_2}{S_1} = \left(\frac{1}{2}\right)^4$

$\Rightarrow S_2 = \frac{S}{16}$

46. Answer (2)

Hint: Steel has positive coefficient of areal expansion.

Sol.: Hole will expand as molecules move away from each other due to increase in kinetic energy.

47. Answer (2)

Hint: Equation of continuity.

Sol.: $A_1v_1 = A_2v_2$

$\therefore v \propto \frac{1}{A}$

48. Answer (2)

Hint: $Q = \int msdT$

Sol.: $Q_1 = \int_{T}^{2T} msdT$ ...(1)

and $Q_2 = \int_{2T}^{3T} msdT$ ...(2)

since 's' is decreasing with temperature therefore, $Q_1 > Q_2$.

49. Answer (1)

Hint: $Q_{Fusion} = ml_F$; $Q_{vaporisation} = ml_v$; $Q = ms\Delta T$

Sol.: From 2 g of steam to loose heat and come to 0°C water.

$Q_1 = 2(540) + 2(1)(100) = 1280$ cal

Heat absorbed by ice to melt

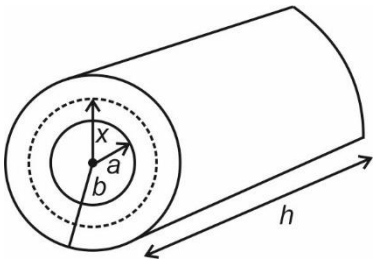
$Q_2 = 16(80) = 1280$ cal

As $Q_1 = Q_2$; final temperature is 0°C and we will have 18 g water.

50. Answer (2)

Hint: For radial flow in cylinder, the resistance is proportional to $\ln\left(\frac{b}{a}\right)$

Sol.:



$$dR = \frac{dx}{k2\pi xh}$$

$$\Rightarrow R = \frac{1}{2\pi kh}\ln\left(\frac{b}{a}\right)$$

$\Rightarrow$ Resistance between r to $1.5r$ is more than resistance between $1.5r$ to $2r$.

Hence, temperature drop between r to $1.5r$ is more than temperature drop between $1.5r$ to $2r$.

[CHEMISTRY]

SECTION - A

51. Answer (3)

Hint: If central atom has vacant orbital, the species gets easily hydrolysed.

Sol.: Silicon (Si) in $SiCl_4$ has vacant d orbital, hence it is hydrolysed easily while C of CCl_4 does not have vacant orbital.

52. Answer (2)

Hint: Number of neutrons (N) = A – Z

Sol.:

Isotopes	$^{3}_{1}T$	$^{2}_{1}D$	$^{1}_{1}H$
No. of neutrons	2	1	0

53. Answer (2)

Hint: Acid-base reaction takes place.

Sol.: $2NH_4Cl + Ca(OH)_2 \rightarrow 2NH_3 + CaCl_2 + H_2O$

54. Answer (1)

Hint: More is the extent of hydration, less will be the ionic mobility of ions in aqueous medium.

Sol.: The hydration of alkaline earth metal ions decreases with increase in ionic sizes

$Be^{2+} > Mg^{2+} > Ca^{2+} > Sr^{2+}$

Ionic mobility is

$Be^{2+}(aq) < Mg^{2+}(aq) < Ca^{2+}(aq) < Sr^{2+}(aq)$

55. Answer (3)

Hint & Sol.: Lithium shows anomalous behaviour.

Sol.: $4LiNO_3 \xrightarrow{\Delta} 2Li_2O + 4NO_2 + O_2$

56. Answer (2)

Hint: Rb gives red-violet colour to the flame test.

Sol.:

Li — Crimson red

Na — Yellow

K — Violet

Rb — Red violet

57. Answer (4)

Hint and Sol.: In $CuSO_4 \cdot 5H_2O$, four H_2O molecules form coordinate bonds and one H_2O molecule is hydrogen-bonded.

58. Answer (4)

Hint and Sol:

Property	**H_2O**	**D_2O**
Dielectric constant (C^2/Nm^2)	78.39	78.06
Boiling point (K)	373	374.4
Viscosity (centipoise)	0.89	1.1
Enthalpy of vaporisation at 373 K ($kJ\ mol^{-1}$)	40.66	41.61

59. Answer (2)

Hint: Electron-precise compounds have the required number of electrons to write their conventional Lewis structures.

Sol.: CH_4 : Electron-precise hydride

NH_3, H_2O : Electron-rich hydrides

BH_3 : Electron-deficient hydride

60. Answer (4)

Hint: Metals of group 7, 8 and 9 do not form metallic hydrides.

Sol.: Iron (Fe) belongs to group 8 and it does not form metallic hydride.

61. Answer (3)

Hint: Peroxide on hydrolysis gives H_2O_2 as one of the products.

Sol.: $Li_2O_2 + H_2O \rightarrow LiOH + H_2O_2$

62. Answer (2)

Hint: Alkali metals form various oxides on reaction with air.

Sol.: Lithium forms monoxide, sodium forms peroxide and other alkali metals form superoxides.

63. Answer (2)

Hint: Negative reduction potential of Li^+/Li is maximum in alkali metals.

Sol.: Potassium is lighter than sodium

Metal	Density (gml^{-1})
Na	0.97
K	0.86

64. Answer (3)

Hint: Smaller the ion more is the extent of hydration.

Sol.:

Metal	Hydration enthalpy $kJ\ mol^{-1}$
Li	–506
Na	–406
K	–330
Rb	–310
Cs	–276

65. Answer (2)

Hint: Alkaline earth metal chlorides generally exist in hydrated form.

Sol.: In alkali metal chlorides, except Li, all other elements do not exist in hydrated salt.

66. Answer (2)

Hint: NaOH is commercially prepared by Castner-$NaHCO_3$ Kellner cell.

Sol.: In Castner-Kellner cell, mercury is used as cathode and carbon as anode.

67. Answer (3)

Hint: Solvay process is use to prepare sodium carbonate.

Sol.: NH_4Cl is obtained as one of the products.

$NH_4HCO_3 + NaCl \rightarrow NH_4Cl + NaHCO_3$

68. Answer (4)

Hint: Among alkali metal chlorides, only LiCl can form hydrates.

Sol.: LiCl crystallises as a hydrate, $LiCl{\cdot}2H_2O$.

69. Answer (1)

Hint: The thermal stability increases with increasing cationic size.

Sol.: The stability of group I carbonates increases down the group as the electropositive character increases.

70. Answer (2)

Hint & Sol.: ZSM-5 is a type of zeolite which is used to convert alcohols directly into gasoline.

71. Answer (4)

Hint: Number of five-membered rings present in Buckminsterfullerene is 12.

Sol.: Number of six-membered rings present in Buckminsterfullerene is 20.

72. Answer (3)

Hint: Species containing unpaired electrons are paramagnetic in nature.

Sol.: KO_2 contains O_2^- which is having one unpaired electron in π^*2p_x molecular orbital.

73. Answer (3)

Hint: Thermal stability of Group I hydride decreases on going down the group.

Sol.: As bond strength of M – H decreases on going down the group, the thermal stability decreases Thermal stability order:

LiH > NaH > KH > RbH > CsH.

74. Answer (1)

Hint: $Be(OH)_2$ reacts with both acid and alkali.

Sol.: $Be(OH)_2$ is amphoteric in nature whereas all other hydroxides of alkaline earth metals are basic in nature.

75. Answer (3)

Hint: Down the group, the size increases and tendency to show catenation decreases

Sol.: Catenation: $C >> Si > Ge \simeq Sn$. Pb does not show catenation.

76. Answer (4)

Hint: Aluminium dissolves in aqueous mineral acids and aqueous alkalies.

Sol.: Concentrated HNO_3 renders Al passive by forming a protective oxide layer on the surface of Al.

77. Answer (3)

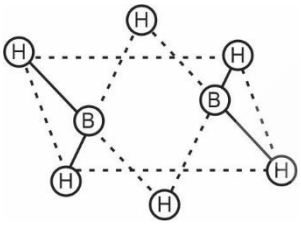
Hint: Stability of lower oxidation state increases down the group.

Sol.: Due to inert pair effect, +1 oxidation state stability in group 13 elements increases on moving down the group.

78. Answer (4)

Hint: B_2H_6 contains four terminal bonds and two bridging bonds.

Sol.: B_2H_6 is a non-planar compound.



Structure of B_2H_6

79. Answer (2)

Hint: H_3BO_3 on heating undergoes dehydration.

Sol.: $H_3BO_3 \xrightarrow{100^\circ C} \underset{[A]}{HBO_2} \xrightarrow{\text{further heating}} \underset{[B]}{B_2O_3}$

80. Answer (3)

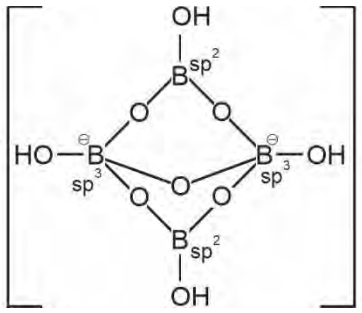
Hint: Amphoteric oxide can react with both acid and base.

Sol.:

Oxide	Chemical nature
B_2O_3	Acidic
SiO_2	Acidic
Al_2O_3	Amphoteric
BaO	Basic

81. Answer (4)

Hint: The formula of borax is $Na_2[B_4O_5(OH)_4].8H_2O$

Sol.: $2Na^+$  $.8H_2O$

82. Answer (1)

Hint: $\underset{sp^3}{NH_3} + \underset{sp^2}{BF_3} \longrightarrow [\underset{sp^3}{NH_3} \rightarrow \underset{sp^3}{BF_3}]$

Sol.: Hybridization of 'N' is same as sp^3.

83. Answer (4)

Hint: Acidic strength is inversely proportional to back-bonding.

Sol.: Lewis acidic strength will increase as $BF_3 < BCl_3 < BBr_3 < BI_3$ back-bonding decrease from BF_3 to BI_3.

84. Answer (2)

Hint: Atomic size of aluminium is greater than gallium.

Sol.:

Element	IE ($kJmol^{-1}$)	Atomic radius (pm)
B	801	88
Al	577	143
Ga	579	135

Because of larger size of aluminium, its ionisation enthalpy is lower than gallium.

85. Answer (2)

Hint: Electronegativity is a measure of the ability of an atom in a chemical compound to attract shared electrons to itself.

Sol.:

Element	EN
B	2.0
Al	1.5
Ga	1.6
In	1.7

SECTION - B

86. Answer (3)

Hint: One B atom and one N atom together have the same number of valence electron as two C atoms.

Sol.: $(BN)_x$ is known as inorganic graphite as it has layer type structure similar to graphite.

87. Answer (3)

Hint & Sol.:

- Calcium plays important role in neuromuscular functions and cell membrane integrity.
- Potassium ions are the most abundant cations with cell fluids, where they activate many enzymes. Potassium participates in the oxidation of glucose to produce ATP.
- Magnesium (Mg) is used as the cofactor for all enzymes that utilise ATP in phosphate transfer.
- Calcium is majorly present in bones and teeth.

88. Answer (1)

Hint: Volume strength = 11.2 × Molarity

Sol.: Percentage strength $= \frac{10 \times 34}{11.2 \times 10} = 3\%$

89. Answer (3)

Hint: Syngas is also called water gas.

Sol.: Syngas is a mixture of CO and H_2.

90. Answer (1)

Hint: Electrolysis of acidified water using platinum electrode is commercial method of preparation of hydrogen.

Sol.: In laboratory, dihydrogen is prepared by the reaction of granulated zinc with dilute HCl or dilute sulphuric acid.

91. Answer (1)

Hint: More is the lattice enthalpy more will be the melting point.

Sol.: Lattice enthalpy order:

NaF > NaCl > NaBr > NaI

Hence, NaF has the highest melting point.

92. Answer (3)

Hint: Smaller is the size of cation, greater is the hydration enthalpy.

Sol.: As the hydration enthalpy decreases down the group, solubility of group 2 element sulphates decreases too.

Order : $BaSO_4 < SrSO_4 < CaSO_4 < MgSO_4$.

93. Answer (1)

Hint: Smaller is the size of cation, more is the polarising power.

Sol.: Order of ionic size: $Ca^{2+} > Mg^{2+} > Be^{2+}$ smaller is the size of cation, more is the polarising power and more is the covalent character.

94. Answer (3)

Hint & Sol.: $CO(g) + 2H_2(g) \xrightarrow[\text{Catalyst}]{\text{Cobalt}} CH_3OH(l)$

95. Answer (3)

Hint: CaC_2 has acetylide linkage.

Sol.: $CaC_2 + 2D_2O \rightarrow C_2D_2 + Ca(OD)_2$

96. Answer (1)

Hint: In first step, methyl substituted chlorosilane is formed.

Sol.:

$$2CH_3Cl + Si \xrightarrow[570\ K]{\text{Cu powder}} \underset{[A]}{(CH_3)_2SiCl_2} \xrightarrow{2H_2O} \underset{[B]}{(CH_3)_2Si(OH)_2}$$

97. Answer (3)

Hint: Steric hindrance decreases the stability of compounds.

Sol.: $[SiCl_6]^{2-}$ does not exist because six large chloride ions cannot be accommodated around small-sized Si^{4+} ion.

98. Answer (3)

Hint and Sol.: $Na_2CO_3 \cdot 10H_2O$ is washing soda.

99. Answer (3)

Hint: Ammoniated electrons absorb light in visible region.

Sol.: The blue colour of the solution is due to the formation of ammoniated electron, which absorb light in the visible region.

100. Answer (2)

Hint: Permanent hardness of water is due to the presence of soluble salts of Mg and Ca in the form of chloride and sulphate.

Sol.: Clark's method can only remove temporary hardness of water.

[BOTANY]

SECTION - A

101. Answer (3)

Hint: The most abundant enzyme on the earth is RuBisCO.

Sol.: RuBisCO can carry out photorespiration when O_2 concentration is higher.

102. Answer (1)

Hint: Plastocyanin (PC) transfers the electrons to PS I.

Sol.: PC transfers the electrons from Cyt b_6f to PS I.

103. Answer (2)

Hint: Oxygen is evolved during non-cyclic photophosphorylation.

Sol.: Water (H_2O) is electron donor to PS II.

104. Answer (4)

Hint: Transportation of malic acid to bundle sheath cells takes place in the C_4 pathway.

Sol.: There is no transportation of OAA to bundle sheath cells in C_3 cycle.

105. Answer (4)

Hint: Plants showing Kranz anatomy are C_4 plants.

Sol.: C_4 plants perform C_3 cycle in bundle sheath cells.

106. Answer (4)

Hint: Light is a limiting factor for shade plants.

Sol.: Light rarely becomes limiting factor except for shade plants.

107. Answer (3)

Hint: CAM plants grow in arid regions.

Sol.: Wheat is a C_3 plant. *Opuntia*, pineapple and *Sedum* are CAM plants.

108. Answer (4)

Hint: C_4 plants lack photorespiration.

Sol.: They have CO_2 concentrating mechanism in bundle sheath cells.

109. Answer (1)

Sol.: Dark reaction occurs in stroma of the chloroplast.

110. Answer (4)

Hint: In C_4 plants, bundle sheath cells have agranal chloroplasts.

Sol.: They are thick walled. They fix CO_2 via the Calvin cycle.

111. Answer (3)

Hint: Carboxylation is the most crucial step of the Calvin cycle.

Sol.: Regeneration step of Calvin cycle requires one ATP for phosphorylation to form RuBP.

112. Answer (4)

Hint: In C_4 plants, primary CO_2 fixation occurs in mesophyll cells.

Sol.: In C_4 plants, second fixation of CO_2 takes place in bundle sheath cells. So double carboxylation takes place in C_4 plants.

113. Answer (4)

Hint: In C_3 plants, to fix one CO_2 molecule two NADPH are required.

Sol.: In C_4 plants also two NADPH molecules are required to fix one CO_2 molecule. So there is no difference in numbers of NADPH molecules.

114. Answer (2)

Hint: Primary CO_2 acceptor in sugarcane is PEP.

Sol.: PEP is a 3C molecule.

115. Answer (4)

Hint: Calvin cycle occurs during day-time in CAM plants.

Sol.: In all C_3, C_4, and CAM plants, Calvin cycle occurs.

116. Answer (1)

Hint: PS II is associated with Oxygen-Evolving Complex (OEC).

Sol.: PS II is associated with splitting of water. It is found on grana lamellae.

117. Answer (4)

Hint: Sugars are produced during dark reaction.

Sol.: Glucose is formed during dark reaction. O_2, ATP and NADPH are formed during light reaction.

118. Answer (1)

Hint: During photorespiration, one molecule of PGA and one molecule of phosphoglycolate is formed.

Sol.: PGA is a 3C compound and phosphoglycolate is a 2C compound.

119. Answer (2)

Sol.: T.W. Engelmann described the first action spectrum of photosynthesis.

120. Answer (2)

Hint: This element helps in opening and closing of stomata.

Sol.: Potassium (K) helps in maintaining anion-cation balance in cells.

121. Answer (2)

Hint: Denitrification is carried out by rod-shaped bacteria.

Sol.: *Thiobacillus* carries out denitrification, which is conversion of soil NO_3^- to gaseous N_2.

122. Answer (1)

Hint: *Anabaena* and *Nostoc* are autotrophic organisms.

Sol.: *Rhizobium* and *Azotobacter* are heterotrophic but *Rhizobium* fixes N_2 in a symbiotic association.

Azotobacter fixes N_2 in free living state.

123. Answer (3)

Hint: Macronutrients are required more than trace elements.

Sol.: C, H, N, P, K and S are macronutrients.

124. Answer (2)

Hint: A macronutrient maintains the structure of ribosome.

Sol.: Mg^{2+} is essential to maintain ribosome structure.

125. Answer (4)

Hint: Leghaemoglobin is pink-coloured pigment which helps nitrogenase to function.

Sol.: Leghaemoglobin scavenges oxygen. Only in the absence of oxygen, nitrogenase is active.

126. Answer (1)

Hint: Nitrification is conversion of NH_3 to nitrate.

Sol.: $NH_3 \rightarrow NO_2^- \rightarrow NO_3^-$

Above conversion is called nitrification which is carried out by nitrifying bacteria.

127. Answer (1)

Hint: Nitrifying bacteria are autotrophs.

Sol.: They obtain their energy from oxidising chemicals. They carry out nitrification.

128. Answer (1)

Hint: Nitrogenase converts atmospheric nitrogen to ammonia.

Sol.: Nitrogenase enzyme is present in some prokaryotes. It is not found in eukaryotes.

129. Answer (2)

Hint: A component of nitrate reductase is a trace element.

Sol.: Molybdenum (Mo) is component of nitrogenase and nitrate reductase is a trace element.

130. Answer (4)

Hint: Deficiency symptoms of immobile elements first appear in young tissues.

Sol.: In plants, calcium is immobile element. N, P and K are mobile elements.

131. Answer (4)

Hint: Micronutrients becomes toxic in slight excess.

Sol.: Manganese (Mn) is a micronutrient. Its deficiency causes grey spots in oats. It is required for photolysis of water.

132. Answer (3)

Hint: Zn^{2+} is an activator of alcohol dehydrogenase.

Sol.: Mg^{2+} is an activator for both RuBisCO and PEPCase.

133. Answer (4)

Hint: Sulphur is not found in DNA and RNA.

Sol.: Ribonucleotides are basic units of RNA. They do not have sulphur.

134. Answer (4)

Hint: A macronutrient which is immobile in plants is required for synthesis of cell wall.

Sol.: Calcium is required for synthesis of cell wall in plants.

135. Answer (1)

Hint: Micronutrients become toxic when their concentration exceeds 10 mmol/kg of dry matter in plants.

Sol.: Manganese (Mn) is a micronutrient. Mg, Ca and S are macronutrients.

SECTION - B

136. Answer (1)

Hint: Two of them are macronutrients and one is micronutrient.

Sol.: N, S and Mo deficiency cause late flowering in plants.

137. Answer (3)

Hint: It is an immobile element.

Sol.: Calcium is a constituent of middle lamella.

138. Answer (3)

Hint: Toxic concentration of elements decreases the fresh weight of the plant.

Sol.: Toxic concentration of elements decreases the dry weight by 10%.

139. Answer (1)

Hint: Nitrate reductase is found in plants too.

Sol.: Nitrate reductase is a flavoprotein and contains Mo. It reduces nitrate to nitrite.

140. Answer (2)

Hint: *Frankia* and *Rhizobium* are heterotrophic organisms.

Sol.: *Frankia* is filamentous which fixes N_2 in non-legumes symbiotically.

Bacillus and *Clostridium* are free-living nitrogen fixers.

141. Answer (3)

Hint: Conversion of nitrogen into ammonia is nitrogen fixation.

Sol.: Dead plants and animals release N_2 which is converted to NH_3 by the process called ammonification.

142. Answer (2)

Hint: Reductive amination does not involve transfer of amino group.

Sol.: NH_4^+ is assimilated to form amino acids in reductive amination.

143. Answer (2)

Hint: Photosynthesis is least in green light.

Sol.: In red light, photosynthesis is higher.

144. Answer (1)

Hint: It is coloured plastid.

Sol.: In chloroplast, O_2 is consumed during photorespiration.

145. Answer (4)

Hint: Z-scheme is non-cyclic photophosphorylation.

Sol.: Outer membrane is not involved in Z-scheme of light reaction.

146. Answer (2)

Hint: In photorespiration, three cell organelles are involved. These are chloroplast, mitochondria and peroxisome.

Sol.: Mitochondria releases CO_2 and chloroplast fixes it.

147. Answer (2)

Hint: C_4 plants lack oxygenase activity of RuBisCO.

Sol.: The C_4 plants do not show photorespiration.

148. Answer (4)

Hint: Tomato is a C_3 plant. It shows the CO_2 fertilisation effect.

Sol.: Light saturation for CO_2 fixation occurs at 10% of full sunlight.

149. Answer (3)

Hint: Red drop is seen beyond red light.

Sol.: Sharp decline in quantum yield is seen at wavelengths greater than 680 nm. This is called red drop.

150. Answer (3)

Hint: Regeneration of PEP during the C_4 pathway requires ATP.

Sol.: In leaves of C_4 plants, malic acid is formed in mesophyll cells.

[ZOOLOGY]

SECTION - A

151. Answer (3)

Hint: Hypercalcemic hormone

Sol.: The secretion of PTH is regulated by the circulating levels of calcium ions. PTH increases the Ca^{2+} levels in the blood. PTH also stimulates reabsorption of Ca^{2+} by the renal tubules and increases Ca^{2+} absorption from the digested food, so it is a hypercalcemic hormone.

Thyrocalcitonin is a hypocalcemic hormone.

Cortisol is the main glucocorticoid that stimulates gluconeogenesis, lipolysis and proteolysis.

152. Answer (3)

Hint: Secreted by atrial wall

Sol.: The atrial wall of our heart secretes a very important peptide hormone called Atrial Natriuretic Factor (ANF) which decreases blood pressure.

Endocrine cells present in different parts of the GIT secrete four major peptide hormones namely gastrin, secretin, CCK and GIP.

153. Answer (4)

Hint: Part of forebrain

Sol.: Hypothalamus contains several groups of neurosecretory cells called nuclei which produce hormones *i.e.*, releasing hormones and inhibiting hormones.

Releasing hormones stimulate secretion of pituitary hormones. Pituitary gland is attached to the hypothalamus by a stalk and is divided anatomically into adenohypophysis and neurohypophysis.

154. Answer (1)

Hint: Characterised by the presence of nephrons

Sol.: Pituitary, pineal, thyroid, adrenal, pancreas, parathyroid, thymus and gonads are organised endocrine bodies.

Hormones are also secreted by some tissues which are not endocrine glands *e.g.,* GIT, liver, kidneys, heart, *etc*.

155. Answer (1)

Hint: *Hydra* is an invertebrate.

Sol.: Invertebrates possess very simple endocrine systems with few hormones whereas a large number of chemicals act as hormones and provide coordination in the vertebrates. Hormones are also secreted by some tissues which are not endocrine glands.

156. Answer (4)

Hint: Hypothalamus is supreme commander of the endocrine system.

Sol.: The secretion of endocrine glands are called hormones. As the nerve fibres do not innervate all cells of the body and the cellular functions need to be continuously regulated; a special kind of co-ordination and integration has to be provided. This function is carried out by hormones.

157. Answer (1)

Hint: Only cones are present

Sol.: Macula lutea is situated at the posterior pole of the eye lateral to blind spot. Fovea is the point where the visual acuity (resolution) is the greatest.

158. Answer (1)

Hint: Gustation means the sense of taste

Sol.:

a.	Gustatory receptors	iii	Taste buds on tongue
b.	Insulin	iv	Protein hormone
c.	Stapes	i	Ear ossicle
d.	Epinephrine	ii	Amino-acid derivative

159. Answer (1)

Hint: Macula senses the changes in the position of head in relation to the force of gravity.

Sol.: The saccule and utricle contain a projecting ridge called macula. Ampulla contains a projecting ridge called crista ampullaris which has hair cells.

160. Answer (4)

Hint: Part of inner ear filled with perilymph

Sol.: The coiled portion of the labyrinth is called cochlea. The scala tympani terminates at the round window which opens to the middle ear.

161. Answer (2)

Hint: Intracellular receptors

Sol.: Hormones which interact with intracellular receptors, mostly regulate gene expression or chromosome function by the interaction of hormone-receptor complex with the genome. These hormones are steroid hormones and iodothyronines.

162. Answer (2)

Hint: Sex hormone

Sol.: The stromal or interstitial cells produce a group of hormones called androgens, mainly testosterone. Androgens regulate the development, maturation and functions of the male accessory sex organs. Progesterone is secreted by corpus luteum. Erythropoietin is secreted from JG cells of the kidney.

163. Answer (3)

Hint: Hormone from unorganised endocrine organ

Sol.: Some of the hormones are secreted by some tissues which are not endocrine glands. Secretin acts on the exocrine pancreas and stimulates secretion of water and bicarbonate ions. Gastrin acts on the gastric glands and stimulates the secretion of hydrochloric acid and pepsinogen.

Thymosin is secreted by thymus gland and melatonin is secreted by pineal gland.

164. Answer (1)

Hint: The choroid is situated in between sclera and retina.

Sol.: The choroid layer is thin over the posterior two-thirds of the eyeball. At the posterior pole of the eye lateral to the blind spot, there is a yellowish pigmented spot called macula lutea.

Hypothalamus is the basal part of diencephalon, forebrain.

165. Answer (3)

Hint: Catecholamines

Sol.: Catecholamines are also called emergency hormones. Catecholamines increase the heart beat, the strength of heart contraction, pupillary dilation, sweating and the rate of respiration.

166. Answer (4)

Hint: First discovered hormone

Sol.: Gastrin, secretin and CCK are secreted by gastro-intestinal tract.

Gastrin	–	Stimulates the secretion of HCl and pepsinogen
CCK	–	Stimulates the secretion of pancreatic enzymes and bile juice
ANF	–	Causes dilation of blood vessels

167. Answer (4)

Hint: Collip's hormone

Sol.: Along with TCT (Thyrocalcitonin-proteinaceous hormone from thyroid gland), PTH (a hypercalcemic hormone) plays a significant role in calcium balance in the body.

Aldosterone mainly helps in the maintenance of electrolytes, body fluid volume, osmotic pressure and blood pressure. GnRH stimulates the pituitary synthesis and release of gonadotrophins.

168. Answer (2)

Hint: Present on anterior part of the kidney

Sol.: Aldosterone is produced by zona glomerulosa that acts mainly at the renal tubules and stimulates the reabsorption of Na^+, water, *etc*. The adrenal cortex secretes many hormones, commonly called corticoids like glucocorticoids, mineralocorticoids, *etc*.

Glucocorticoids are produced by the zona fasciculata layer.

Sex corticoids are produced by the zona reticularis layer.

Cortisol is the main glucocorticoid.

169. Answer (4)

Hint: Identify a steroid hormone.

Sol.: Steroid hormones and iodothyronines interact with intracellular receptors and mostly regulate gene expression or chromosome function by the interaction of hormone-receptor complex with the genome.

Insulin, FSH and adrenaline interact with membrane-bound receptors and generate second messengers.

170. Answer (4)

Hint: Present in nose

Sol.: Olfactory receptors are made up of olfactory epithelium that consists of three kinds of cells.

The chemical senses of gustation (taste) and olfactory (smell) are functionally similar and interrelated.

Statoreceptors are the receptors that sense changes in equilibrium and orientation of the body.

Auditory receptors are associated with hearing.

171. Answer (4)

Hint: GnRH acts on gonadotrophs

Sol.: GnRH secreted by hypothalamus acts on anterior pituitary to release gonadotrophins *i.e.,* LH and FSH.

172. Answer (2)

Hint: Made up of three layers

Sol.: The external auditory meatus leads inwards and extends upto the tympanic membrane (the eardrum). The tympanic membrane is composed of connective tissues covered with skin outside and with mucus membrane inside.

173. Answer (3)

Hint: Characterised by exopthalmos

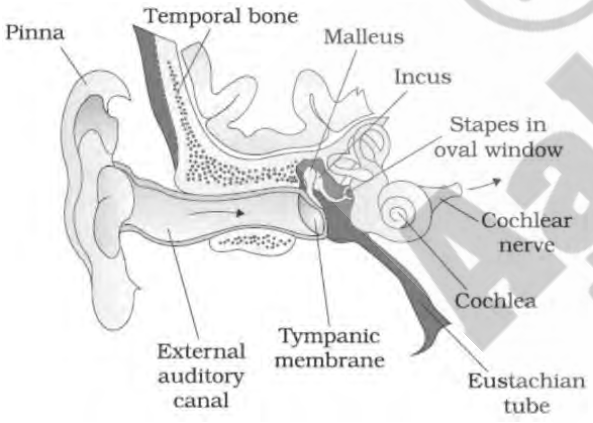
Sol.: Iodine is essential for the normal rate of hormone synthesis in the thyroid. Exopthalmic goitre is a form of hyperthyroidism, characterised by enlargement of the thyroid gland, protrusion of the eyeballs, increased BMR and weight loss, also called Graves' disease.

Dwarfism, diabetes insipidus and simple goitre are the disorders that occur due to hyposecretion of their respective glands.

174. Answer (1)

Hint: Ear ossicles

Sol.: The ear performs two sensory functions; hearing and maintenance of body balance.



175. Answer (4)

Hint: One of the characteristics of mammals

Sol.: The pinna collects the vibrations in the air which produce sound. There are very fine hair and wax-secreting glands in the skin of pinna and the meatus.

176. Answer (3)

Hint: Membranous labyrinth –Endolymph

Sol.: The bony labyrinth is a series of channels. The space within the cochlea called scala media is filled with endolymph. The membranes constituting cochlea, the Reissner's and basilar, divide the surrounding perilymph filled bony labyrinth into an upper scala vestibuli and a lower scala tympani.

177. Answer (2)

Hint: Equals to the number of days in a week

Sol.: Anatomically, the ear can be divided into three major sections called the outer ear, the middle ear and the inner ear.

The fluid-filled inner ear called labyrinth, consists of two parts *i.e.*, the bony and the membranous labyrinth. The vestibular apparatus is composed of three semi-circular canals and the otolith (macula is the sensory part of saccule and utricle).

The swollen base of semi-circular canal is called ampulla, which contains a projecting ridge called crista ampullaris which has hair cells. It acts as the sensory receptor for sensing the change in the positions of head or body.

178. Answer (2)

Hint: Impulses are transmitted by the afferent fibres *via* auditory nerves.

Sol.: Visual nerve impulses are transmitted by the optic nerves to the visual cortex area.

Olfactory bulbs are the extensions of the brain's limbic system.

Organ of Corti is a structure located on the basilar membrane and is involved in hearing mechanism.

179. Answer (2)

Hint: Ear converts sound waves into neural impulses.

Sol.: Direction of sound waves during mechanism of hearing:- Ear drum $\rightarrow$ Ear ossicles $\rightarrow$ Oval window $\rightarrow$ Cochlear fluids $\rightarrow$ Basilar membrane $\rightarrow$ Auditory nerve

The impulses are transmitted by the afferent fibres *via* auditory nerves to the auditory cortex of the brain. The Eustachian tube connects the middle ear cavity with the pharynx, which helps in equalising the pressures on either sides of the ear drum.

180. Answer (4)

Hint: Involved in hearing and balancing

Sol.: The fluid-filled inner ear is called the labyrinth, and the coiled portion of the labyrinth is called cochlea. The membranes constituting cochlea *i.e.*, the Reissner's and basilar, divide the surrounding perilymph-filled bony labyrinth into an upper scala vestibuli and a lower scala tympani.

181. Answer (2)

Hint: Ear ossicles are in middle ear.

Sol.: The inner ear contains a complex system called vestibular apparatus, located above the cochlea. The vestibular apparatus is composed of three semi-circular canals and the otolith.

The middle ear contains three ossicles called malleus, incus and stapes which increase the efficiency of transmission of sound waves to the inner ear.

182. Answer (2)

Hint: Twilight vision

Sol.: The day light (photopic) vision and colour vision are functions of cones and the twilight (scotopic) vision is the function of the rods. In the human eye, there are three types of cones which possess their own characteristic photopigments that respond to red, green and blue lights.

183. Answer (1)

Hint: Thinned out portion of the retina.

Sol.: The space between the

- Cornea and the lens – Aqueous chamber
- Lens and retina – Vitreous chamber

Fovea is the central pit present on macula lutea. It is the thinned out portion of retina where only cones are densely packed.

184. Answer (2)

Hint: Highly vascular layer of the eyeball.

Sol.: Photoreceptor cells are not present in blind spot.
The external layer is composed of a dense connective tissue and is called the sclera. The anterior portion of this layer is called the cornea. The middle layer, choroid, contains many blood vessels and looks bluish in colour.

185. Answer (3)

Hint: Pars nervosa is also known as posterior pituitary.

Sol.: Pars nervosa (neurohypophysis) stores and releases two hormones called oxytocin and vasopressin, which are actually synthesized within the hypothalamus.

GnRH from hypothalamus stimulates the release of gonadotrophins (LH and FSH) from anterior pituitary.

Pars intermedia secretes MSH.

SECTION - B

186. Answer (1)

Hint: Identify the function of oxytocin

Sol.: Oxytocin stimulates the contraction of smooth muscles of the uterus. Thymosins play a major role in the differentiation of T lymphocytes. Thyroxine plays an important role in the regulation of the BMR.

These hormones also support the process of RBC formation, controlling the metabolism of carbohydrates, proteins and fats.

187. Answer (2)

Hint: Erythropoiesis

Sol.: CCK acts on both pancreas and gall bladder, ANF decreases blood pressure and both adrenaline and nor-adrenaline are collectively known as catecholamines.

188. Answer (4)

Hint: Cones are responsible for photopic vision.

Sol.: The day light (photopic) vision and colour vision are functions of cones and the twilight (scotopic) vision is the function of the rods. In the human eye, there are three types of cones which possess their own characteristic photopigments that respond to red, green and blue lights.

189. Answer (4)

Hint: Image formation is the last step

Sol.: The light rays in visible wavelength focussed on the retina through the cornea and lens generate potentials (impulses) in rods and cones. The photosensitive compound (photopigment) in the human eye is composed of **opsin** (a protein) and **retinal** (an aldehyde of vitamin A). Light induces dissociation of the retinal from opsin resulting in changes in the structure of the opsin. This causes membrane permeability changes. As a result, potential differences are generated in the photoreceptor cells. This produces a signal that generates action potentials in the ganglion cells through the bipolar cells. These action potentials (impulses) are transmitted by the optic nerves to the **visual cortex** area of the brain, where the neural impulses are analysed and the image formed on the retina is recognised based on earlier memory and experience.

190. Answer (4)

Hint: ANF is atrial natriuretic factor

Sol.: GIP inhibits gastric secretion and motility and is secreted by endocrine cells present in gastro-intestinal tract.

191. Answer (2)

Hint: Hormone secreted by testis

Sol.:

(i) **Peptide, polypeptide, protein hormones** (*e.g.,* insulin, glucagon, pituitary hormones, hypothalamic hormones, *etc.*)

(ii) **Steroids** (*e.g.,* cortisol, testosterone, estradiol and progesterone)

(iii) **Iodothyronines** (thyroid hormones)

(iv) **Amino-acid derivatives** (*e.g.,* epinephrine).

192. Answer (2)

Hint: Stored in sarcoplasmic reticulum

Sol.: Target tissue metabolism and hence physiological functions are regulated by hormones. Secondary messengers like cAMP, IP_3 and Ca^{2+} in turn regulate cellular metabolism.

193. Answer (3)

Hint: Identify steroid hormones

Sol.: The receptors present inside the target cell are called intracellular receptors. Steroid hormones and iodothyronines interact with intracellular receptors.

Cortisol and androgens are steroid hormones.

194. Answer (3)

Hint: Diabetes insipidus

Sol.: Oxytocin and vasopressin are actually synthesized by hypothalamus. Hyposecretion of insulin causes diabetes mellitus.

195. Answer (2)

Hint: Hypothyroidism

Sol.: Over secretion of GH stimulates abnormal growth of the body leading to gigantism. Hypothyroidism during pregnancy causes defective development and maturation of the growing baby leading to stunted growth (cretinism). Deficiency of iodine in our diet results in hypothyroidism and enlargement of the thyroid gland, commonly called goitre.

196. Answer (2)

Hint: Glycogenesis

Sol.: The β-cells of islets of Langerhans produce insulin. Insulin stimulates conversion of glucose to glycogen and is antagonistic to glucagon. Glucagon acts mainly on the liver cells and stimulates glycogenolysis resulting in an increased blood sugar (hyperglycemia).

197. Answer (3)

Hint: Related to light adaptation

Sol.: When we move from the dark into bright light, both rods and cones are stimulated and large amount of the photopigments are broken down instantaneously, producing a flood of signals resulting in the glare.

Dark adaptation occurs when we move to dark area.

198. Answer (1)

Hint: Regulate expression of emotional reactions

Sol.: Olfactory bulbs are a pair of broad bean-sized organs, which are extensions of the limbic system in the brain. Medulla oblongata and cerebellum are the parts of hindbrain.

Pons consists of fibre tracts that interconnect different regions of the brain.

199. Answer (1)

Hint: Window of middle ear and labyrinth

Sol.: Organ of Corti is located on the basilar membrane. At the base of the cochlea, the scala vestibuli ends at the oval window, while scala tympani terminates at the round window which opens to the middle ear.

200. Answer (2)

Hint: The membranous canals are suspended in the perilymph of the bony canals.

Sol.:

a.	Tectorial membrane	iii.	Above the rows of the hair cells (in cochlea)
b.	Membranous labyrinth	ii.	Suspended in perilymph
c.	Vestibular apparatus	i.	Maintenance of balance of body

❑ ❑ ❑