

All India Aakash Test Series for NEET - 2026

TEST - 8 (Code - C)[Click here for code-D sol.](#)

Test Date : 06/04/2025

ANSWERS

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

HINTS & SOLUTIONS

[PHYSICS]

1. Answer (3)

Hint: Use, $n_1 u_1 = n_2 u_2$

Sol.: $n_1 u_1 = n_2 u_2$

$$10 \text{ kg} \frac{\text{m}}{\text{s}^2} = n_2 \frac{(2 \text{ kg})(2 \text{ m})}{\text{s}^2}$$

$$n_2 = \frac{10}{4} = 2.5$$

2. Answer (2)

Hint: $\vec{v}_{bR} + \vec{v}_{Rg} = \vec{v}_{bg}$

Sol.: $\vec{v}_{bR} = \vec{v}_b - \vec{v}_R = (\hat{i} - \hat{j}) \quad \dots(1)$

$\vec{v}_{Rg} = (\hat{i} + \hat{j}) \quad \dots(2)$

$$\vec{v}_{bg} = (\hat{i} - \hat{j}) + (\hat{i} + \hat{j}) = 2\hat{i}$$

3. Answer (2)

Hint & Sol.: Heat supplied is not a state function
Heat supplied to a gaseous system is a path function and hence depends on the type of process.

4. Answer (4)

Hint: Potential energy is defined for conservative forces only.

Sol.: Negative work done by conservative forces increases PE of a system

$$\Delta U = -W_{\text{cons}}$$

5. Answer (4)

Hint: Work done by a constant force $W = FS$

Sol.: $u = 0$, $F = 15 \text{ N}$, $m = 5 \text{ kg}$, $a = 3 \text{ m/s}^2$

$$\frac{\text{Work done in first 3 second}}{\text{Work done in third second}} = \frac{F \times S_3}{F \times S_{3^{\text{rd}}}}$$

$$\frac{\frac{1}{2}at^2}{\frac{1}{2}a(2n-1)} = \frac{\frac{1}{2}a(3)^2}{\frac{1}{2}a[5]} = \frac{9}{5}$$

6. Answer (1)

Hint & Sol.: Unit of thermal coefficient of volume expansion is K^{-1}

Unit of universal thermal conductivity is $\text{J s}^{-1} \text{K}^{-1} \text{m}^{-1}$

Unit of universal gas constant is $\text{J mol}^{-1} \text{K}^{-1}$

Unit of specific heat capacity is $\text{J kg}^{-1} \text{K}^{-1}$

7. Answer (2)

Hint & Sol.: Plane progressive wave travelling along the negative x-axis is given by,

$$y = A \sin \omega \left(t + \frac{x}{v} \right)$$

8. Answer (1)

Hint: Use equations of motion for uniform angular acceleration.

Sol.: $\theta = \omega_0 t + \frac{1}{2} \alpha t^2$

$$\omega_0 = 0$$

$$\text{At } t = 10 \text{ s, } 100\pi = \frac{1}{2} \alpha (10)^2$$

$$\alpha = 2\pi \text{ rad/s}^2$$

$$\omega = \omega_0 + \alpha t$$

$$= 2\pi(10) = 20\pi \text{ rad/s}$$

9. Answer (3)

Hint: Work done = $\frac{1}{2} \times \text{force} \times \text{elongation}$

Sol.: $Y = \frac{F\ell}{Ax}$, $F = \frac{AYx}{\ell}$

$$\text{Work done} = \frac{1}{2} \left(\frac{YA}{\ell} \right) x^2$$

$$W \propto x^2$$

10. Answer (1)

Hint & Sol.: $Kl = \text{constant}$ for a spring

$K \propto \frac{1}{l}$, spring constant is inversely proportional to its length

For a given force, higher value of K will give smaller elongation.

11. Answer (3)

Hint: To escape into space, kinetic energy is given such that its TE becomes zero.

Sol.: In orbit, TE = - KE

$$TE + \Delta E = 0$$

$$\Delta E = KE = \frac{GM_e m}{2(R+h)}$$

12. Answer (4)

Hint: $a = \frac{v dv}{dx}$

Sol.: $v = x^2 + x$

$$\frac{dv}{dx} = 2x + 1$$

$$a = v \left(\frac{dv}{dx} \right) = (x^2 + x)(2x + 1)$$

$$a(x = 2 \text{ m}) = (2^2 + 2)((2(2) + 1)) = (6)(5) = 30 \text{ m/s}^2$$

13. Answer (3)

Hint: Tension is different at different points of string having mass.

Sol.: $T = \left(\text{Mass of block} + \frac{1}{2} \text{ mass of rope} \right) g$

$$= (6 + 5)(10) = 110 \text{ N}$$

14. Answer (1)

Hint: Use, first law of thermodynamics

$$\Delta Q = \Delta U + W$$

Sol.: $\Delta Q = \Delta U + W$

$$-20 = (U_f - U_i) + 20$$

$$-40 = U_f - U_i$$

$$-40 = 50 - U_i \Rightarrow U_i = 90 \text{ J}$$

15. Answer (2)

Hint: Use free body diagram

Sol.: $F_{\text{applied}} = 20 \text{ N}$

$$\therefore N_w = 20 \text{ N}$$

16. Answer (2)

Hint: For horizontal track, force of friction provides necessary centripetal force.

Sol.: Force of friction provides necessary centripetal force.

$$\frac{mv^2}{r} = \mu mg$$

$$v^2 = \mu rg$$

$$\frac{v^2}{rg} = \mu$$

$$\frac{15 \times 15}{30 \times 10} = \mu = 0.75$$

17. Answer (3)

Hint: Pseudo force are defined for non-inertial frame of reference

Sol.: Pseudo force acts opposite to the direction of acceleration of frame at centre of mass of the body.

18. Answer (2)

Hint: Moment of inertia of a rod about perpendicular axis passing through its centre.

$$I_1 = \frac{ML^2}{12}$$

Sol.: When rod is bent into a ring

$$L = 2\pi R \Rightarrow R = \frac{L}{2\pi}$$

$$I_2 = \frac{MR^2}{2}$$

$$\frac{I_1}{I_2} = \frac{ML^2}{12} \cdot \frac{2 \cdot 4\pi^2}{ML^2}$$

$$\frac{I_1}{I_2} = \frac{2}{3} \pi^2$$

19. Answer (3)

Hint: Use principle of calorimetry

(Heat lost by water) = (Heat gained by ice)

Sol.: $mc\Delta\theta = ML$

Heat lost by water at 40°C = Heat gained by ice at 0°C

$$80 \times 1 \times (40 - 0) = M \cdot (80)$$

$$M = 40 \text{ g}$$

20. Answer (4)

Hint: Rate of heat loss

$$\frac{dQ}{dt} = \sigma eA(T^4 - T_0^4)$$

Sol.: Rate of cooling = $\frac{-dT}{dt}$

$$\Rightarrow \frac{dT}{dt} = \frac{\sigma eA(T^4 - T_0^4)}{ms}$$

21. Answer (1)

Hint: Use Stefan's law $E \propto T^4$

$$\text{Sol.: } \frac{E_1}{E_2} = \frac{(300)^4}{(600)^4} = \frac{1}{2^4}$$

$$\frac{E_2}{E_1} = 16$$

22. Answer (1)

Hint: For adiabatic process $dQ = 0$

Sol.: Work done during adiabatic process

$$dU = nC_v dT$$

$$dU = \frac{nR(T_2 - T_1)}{\gamma - 1}$$

$$dw = -dU$$

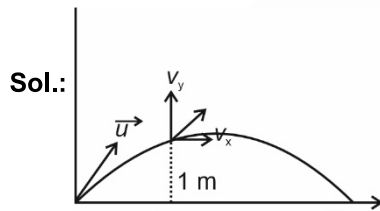
$$\text{Work done} = \frac{nR(T_1 - T_2)}{\gamma - 1}$$

Using $PV = nRT$

$$= \frac{P_1 V_1 - P_2 V_2}{\gamma - 1}$$

23. Answer (2)

Hint: Using $v^2 = u^2 + 2as$ for motion in y-direction



$$v_x = u_x = 6 \text{ m/s}$$

$$v_y^2 - u_y^2 = 2gh$$

$$v_y = \sqrt{u_y^2 + 2(-g)(+h)} = \sqrt{6^2 - 2(10)(1)} = 4 \text{ m/s}$$

$$\therefore \vec{v} = 6\hat{i} + 4\hat{j} \text{ m/s}$$

24. Answer (2)

Hint & Sol.: When acceleration is zero, then its velocity is constant but when its speed is constant then it can have acceleration like in uniform circular motion.

25. Answer (4)

Hint: Use formula, $P = \vec{F} \cdot \vec{v}$

$$\text{Sol.: } P = \vec{F} \cdot \vec{v}$$

$F = \text{constant}$; $a = \text{constant}$; velocity $\propto t$

\therefore Power $\propto t^1$

26. Answer (2)

Hint: General equation of a progressive wave $y = A \sin(\omega t - kx)$

$$\text{Sol.: } y = 0.1 \sin(10\pi t - \pi x)$$

$$\omega = 10\pi ; k = \pi$$

$$k = \frac{2\pi}{\lambda} = \frac{2\pi}{\pi}$$

$$\lambda = 2 \text{ m}$$

$$\text{Velocity} = \frac{\omega}{k} = 10 \text{ m/s}$$

27. Answer (3)

Hint: General equation of SHM $y = A \sin \omega t$

$$\text{K.E} = \frac{1}{2} m \omega^2 (A^2 - y^2)$$

$$\text{P.E} = \frac{1}{2} m \omega^2 y^2$$

Sol.: K.E = P.E

$$\frac{1}{2} m \omega^2 (A^2 - y^2) = \frac{1}{2} m \omega^2 y^2$$

$$y = \frac{A}{\sqrt{2}}$$

$$y = A \sin\left(\frac{2\pi}{T} t\right)$$

$$\frac{A}{\sqrt{2}} = A \sin \frac{2\pi}{T} t ; t = \frac{T}{8}$$

28. Answer (1)

Hint: Velocity of wave on string, $v = \sqrt{\frac{T}{\mu}}$

$$\text{Sol.: } \text{Velocity} = \sqrt{\frac{TI}{M}}$$

$$200 = \sqrt{\frac{80 l}{5 \times 10^{-3}}} \Rightarrow l = 2.5 \text{ m}$$

29. Answer (1)

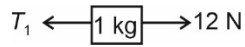
Hint & Sol.: $Y_{Fe} > Y_{rubber}$

Iron is more elastic than rubber.

30. Answer (1)

Hint: $a = \frac{F_{\text{net}}}{\text{Total mass}}$

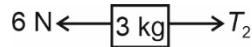
$$\text{Sol.: } \text{Acceleration of system} = \frac{12 - 6}{m_1 + m_2 + m_3} = \frac{6}{6} = 1 \text{ m/s}^2$$



$$12 - T_1 = m_1 a$$

$$12 - T_1 = 1 (1)$$

$$T_1 = 11 \text{ N}$$



$$T_2 - 6 = 3(a)$$

$$T_2 = 6 + 3$$

$$= 9 \text{ N}$$

31. Answer (3)

Hint & Sol.: Two or more physical quantity can have same dimensional formula.

We can check the dimensional correctness using principle of homogeneity.

Unitless quantities cannot have dimension.

32. Answer (1)

Hint: Work done by external force = change in potential energy

Sol.: $W = U_f - U_i$

$$\frac{mgR}{2} = \frac{-GMm}{R+h} - \left(\frac{-GMm}{R} \right) = \frac{-GMm}{R+h} + mgR$$

$$\frac{mgR}{2} = \frac{-GMm}{R+h}$$

$$\frac{mgR}{2} = \frac{mgR^2}{R+h}$$

$$2R = R + h$$

$$R = h$$

33. Answer (2)

Hint: Fundamental frequency of closed organ pipe

$$v = \frac{v}{4L}$$

Sol.: The fundamental frequency of closed pipe is

$$v = \frac{v}{4L} = \frac{320}{4(1)} = 80$$

In closed pipe only odd harmonics are present therefore 320 Hz is not possible.

34. Answer (1)

Hint: $v_{rms} = \sqrt{\frac{3RT}{M}}$

Sol.: $v_{rms} = \sqrt{\frac{3RT}{M}}$

$$v_{rms} \propto \sqrt{T}$$

$$\frac{\Delta v_{rms}}{v_{rms}} \times 100 = \frac{1}{2} \frac{\Delta T}{T} \times 100$$

$$\frac{\Delta T}{T} \times 100 = 2\%$$

$$\text{New temperature} = 300 \text{ K} + \frac{2}{100} \times 300 \text{ K}$$

$$= 306 \text{ K} = 33^\circ\text{C}$$

35. Answer (4)

Hint: $P = \frac{1}{3} \rho v_{rms}^2$

Sol.: $P = \frac{1}{3} \rho v_{rms}^2 = \frac{2}{3} E = \frac{1}{3} \frac{M}{V} v_{rms}^2$

36. Answer (4)

Hint : Use ideal gas equation $PV = nRT$

Sol: For 16 g of $O_2 \Rightarrow P = \frac{RT}{2V}$

For 4 g of $H_2 \Rightarrow P' = \frac{4RT}{V} = 8P$

37. Answer (2)

Hint: Fundamental frequency of open organ pipe

$$= \frac{v}{2L}$$

$$\text{Frequency of closed organ pipe} = \frac{v}{4L}$$

Sol.: Fundamental frequency of second overtone

$$\text{of open pipe} = \frac{3v}{2L_1}$$

Fundamental frequency of second overtone of

$$\text{closed pipe} = \frac{5v}{4L_2}$$

$$\frac{3v}{2L_1} = \frac{5v}{4L_2}$$

$$L_2 = \frac{5}{6} L_1$$

$$= \frac{5}{6} l$$

38. Answer (4)

Hint: For polytropic process $PV^N = \text{constant}$,

$$C = C_v + \frac{R}{1-N}$$

Sol.: $VT^{\frac{1}{3}} = \text{constant}$

Using $PV = nRT$

$$V \left(\frac{PV}{nR} \right)^{\frac{1}{3}} = \text{constant}$$

$$P^{\frac{1}{3}} V^{\frac{4}{3}} = \text{constant}$$

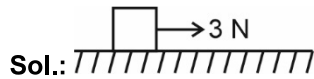
$$PV^{\frac{4}{3}} = \text{constant}$$

$$C = C_v + \frac{R}{1-N} = \frac{3}{2}R + \frac{R}{1-4} = \frac{3}{2}R - \frac{R}{3}$$

$$C = \frac{7R}{6}$$

39. Answer (4)

Hint: Maximum value of static friction, $f_L = \mu_s mg$



Sol.:

$$f_L = \mu_s mg$$

$$= (0.5)(1)(10)$$

$$= 5 \text{ N}$$

As $F_{\text{applied}} < f_L$

Static friction = 3 N

40. Answer (2)

Hint: Efficiency $\eta = 1 - \frac{T_2}{T_1}$

Sol.: $\eta = 1 - \frac{T_2}{T_1}$

$$0.4 = 1 - \frac{T_2}{T} \Rightarrow T_2 = 0.6 T$$

$$0.5 = 1 - \frac{T_2}{T'}$$

$$0.5 = \frac{0.6T}{T'} \Rightarrow T' = \frac{6}{5}T$$

$$\% \text{ increase in temperature} = \frac{T' - T}{T} \times 100$$

$$= \frac{\frac{6}{5}T - T}{T} \times 100 = 20\%$$

41. Answer (4)

Hint: Use first law $\Delta Q = \Delta U + W$,

Work done is equal to area under the PV graph.

Sol.: From first law of thermodynamics

$$\Delta Q = \Delta U + W$$

$$\Delta Q = 0 + W$$

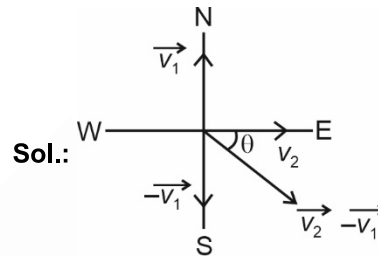
$$W_{\text{net}} > 0$$

$$Q > 0$$

Heat is absorbed by the system

42. Answer (3)

Hint: $\vec{\Delta v} = \vec{v}_2 - \vec{v}_1$



$\vec{v}_1 = 10 \text{ m/s due North}$

$\vec{v}_2 = 10 \text{ m/s due East}$

Change in velocity

$$\vec{\Delta v} = \vec{v}_2 - \vec{v}_1 = \vec{v}_2 + (-\vec{v}_1)$$

$$|\vec{\Delta v}| = \sqrt{v_2^2 + v_1^2} = \sqrt{10^2 + 10^2}$$

$$= 10\sqrt{2} \text{ m/s}$$

$$\tan \theta = \frac{v_2}{v_1} = \frac{10}{10} = 1$$

$$\theta = 45^\circ \text{ SE}$$

43. Answer (2)

Hint: Use relative motion concept

Sol.: Time taken by the ball to reach the floor of the lift is

$$t = \sqrt{\frac{2h}{a+g}}$$

$$(0.4)^2 = \frac{2(1.25)}{a+10} \Rightarrow a = 5.6 \text{ m/s}^2$$

44. Answer (2)

Hint: $\Delta P = h\rho g$

Sol.: Increase in pressure = $h\rho_w g$

$$= 10 \text{ m} \times 10^3 \frac{\text{kg}}{\text{m}^3} \times 10 \frac{\text{m}}{\text{s}^2}$$

$$= 10^5 \text{ Pa}$$

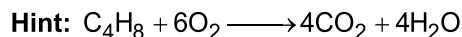
$$= 1 \text{ atm}$$

45. Answer (1)

Hint: & Sol.: Bernoulli's equation is valid for ideal fluid flow and continuity equation is based on conservation of mass.

[CHEMISTRY]

46. Answer (4)



Sol.: 1 mole $C_4H_8 \rightarrow 4$ moles CO_2

$$\therefore \frac{560}{56} \text{ g } C_4H_8 \longrightarrow \frac{4}{1} \times 10 = 40 \text{ moles } CO_2$$

$$\begin{aligned} \text{Volume of } CO_2 \text{ at STP} &= 40 \times 22.4 \text{ L} \\ &= 896 \text{ L} \end{aligned}$$

47. Answer (2)

Hint: Mole fraction of solvent = $\frac{\text{Moles of solvent}}{\text{Total moles of solution}}$

Sol.: 4.4 molal aqueous urea solution refers to 4.4 moles of urea in 1000 g of H_2O

$$\text{Moles of } H_2O = \frac{1000}{18} = 55.55$$

$$\begin{aligned} \text{Mole fraction (solvent)} &= \frac{55.55}{55.55 + 4.4} \\ &= \frac{55.55}{59.95} \\ &= 0.926 \end{aligned}$$

48. Answer (3)

Hint: Zeros between two non-zero digits are significant.

Sol.: Zeros preceding to first non-zero digit are not significant.

49. Answer (3)

Hint: 0.56% iron by mass refers to 0.56 g Fe in 100 g Haemoglobin.

Sol.: 100 g Hb = 0.56 g Fe

$$1.65 \text{ g Hb} = \frac{0.56}{100} \times \frac{1.65}{56} \text{ mole}$$

$$\text{Number of iron atoms} = \frac{0.56}{100} \times \frac{1.65}{56} \times N_A$$

$$= \frac{0.56}{100} \times \frac{1.65}{56} \times 6.022 \times 10^{23}$$

$$= 9.9 \times 10^{19} \text{ atoms}$$

50. Answer (3)

Hint: Moles of HCl = $M \times V$ (in L)

Sol.: Moles of HCl = $\frac{0.2 \times 50}{1000} = 0.01 \text{ mol}$

$$\text{Moles of } CaCO_3 \text{ (100\% pure) required} = \frac{0.01}{2} \text{ mol}$$

$$\begin{aligned} \text{Mass of } CaCO_3 \text{ (100\% pure)} &= \frac{0.01}{2} \times 100 \text{ g} \\ &= 0.5 \text{ g} \end{aligned}$$

Mass of 80% pure $CaCO_3$ required

$$= \frac{100 \times 0.5}{80} = 0.625 \text{ g}$$

51. Answer (3)

Hint: Number of photoelectrons ejected \propto intensity of light

Sol.: There is no time lag between striking of light and ejection of electrons.

52. Answer (4)

Hint: p_x , p_y and p_z orbital have dumb-bell shape.

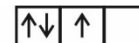
Sol.: d_{xy} , d_{yz} , d_{zx} and $d_{x^2-y^2}$ have double dumb-bell shape, but d_{z^2} has a baby soother shape.

53. Answer (3)

Hint: According to Pauli's exclusion principle, in an orbital no two electrons can have the same set of all four quantum numbers.



Sol.: Violates Pauli's exclusion principle



Violates Hund's rule of maximum multiplicity

54. Answer (2)

Hint: Radius of n^{th} orbit = $a_0 \frac{n^2}{Z} \text{ pm}$

$$\text{Sol.} \quad \frac{r_{Li^{2+}}}{r_{He^+}} = \frac{a_0 \frac{9}{3}}{a_0 \frac{n^2}{2}}$$

$$= \frac{158.7}{105.8} = \frac{9}{3} \times \frac{2}{n^2}$$

$$= \frac{1.5 \times 3}{9 \times 2} = \frac{1}{n^2}$$

$$= \frac{4.5}{18} = \frac{1}{n^2}$$

$$= n = 2$$

55. Answer (1)

Hint: Unnilbium is Nobelium**Sol.:**

IUPAC name	IUPAC official name
Unniltrium	Lawrencium
Unnilquadium	Rutherfordium
Unnilseptium	Bohrium

56. Answer (1)

Hint: CO = Neutral oxideAl₂O₃ = Amphoteric oxideCl₂O₇ = Acidic oxide**Sol.:** Th (Z = 90)

Am (Z = 95)

Np (Z = 93)

(Elements after (Z = 92) i.e. Uranium are called Transuranium elements.)

57. Answer (2)

Hint:

Electronic configuration	Element
1s ² 2s ²	Be
1s ² 2s ² 2p ¹	B
1s ² 2s ² 2p ³	N
1s ² 2s ² 2p ⁴	O

Sol.: Due to stable electronic configuration of 'Be' & 'N', they have higher first ionization enthalpy than B and O respectively

B < Be < C < O < N < F
(801 889 1086 1314 1402 1681) Δ_H / kJ mol⁻¹

58. Answer (4)

Hint: Dipole moment is the product of the magnitude of the charge and the distance between the centres of positive and negative charge.

Sol.: Molecule	Dipole moment, μ (D)
HF	1.78
HCl	1.07
HBr	0.79
HI	0.38

59. Answer (1)

Hint: Bond order = $\frac{N_b - N_a}{2}$ **Sol.:** O₂²⁻; B.O = $\frac{10 - 8}{2} = 1$ Highest occupied molecular orbital (HOMO) of O₂²⁻; π*2p_x and π*2p_y have 2 electrons each.

∴ Diamagnetic

60. Answer (1)

Hint: A negative E[⊖] means that the redox couple is a stronger reducing agent than the H⁺/H₂ couple.**Sol.:** Order of negative E[⊖] valuesCa²⁺/Ca > Sn²⁺/Sn > Ag⁺/Ag > Co³⁺/Co²⁺

order of reducing power,

Ca > Sn > Ag > Co²⁺

61. Answer (3)

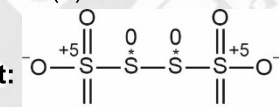
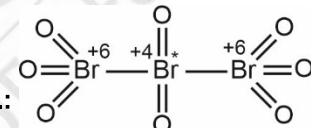
Hint & Sol.: 2KMnO₄ $\xrightarrow{\Delta}$ K₂MnO₄ + MnO₂ + O₂

Decomposition reaction

Cr₂O₃(s) + 2Al(s) $\xrightarrow{\Delta}$ 2Al₂O₃(s) + 2Cr(s)

Metal displacement reaction

62. Answer (3)

Hint:  Tetrathionate ion (S₄O₆²⁻)**Sol.:**  Br₃O₈ (tribromooctaoxide)

Average oxidation state of bromine

⇒ 3x - 16 = 0

x = $\frac{+16}{3}$

63. Answer (1)

Hint: Na₂B₄O₇ · 10H₂O + CoO $\xrightarrow{\text{Pt wire}}$ Co(BO₂)₂ (Bead)**Solution:** Colour of the bead is blue.

64. Answer (1)

Hint.: Molar heat capacity is the intensive and internal energy is extensive property.**Sol:** For the process, H₂O(ℓ) \rightleftharpoons H₂O(g)
(1 bar, 373 K) (1 bar, 373 K)

ΔG = 0 as equilibrium is attained during phase transformation.

65. Answer (3)

Hint: Work has been done at constant pressure, hence it is an irreversible process.

Sol.: $W = -P_{\text{ext}}(\Delta V)$

$$= -1.2(0.75 - 0.1)$$

$$= -1.2(0.65)$$

$$= -0.78 \text{ L bar}$$

$$= -78 \text{ joule}$$

66. Answer (1)

Hint: Intermolecular forces of spherical molecules can be overcome at lower temperature

Sol.: b.p(K)

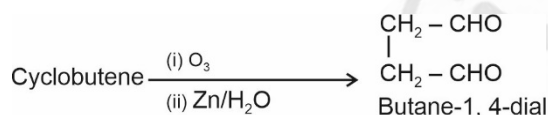
2-Methylbutane 300.9

2, 2-Dimethylpropane 282.5

Branching leads to decrease in boiling point.

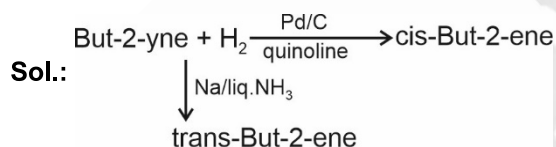
67. Answer (1)

Hint & Sol.:



68. Answer (2)

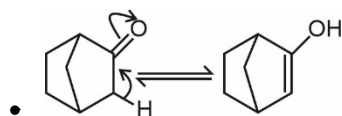
Hint: Alkynes on reduction with sodium in liquid ammonia form trans alkenes.



69. Answer (4)

Hint: Aldehydes and ketones having at least one α -hydrogen atom can show keto-enol tautomerism.

Sol.:



- If α -hydrogen is present at bridgehead, tautomerism is not possible.

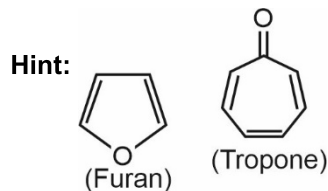
70. Answer (1)

Hint: Allylic free radicals are highly stable.

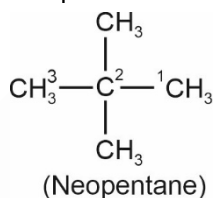
Sol.: Relative order of stability of free radical is

Allyl > Benzyl > 3° > 2° > 1° > methyl

71. Answer (4)



Sol.: Tropone is nonbenzenoid aromatic compound while furan is heterocyclic aromatic compound.



IUPAC Name \rightarrow 2, 2-Dimethylpropane

72. Answer (4)

Hint: Moist HCl is white in colour

Sol.: Anhydrous AlCl_3 partially hydrolyses with atmospheric moisture and liberate white fumes of HCl gas.

73. Answer (2)

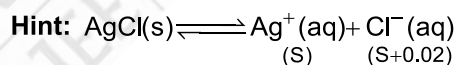
Hint: Galena – PbS

Cryolite – Na_3AlF_6

Sol.: Cassiterite – SnO_2

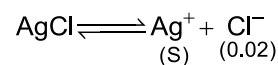
Bauxite – $\text{Al}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$

74. Answer (3)



Sol.: $\therefore (0.02 \gg \gg S)$

$$\therefore (S + 0.02) \approx 0.02$$



$$K_{\text{sp}} = [\text{Ag}^+][\text{Cl}^-]$$

$$1.6 \times 10^{-10} = (S) 0.02$$

$$(S) = \frac{1.6}{2} \times 10^{-8}$$

$$= 8 \times 10^{-9} \text{ M}$$

75. Answer (2)

Hint: Salt of SB + WA = Basic solution

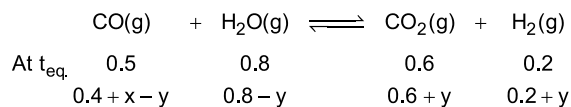
Sol.: $\text{NH}_4\text{Cl} \rightarrow$ Salt of WB + SA

$\text{CH}_3\text{COONa} \rightarrow$ Salt of SB + WA

$\text{Na}_2\text{SO}_4 \rightarrow$ Salt of SB + SA

$\text{CH}_3\text{COONH}_4 \rightarrow$ Salt of WA + WB

76. Answer (3)

Hint & Sol.:Number of moles of $\text{CO}_2 = 1$

$$0.6 + y = 1$$

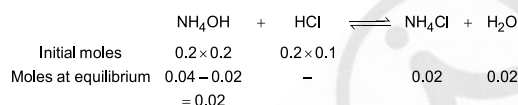
$$y = 0.4$$

$$K_C = \frac{0.6 \times 0.2}{0.4 \times 0.8} = \frac{3}{8}$$

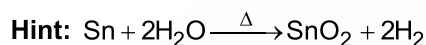
$$\frac{3}{8} = \frac{0.6 \times 1}{x \times 0.4}$$

$$x = 4$$

77. Answer (3)

Hint: Basic buffer consists of weak base and its salt with strong acid.**Sol.:**Solution at equilibrium consists of NH_4OH and its salt with HCl i.e. NH_4Cl .

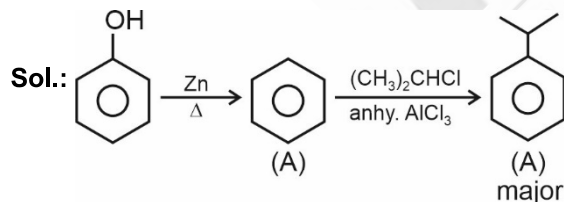
78. Answer (3)

**Sol.: Element** **First ionization enthalpy**
(kJ mol^{-1})

Sn 708

Pb 715

79. Answer (1)

Hint: Zinc reduced phenol to benzene.

80. Answer (1)

Hint: Radial nodes = $n-l-1$ **Sol.:** Radial nodes

4s 3

4f 0

3p 1

4p 2

81. Answer (4)

Hint & Sol.: The energies of various molecular orbitals of N_2 is

$$\sigma 1s^2 < \sigma^* 1s^2 < \sigma 2s^2 < \sigma 2s^2 < (\pi 2p_x^2 = \pi 2p_y^2) < \sigma 2p_z^2$$

$$\text{B}_2 \rightarrow \sigma 1s^2 < \sigma^* 1s^2 < \sigma 2s^2 < \sigma^* 2s^2 < \pi 2p_x^1 = \pi 2p_y^1$$

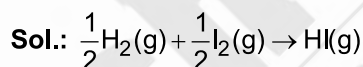
$$\text{N}_2^- \rightarrow \sigma 1s^2 < \sigma^* 1s^2 < \sigma 2s^2 < \sigma^* 2s^2 < (\pi 2p_x^2 = \pi 2p_y^2)$$

$$< \sigma 2p_z^2 < \pi^* 2p_x^1$$

$$\text{F}_2^- \rightarrow 1s^2 < \sigma^* 1s^2 < \sigma 2s^2 < \sigma^* 2s^2 < \sigma 2p_z^2 < \pi 2p_x^2 = \pi 2p_y^2$$

$$< \pi^* 2p_x^2 = \pi^* 2p_y^2 < \sigma^* 2p_z^1$$

82. Answer (3)

Hint: $\Delta_r H^\circ = \sum \text{bond enthalpies (reactions)}$ $\sum \text{bond enthalpies (product)}$ 

$$\Delta_r H^\circ = \frac{1}{2} \times a + \frac{1}{2} \times b - c$$

$$= \frac{a}{2} + \frac{b}{2} - c$$

83. Answer (1)

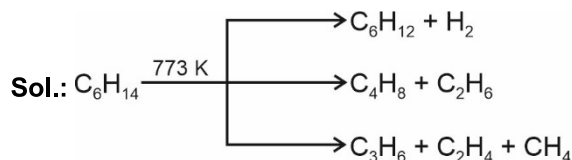
Hint: HNO_3 ; oxidation state = +5 (Highest among all)**Sol.:**

Compound	Oxidation state
NF_3	+3
N_2O	+1
N_2	0

84. Answer (2)

Hint: $[\text{Fe}(\text{CN})_5\text{NOS}]^{4-}$ is a violet colour compound.

85. Answer (2)

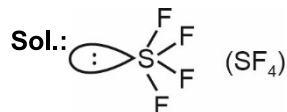
Hint: Higher alkanes on heating at higher temperature give lower alkanes, alkenes etc.

86. Answer (1)

Hint & Sol.: $\text{CH} \equiv \underset{\text{sp}}{\text{C}} - \underset{\text{sp}}{\text{C}} \equiv \underset{\text{sp}}{\text{CH}}$

87. Answer (3)

Hint: SF_4 is see-saw shape molecule



88. Answer (3)

Hint: $H = U + PV$

Enthalpy is a state function

Sol.:

$\Delta_r H^\ominus / \text{kJ mol}^{-1}$	Substance
0	$\text{Br}_2(\text{l})$
+1.89	C (diamond)
0	$\text{Cl}_2(\text{g})$

89. Answer (1)

Hint: For spontaneous reaction $\Delta_r G^\ominus = -ve$

$$\Delta_r G^\ominus = \Delta_r H^\ominus - T\Delta_r S^\ominus$$

Sol.: $\Delta_r G^\ominus = \Delta_r H^\ominus - T\Delta_r S^\ominus$

If $\Delta_r H^\ominus = +ve$

$$\Delta_r S^\ominus = +ve$$

$\Delta_r G^\ominus = -ve$ only at high temperature

90. Answer (4)

Hint: According to Le-Chatelier's principle, upon changing factors which affect equilibrium, an opposite change to reduce the change caused by the factor happens.

Sol.: For an exothermic reaction, raising the temperature shifts the equilibrium to left and decreases the equilibrium concentration of ammonia.

[BIOLOGY]

91. Answer (1)

Hint: Cell is the smallest unit, which is capable of independent living and all living organisms are made up of cell.

Sol.: Anything less than a complete structure of a cell does not ensure independent living. Hence, cell is the fundamental, structural and functional unit of all living organisms.

92. Answer (2)

Hint: The cell wall determines the shape of a cell.

Sol.: Cell wall provides a strong structural support to prevent the bacterium from bursting or collapsing

93. Answer (3)

Hint: The direct synthesis of ATP from metabolites is called substrate level phosphorylation.

Sol.: Substrate level phosphorylation occurs during

- Conversion of 1,3 BPGA to 3-PGA, catalysed by phosphoglycerate kinase.
- Conversion of PEP to pyruvate, catalysed by pyruvate kinase.
- Conversion of succinyl CoA to succinic acid, catalysed by succinate thiokinase.

94. Answer (4)

Hint: In many cells, as in protists, food vacuoles are formed by engulfing the food particles.

Sol.: In *Amoeba*, the contractile vacuole is important for osmoregulation and excretion.

95. Answer (4)

Hint: Pyruvate dehydrogenase converts pyruvate into acetyl CoA.

Sol.: Pyruvate dehydrogenase participates in the link reaction.

96. Answer (3)

Hint: The sequence of phases in M phase is karyokinesis and then cytokinesis.

Sol.: The accurate sequence of the events in M phase is as follows:

- Prophase → Centrosome begins to move towards opposite poles of the cell.
- Metaphase → Spindle fibres attach to kinetochores of chromosomes.
- Anaphase → Chromosomes begin their migration towards the two opposite poles.
- Telophase → Chromosomes cluster at opposite spindle poles and their identity is lost as discrete elements.
- Cytokinesis → Appearance of a furrow in the plasma membrane.

97. Answer (2)

Hint: Kinetin is an artificial cytokinin.

Sol.: The plant growth regulators (PGRs) are small, simple molecules of diverse chemical composition. They could be indole compounds (indole-3-acetic acid, IAA); adenine derivatives (N₆-furfurylamino purine, kinetin), derivatives of carotenoids (abscisic acid, ABA); terpenes (gibberellic acid, GA₃) or gases (ethylene, C₂H₄).

98. Answer (1)

Hint: Metaphase is the stage at which morphology of chromosomes is most easily studied.

Sol.: During metaphase, chromosomes are moved to spindle equator and get aligned along the metaphase plate through spindle fibres to both the poles.

99. Answer (1)

Hint: Liquid endosperm of coconut exemplifies multinucleate condition.

Sol.: In some organisms karyokinesis is not followed by cytokinesis as a result of which multinucleate condition arises leading to the formation of syncytium (e.g., liquid endosperm in coconut).

100. Answer (1)

Hint: Separation of homologous chromosomes takes place during meiosis.

Sol.: During anaphase I, the homologous chromosomes separate, while sister chromatids remain associated at their centromeres.

101. Answer (1)

Hint: In Phycomycetes, spores are endogenously produced in sporangium.

Sol.: Ascomycetes is commonly known as sac-fungi. In Basidiomycetes, the basidiospores are exogenously produced on the basidium. Some members of Deuteromycetes are saprophytes or parasites while a large number of them are decomposers of litter and help in mineral cycling.

102. Answer (2)

Hint: Viroids are the causative agents of potato spindle tuber disease.

Sol.: RNA of the viroids has a low molecular weight.

103. Answer (3)

Hint: r is the relative growth rate.

Sol.: r is the measure of the ability of a plant to produce new plant material. This ability is referred to as efficiency index.

104. Answer (1)

Hint: In chrysophytes, cell wall is present.

Sol.: In diatoms, the cell wall forms two thin overlapping shells, which fit together as in a soap box.

105. Answer (4)

Hint: Axile placentation is seen in china rose.

Sol.: Parietal placentation is seen in *Argemone*. Free central placentation is seen in *Primrose*. Basal placentation is seen in marigold.

106. Answer (2)

Hint: Exclude the leucocytes responsible for inflammatory reaction.

Sol.: Both neutrophils and monocytes are phagocytic cells which destroy foreign organisms entering the body.

Basophils are involved in inflammatory reactions. Eosinophils resist infections and are also associated with allergic reactions.

107. Answer (3)

Hint: Present in the brain

Sol.: Pineal gland is located on the dorsal side of the forebrain.

Therefore, it is present in the cranial cavity.

Thymus is located between the lungs, behind the sternum, on the ventral side of aorta.

Each of the two adrenal glands is located above the each kidney in the abdominal cavity.

A pair of ovaries are located in the abdomen.

108. Answer (2)

Hint: Exclude the multi-layered epithelium

Sol.: Blood is filtered so finely through filtration slits or slit pores that almost all the constituents of plasma except the proteins pass onto the lumen of Bowman's capsule due to the presence of podocytes which are modified cells of squamous epithelium.

Fibrinogens, globulins and albumins are the major proteins in plasma.

109. Answer (4)

Hint: Takes place through skin

Sol.: In frogs, during aestivation and hibernation, gaseous exchange takes place through the skin. Skin acts as a respiratory organ under water. On land, the buccal cavity, skin and lungs act as the respiratory organs.

110. Answer (3)

Hint: It is numerically equal to 2100-2300 mL

Sol.: FRC (Functional residual capacity) is the sum of RV(1100-1200 mL) and ERV (1000-1100 mL).

Inspiratory capacity	=	3000 - 3500 mL
Total lung capacity	=	5100-5800 mL
Expiratory capacity	=	1500-1600 mL

111. Answer (1)

Hint: Lower large thick walled chambers.

Sol.: A bundle of nodal fibres, atrio-ventricular bundle (AV bundle) continues from the AV node which passes through the atrio-ventricular septum and immediately divides into a right and left bundle. These bundle branches give rise to minute fibres throughout the ventricular musculature of the respective sides which are called Purkinje fibres.

112. Answer (1)

Hint: Gases move down their concentration gradient.

Sol.: Alveoli are the primary sites of exchange of gases. Gaseous exchange occurs between blood and tissues. O₂ and CO₂ are exchanged at these sites by simple diffusion, mainly based on the pressure/concentration gradient.

113. Answer (4)

Hint: An aschelminth

Sol.:

- Hookworm i.e., *Ancylostoma*, belongs to the phylum Aschelminthes.
- Earthworm is coelomate and monoecious.
- Silkworm is coelomate and dioecious.
- Tapeworm is an acoelomate and monoecious.

114. Answer (2)

Hint: Haemoglobin has a quaternary structure.

Sol.: Some proteins are an assembly of more than one polypeptide or subunit which form quaternary structure.

The sequence of amino acids i.e. positional information in a protein is represented by its primary structure.

115. Answer (2)

Hint: Forms ribcage

Sol.: Cartilaginous joints are present between adjacent thoracic vertebrae. Saddle joint is present between carpal and metacarpal of thumb and fibrous joints are present between cranial bones.

116. Answer (2)

Hint: Genus is the lowest taxonomic category.

Sol.: The correct sequential order of these categories in ascending order is as follows:

Genus → Order → Class → Phylum

117. Answer (1)

Hint: There may be a variation in the length of filaments within a flower, as in *Salvia* and mustard.

Sol.: If the margins of sepals or petals overlap one another but not in any particular direction as in *Cassia* and gulmohur, the aestivation is called imbricate.

118. Answer (2)

Hint: When a flower can be divided into two similar halves only in one particular vertical plane, it is zygomorphic.

Sol.: Example of zygomorphic flowers are pea, gulmohur, bean and *Cassia*, etc. Example of actinomorphic flowers are mustard, datura and chilli etc.

119. Answer (2)

Hint: Phyllotaxy is the pattern of arrangement of leaves on the stem or branch.

Sol.: In opposite type of phyllotaxy, a pair of leaves arise at each node and lie opposite to each other as in *Calotropis* and guava plants.

120. Answer (2)

Hint: Collenchyma is found in dicot stems.

Sol.: In dicot leaves, the outer walls of guard cells (away from the stomatal pore) are thin and the inner walls (towards the stomatal pore) are highly thickened. In conjoint type of vascular bundles, the xylem and phloem are jointly situated along the same radius of vascular bundles.

121. Answer (2)

Hint: Dicot leaves exhibit reticulate venation.

Sol.: In monocot stem, peripheral vascular bundles are generally smaller than the centrally located ones. The size of the vascular bundles is dependent on the size of the veins. The veins vary in thickness in the reticulate venation of the dicot leaves.

122. Answer (4)

Hint: Systematics include phylogenetic relationships.

Sol.: Taxonomy does not include Phylogenetic relationships.

123. Answer (3)

Hint: This component is made up of elongated, tapering cylindrical cells which have dense cytoplasm and nucleus.

Sol.: Phloem parenchyma is absent in most of the monocotyledons.

124. Answer (1)

Hint: The given plant is *Selaginella*.

Sol.: *Selaginella* is a heterosporous pteridophyte that shows the presence of cones. It possesses vascular tissues.

125. Answer (2)

Hint: *Pinus* shows mycorrhizal association with fungi.

Sol.: The male or female cones or strobili may be borne on the same tree (*Pinus*). However, in *Cycas* male cones and megasporophylls are borne on different trees.

126. Answer (3)

Hint: Floridean starch is stored in the form of food material in the members of Rhodophyceae.

Sol: In red algae, the food is stored as floridean starch which is very similar to amylopectin and glycogen in structure, e.g., *Porphyra*, *Gelidium*.

127. Answer (3)

Hint: Ethylene promotes rapid internode/petiole elongation in deep water rice plants.

Sol.: Ethylene also induces flowering in mango.

128. Answer (3)

Hint: The given diagram is of chloroplast, where Label C represents stroma.

Sol.: Label A represents stroma lamellae. Label B represents grana. Label D represents outer membrane and label E represents inner membrane. Stroma possesses RuBisCO that does not show oxygenase activity in C_4 plants (*Sorghum*).

129. Answer (4)

Hint: This set carries the taxa that depicts the taxonomical category, order.

Sol.: Diptera, Sapindales and Poales are the orders of housefly, mango and wheat respectively.

130. Answer (4)

Hint: Respiratory quotient is the ratio of volume of CO_2 evolved to the volume of O_2 consumed in respiration.

Sol.: When proteins are used as respiratory substrates, RQ value would be about 0.9.

131. Answer (2)

Hint: Total number of fingers in human limbs

Sol.: Palmitic acid and arachidonic acid have 16 and 20 carbon atoms respectively including the carboxyl carbon.

132. Answer (3)

Hint: Function of exchange part.

Sol.: Oxygen is utilised by the organisms to indirectly breakdown simple molecules like glucose, amino acids, fatty acids, etc., to derive energy to perform various activities.

Conducting part of human respiratory system transports the atmospheric air to the alveoli, clears it from foreign particles, humidifies and also brings the air to body temperature.

Exchange part is the site of actual diffusion of O_2 and CO_2 between blood and atmospheric air.

133. Answer (2)

Hint: The outer surface of axonal membrane has positive charge.

Sol.: When a neuron is not conducting any impulse, i.e., resting, the axonal membrane is comparatively more permeable to K^+ and nearly impermeable to Na^+ . The membrane is impermeable to negatively charged proteins present in the axoplasm.

134. Answer (2)

Hint: Number of fingers in a human hand.**Sol.:** Paired cranial bones – temporal, parietal
Paired facial bones – Maxilla, palatine, nasal, lacrimal, zygomatic and inferior nasal conchae
Mandible and vomer are unpaired facial bones.

135. Answer (3)

Hint: 'A' is glucagon and 'B' is insulin.**Sol.:** Both insulin and glucagon are peptide hormones. Glucagon acts mainly on hepatocytes (liver cells) and insulin acts mainly on hepatocytes and adipocytes.

Glucagon stimulates gluconeogenesis and insulin stimulates glycogenesis.

136. Answer (1)

Hint: Exclude the monomers of actin filament**Sol.:** A complex protein, troponin is distributed at regular intervals on the tropomyosin. In resting state, a subunit of troponin masks the active binding sites for myosin present on the actin filament.

Each F-actin is a polymer of monomeric 'G' actins. Meromyosins are monomeric proteins which constitute one thick filament known as myosin.

137. Answer (4)

Hint: Chordates possess ventral heart.**Sol.:**

<i>Sepia</i>	Cuttle fish	Non-chordate
<i>Asterias</i>	Star fish	Non-chordate
<i>Octopus</i>	Devil fish	Non-chordate
<i>Scoliodon</i>	Dogfish	Chordate

138. Answer (1)

Hint: Identify the structure present in human fallopian tubes**Sol.:** In *Paramoecium*, cilia help in the movement of food through cytopharynx as well as in locomotion.*Hydra* uses its tentacles for capturing its prey and also use them for locomotion.*Ophiura* is an echinoderm.

139. Answer (1)

Hint: Amino acids have tendency to form zwitter ions**Sol.:** The chemical and physical properties of amino acids are essentially due to the amino, carboxyl and the R functional groups.A particular property of amino acids is the ionisable nature of $-NH_2$ and $-COOH$ groups. Hence, in the solutions of different pH, the structure of amino acids changes.

140. Answer (2)

Hint: Exclude the excretory structure of hemichordates**Sol.:** A rudimentary structure in the collar region called stomochord, a structure similar to notochord. Notochord is a mesodermally-derived structure present in the dorsal part of cephalochordates.

141. Answer (1)

Hint: Human heart pumps 5 L of blood per minute**Sol.:** On an average, 1100-1200 mL of blood is filtered by the kidneys per minute which constitutes roughly $1/5^{th}$ of the blood pumped out by each ventricle of the heart in a minute.

142. Answer (1)

Hint: Grey in colour**Sol.:** Cerebral cortex is referred to as grey matter due to concentration of neuronal cell bodies. This also includes association areas which are clearly neither sensory nor motor. Cerebral aqueduct is a canal that passes through the midbrain.

143. Answer (3)

Hint: Acetabulum is the cavity formed at their point of fusion.**Sol.:** Pelvic girdle consists of two coxal bones. Each coxal bone is formed by the fusion of three bones – ilium, ischium and pubis.

144. Answer (2)

Hint: Neuromuscular junction.**Sol.:** The junction between a motor neuron and the sarcolemma of a muscle fibre is called the neuromuscular junction or motor-end plate.

145. Answer (1)

Hint: Caused due to chronic cigarette smoking**Sol.:** Emphysema is a chronic disorder in which alveolar walls are damaged, due to which respiratory surface is decreased. One of the major causes of this is cigarette smoking.

Inflammation of upper respiratory tract occurs mainly due to occupational respiratory disorders.

146. Answer (1)

Hint: Also called Coelenterata**Sol.:** Cnidarians have a central gastro-vascular cavity with a single opening, mouth on hypostome.

- Aschelminths possess a well developed muscular pharynx.
- The mouth of molluscs contains a file-like rasping organ for feeding called radula.
- Echinoderms have a complete digestive system with mouth on lower (ventral) side and anus on the upper (dorsal) side.

147. Answer (4)

Hint: Released from neurohypophysis**Sol.:** The functioning of kidneys is effectively monitored and regulated by hormonal feedback mechanism involving the hypothalamus, JGA and to a certain extent, heart. JGA is involved in producing renin. ADH is produced from hypothalamus. ANF is produced from the atrial wall of the heart.

148. Answer (1)

Hint: Systemic veins and pulmonary arteries carry deoxygenated blood.**Sol.:**

Respiratory Gas	Atmospheric Air	Alveoli	Blood (Deoxygenated)	Blood (Oxygenated)	Tissues
O ₂	159	104	40	95	40
CO ₂	0.3	40	45	40	45

149. Answer (1)

Hint: Smooth muscle fibres are present in middle layer of uterus.**Sol.:** Oxytocin acts on smooth muscles of the body and stimulates their contraction. Smooth muscles fibres are non-striated.

In females, it stimulates a vigorous contraction of uterus at the time of child birth, and milk ejection from mammary glands.

150. Answer (4)

Hint: Has a brush bordered epithelium**Sol.:**

Part of kidney	Function
PCT	Absorbs maximum amount of water
DCT	Reabsorbs H ₂ O, HCO ₃ ⁻
Collecting duct	Selective secretion of H ⁺ and K ⁺

151. Answer (3)

Hint: It is also called congestive heart failure**Sol.:** Heart failure means the state of heart where it is not pumping blood effectively enough to meet the needs of the body.

It is sometimes called congestive heart failure because congestion of lungs is one of the main symptoms of heart failure.

152. Answer (3)

Hint: Exclude the squamous epithelium.**Sol.:** The diffusion membrane is made up of three major layers.

- The thin squamous epithelium of alveoli.
- The endothelium of alveolar capillaries.
- The basement substance (composed of a thin basement membrane supporting the squamous epithelium and the basement membrane surrounding the single layer endothelial cells of capillaries) in between them.

Squamous epithelium of alveoli and the endothelium of alveolar capillaries are cellular layers.

Basement substance is a non cellular layer.

153. Answer (3)

Hint: 'A band' remains same during contraction.**Sol.:** 'I band' and 'H zone' shorten during muscle contraction while 'A band' remains the same.

154. Answer (3)

Hint: Inhibitory neurotransmitters are also released in synapse.**Sol.:** Neuroglia make up more than one-half the volume of neural tissue in our body.

Arrival of the disturbance at the neuron's endings or output zone, triggers events that may cause stimulation or inhibition of adjacent neurons and other cells.

155. Answer (4)

Hint: An arthropod**Sol.:** Protonephridia or flame cells are the excretory structures in platyhelminths (Flatworms e.g. *Planaria*), rotifers, some annelids and the cephalochordate – *Amphioxus*.*Palaemon* or prawn possesses green glands as the excretory structure.

156. Answer (1)

Hint: Cyclic photophosphorylation takes place in stroma lamella.

Sol.: Only ATP is produced during cyclic photophosphorylation.

157. Answer (4)

Hint: This pigment imparts bright or blue green color in the chromatogram.

Sol.: Chlorophyll *a* is the chief pigment associated with photosynthesis.

158. Answer (2)

Hint: Plants do not present great demands for gas exchange.

Sol.: The F_1 headpiece of oxysome in mitochondria is a peripheral membrane protein complex and contains the site for synthesis of ATP from ADP and inorganic phosphate. Oxidation of one molecule of NADH gives rise to 3 molecules of ATP.

159. Answer (4)

Hint: EMP pathway is glycolysis.

Sol.: Location of EMP pathway is cytoplasm regardless of the type of respiration and organisms.

160. Answer (3)

Hint: Both the cilium and flagellum emerge from a centriole-like structure called the basal bodies.

Sol.: Centrioles are surrounded by an amorphous pericentriolar material.

161. Answer (4)

Hint: These are small bristle like fibres sprouting out of the bacterial cell.

Sol.: The fimbriae help to attach the bacteria to rocks in streams and also to the host tissues.

162. Answer (4)

Hint: Wheat is a C_3 Plant.

Sol.: C_4 plants show saturation at about 360 ppm while C_3 responds to increased CO_2 concentration and saturation is seen only beyond 450 ppm.

163. Answer (1)

Hint: Differentiation in plants is open.

Sol.: Cells/tissues arising out of the same meristem have different structures at maturity.

164. Answer (2)

Hint: Diakinesis represents transition to metaphase.

Sol.: The final stage of meiotic prophase I is diakinesis. This stage is marked by terminalisation of chiasmata.

165. Answer (3)

Hint: Chemotaxonomy uses the chemical constituents of the plant to classify organisms.

Sol.: Cytotaxonomy is based on cytological information like chromosome number, structure and behaviour.

166. Answer (3)

Hint: This fungus belongs to Ascomycetes.

Sol.: *Neurospora* is used extensively in biochemical and genetic work.

167. Answer (4)

Hint: A dedifferentiated tissue can act as meristem.

Sol.: Interfascicular vascular cambium, cork cambium and wound cambium exemplify dedifferentiated tissue. Secondary phloem is an example of redifferentiated tissue.

168. Answer (4)

Hint: In C_3 plants, PEPcase enzyme is not involved in CO_2 fixation.

Sol.: Bell pepper is a C_3 plant, thus its mesophyll cells show the presence of RuBisCO enzyme for CO_2 fixation.

169. Answer (2)

Hint: Makoi belongs to Solanaceae family and pea belongs to Fabaceae family.

Sol.: Makoi plant exhibit epipetalous stamen, while such a condition is not found in pea plant. Valvate aestivation of calyx is seen in both makoi and pea. Both also have bisexual flowers.

170. Answer (4)

Hint: All tissues on the inner side of endodermis constitute the stele.

Sol.: The outermost layer in root is epiblema. Tissues like pericycle, vascular bundle and pith together constitute the stele.

171. Answer (3)

Hint: Exclude the cells of squamous epithelium

Sol.: Some of the cells of columnar or cuboidal cells get specialised for secretion and are called glandular epithelium.

172. Answer (4)

Hint: Chordates have closed circulatory system

Sol.: The opening of the right and the left ventricles into the pulmonary artery and the aorta respectively are guarded with semilunar valves.

Closed circulatory system is advantageous over open circulatory system as the flow of fluid can be more precisely regulated. In annelids, closed circulatory system is present.

173. Answer (2)

Hint: Genital pouch is also called brood pouch

Sol.: In female cockroaches, the 7th sternum is boat-shaped and together with 8th and 9th sternum forms brood or genital pouch whose anterior part contains female gonopore, spermathecal pores and opening of ducts of collateral glands.

174. Answer (3)

Hint: DNA possesses deoxyribose sugar.

Sol.: The sugar found in polynucleotides is either ribose (a monosaccharide pentose) or 2' deoxyribose. A nucleic acid containing deoxyribose sugar is called deoxyribonucleic acid (DNA) while the one which contains ribose sugar is called ribonucleic acid.

175. Answer (2)

Hint: 'X' is starch

Sol.: Ribose and deoxyribose are present in nucleic acid.

Fructose is present in inulin, glucose is the monomer of starch and glycogen which give colour with iodine.

176. Answer (1)

Hint: Exclude the human uterine layer

Sol.: Frogs have well-organised male and female reproductive systems. Male reproductive organs consist of a pair of yellowish ovoid testes, which are found adhered to the upper part of kidneys by a double fold of peritoneum called mesorchium.

Myometrium is the middle layer of uterine wall. Myocardium is the muscular tissue of the heart.

177. Answer (4)

Hint: Constituent of brain stem

Sol.: The medulla oblongata contains centres which control respiration, cardiovascular reflexes and gastric secretions. Pons, cerebellum and medulla are parts of hindbrain. Cerebrum is a part of forebrain.

178. Answer (1)

Hint: Stroke volume = EDV – ESV

Sol: CO = Stroke volume × Number of heart beats/minute

$$\Rightarrow \text{Stroke volume} = 140 - 80 \text{ mL} \\ = 60 \text{ mL}$$

$$\text{CO} = 60 \text{ mL} \times 90 \text{ beats/min}$$

$$\Rightarrow 5400 \text{ mL/min}$$

$$\Rightarrow 5.4 \text{ L/min}$$

179. Answer (3)

Hint: Apoenzyme is the protein part

Sol.: Enzymes are composed of one or several polypeptide chains. However, there are a number of cases in which non-protein constituents called co-factors are bound to the enzyme to make the enzyme catalytically active.

In these instances, the protein portion of the enzymes is called the apoenzyme. Three kinds of co-factors may be identified; prosthetic groups, co-enzymes and metal ions.

180. Answer (4)

Hint: Fibrous joint do not allow any movement

Sol.:

Fibrous joint – Between flat skull bones

Pivot joint – Between atlas and axis (C₁ and C₂)

Saddle joint – Between carpal and metacarpal of thumb

Gliding joint – Between carpals



All India Aakash Test Series for NEET - 2026

TEST - 8 (Code - D)[Click here for code-C sol.](#)

Test Date : 06/04/2025

ANSWERS

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

HINTS & SOLUTIONS

[PHYSICS]

1. Answer (1)

Hint: & Sol.: Bernoulli's equation is valid for ideal fluid flow and continuity equation is based on conservation of mass.

2. Answer (2)

Hint: $\Delta P = h\rho g$

Sol.: Increase in pressure = $h\rho_w g$

$$= 10 \text{ m} \times 10^3 \frac{\text{kg}}{\text{m}^3} \times 10 \frac{\text{m}}{\text{s}^2}$$

$$= 10^5 \text{ Pa}$$

$$= 1 \text{ atm}$$

3. Answer (2)

Hint: Use relative motion concept

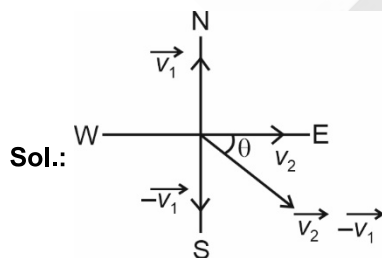
Sol.: Time taken by the ball to reach the floor of the lift is

$$t = \sqrt{\frac{2h}{a+g}}$$

$$(0.4)^2 = \frac{2(1.25)}{a+10} \Rightarrow a = 5.6 \text{ m/s}^2$$

4. Answer (3)

Hint: $\overline{\Delta v} = \overline{v_2} - \overline{v_1}$



$$\overline{v_1} = 10 \text{ m/s due North}$$

$$\overline{v_2} = 10 \text{ m/s due East}$$

Change in velocity

$$\overline{\Delta v} = \overline{v_2} - \overline{v_1} = \overline{v_2} + (-\overline{v_1})$$

$$|\overline{\Delta v}| = \sqrt{v_2^2 + v_1^2} = \sqrt{10^2 + 10^2}$$

$$= 10\sqrt{2} \text{ m/s}$$

$$\tan \theta = \frac{v_2}{v_1} = \frac{10}{10} = 1$$

$$\theta = 45^\circ \text{ SE}$$

5. Answer (4)

Hint: Use first law $\Delta Q = \Delta U + W$,

Work done is equal to area under the PV graph.

Sol.: From first law of thermodynamics

$$\Delta Q = \Delta U + W$$

$$\Delta Q = 0 + W$$

$$W_{\text{net}} > 0$$

$$Q > 0$$

Heat is absorbed by the system

6. Answer (2)

Hint: Efficiency $\eta = 1 - \frac{T_2}{T_1}$

$$\text{Sol.} \quad \eta = 1 - \frac{T_2}{T_1}$$

$$0.4 = 1 - \frac{T_2}{T} \Rightarrow T_2 = 0.6 T$$

$$0.5 = 1 - \frac{T_2}{T'}$$

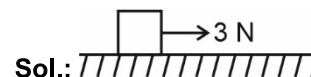
$$0.5 = \frac{0.6T}{T'} \Rightarrow T' = \frac{6}{5} T$$

$$\% \text{ increase in temperature} = \frac{T' - T}{T} \times 100$$

$$= \frac{\frac{6}{5}T - T}{T} \times 100 = 20\%$$

7. Answer (4)

Hint: Maximum value of static friction, $f_L = \mu_s mg$



$$f_L = \mu_s mg$$

$$= (0.5)(1)(10)$$

$$= 5 \text{ N}$$

As $F_{\text{applied}} < f_L$

Static friction = 3 N

8. Answer (4)

Hint: For polytropic process $PV^N = \text{constant}$,

$$C = C_V + \frac{R}{1-N}$$

Sol.: $VT^{\frac{1}{3}} = \text{constant}$

Using $PV = nRT$

$$V \left(\frac{PV}{nR} \right)^{\frac{1}{3}} = \text{constant}$$

$$P^{\frac{1}{3}} V^{\frac{4}{3}} = \text{constant}$$

$PV^4 = \text{constant}$

$$C = C_V + \frac{R}{1-N} = \frac{3}{2}R + \frac{R}{1-4} = \frac{3}{2}R - \frac{R}{3}$$

$$C = \frac{7R}{6}$$

9. Answer (2)

Hint: Fundamental frequency of open organ pipe

$$= \frac{v}{2L}$$

$$\text{Frequency of closed organ pipe} = \frac{v}{4L}$$

Sol.: Fundamental frequency of second overtone

$$\text{of open pipe} = \frac{3v}{2L_1}$$

Fundamental frequency of second overtone of

$$\text{closed pipe} = \frac{5v}{4L_2}$$

$$\frac{3v}{2L_1} = \frac{5v}{4L_2}$$

$$L_2 = \frac{5}{6}L_1$$

$$= \frac{5}{6}l$$

10. Answer (4)

Hint : Use ideal gas equation $PV = nRT$

Sol: For 16 g of $O_2 \Rightarrow P = \frac{RT}{2V}$

For 4 g of $H_2 \Rightarrow P' = \frac{4RT}{V} = 8P$

11. Answer (4)

Hint: $P = \frac{1}{3}\rho v_{\text{rms}}^2$

Sol.: $P = \frac{1}{3}\rho v_{\text{rms}}^2 = \frac{2}{3}E = \frac{1}{3} \frac{M}{V} v_{\text{rms}}^2$

12. Answer (1)

Hint: $v_{\text{rms}} = \sqrt{\frac{3RT}{M}}$

Sol.: $v_{\text{rms}} = \sqrt{\frac{3RT}{M}}$

$v_{\text{rms}} \propto \sqrt{T}$

$$\frac{\Delta v_{\text{rms}}}{v_{\text{rms}}} \times 100 = \frac{1}{2} \frac{\Delta T}{T} \times 100$$

$$\frac{\Delta T}{T} \times 100 = 2\%$$

New temperature = $300 \text{ K} + \frac{2}{100} \times 300 \text{ K}$
 $= 306 \text{ K} = 33^\circ\text{C}$

13. Answer (2)

Hint: Fundamental frequency of closed organ pipe

$$v = \frac{v}{4L}$$

Sol.: The fundamental frequency of closed pipe is

$$v = \frac{v}{4L} = \frac{320}{4(1)} = 80$$

In closed pipe only odd harmonics are present therefore 320 Hz is not possible.

14. Answer (1)

Hint: Work done by external force = change in potential energy

Sol.: $W = U_f - U_i$

$$\frac{mgR}{2} = \frac{-GMm}{R+h} - \left(\frac{-GMm}{R} \right) = \frac{-GMm}{R+h} + mgR$$

$$-\frac{mgR}{2} = \frac{-GMm}{R+h}$$

$$\frac{mgR}{2} = \frac{mgR^2}{R+h}$$

$$2R = R + h$$

$$R = h$$

15. Answer (3)

Hint & Sol.: Two or more physical quantity can have same dimensional formula.

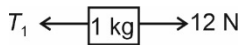
We can check the dimensional correctness using principle of homogeneity.

Unitless quantities cannot have dimension.

16. Answer (1)

Hint: $a = \frac{F_{\text{net}}}{\text{Total mass}}$

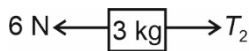
Sol.: Acceleration of system = $\frac{12-6}{m_1+m_2+m_3} = \frac{6}{6}$
 $= 1 \text{ m/s}^2$



$$12 - T_1 = m_1 a$$

$$12 - T_1 = 1 (1)$$

$$T_1 = 11 \text{ N}$$



$$T_2 - 6 = 3(a)$$

$$T_2 = 6 + 3$$

$$= 9 \text{ N}$$

17. Answer (1)

Hint & Sol.: $Y_{\text{Fe}} > Y_{\text{rubber}}$

Iron is more elastic than rubber.

18. Answer (1)

Hint: Velocity of wave on string, $v = \sqrt{\frac{T}{\mu}}$

Sol.: Velocity = $\sqrt{\frac{T}{M}}$

$$200 = \sqrt{\frac{80 l}{5 \times 10^{-3}}} \Rightarrow l = 2.5 \text{ m}$$

19. Answer (3)

Hint: General equation of SHM $y = A \sin \omega t$

$$\text{K.E} = \frac{1}{2} m \omega^2 (A^2 - y^2)$$

$$\text{P.E} = \frac{1}{2} m \omega^2 y^2$$

Sol.: K.E = P.E

$$\frac{1}{2} m \omega^2 (A^2 - y^2) = \frac{1}{2} m \omega^2 y^2$$

$$y = \frac{A}{\sqrt{2}}$$

$$y = A \sin\left(\frac{2\pi}{T} t\right)$$

$$\frac{A}{\sqrt{2}} = A \sin \frac{2\pi}{T} t; t = \frac{T}{8}$$

20. Answer (2)

Hint: General equation of a progressive wave $y = A \sin(\omega t - kx)$

Sol.: $y = 0.1 \sin(10\pi t - \pi x)$

$$\omega = 10\pi; k = \pi$$

$$k = \frac{2\pi}{\lambda} = \frac{2\pi}{\pi}$$

$$\lambda = 2 \text{ m}$$

$$\text{Velocity} = \frac{\omega}{k} = 10 \text{ m/s}$$

21. Answer (4)

Hint: Use formula, $P = \vec{F} \cdot \vec{v}$

Sol.: $P = \vec{F} \cdot \vec{v}$

$F = \text{constant}; a = \text{constant}; \text{velocity} \propto t$

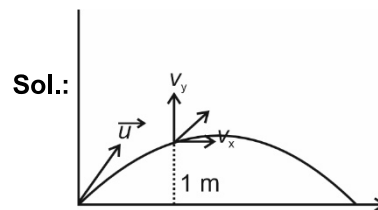
$\therefore \text{Power} \propto t^1$

22. Answer (2)

Hint & Sol.: When acceleration is zero, then its velocity is constant but when its speed is constant then it can have acceleration like in uniform circular motion.

23. Answer (2)

Hint: Using $v^2 = u^2 + 2as$ for motion in y -direction



$$v_x = u_x = 6 \text{ m/s}$$

$$v_y^2 - u_y^2 = 2gh$$

$$v_y = \sqrt{u_y^2 + 2(-g)(+h)} = \sqrt{6^2 - 2(10)(1)} = 4 \text{ m/s}$$

$$\therefore \vec{v} = 6\hat{i} + 4\hat{j} \text{ m/s}$$

24. Answer (1)

Hint: For adiabatic process $dQ = 0$

Sol.: Work done during adiabatic process

$$dU = nC_v dT$$

$$dU = \frac{nR(T_2 - T_1)}{\gamma - 1}$$

$$dw = -dU$$

$$\text{Work done} = \frac{nR(T_1 - T_2)}{\gamma - 1}$$

Using $PV = nRT$

$$= \frac{P_1 V_1 - P_2 V_2}{\gamma - 1}$$

25. Answer (1)

Hint: Use Stefan's law $E \propto T^4$

$$\text{Sol.} \frac{E_1}{E_2} = \frac{(300)^4}{(600)^4} = \frac{1}{2^4}$$

$$\frac{E_2}{E_1} = 16$$

26. Answer (4)

Hint: Rate of heat loss

$$\frac{dQ}{dt} = \sigma e A (T^4 - T_0^4)$$

$$\text{Sol.} \text{ Rate of cooling} = \frac{-dT}{dt}$$

$$\Rightarrow \frac{dT}{dt} = \frac{\sigma e A (T^4 - T_0^4)}{ms}$$

27. Answer (3)

Hint: Use principle of calorimetry

(Heat lost by water) = (Heat gained by ice)

$$\text{Sol.} \quad mc\Delta\theta = ML$$

Heat lost by water at 40°C = Heat gained by ice at 0°C

$$80 \times 1 \times (40 - 0) = M \cdot (80)$$

$$M = 40 \text{ g}$$

28. Answer (2)

Hint: Moment of inertia of a rod about perpendicular axis passing through its centre.

$$I_1 = \frac{ML^2}{12}$$

Sol.: When rod is bent into a ring

$$L = 2\pi R \Rightarrow R = \frac{L}{2\pi}$$

$$I_2 = \frac{MR^2}{2}$$

$$\frac{I_1}{I_2} = \frac{ML^2}{12} \cdot \frac{2 \cdot 4\pi^2}{ML^2}$$

$$\frac{I_1}{I_2} = \frac{2}{3}\pi^2$$

29. Answer (3)

Hint: Pseudo force are defined for non-inertial frame of reference

Sol.: Pseudo force acts opposite to the direction of acceleration of frame at centre of mass of the body.

30. Answer (2)

Hint: For horizontal track, force of friction provides necessary centripetal force.

Sol.: Force of friction provides necessary centripetal force.

$$\frac{mv^2}{r} = \mu mg$$

$$v^2 = \mu rg$$

$$\frac{v^2}{rg} = \mu$$

$$\frac{15 \times 15}{30 \times 10} = \mu = 0.75$$

31. Answer (2)

Hint: Use free body diagram

$$\text{Sol.} \quad F_{\text{applied}} = 20 \text{ N}$$

$$\therefore N_w = 20 \text{ N}$$

32. Answer (1)

Hint: Use, first law of thermodynamics

$$\Delta Q = \Delta U + W$$

$$\text{Sol.} \quad \Delta Q = \Delta U + W$$

$$-20 = (U_f - U_i) + 20$$

$$-40 = U_f - U_i$$

$$-40 = 50 - U_i \Rightarrow U_i = 90 \text{ J}$$

33. Answer (3)

Hint: Tension is different at different points of string having mass.

$$\text{Sol.: } T = \left(\text{Mass of block} + \frac{1}{2} \text{ mass of rope} \right) g$$

$$= (6 + 5)(10) = 110 \text{ N}$$

34. Answer (4)

$$\text{Hint: } a = \frac{v dv}{dx}$$

$$\text{Sol.: } v = x^2 + x$$

$$\frac{dv}{dx} = 2x + 1$$

$$a = v \left(\frac{dv}{dx} \right) = (x^2 + x)(2x + 1)$$

$$a(x = 2 \text{ m}) = (2^2 + 2)((2) + 1) \\ = (6)(5) = 30 \text{ m/s}^2$$

35. Answer (3)

Hint: To escape into space, kinetic energy is given such that its TE becomes zero.

$$\text{Sol.: In orbit, TE} = -\text{KE}$$

$$\text{TE} + \Delta E = 0$$

$$\Delta E = \text{KE} = \frac{GM_e m}{2(R+h)}$$

36. Answer (1)

Hint & Sol.: $Kl = \text{constant}$ for a spring

$K \propto \frac{1}{l}$, spring constant is inversely proportional to

its length

For a given force, higher value of K will give smaller elongation.

37. Answer (3)

Hint: Work done = $\frac{1}{2} \times \text{force} \times \text{elongation}$

$$\text{Sol.: } Y = \frac{F \ell}{A x}, F = \frac{A Y x}{\ell}$$

$$\text{Work done} = \frac{1}{2} \left(\frac{Y A}{\ell} \right) x^2$$

$$W \propto x^2$$

38. Answer (1)

Hint: Use equations of motion for uniform angular acceleration.

$$\text{Sol.: } \theta = \omega_0 t + \frac{1}{2} \alpha t^2$$

$$\omega_0 = 0$$

$$\text{At } t = 10 \text{ s, } 100\pi = \frac{1}{2} \alpha (100)$$

$$\alpha = 2\pi \text{ rad/s}^2$$

$$\omega = \omega_0 + \alpha t$$

$$= 2\pi(10) = 20\pi \text{ rad/s}$$

39. Answer (2)

Hint & Sol.: Plane progressive wave travelling along the negative x -axis is given by,

$$y = A \sin \omega \left(t + \frac{x}{v} \right)$$

40. Answer (1)

Hint & Sol.: Unit of thermal coefficient of volume expansion is K^{-1}

Unit of universal thermal conductivity is $\text{J s}^{-1} \text{K}^{-1} \text{m}^{-1}$

Unit of universal gas constant is $\text{J mol}^{-1} \text{K}^{-1}$

Unit of specific heat capacity is $\text{J kg}^{-1} \text{K}^{-1}$

41. Answer (4)

Hint: Work done by a constant force $W = FS$

$$\text{Sol.: } u = 0, F = 15 \text{ N, } m = 5 \text{ kg, } a = 3 \text{ m/s}^2$$

$$\frac{\text{Work done in first 3 second}}{\text{Work done in third second}} = \frac{F \times S_3}{F \times S_{3\text{rd}}}$$

$$\frac{\frac{1}{2} a t^2}{\frac{1}{2} a (2n-1)} = \frac{\frac{1}{2} a (3)^2}{\frac{1}{2} a [5]} = \frac{9}{5}$$

42. Answer (4)

Hint: Potential energy is defined for conservative forces only.

Sol.: Negative work done by conservative forces increases PE of a system

$$\Delta U = -W_{\text{cons}}$$

43. Answer (2)

Hint & Sol.: Heat supplied is not a state function

Heat supplied to a gaseous system is a path function and hence depends on the type of process.

44. Answer (2)

$$\text{Hint: } \vec{v}_{bR} + \vec{v}_{Rg} = \vec{v}_{bg}$$

$$\text{Sol.: } \vec{v}_{bR} = \vec{v}_b - \vec{v}_R = (\hat{i} - \hat{j}) \quad \dots(1)$$

$$\vec{v}_{Rg} = (\hat{i} + \hat{j}) \quad \dots(2)$$

$$\vec{v}_{bg} = (\hat{i} - \hat{j}) + (\hat{i} + \hat{j}) = 2\hat{i}$$

45. Answer (3)

$$\text{Hint: Use, } n_1 u_1 = n_2 u_2$$

$$\text{Sol.: } n_1 u_1 = n_2 u_2$$

$$10 \text{ kg} \frac{\text{m}}{\text{s}^2} = n_2 \frac{(2 \text{ kg})(2 \text{ m})}{\text{s}^2}$$

$$n_2 = \frac{10}{4} = 2.5$$

[CHEMISTRY]

46. Answer (4)

Hint: According to Le-Chatelier's principle, upon changing factors which affect equilibrium, an opposite change to reduce the change caused by the factor happens.

Sol.: For an exothermic reaction, raising the temperature shifts the equilibrium to left and decreases the equilibrium concentration of ammonia.

47. Answer (1)

Hint: For spontaneous reaction $\Delta G^\circ = -ve$

$$\Delta_r G^\circ = \Delta_r H^\circ - T\Delta_r S^\circ$$

$$\text{Sol.: } \Delta_r G^\circ = \Delta_r H^\circ - T\Delta_r S^\circ$$

If $\Delta_r H^\circ = +ve$

$\Delta_r S^\circ = +ve$

$\Delta_r G^\circ = -ve$ only at high temperature

48. Answer (3)

$$\text{Hint: } H = U + PV$$

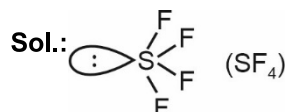
Enthalpy is a state function

Sol.:

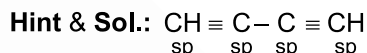
$\Delta_r H^\ominus / \text{kJ mol}^{-1}$	Substance
0	$\text{Br}_2(\text{l})$
+1.89	C (diamond)
0	$\text{Cl}_2(\text{g})$

49. Answer (3)

Hint: SF_4 is see-saw shape molecule

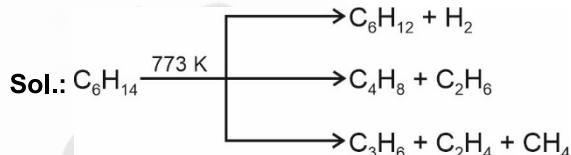


50. Answer (1)



51. Answer (2)

Hint: Higher alkanes on heating at higher temperature give lower alkanes, alkenes etc.



52. Answer (2)

Hint: $[\text{Fe}(\text{CN})_5\text{NOS}]^{4-}$ is a violet colour compound.



53. Answer (1)

Hint: HNO_3 ; oxidation state = +5 (Highest among all)

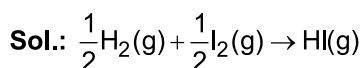
Sol.:

Compound	Oxidation state
NF_3	+3
N_2O	+1
N_2	0

54. Answer (3)

Hint: $\Delta_r H^\circ = \sum \text{bond enthalpies (reactions)}$

$\sum \text{bond enthalpies (product)}$



$$\Delta_r H^\circ = \frac{1}{2} \times a + \frac{1}{2} \times b - c$$

$$= \frac{a}{2} + \frac{b}{2} - c$$

55. Answer (4)

Hint & Sol.: The energies of various molecular orbitals of N_2 is

$$\sigma 1s^2 < \sigma^* 1s^2 < \sigma 2s^2 < \sigma^* 2s^2 < (\pi 2p_x^2 = \pi 2p_y^2) < \sigma 2p_z^2$$

$$B_2 \rightarrow \sigma 1s^2 < \sigma^* 1s^2 < \sigma 2s^2 < \sigma^* 2s^2 < \pi 2p_x^1 = \pi 2p_y^1$$

$$N_2^- \rightarrow \sigma 1s^2 < \sigma^* 1s^2 < \sigma 2s^2 < \sigma^* 2s^2 < (\pi 2p_x^2 = \pi 2p_y^2)$$

$$< \sigma 2p_z^2 < \pi 2p_x^1$$

$$F_2^- \rightarrow 1s^2 < \sigma^* 1s^2 < \sigma 2s^2 < \sigma^* 2s^2 < \sigma 2p_z^2 < \pi 2p_x^2 = \pi 2p_y^2$$

$$< \pi^* 2p_x^2 = \pi^* 2p_y^2 < \sigma^* 2p_z^1$$

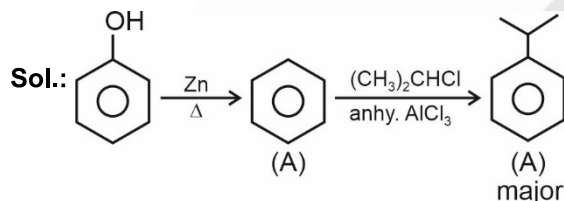
56. Answer (1)

Hint: Radial nodes = $n-l-1$

Sol.:	Radial nodes
4s	3
4f	0
3p	1
4p	2

57. Answer (1)

Hint: Zinc reduced phenol to benzene.



58. Answer (3)

Hint: $Sn + 2H_2O \xrightarrow{\Delta} SnO_2 + 2H_2$

Sol.: Element	First ionization enthalpy (kJ mol ⁻¹)
Sn	708
Pb	715

59. Answer (3)

Hint: Basic buffer consists of weak base and its salt with strong acid.

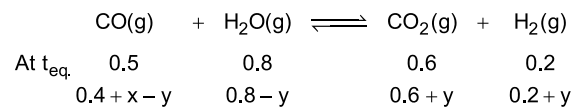
Sol.:

	NH_4OH	+	HCl	\rightleftharpoons	NH_4Cl	+	H_2O
Initial moles	0.2 × 0.2		0.2 × 0.1				
Moles at equilibrium	0.04 - 0.02		-		0.02		0.02
	= 0.02						

Solution at equilibrium consists of NH_4OH and its salt with HCl i.e. NH_4Cl .

60. Answer (3)

Hint & Sol.:



Number of moles of $CO_2 = 1$

$$0.6 + y = 1$$

$$y = 0.4$$

$$K_C = \frac{0.6 \times 0.2}{0.4 \times 0.8} = \frac{3}{8}$$

$$\frac{3}{8} = \frac{0.6 \times 1}{x \times 0.4}$$

$$x = 4$$

61. Answer (2)

Hint: Salt of SB + WA = Basic solution

Sol.: $NH_4Cl \rightarrow$ Salt of WB + SA

$CH_3COONa \rightarrow$ Salt of SB + WA

$Na_2SO_4 \rightarrow$ Salt of SB + SA

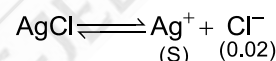
$CH_3COONH_4 \rightarrow$ Salt of WA + WB

62. Answer (3)

Hint: $AgCl(s) \rightleftharpoons Ag^+(aq) + Cl^-(aq)$
(S) (S+0.02)

Sol.: $\therefore (0.02 \gg \gg S)$

$$\therefore (S + 0.02) \approx 0.02$$



$$K_{sp} = [Ag^+][Cl^-]$$

$$1.6 \times 10^{-10} = (S) 0.02$$

$$(S) = \frac{1.6}{2} \times 10^{-8}$$

$$= 8 \times 10^{-9} M$$

63. Answer (2)

Hint: Galena - PbS

Cryolite - Na_3AlF_6

Sol.: Cassiterite - SnO_2

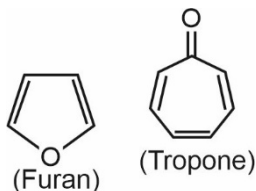
Bauxite - $Al_2O_3 \cdot 2H_2O$

64. Answer (4)

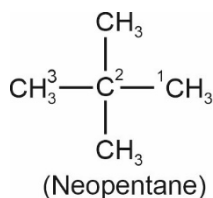
Hint: Moist HCl is white in colour

Sol.: Anhydrous $AlCl_3$ partially hydrolyses with atmospheric moisture and liberate white fumes of HCl gas.

65. Answer (4)

Hint:


Sol.: Tropone is nonbenzenoid aromatic compound while furan is heterocyclic aromatic compound.



IUPAC Name → 2, 2-Dimethylpropane

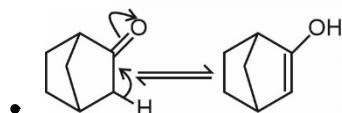
66. Answer (1)

Hint: Allylic free radicals are highly stable.

Sol.: Relative order of stability of free radical is
 Allyl > Benzyl > 3° > 2° > 1° > methyl

67. Answer (4)

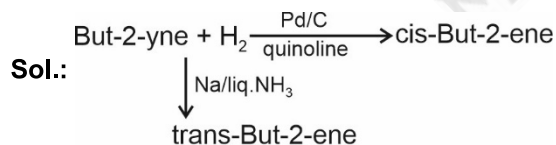
Hint: Aldehydes and ketones having at least one α-hydrogen atom can show keto-enol tautomerism.

Sol.:


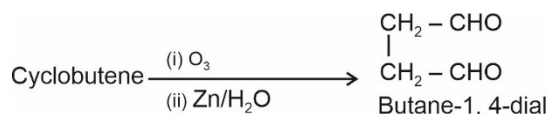
- If α-hydrogen is present at bridgehead, tautomerism is not possible.

68. Answer (2)

Hint: Alkynes on reduction with sodium in liquid ammonia form trans alkenes.



69. Answer (1)

Hint & Sol.:


70. Answer (1)

Hint: Intermolecular forces of spherical molecules can be overcome at lower temperature

Sol.: b.p(K)

2-Methylbutane 300.9

2, 2-Dimethylpropane 282.5

Branching leads to decrease in boiling point.

71. Answer (3)

Hint: Work has been done at constant pressure, hence it is an irreversible process.

Sol.: $W = -P_{\text{ext}}(\Delta V)$

$$= -1.2(0.75 - 0.1)$$

$$= -1.2(0.65)$$

$$= -0.78 \text{ L bar}$$

$$= -78 \text{ joule}$$

72. Answer (1)

Hint: Molar heat capacity is the intensive and internal energy is extensive property.

Sol: For the process, $\text{H}_2\text{O}(\ell) \rightleftharpoons \text{H}_2\text{O}(\text{g})$
 (1 bar, 373 K) (1 bar, 373 K)

$\Delta G = 0$ as equilibrium is attained during phase transformation.

73. Answer (1)

Hint: $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O} + \text{CoO} \xrightarrow[\text{(Bead)}]{\text{Pt wire}} \text{Co}(\text{BO}_2)_2$

Solution: Colour of the bead is blue.

74. Answer (3)

Hint: Tetrathionate ion ($\text{S}_4\text{O}_6^{2-}$)

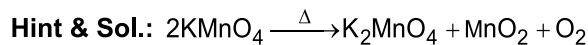
Sol.: Br_3O_8 (tribromooctaoxide)

Average oxidation state of bromine

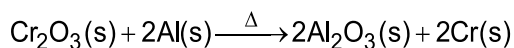
$$\Rightarrow 3x - 16 = 0$$

$$x = \frac{+16}{3}$$

75. Answer (3)



Decomposition reaction



Metal displacement reaction

76. Answer (1)

Hint: A negative E^\ominus means that the redox couple is a stronger reducing agent than the H^+/H_2 couple.

Sol.: Order of negative E^\ominus values

$\text{Ca}^{2+}/\text{Ca} > \text{Sn}^{2+}/\text{Sn} > \text{Ag}^+/\text{Ag} > \text{Co}^{3+}/\text{Co}^{2+}$
order of reducing power,

$\text{Ca} > \text{Sn} > \text{Ag} > \text{Co}^{2+}$

77. Answer (1)

Hint: Bond order = $\frac{N_b - N_a}{2}$

Sol.: O_2^{2-} ; $\text{B.O} = \frac{10 - 8}{2} = 1$

Highest occupied molecular orbital (HOMO) of O_2^{2-} ; π^*2p_x and π^*2p_y have 2 electrons each.

\therefore Diamagnetic

78. Answer (4)

Hint: Dipole moment is the product of the magnitude of the charge and the distance between the centres of positive and negative charge.

Sol.: Molecule	Dipole moment, μ (D)
HF	1.78
HCl	1.07
HBr	0.79
HI	0.38

79. Answer (2)

Hint:

Electronic configuration	Element
$1s^2 2s^2$	Be
$1s^2 2s^2 2p^1$	B
$1s^2 2s^2 2p^3$	N
$1s^2 2s^2 2p^4$	O

Sol.: Due to stable electronic configuration of 'Be' & 'N', they have higher first ionization enthalpy than B and O respectively

B	<	Be	<	C	<	O	<	N	<	F
(801)		889		1086		1314		1402		1681) $\Delta_f H / \text{kJ mol}^{-1}$

80. Answer (1)

Hint: $\text{CO} =$ Neutral oxide

$\text{Al}_2\text{O}_3 =$ Amphoteric oxide

$\text{Cl}_2\text{O}_7 =$ Acidic oxide

Sol.: Th (Z = 90)

Am (Z = 95)

Np (Z = 93)

(Elements after (Z = 92) i.e. Uranium are called Transuranium elements.)

81. Answer (1)

Hint: Unnilbium is Nobelium

Sol.:

IUPAC name	IUPAC official name
Unniltrium	Lawrencium
Unnilquadium	Rutherfordium
Unnilseptium	Bohrium

82. Answer (2)

Hint: Radius of n^{th} orbit = $a_0 \frac{n^2}{Z}$ pm

Sol.: $\frac{r_{\text{Li}^{2+}}}{r_{\text{He}^+}} = \frac{a_0 \frac{9}{3}}{a_0 \frac{n^2}{2}}$

$$= \frac{158.7}{105.8} = \frac{9}{3} \times \frac{2}{n^2}$$

$$= \frac{1.5 \times 3}{9 \times 2} = \frac{1}{n^2}$$

$$= \frac{4.5}{18} = \frac{1}{n^2}$$

$$= n = 2$$

83. Answer (3)

Hint: According to Pauli's exclusion principle, in an orbital no two electrons can have the same set of all four quantum numbers.



Sol.: Violates Pauli's exclusion principle



Violates Hund's rule of maximum multiplicity

84. Answer (4)

Hint: p_x , p_y and p_z orbital have dumb-bell shape.**Sol.:** d_{xy} , d_{yz} , d_{zx} and $d_{x^2-y^2}$ have double dumb-bell shape, but d_{z^2} has a baby soother shape.

85. Answer (3)

Hint: Number of photoelectrons ejected \propto intensity of light**Sol.:** There is no time lag between striking of light and ejection of electrons.

86. Answer (3)

Hint: Moles of HCl = $M \times V$ (in L)**Sol.:** Moles of HCl = $\frac{0.2 \times 50}{1000} = 0.01$ molMoles of CaCO_3 (100% pure) required = $\frac{0.01}{2}$ molMass of CaCO_3 (100% pure) = $\frac{0.01}{2} \times 100$ g
= 0.5 gMass of 80% pure CaCO_3 required
= $\frac{100 \times 0.5}{80} = 0.625$ g

87. Answer (3)

Hint: 0.56% iron by mass refers to 0.56 g Fe in 100 g Haemoglobin.**Sol.:** 100 g Hb = 0.56 g Fe1.65 g Hb = $\frac{0.56}{100} \times \frac{1.65}{56}$ moleNumber of iron atoms = $\frac{0.56}{100} \times \frac{1.65}{56} \times N_A$

$$= \frac{0.56}{100} \times \frac{1.65}{56} \times 6.022 \times 10^{23}$$

$$= 9.9 \times 10^{19} \text{ atoms}$$

88. Answer (3)

Hint: Zeros between two non-zero digits are significant.**Sol.:** Zeros preceding to first non-zero digit are not significant.

89. Answer (2)

Hint: Mole fraction of solvent = $\frac{\text{Moles of solvent}}{\text{Total moles of solution}}$ **Sol.:** 4.4 molal aqueous urea solution refers to 4.4 moles of urea in 1000 g of H_2O

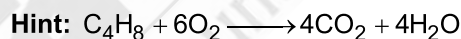
Moles of H_2O = $\frac{1000}{18} = 55.55$

Mole fraction (solvent) = $\frac{55.55}{55.55 + 4.4}$

= $\frac{55.55}{59.95}$

= 0.926

90. Answer (4)

**Sol.:** 1 mole $\text{C}_4\text{H}_8 \rightarrow 4$ moles CO_2

$$\therefore \frac{560}{56} \text{ g } \text{C}_4\text{H}_8 \longrightarrow \frac{4}{1} \times 10 = 40 \text{ moles } \text{CO}_2$$

Volume of CO_2 at STP = 40×22.4 L
= 896 L

[BIOLOGY]

91. Answer (1)

Hint: Cell is the smallest unit, which is capable of independent living and all living organisms are made up of cell.**Sol.:** Anything less than a complete structure of a cell does not ensure independent living. Hence, cell is the fundamental, structural and functional unit of all living organisms.

92. Answer (2)

Hint: The cell wall determines the shape of a cell.**Sol.:** Cell wall provides a strong structural support to prevent the bacterium from bursting or collapsing

93. Answer (3)

Hint: The direct synthesis of ATP from metabolites is called substrate level phosphorylation.**Sol.:** Substrate level phosphorylation occurs during

- Conversion of 1,3 BPGA to 3-PGA, catalysed by phosphoglycerate kinase.
- Conversion of PEP to pyruvate, catalysed by pyruvate kinase.
- Conversion of succinyl CoA to succinic acid, catalysed by succinate thiokinase.

94. Answer (4)

Hint: In many cells, as in protists, food vacuoles are formed by engulfing the food particles.

Sol.: In *Amoeba*, the contractile vacuole is important for osmoregulation and excretion.

95. Answer (4)

Hint: Pyruvate dehydrogenase converts pyruvate into acetyl CoA.

Sol.: Pyruvate dehydrogenase participates in the link reaction.

96. Answer (3)

Hint: The sequence of phases in M phase is karyokinesis and then cytokinesis.

Sol.: The accurate sequence of the events in M phase is as follows:

b. Prophase → Centrosome begins to move towards opposite poles of the cell.

a. Metaphase → Spindle fibres attach to kinetochores of chromosomes.

c. Anaphase → Chromosomes begin their migration towards the two opposite poles.

e. Telophase → Chromosomes cluster at opposite spindle poles and their identity is lost as discrete elements.

d. Cytokinesis → Appearance of a furrow in the plasma membrane.

97. Answer (2)

Hint: Kinetin is an artificial cytokinin.

Sol.: The plant growth regulators (PGRs) are small, simple molecules of diverse chemical composition. They could be indole compounds (indole-3-acetic acid, IAA); adenine derivatives (N₆-furfurylamino purine, kinetin), derivatives of carotenoids (abscisic acid, ABA); terpenes (gibberellic acid, GA₃) or gases (ethylene, C₂H₄).

98. Answer (1)

Hint: Metaphase is the stage at which morphology of chromosomes is most easily studied.

Sol.: During metaphase, chromosomes are moved to spindle equator and get aligned along the metaphase plate through spindle fibres to both the poles.

99. Answer (1)

Hint: Liquid endosperm of coconut exemplifies multinucleate condition.

Sol.: In some organisms karyokinesis is not followed by cytokinesis as a result of which

multinucleate condition arises leading to the formation of syncytium (e.g., liquid endosperm in coconut).

100. Answer (1)

Hint: Separation of homologous chromosomes takes place during meiosis.

Sol.: During anaphase I, the homologous chromosomes separate, while sister chromatids remain associated at their centromeres.

101. Answer (1)

Hint: In Phycmycetes, spores are endogenously produced in sporangium.

Sol.: Ascomycetes is commonly known as sac-fungi. In Basidiomycetes, the basidiospores are exogenously produced on the basidium. Some members of Deuteromycetes are saprophytes or parasites while a large number of them are decomposers of litter and help in mineral cycling.

102. Answer (2)

Hint: Viroids are the causative agents of potato spindle tuber disease.

Sol.: RNA of the viroids has a low molecular weight.

103. Answer (3)

Hint: r is the relative growth rate.

Sol.: r is the measure of the ability of a plant to produce new plant material. This ability is referred to as efficiency index.

104. Answer (1)

Hint: In chrysophytes, cell wall is present.

Sol.: In diatoms, the cell wall forms two thin overlapping shells, which fit together as in a soap box.

105. Answer (4)

Hint: Axile placentation is seen in china rose.

Sol.: Parietal placentation is seen in *Argemone*. Free central placentation is seen in *Primrose*. Basal placentation is seen in marigold.

106. Answer (2)

Hint: Forms ribcage

Sol.: Cartilaginous joints are present between adjacent thoracic vertebrae. Saddle joint is present between carpal and metacarpal of thumb and fibrous joints are present between cranial bones.

107. Answer (2)

Hint: Haemoglobin has a quaternary structure.

Sol.: Some proteins are an assembly of more than one polypeptide or subunit which form quaternary structure.

The sequence of amino acids *i.e.* positional information in a protein is represented by its primary structure.

108. Answer (4)

Hint: An aschelminth

Sol.:

- Hookworm *i.e.*, Ancylostoma, belongs to the phylum Aschelminthes.
- Earthworm is coelomate and monoecious.
- Silkworm is coelomate and dioecious.
- Tapeworm is an acoelomate and monoecious.

109. Answer (1)

Hint: Gases move down their concentration gradient.

Sol.: Alveoli are the primary sites of exchange of gases. Gaseous exchange occurs between blood and tissues. O_2 and CO_2 are exchanged at these sites by simple diffusion, mainly based on the pressure/concentration gradient.

110. Answer (1)

Hint: Lower large thick walled chambers.

Sol.: A bundle of nodal fibres, atrio-ventricular bundle (AV bundle) continues from the AV node which passes through the atrio-ventricular septum and immediately divides into a right and left bundle. These bundle branches give rise to minute fibres throughout the ventricular musculature of the respective sides which are called Purkinje fibres.

111. Answer (3)

Hint: It is numerically equal to 2100-2300 mL

Sol.: FRC (Functional residual capacity) is the sum of RV(1100-1200 mL) and ERV (1000-1100 mL).

Inspiratory capacity	=	3000 - 3500 mL
Total lung capacity	=	5100-5800 mL
Expiratory capacity	=	1500-1600 mL

112. Answer (4)

Hint: Takes place through skin

Sol.: In frogs, during aestivation and hibernation, gaseous exchange takes place through the skin. Skin acts as a respiratory organ under water. On land, the buccal cavity, skin and lungs act as the respiratory organs.

113. Answer (2)

Hint: Exclude the multi-layered epithelium

Sol.: Blood is filtered so finely through filtration slits or slit pores that almost all the constituents of plasma except the proteins pass onto the lumen of Bowman's capsule due to the presence of podocytes which are modified cells of squamous epithelium.

Fibrinogens, globulins and albumins are the major proteins in plasma.

114. Answer (3)

Hint: Present in the brain

Sol.: Pineal gland is located on the dorsal side of the forebrain.

Therefore, it is present in the cranial cavity.

Thymus is located between the lungs, behind the sternum, on the ventral side of aorta.

Each of the two adrenal glands is located above the each kidney in the abdominal cavity.

A pair of ovaries are located in the abdomen.

115. Answer (2)

Hint: Exclude the leucocytes responsible for inflammatory reaction.

Sol.: Both neutrophils and monocytes are phagocytic cells which destroy foreign organisms entering the body.

Basophils are involved in inflammatory reactions. Eosinophils resist infections and are also associated with allergic reactions.

116. Answer (4)

Hint: Respiratory quotient is the ratio of volume of CO_2 evolved to the volume of O_2 consumed in respiration.

Sol.: When proteins are used as respiratory substrates, RQ value would be about 0.9.

117. Answer (4)

Hint: This set carries the taxa that depicts the taxonomical category, order.

Sol.: Diptera, Sapindales and Poales are the orders of housefly, mango and wheat respectively.

118. Answer (3)

Hint: The given diagram is of chloroplast, where Label C represents stroma.

Sol.: Label A represents stroma lamellae. Label B represents grana. Label D represents outer membrane and label E represents inner membrane. Stroma possesses RuBisCO that does not show oxygenase activity in C₄ plants (*Sorghum*).

119. Answer (3)

Hint: Ethylene promotes rapid internode/petiole elongation in deep water rice plants.

Sol.: Ethylene also induces flowering in mango.

120. Answer (3)

Hint: Floridean starch is stored in the form of food material in the members of Rhodophyceae.

Sol: In red algae, the food is stored as floridean starch which is very similar to amylopectin and glycogen in structure, e.g., *Porphyra*, *Gelidium*.

121. Answer (2)

Hint: *Pinus* shows mycorrhizal association with fungi.

Sol.: The male or female cones or strobili may be borne on the same tree (*Pinus*). However, in *Cycas* male cones and megasporophylls are borne on different trees.

122. Answer (1)

Hint: The given plant is *Selaginella*.

Sol.: *Selaginella* is a heterosporous pteridophyte that shows the presence of cones. It possesses vascular tissues.

123. Answer (3)

Hint: This component is made up of elongated, tapering cylindrical cells which have dense cytoplasm and nucleus.

Sol.: Phloem parenchyma is absent in most of the monocotyledons.

124. Answer (4)

Hint: Systematics include phylogenetic relationships.

Sol.: Taxonomy does not include Phylogenetic relationships.

125. Answer (2)

Hint: Dicot leaves exhibit reticulate venation.

Sol.: In monocot stem, peripheral vascular bundles are generally smaller than the centrally located ones. The size of the vascular bundles is dependent on the size of the veins. The veins vary in thickness in the reticulate venation of the dicot leaves.

126. Answer (2)

Hint: Collenchyma is found in dicot stems.

Sol.: In dicot leaves, the outer walls of guard cells (away from the stomatal pore) are thin and the inner walls (towards the stomatal pore) are highly thickened. In conjoint type of vascular bundles, the xylem and phloem are jointly situated along the same radius of vascular bundles.

127. Answer (2)

Hint: Phyllotaxy is the pattern of arrangement of leaves on the stem or branch.

Sol.: In opposite type of phyllotaxy, a pair of leaves arise at each node and lie opposite to each other as in *Calotropis* and guava plants.

128. Answer (2)

Hint: When a flower can be divided into two similar halves only in one particular vertical plane, it is zygomorphic.

Sol.: Example of zygomorphic flowers are pea, gulmohur, bean and *Cassia*, etc. Example of actinomorphic flowers are mustard, datura and chilli etc.

129. Answer (1)

Hint: There may be a variation in the length of filaments within a flower, as in *Salvia* and mustard.

Sol.: If the margins of sepals or petals overlap one another but not in any particular direction as in *Cassia* and gulmohur, the aestivation is called imbricate.

130. Answer (2)

Hint: Genus is the lowest taxonomic category.

Sol.: The correct sequential order of these categories in ascending order is as follows:

Genus → Order → Class → Phylum

131. Answer (4)

Hint: An arthropod

Sol.: Protonephridia or flame cells are the excretory structures in platyhelminths (Flatworms e.g. *Planaria*), rotifers, some annelids and the cephalochordate – *Amphioxus*.

Palaemon or prawn possesses green glands as the excretory structure.

132. Answer (3)

Hint: Inhibitory neurotransmitters are also released in synapse.

Sol.: Neuroglia make up more than one-half the volume of neural tissue in our body.

Arrival of the disturbance at the neuron's endings or output zone, triggers events that may cause stimulation or inhibition of adjacent neurons and other cells.

133. Answer (3)

Hint: 'A band' remains same during contraction.

Sol.: 'I band' and 'H zone' shorten during muscle contraction while 'A band' remains the same.

134. Answer (3)

Hint: Exclude the squamous epithelium.

Sol.: The diffusion membrane is made up of three major layers.

- The thin squamous epithelium of alveoli.
- The endothelium of alveolar capillaries.
- The basement substance (composed of a thin basement membrane supporting the squamous epithelium and the basement membrane surrounding the single layer endothelial cells of capillaries) in between them.

Squamous epithelium of alveoli and the endothelium of alveolar capillaries are cellular layers.

Basement substance is a non cellular layer.

135. Answer (3)

Hint: It is also called congestive heart failure

Sol.: Heart failure means the state of heart where it is not pumping blood effectively enough to meet the needs of the body.

It is sometimes called congestive heart failure because congestion of lungs is one of the main symptoms of heart failure.

136. Answer (4)

Hint: Has a brush bordered epithelium

Sol.:

Part of kidney	Function
PCT	Absorbs maximum amount of water
DCT	Reabsorbs H ₂ O, HCO ₃ ⁻
Collecting duct	Selective secretion of H ⁺ and K ⁺

137. Answer (1)

Hint: Smooth muscle fibres are present in middle layer of uterus.

Sol.: Oxytocin acts on smooth muscles of the body and stimulates their contraction. Smooth muscles fibres are non-striated.

In females, it stimulates a vigorous contraction of uterus at the time of child birth, and milk ejection from mammary glands.

138. Answer (1)

Hint: Systemic veins and pulmonary arteries carry deoxygenated blood.

Sol.:

Respiratory Gas	Atmospheric Air	Alveoli	Blood (Deoxygenated)	Blood (Oxygenated)	Tissues
O ₂	159	104	40	95	40
CO ₂	0.3	40	45	40	45

139. Answer (4)

Hint: Released from neurohypophysis

Sol.: The functioning of kidneys is effectively monitored and regulated by hormonal feedback mechanism involving the hypothalamus, JGA and to a certain extent, heart. JGA is involved in producing renin. ADH is produced from hypothalamus. ANF is produced from the atrial wall of the heart.

140. Answer (1)

Hint: Also called Coelenterata

Sol.: Cnidarians have a central gastro-vascular cavity with a single opening, mouth on hypostome.

- Aschelminths possess a well developed muscular pharynx.
- The mouth of molluscs contains a file-like rasping organ for feeding called radula.
- Echinoderms have a complete digestive system with mouth on lower (ventral) side and anus on the upper (dorsal) side.

141. Answer (1)

Hint: Caused due to chronic cigarette smoking

Sol.: Emphysema is a chronic disorder in which alveolar walls are damaged, due to which respiratory surface is decreased. One of the major causes of this is cigarette smoking.

Inflammation of upper respiratory tract occurs mainly due to occupational respiratory disorders.

142. Answer (2)

Hint: Neuromuscular junction.

Sol.: The junction between a motor neuron and the sarcolemma of a muscle fibre is called the neuromuscular junction or motor-end plate.

143. Answer (3)

Hint: Acetabulum is the cavity formed at their point of fusion.

Sol.: Pelvic girdle consists of two coxal bones. Each coxal bone is formed by the fusion of three bones – ilium, ischium and pubis.

144. Answer (1)

Hint: Grey in colour

Sol.: Cerebral cortex is referred to as grey matter due to concentration of neuronal cell bodies. This also includes association areas which are clearly neither sensory nor motor. Cerebral aqueduct is a canal that passes through the midbrain.

145. Answer (1)

Hint: Human heart pumps 5 L of blood per minute

Sol.: On an average, 1100-1200 mL of blood is filtered by the kidneys per minute which constitutes roughly $1/5^{\text{th}}$ of the blood pumped out by each ventricle of the heart in a minute.

146. Answer (2)

Hint: Exclude the excretory structure of hemichordates

Sol.: A rudimentary structure in the collar region called stomochord, a structure similar to notochord. Notochord is a mesodermally-derived structure present in the dorsal part of cephalochordates.

147. Answer (1)

Hint: Amino acids have tendency to form zwitter ions

Sol.: The chemical and physical properties of amino acids are essentially due to the amino, carboxyl and the R functional groups.

A particular property of amino acids is the ionisable nature of $-\text{NH}_2$ and $-\text{COOH}$ groups. Hence, in the solutions of different pH, the structure of amino acids changes.

148. Answer (1)

Hint: Identify the structure present in human fallopian tubes

Sol.: In *Paramoecium*, cilia help in the movement of food through cytopharynx as well as in locomotion.

Hydra uses its tentacles for capturing its prey and also use them for locomotion.

Ophiura is an echinoderm.

149. Answer (4)

Hint: Chordates possess ventral heart.

Sol.:

<i>Sepia</i>	Cuttle fish	Non-chordate
<i>Asterias</i>	Star fish	Non-chordate
<i>Octopus</i>	Devil fish	Non-chordate
<i>Scoliodon</i>	Dogfish	Chordate

150. Answer (1)

Hint: Exclude the monomers of actin filament

Sol.: A complex protein, troponin is distributed at regular intervals on the tropomyosin. In resting state, a subunit of troponin masks the active binding sites for myosin present on the actin filament.

Each F-actin is a polymer of monomeric 'G' actins. Meromyosins are monomeric proteins which constitute one thick filament known as myosin.

151. Answer (3)

Hint: 'A' is glucagon and 'B' is insulin.

Sol.: Both insulin and glucagon are peptide hormones. Glucagon acts mainly on hepatocytes (liver cells) and insulin acts mainly on hepatocytes and adipocytes.

Glucagon stimulates gluconeogenesis and insulin stimulates glycogenesis.

152. Answer (2)

Hint: Number of fingers in a human hand.

Sol.: Paired cranial bones – temporal, parietal
Paired facial bones – Maxilla, palatine, nasal, lacrimal, zygomatic and inferior nasal conchae
Mandible and vomer are unpaired facial bones.

153. Answer (2)

Hint: The outer surface of axonal membrane has positive charge.

Sol.: When a neuron is not conducting any impulse, *i.e.*, resting, the axonal membrane is comparatively more permeable to K^+ and nearly impermeable to Na^+ . The membrane is impermeable to negatively charged proteins present in the axoplasm.

154. Answer (3)

Hint: Function of exchange part.

Sol.: Oxygen is utilised by the organisms to indirectly breakdown simple molecules like glucose, amino acids, fatty acids, *etc.*, to derive energy to perform various activities.

Conducting part of human respiratory system transports the atmospheric air to the alveoli, clears it from foreign particles, humidifies and also brings the air to body temperature.

Exchange part is the site of actual diffusion of O_2 and CO_2 between blood and atmospheric air.

155. Answer (2)

Hint: Total number of fingers in human limbs

Sol.: Palmitic acid and arachidonic acid have 16 and 20 carbon atoms respectively including the carboxyl carbon.

156. Answer (4)

Hint: All tissues on the inner side of endodermis constitute the stele.

Sol.: The outermost layer in root is epiblema. Tissues like pericycle, vascular bundle and pith together constitute the stele.

157. Answer (2)

Hint: Makoi belongs to Solanaceae family and pea belongs to Fabaceae family.

Sol.: Makoi plant exhibit epipetalous stamen, while such a condition is not found in pea plant. Valvate aestivation of calyx is seen in both makoi and pea. Both also have bisexual flowers.

158. Answer (4)

Hint: In C_3 plants, PEPcase enzyme is not involved in CO_2 fixation.

Sol.: Bell pepper is a C_3 plant, thus its mesophyll cells show the presence of RuBisCO enzyme for CO_2 fixation.

159. Answer (4)

Hint: A dedifferentiated tissue can act as meristem.

Sol.: Interfascicular vascular cambium, cork cambium and wound cambium exemplify dedifferentiated tissue. Secondary phloem is an example of redifferentiated tissue.

160. Answer (3)

Hint: This fungus belongs to Ascomycetes.

Sol.: *Neurospora* is used extensively in biochemical and genetic work.

161. Answer (3)

Hint: Chemotaxonomy uses the chemical constituents of the plant to classify organisms.

Sol.: Cytotaxonomy is based on cytological information like chromosome number, structure and behaviour.

162. Answer (2)

Hint: Diakinesis represents transition to metaphase.

Sol.: The final stage of meiotic prophase I is diakinesis. This stage is marked by terminalisation of chiasmata.

163. Answer (1)

Hint: Differentiation in plants is open.

Sol.: Cells/tissues arising out of the same meristem have different structures at maturity.

164. Answer (4)

Hint: Wheat is a C_3 Plant.

Sol.: C_4 plants show saturation at about 360 ppm while C_3 responds to increased CO_2 concentration and saturation is seen only beyond 450 ppm.

165. Answer (4)

Hint: These are small bristle like fibres sprouting out of the bacterial cell.

Sol.: The fimbriae help to attach the bacteria to rocks in streams and also to the host tissues.

166. Answer (3)

Hint: Both the cilium and flagellum emerge from a centriole-like structure called the basal bodies.

Sol.: Centrioles are surrounded by an amorphous pericentriolar material.

167. Answer (4)

Hint: EMP pathway is glycolysis.

Sol.: Location of EMP pathway is cytoplasm regardless of the type of respiration and organisms.

168. Answer (2)

Hint: Plants do not present great demands for gas exchange.

Sol.: The F_1 headpiece of oxysome in mitochondria is a peripheral membrane protein complex and contains the site for synthesis of ATP from ADP and inorganic phosphate. Oxidation of one molecule of NADH gives rise to 3 molecules of ATP.

169. Answer (4)

Hint: This pigment imparts bright or blue green color in the chromatogram.

Sol.: Chlorophyll *a* is the chief pigment associated with photosynthesis.

170. Answer (1)

Hint: Cyclic photophosphorylation takes place in stroma lamella.

Sol.: Only ATP is produced during cyclic photophosphorylation.

171. Answer (4)

Hint: Fibrous joint do not allow any movement

Sol.:

Fibrous joint – Between flat skull bones

Pivot joint – Between atlas and axis (C_1 and C_2)

Saddle joint – Between carpal and metacarpal of thumb

Gliding joint – Between carpals

172. Answer (3)

Hint: Apoenzyme is the protein part

Sol.: Enzymes are composed of one or several polypeptide chains. However, there are a number of cases in which non-protein constituents called co-factors are bound to the enzyme to make the enzyme catalytically active.

In these instances, the protein portion of the enzymes is called the apoenzyme. Three kinds of co-factors may be identified; prosthetic groups, co-enzymes and metal ions.

173. Answer (1)

Hint: Stroke volume = EDV – ESV

Sol: CO = Stroke volume × Number of heart beats/minute

⇒ Stroke volume = 140 – 80 mL

= 60 mL

CO = 60 mL × 90 beats/min

⇒ 5400 mL/min

⇒ 5.4 L/min

174. Answer (4)

Hint: Constituent of brain stem

Sol.: The medulla oblongata contains centres which control respiration, cardiovascular reflexes and gastric secretions. Pons, cerebellum and medulla are parts of hindbrain. Cerebrum is a part of forebrain.

175. Answer (1)

Hint: Exclude the human uterine layer

Sol.: Frogs have well-organised male and female reproductive systems. Male reproductive organs consist of a pair of yellowish ovoid testes, which are found adhered to the upper part of kidneys by a double fold of peritoneum called mesorchium. Myometrium is the middle layer of uterine wall. Myocardium is the muscular tissue of the heart.

176. Answer (2)

Hint: 'X' is starch

Sol.: Ribose and deoxyribose are present in nucleic acid.

Fructose is present in inulin, glucose is the monomer of starch and glycogen which give colour with iodine.

177. Answer (3)

Hint: DNA possesses deoxyribose sugar.

Sol.: The sugar found in polynucleotides is either ribose (a monosaccharide pentose) or 2' deoxyribose. A nucleic acid containing deoxyribose sugar is called deoxyribonucleic acid (DNA) while the one which contains ribose sugar is called ribonucleic acid.

178. Answer (2)

Hint: Genital pouch is also called brood pouch

Sol.: In female cockroaches, the 7th sternum is boat-shaped and together with 8th and 9th sterna forms brood or genital pouch whose anterior part contains female gonopore, spermathecal pores and opening of ducts of collateral glands.

179. Answer (4)

Hint: Chordates have closed circulatory system

Sol.: The opening of the right and the left ventricles into the pulmonary artery and the aorta respectively are guarded with semilunar valves.

Closed circulatory system is advantageous over open circulatory system as the flow of fluid can be more precisely regulated. In annelids, closed circulatory system is present.

180. Answer (3)

Hint: Exclude the cells of squamous epithelium

Sol.: Some of the cells of columnar or cuboidal cells get specialised for secretion and are called glandular epithelium.




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