All India Aakash Test Series for NEET - 2026

OPEN MOCK TEST - 2

Click here for Code-F Sol.

Test Date : 12/04/2026

ANSWERS

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

HINTS & SOLUTIONS

[PHYSICS]

1. Answer (4)

Hint: Induced emf across the ends, $E = \frac{1}{2}B\omega L_{eff}^2$

Sol.: $L_{eff}^2 = 16x^2 + 9x^2$

$L_{eff}^2 = 25x^2$

$E = \frac{1}{2}B\omega \times 25x^2$

$= \frac{25}{2}B\omega x^2$

2. Answer (3)

Hint: Magnitude of resultant,

$R = \sqrt{P^2 + Q^2 + 2PQ\cos\theta}$

Sol.: $R_{max} = P + Q = 20$ …(i)

$R_{min} = P - Q = 8$ …(ii)

Adding (i) and (ii),

$2P = 28$

$P = 14$

Subtracting (i) and (ii),

$2Q = 12 \Rightarrow Q = 6$

$\frac{P}{Q} = \frac{14}{6} = \frac{7}{3}$

3. Answer (3)

Hint: For horizontal projection, $u_y = 0$

Sol.: Time taken, $T = \sqrt{\frac{2h}{g}} = \sqrt{\frac{2\times 80}{10}} = 4$ s

4. Answer (3)

Hint: $v = \sqrt{2gh} \Rightarrow \vec{P} = m\vec{v}$

Sol.: $v = \sqrt{2gh} = \sqrt{2\times 10\times 20}$

= 20 m/s

At position A, $(p_i)_x = mv\cos\theta$

$= 2\times 20\times\frac{1}{2} = 20$ kg m/s

$(p_i)_y = 2\times 20\times\frac{\sqrt{3}}{2} = 20\sqrt{3}$ kg m/s

When particle reaches point C,

$(p_f)_x = mv = 2 \times 20 = 40$ kg m/s

$(p_f)_y = 0$

$\Delta p_x = (p_f)_x - (p_i)_x$

$= 40 - 20 = 20$ kg m/s

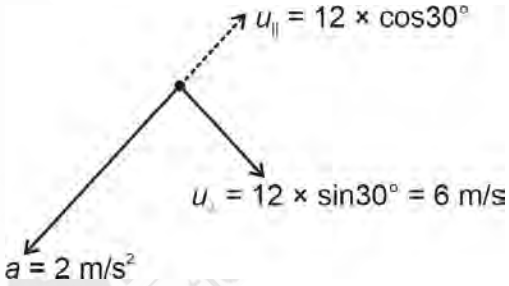
$\Delta p_y = 0 - 20\sqrt{3} = -20\sqrt{3}$ kg m/s

$\Delta\vec{p} = \sqrt{(20)^2 + (-20\sqrt{3})^2}$

$= \sqrt{400 + 1200} = \sqrt{1600} \Rightarrow$ = 40 kg m/s

5. Answer (3)

Hint: The acceleration vector shall change the component of velocity parallel to it while radius of curvature $r = \frac{v^2}{a_n}$



Sol.: The radius of curvature r_{min} occurs when v is minimum and a_n is maximum. This is at the point when component of velocity parallel to acceleration vector ($v_{||}$) becomes zero.

$\therefore r_{min} = \frac{6^2}{2} = \frac{36}{2} = 18$ m

6. Answer (3)

Hint: Phase difference, $\Delta\phi = k\Delta x$

Sol.: $\Delta\phi = \frac{2\pi}{\lambda}\Delta x = \frac{2\pi}{\lambda}\times\frac{\lambda}{4}$

$\Delta\phi = \frac{\pi}{2}$

$\therefore$ Resultant amplitude, $A = \sqrt{a_1^2 + a_2^2}$

$= \sqrt{\frac{a^2}{4} + \frac{a^2}{4}} = \sqrt{\frac{2a^2}{4}} = \frac{a}{\sqrt{2}}$

7. Answer (3)

Hint & Sol.: T.E. of simple harmonic oscillator is

$\frac{1}{2}m\omega^2A^2$ or $\frac{1}{2}kA^2$

8. Answer (3)

Hint: Lorentz force on charged particle, $\vec{F}_{net} = q\vec{E} + q(\vec{v}\times\vec{B})$

Sol.: $\vec{F}_B = q(\vec{v} \times \vec{B})$

$\vec{F}_E = q\vec{E}$

$\vec{F}_{net} = \text{zero} \Rightarrow \vec{E} = -(\vec{v} \times \vec{B})$

$|\vec{E}| = vB\sin\theta$

This condition ensures force due to electric and magnetic forces cancel out completely.

9. Answer (2)

Hint: Magnetic moment, $M = mL$

Sol.: $M_{net} = \sqrt{\left(\frac{M}{2}\right)^2 + \left(\frac{M}{2}\right)^2} = \frac{M}{\sqrt{2}}$

10. Answer (2)

Hint: Force per unit length on current carrying wire C, $F = \frac{\mu_0 I_1 I_2}{2\pi d}$

Sol.: $F = \frac{\mu_0}{2\pi}\frac{I_1 I_2}{d}$

$F_{CB} = \frac{\mu_0}{2\pi} \times \frac{20 \times 5}{x}$ (towards left)

$F_{CD} = \frac{\mu_0}{2\pi} \times \frac{5 \times 10}{(20 - x)}$ (towards right)

$F_{CB} = F_{CD}$

$\Rightarrow \frac{\mu_0}{2\pi} \times \frac{100}{x} = \frac{\mu_0}{2\pi} \times \frac{50}{(20 - x)}$

$40 - 2x = x \Rightarrow x = \frac{40}{3}$ cm

11. Answer (1)

Hint & Sol.: At equilibrium,

$P_0A = Mg$

Let piston be displaced by small displacement x, then new volume of gas

$V = V_0 - Ax = V_0\left[1 - \frac{Ax}{V_0}\right]$

Adiabatic relation PV^γ = constant = $P_0V_0^\gamma$

$P = P_0\left(\frac{V_0}{V}\right)^\gamma = P_0\left(1 - \frac{Ax}{V_0}\right)^{-\gamma}$

By binomial expansion, $P \approx P_0\left[1 + \frac{\gamma Ax}{V_0}\right]$

Force on piston due to pressure change

$F = -(PA - Mg) = -A(P - P_0) = -A.\ P_0\gamma.\ \frac{Ax}{V_0}$ (since displacement is downward and restoring force is upwards)

So $\vec{F} = -\left(\frac{\gamma A^2 P_0}{V_0}\right)\vec{x} \Rightarrow$ This is SHM

$\vec{F} = -k\vec{x} \Rightarrow k = \frac{\gamma A^2 P_0}{V_0} \Rightarrow \omega = \sqrt{\frac{k}{M}} = \sqrt{\frac{\gamma A^2 P_0}{MV_0}}$

$f = \frac{\omega}{2\pi} = \frac{1}{2\pi}\sqrt{\frac{\gamma A^2 P_0}{MV_0}}$

12. Answer (1)

Hint & Sol.: Final velocity at bottom of well,

$v = \sqrt{u^2 + 2g(5)}$

$= \sqrt{u^2 + 100}$

After bouncing from the bottom,

$v' = \frac{1}{2}\left(\sqrt{u^2 + 100}\right)$

In order to reach point B,

$v^2 = u^2 - 2gh$

$0 = v'^2 - 2g(6.5)$

$v'^2 = 130$

$\left(\frac{1}{2}\sqrt{u^2 + 100}\right)^2 = 130$

$\frac{1}{4}(u^2 + 100) = 130$

$u^2 + 100 = 520$

$u^2 = 420$

$\Rightarrow u = 20.49$ m/s

13. Answer (3)

Hint & Sol.: For polytropic process,

PV^x = constant

$C_v = \frac{3R}{2}$ (Monoatomic gas)

$\frac{1}{T} = \tan\theta\gamma$

$dV = V\gamma dT$

$\frac{1}{T} = \tan\theta\frac{dV}{V\,dT}$

$\int_{T_1}^{T_2}\frac{dT}{T} = \tan\theta\int_{V_1}^{V_2}\frac{dV}{V}$

$\ln\left(\frac{T_2}{T_1}\right) = \ln\left(\frac{V_2}{V_1}\right)^{\tan\theta}$

$\frac{T_2}{T_1} = \left(\frac{V_2}{V_1}\right)^{\tan\theta}$

$\frac{V^{\tan\theta}}{T} = C$

$PV = nRT$

$\frac{V^{\tan\theta}}{PV} = C'$

$PV^{1-\tan\theta}$ = constant

14. Answer (2)

Hint & Sol.: T_r = Thermometer reading

T_a = Actual reading

$\frac{T_r - T_1}{T_2 - T_1} = \frac{T_a - A_1}{A_2 - A_1}$

$T_1 = 15°C$

$T_2 = 165°C$

$\frac{T_r - 15}{165 - 15} = \frac{75 - 0}{100 - 0} \Rightarrow \frac{T_r - 15}{150} = \frac{75}{100}$

$T_r - 15 = \frac{75 \times 3}{2} \Rightarrow T_r = 127.5°C$

15. Answer (1)

Hint & Sol.: Average translational kinetic energy = $\frac{3}{2}KT$, which depends only on temperature.

16. Answer (1)

Hint: K.E. $= \frac{1}{2}k(A^2 - x^2)$ and P.E. $= \frac{1}{2}kx^2$

Sol.: At $t = \frac{T}{12}$,

$x = A\sin\omega t = A\sin\left(\frac{2\pi}{T} \times \frac{T}{12}\right) = \frac{A}{2}$

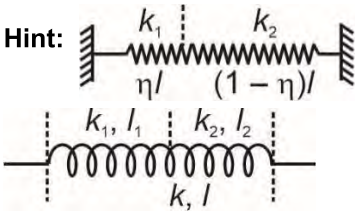
K.E. $= \frac{1}{2}k(A^2 - x^2) = \frac{3}{4} \times \frac{1}{2}kA^2$

P.E. $= \frac{1}{2}kx^2 = \frac{1}{4} \times \frac{1}{2}kA^2$

$\therefore \frac{\text{K.E.}}{\text{P.E.}} = \frac{3}{1}$

17. Answer (3)

Hint:



$T = 2\pi\sqrt{\frac{m}{k_{eq}}}$

Sol.: For any part of spring

$k_1 l_1 = k_2 l_2 = kl$ = constant

$\Rightarrow k_1 \eta l = k_2(1-\eta)l = kl$

$\Rightarrow k_1 = \frac{k}{\eta}$ and $k_2 = \frac{k}{1-\eta}$

Now, both springs are in parallel combination

$\therefore T = 2\pi\sqrt{\frac{m}{k_{eq}}}$

$= 2\pi\sqrt{\frac{m}{k_1 + k_2}} \Rightarrow 2\pi\sqrt{\frac{m\eta(1-\eta)}{k}}$

18. Answer (3)

Hint: Speed of a transverse wave in a stretched wire, $v = \sqrt{\frac{T}{\mu}} = \sqrt{\frac{T}{AS}}$

Sol.: μ = mass per unit length

$\mu_{hollow} < \mu_{solid} \Rightarrow v_{hollow} > v_{solid}$

$\mu_{thin} < \mu_{thick} \Rightarrow v_{thin} > v_{thick}$

19. Answer (2)

Hint: $x_{cm} = \frac{Mx - mx'}{M - m}$, $y_{cm} = \frac{My - my'}{M - m}$

Sol.: $x_{cm} = \frac{[\sigma(2)^2] \times 1 - [\sigma(1)^2] \times \frac{3}{2}}{(\sigma \times 2^2) - [\sigma \times (1)^2]} = \frac{4 - \frac{3}{2}}{4 - 1} = \frac{5}{6}$ m

Similarly; $y_{cm} = \frac{5}{6}$ m

$\therefore$ Position of COM of remaining portion is $(x_{cm}, y_{cm}) = \left(\frac{5}{6}, \frac{5}{6}\right)$ m

20. Answer (2)

Hint: Total distance travelled in all possible collisions,

$s = \frac{u^2}{g}(1 + e^2 + e^4 + ...) = \frac{u^2}{g}\left[\frac{1}{1 - e^2}\right]$

Sol.: u = 30 m/s

e = 0.5

$s = \frac{u^2}{g}\left[\frac{1}{1 - e^2}\right]$

$= \frac{900}{10}\left[\frac{1}{1 - 0.25}\right]$

$= \frac{900}{10} \times \frac{4}{3} \Rightarrow s$ = 120 m

21. Answer (1)

Hint: Gauge pressure = ρgh

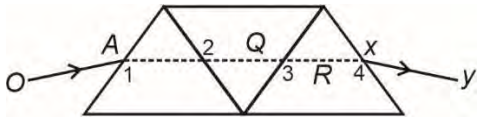
Sol.: $\rho gh = 2000$ Pa

$2000 = 1.06 \times 10^3 \times 10 \times h$

$h = \dfrac{2000}{1.06 \times 10^4} \simeq 0.19$ m

22. Answer (1)

Hint: In an equilateral prism, when a ray undergoes minimum deviation, the refracted ray inside the prism travels parallel to its base.



Sol.: Since prisms are identical, so prism *P* and *Q* results no deviation. Then it incident on *R* same as *P*. So, same deviation will occur as *P*.

23. Answer (3)

Hint: In case 1 : $\tan\phi' = \dfrac{X_c}{R}$;

In case 2 : $\tan\phi = \dfrac{X_L}{R}$

Sol.: When *L* is removed, $\tan\phi' = \dfrac{X_c}{R}$;

$\Rightarrow \tan 45^\circ = \dfrac{X_C}{R}$ ...(i)

When *C* is removed, $\tan\phi = \dfrac{X_L}{R}$

$\Rightarrow \tan 45^\circ = \dfrac{X_L}{R}$ ...(ii)

From (i) and (ii),

$X_L = X_C$

$\therefore$ Circuit is at resonance

$i_{rms} = \dfrac{E_{rms}}{z} = \dfrac{100}{20} = 5$ A

24. Answer (3)

Hint & Sol.: Gauss's law in electrostatics is

$\oint \vec{E}.\vec{ds} = \dfrac{q}{\varepsilon_0}$

Faraday's law is $\oint \vec{E}.\vec{dl} = -\dfrac{d\phi_B}{dt}$

Gauss's law in magnetism is $\oint \vec{B}.\vec{dA} = 0$

Ampere-Maxwell law is

$\oint \vec{B}.\vec{dl} = \left(\mu_0 i_c + \mu_0\varepsilon_0 \dfrac{d\phi_E}{dt}\right)$

25. Answer (4)

Hint & Sol.:

Frequency (*f*) is determined by source of wave and doesn't change at the boundary between two media.

Speed decreases as $v = \dfrac{c}{n}$, where *n* = refractive index of medium

As $\lambda = \dfrac{v}{f}$, thus λ must also decrease.

For perfectly absorbing surface, pressure $P = \dfrac{I}{c}$

and for perfectly reflecting surface, $P = \dfrac{2I}{c}$

26. Answer (3)

Hint & Sol: Inside a conductor in electrostatic equilibrium, electric field is zero. This holds even if there's cavity with a charge inside.

When charge $+q$ is placed in cavity, then charge $-q$ is induced on inner surface of cavity.

To conserve charge, $+q$ gets induced on outer surface of main sphere.

Total charge on outer surface of conductor

$= Q + q$

27. Answer (4)

Hint: Apply KCL at point *A*

Sol.: $(V - 0)2 + (V - 10)2 + (V - 10) \times 1 = 0$

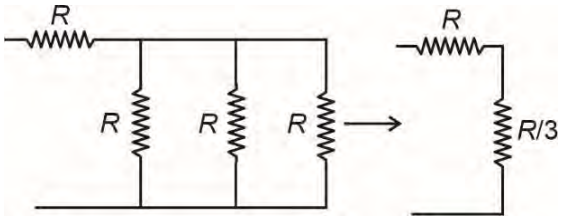
$2V + 2V - 20 + V - 10 = 0$

$5V - 30 = 0 \Rightarrow V = 6$ V

28. Answer (2)

Hint: Total power delivered to the bulbs, $P = \dfrac{V^2}{R_{eq}}$

Sol.:



$R_{eq} = R + \dfrac{R}{3} = \dfrac{4R}{3}$

$R = \dfrac{120 \times 120}{60} \Rightarrow R = 240\ \Omega$

$P = \dfrac{V^2}{R_{eq}} = \dfrac{120 \times 120 \times 3}{4 \times 240} \Rightarrow P = 45$ W

29. Answer (3)

Hint: Magnetic moment of a current carrying loop, $M = NIA$

Sol.: The loop can be divided into two square loops.

$M_1 = M_2 = Ia^2$

$M_{net} = \sqrt{M_1^2 + M_2^2} = \sqrt{2}Ia^2$

30. Answer (3)

Hint: Net magnetic flux, $\phi_{net} = \oint \vec{B}.\overrightarrow{dA}$

Sol.: Net magnetic flux through a closed surface in uniform magnetic field is always zero.

31. Answer (1)

Hint: Induced emf in secondary coil, $e = -M\dfrac{dI_1}{dt}$

Sol.: $e = I_2R_2 = \dfrac{5}{2} = -10^{-2}\dfrac{dI_1}{dt}$

$\left|\dfrac{dI_1}{dt}\right| = 2.5\times10^2$ A/s

32. Answer (3)

Hint: Angular width of central maxima, $\omega = \dfrac{2\lambda}{a}$

Sol.: $\lambda = 6 \times 10^{-7}$ m

Slit width, $a = 2 \times 10^{-4}$ m

$\omega = \dfrac{2\lambda}{a} = \dfrac{2\times6\times10^{-7}}{2\times10^{-4}}$ radian

$= 6 \times 10^{-3}$ radian

33. Answer (1)

Hint: Refractive index $\mu = \tan i_p$

Sol.: Polarising angle $i_p = 60°$

$\mu = \tan i_p = \sqrt{3}$

$\mu = \dfrac{1}{\sin i_c} \Rightarrow i_c = \sin^{-1}\left(\dfrac{1}{\sqrt{3}}\right)$

$v = \dfrac{c}{\mu} = \sqrt{3}\times10^8$ m/s

34. Answer (2)

Hint: Kinetic energy acquired by the electron, K.E. $= eV$

Sol.: $P = \sqrt{2meV}$

de-Broglie wavelength, $\lambda = \dfrac{h}{P}$

$= \dfrac{h}{\sqrt{2meV}} = \dfrac{6.63\times10^{-34}}{\sqrt{2\times9.1\times10^{-31}\times1.6\times10^{-19}\times180}}$

$\lambda \approx 0.9\times10^{-10}$ m

35. Answer (2)

Hint: For hydrogen atom, $\dfrac{1}{\lambda} = R\left[\dfrac{1}{n_f^2} - \dfrac{1}{n_i^2}\right]$

Sol.: $\dfrac{1}{\lambda} = 1.097\times10^7\left[\dfrac{1}{3^2} - \dfrac{1}{5^2}\right]$

$= 1.097\times10^7\left(\dfrac{1}{9} - \dfrac{1}{25}\right) = \left(\dfrac{1.097\times16}{22500}\right)\times10^9$

$\lambda \simeq$ 1282 nm

36. Answer (2)

Hint & Sol.: Mass of constituents = $2m_p + 2m_n$

= 2 × 1.0073 + 2 × 1.0087 = 2.0146 + 2.0174

= 4.032 u

Δm = 4.032 – 4.0015 = 0.0305 u

$B.E = \Delta m \times 931.5 \approx 28.4$ MeV

B.E. per nucleon = $\dfrac{28.4}{4} = 7.1$ MeV

37. Answer (1)

Hint: $R_{eq} = \dfrac{R}{n}$ for n equal resistors in parallel connection and apply KVL

Sol.: $I = \dfrac{V}{R_{eq}} = \dfrac{4-0.3}{10} = 0.37$ A

38. Answer (1)

Hint & Sol: Barrier potential at room temperature:

Silicon ≈ 0.7 V

Germanium ≈ 0.3 V

39. Answer (1)

Hint: Energy density = $\dfrac{1}{2}\varepsilon_0 E^2$

Sol.: [Energy density] = $[ML^{-1}T^{-2}]$

[Pressure] = $[ML^{-1}T^{-2}]$

40. Answer (1)

Hint: Vertical height, $H = ut + \dfrac{1}{2}at^2$

Sol.: $\therefore\ H = 0 + \dfrac{1}{2}gT^2$

$T = \sqrt{\dfrac{2H}{g}} = \sqrt{\dfrac{2\times4500}{10}}$ = 30 s

41. Answer (2)

Hint: Relative velocity of A w.r.t. B, $v_{AB} = v_A - v_B$.

Sol.: $a_{AB} = 0$

d_{AB} = 100 m

v_{AB} = 10 – (–15) = 25 m/s

Time taken, $t = \dfrac{d_{AB}}{v_{AB}}$

$\therefore t$ = 4 s

42. Answer (2)

Hint: Work done $= \vec{F}.\vec{s}$

Sol.: $W_{net} = W_F + W_{mg} + W_{friction}$

$= (20 \times 5) - \left(mg \times 5 \times \frac{1}{2}\right) - \left(\mu mg \times \frac{\sqrt{3}}{2} \times 5\right)$

$= 100 - 50 - 17.32 \simeq 33$ J

43. Answer (1)

Hint: $g = \frac{GM}{R^2}$

Sol.: $g' = \frac{GM}{r^2}$, where $r = 3R$

$\therefore$ Acceleration in orbit = $g' = \frac{GM}{9R^2} = \frac{g}{9}$

44. Answer (3)

Hint: $Y = \frac{\text{stress}}{\text{strain}}$

Sol.: Elongation, $\Delta L = \frac{FL}{AY} = \frac{200 \times 2}{1 \times 10^{-6} \times 2 \times 10^{11}}$

= 2 mm

45. Answer (4)

Hint & Sol.: Let length of water column in inclined tube = l

$l\cos\theta = h$

$l\cos 45^\circ = \frac{l}{\sqrt{2}} = h = 10$ cm

$l = 10\sqrt{2}$ cm

[CHEMISTRY]

46. Answer (3)

Hint: Steam distillation technique is applied to separate substances which are steam volatile and are immiscible with water.

Sol.: Chloroform and aniline are easily separated by the distillation method because they have large difference in boiling point.

47. Answer (1)

Hint: molarity = $\frac{\text{No. of mole}}{\text{Volume in litre}}$

Sol.: Given, molarity of solution = 2.5 M

Volume of solution $= \frac{300}{1000} = \frac{3}{10}$L

Weight of HNO_3 = $2.5 \times 63 \times \frac{3}{10}$ g

Given that concentrated HNO_3 is 70% (w/w)

70 g HNO_3 is present in 100 g solution

$2.5 \times 63 \times \frac{3}{10}$ g HNO_3 will be present in

$= \frac{100}{70} \times 2.5 \times 63 \times \frac{3}{10}$

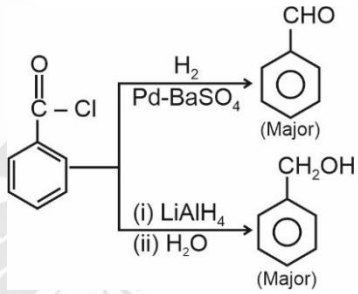
$= \frac{10}{7} \times 2.5 \times 63 \times \frac{3}{10}$

= 67.5 g

48. Answer (2)

Hint: H_2/Pd-$BaSO_4$ reduces acid halide (acid chloride) to aldehyde.

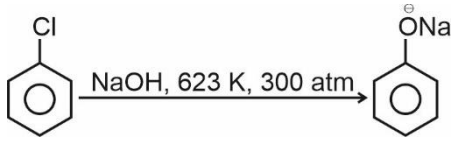
Sol.:



49. Answer (1)

Hint: C – X bond acquires partial double bond character due to resonance in haloarenes. As a result, the bond cleavage in haloarenes is difficult than haloalkanes. Therefore, haloarenes are less reactive towards nucleophilic substitution reaction than haloalkanes.

Sol.:



50. Answer (1)

Hint: +ve charge adjacent to heteroatom with lone pair involved in resonance.

Sol.: (a) and (b) are more stable than (c) and (d) due to resonance therefore correct order will be

(a) > (b) > (c) > (d)

51. Answer (3)

Hint: $\frac{1}{\lambda} = R_H\left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right]$

$\frac{hc}{\lambda} = hcR_H\left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right]$

$\Delta E = E_0\left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right]$, where $n_2 > n_1$.

Sol.: Therefore among the given option, the highest energetic photon will be emitted when electron make transition from n = 5 to n = 1

52. Answer (2)

Hint: $R-OH + SOCl_2 \rightarrow R-Cl + SO_2(g) + HCl(g)$

Sol.: In this reaction both the products are gaseous and they will escape out and we will get pure alkyl chloride.

53. Answer (2)

Hint: In polar protic solvent ions are solvated as

$F^- > Cl^- > Br^- > I^-$

Sol.: Therefore, the correct order of nucleophilicity will be $I^- > Br^- > Cl^- > F^-$

54. Answer (2)

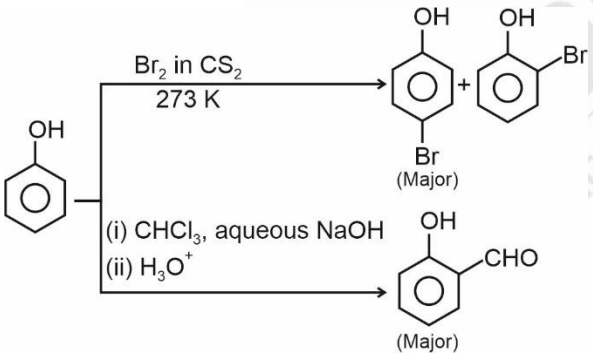
Hint: In hydrocarbons, boiling point increases with increase in molecular mass.

Sol.: This is due to the fact that the intermolecular van der Waals force increase with increase of the molecular size or the surface area of the molecule.

55. Answer (2)

Hint: Phenol react with chloroform in the presence of sodium hydroxide, CHO group is introduced at ortho position of benzene ring.

Sol.:



56. Answer (2)

Hint: Electron donating group decreases the stability of carbanion.

Sol.: As the electronegativity increases, stability of carbanions also increases therefore the correct order will be a > b > c.

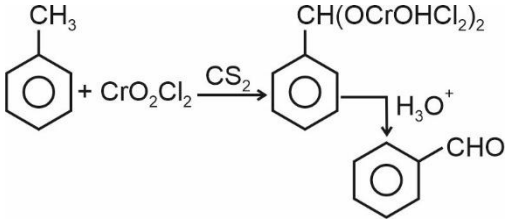
57. Answer (3)

Hint: Compound having $-\overset{O}{\overset{\|}{C}}-CH_3$ or $CH_3-\overset{OH}{\overset{|}{C}}H-$ group will give iodoform test.

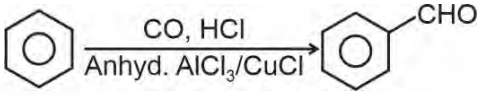
Sol.: $CH_3-\overset{OH}{\overset{|}{C}}H-CH_3$ and CH_3-CH_2-OH will give yellow precipitate on reaction with I_2/NaOH.

58. Answer (3)

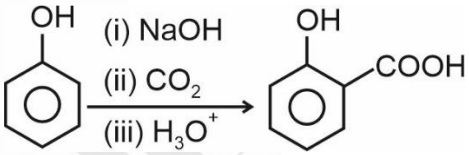
Hint: Etard reaction:



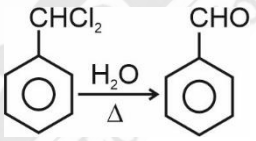
Sol.: Gatterman-Koch reaction



Kolbe's reaction



Hydrolysis of benzal chloride



59. Answer (4)

Hint: pH = –log[H⁺]

Sol.: Milliequivalent of HCl in 75 mL $\frac{M}{5}$HCl

$= \frac{1}{5} \times 75 = 15$

Milliequivalent of NaOH in 25 mL $\frac{M}{5}$ NaOH

$= \frac{1}{5} \times 25 = 5$

Milliequivalent of HCl left unreacted = 15 – 5 = 10

Volume of solution = 100 mL

$= [H^+] = \frac{10}{100} = \frac{1}{10}$

pH = –log[H⁺] = –log10^{-1} = 1

60. Answer (1)

Hint: $CH_3-CH_2-Br \xrightarrow{AgNO_2} CH_2-CH_2-NO_2$

Sol.: $CH_3-CH_2-NO_2 \xrightarrow{Sn+HCl} CH_3-CH_2-NH_2$

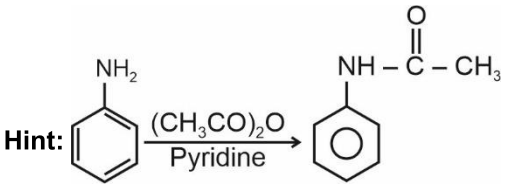
61. Answer (1)

Hint & Sol.:

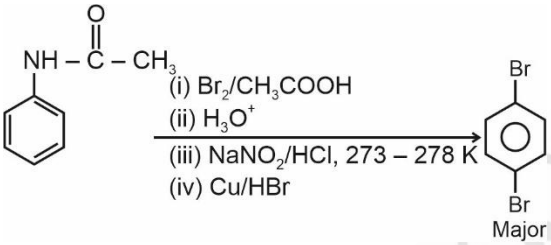
List-I (Deficiency diseases)	List-II (Name of vitamins)
Scurvy	Vitamin C
Beri beri	Vitamin B_1
Convulsions	Vitamin B_6
Increased fragility of RBCs	Vitamin E

62. Answer (2)

Hint:



Sol.:



63. Answer (4)

Hint: The correct balanced chemical equation is given as

$$2MnO_4^- + 5C_2O_4^{2-} + 16H^+ \rightarrow 2Mn^{2+} + 10CO_2 + 8H_2O$$

Sol.: The correct coefficient of the given reactants and product will be.

$MnO_4^- \rightarrow 2$

$H^+ \rightarrow 16$

$CO_2 \rightarrow 10$

64. Answer (1)

Hint: 1 mole of MnO_4^- requires 5 F electricity to get converted into Mn^{2+}.

2 moles of MnO_4^- will requires 10 F to get converted into Mn^{2+}.

Sol.: 2.5 moles of molten $CaCl_2$ requires 5 F to get converted into Ca.

1 mole of FeO to Fe_2O_3 requires 1 F

1 mole of H_2O to O_2 requires 2 F.

65. Answer (4)

Hint: $K_b = \frac{R \times M_1 \times T_b^2}{1000 \times \Delta_{vap}H}$.

Sol.: The value of molal elevation constant (K_b) does not depend on the concentration of solute of the dilute solution.

66. Answer (4)

Hint: The reactant which gets consumed first, limits the amount of product formed in the reaction and is called limiting reagent.

Sol.: $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$

From the balanced chemical reaction 28 g of Nitrogen reacts with 6 g Hydrogen therefore 56 g of Nitrogen will react with 12 g of hydrogen.

But mass of H_2 is given only 10 g therefore in option (4) H_2 acts as limiting reagent.

67. Answer (4)

Hint: For 2s orbital the probability density of electron first decreases sharply to zero and again starts increasing.

Sol.: For 1s orbital the probability density of electron is maximum at the nucleus and it decreases sharply as we move away from it.

Number of angular nodes = Azimuthal quantum number (l).

68. Answer (4)

Hint: Work in isothermal and reversible process is

$= -nRT\ln \frac{V_2}{V_1}$

Sol.: $\Delta H = nC_p\Delta T = 0$

69. Answer (2)

Hint & Sol.:

N = N	418
C = C	611
C = O	741
C = N	615

70. Answer (3)

Hint: For the feasibility of cell reaction, $E^\circ_{cell} > 0$

Sol.:

(a) $CuSO_4(aq) + Fe(s) \rightarrow FeSO_4(aq) + Cu(s)$

$E^\circ_{cell} = 0.78\ V$

(b) $CuSO_4(aq) + Ni(s) \rightarrow NiSO_4(aq) + Cu(s)$

$E^\circ_{cell} = 0.59\ V$

(c) $CuSO_4(aq) + 2Ag(s) \rightarrow Ag_2SO_4(aq) + 2Cu(s)$

$E^\circ_{cell} = -0.46\ V$

(d) $Ag_2SO_4(aq) + Fe(s) \rightarrow FeSO_4(aq) + 2Ag(s)$

$E^\circ_{cell} = 1.24\ V$

71. Answer (2)

Hint: Rate of reaction will be (r) = $k[P]^1[Q]^{1/2}$

Sol.: $r_1 = k[P]^1[Q]^{1/2}$ … (i)

$r_2 = k[4P]^1[4Q]^{1/2}$

$r_2 = 8k[P][Q]^{1/2}$ … (ii)

on dividing equation (ii) by equation (i)

$\frac{r_2}{r_1} = 8K[P][Q]^{1/2}$

$\frac{r_2}{r_1} = 8 \Rightarrow r_2 = 8r_1$

72. Answer (1)

Hint: Isotonic solutions have same osmotic pressure.

Sol.: Osmotic pressure is used to determine molar mass of macromolecules.

73. Answer (1)

Hint: Diamagnetic species do not have unpaired electron.

Sol.: Lu^{3+} : [Xe] $4f^{14}$ Pm^{3+} : [Xe] $4f^4$

Ce^{4+} : [Xe] $4f^0$ Sm^{3+} : [Xe] $4f^5$

Eu^{3+} : [Xe] $4f^6$ Gd^{3+} : [Xe] $4f^7$

Yb^{2+} : [Xe] $4f^{14}$ Tb^{4+} : [Xe] $4f^7$

74. Answer (4)

Hint: Formula used for the calculation of activation energy.

$$\log\frac{K_2}{K_1} = \frac{E_a}{2.303\,R}\left[\frac{1}{T_1} - \frac{1}{T_2}\right]$$

Sol.: $$\log\frac{4}{1} = \frac{E_a}{2.303\,R}\left[\frac{1}{300} - \frac{1}{340}\right]$$

$$0.6 = \frac{E_a}{2.303 \times R}\left[\frac{40}{300 \times 340}\right]$$

$$E_a = \frac{0.6 \times 2.303 \times R \times 300 \times 34}{4}$$

= 0.6 × 2.303 × 8.314 × 75 × 34

= 29.29 kJ mol^{-1}.

75. Answer (4)

Hint: In period as the Z_{eff} increases ionization enthalpy increases.

Sol.: From the given electronic configurations the elements will be

$1s^2, 2s^2, 2p^3 \rightarrow$ N

$1s^2, 2s^2, 2p^4 \rightarrow$ O

$1s^2, 2s^2, 2p^2 \rightarrow$ C

$1s^2, 2s^2, 2p^5 \rightarrow$ F

Therefore, the correct order of first ionisation energy will be F > N > O > C.

76. Answer (4)

Hint: Condition For the precipitation of $Mg(OH)_2$.

Ionic product of $Mg(OH)_2 \geq K_{SP}$ of $Mg(OH)_2$.

Sol.: $\underset{S}{Mg(OH)_2(s)} \rightleftharpoons \underset{S}{Mg^{2+}(aq)} + \underset{2S}{2OH^-}$

$K_{SP} = [Mg^{2+}][OH^-]^2$

$1 \times 10^{-11} \leq 10^{-3} \times [OH^-]^2$

$[OH^-] \geq \sqrt{10^{-8}} \geq 10^{-4}$

$\log[OH^-] \geq -4$

$-\log[OH^-] \leq 4$

$pOH \leq 4$

$pH \geq 10$

77. Answer (2)

Hint: On heating of a sample of pure water K_w increases as the dissociation of water is an endothermic process.

Sol.: $\underset{C}{H_2O} \rightleftharpoons \underset{C\alpha}{H^+} + \underset{C\alpha}{OH^-}$

$C - C\alpha$

Concentration (H^+) will increase that will result into decrease in pH.

78. Answer (4)

Hint: In a disproportionation reaction an element is simultaneously oxidised and reduced.

Sol.: In disproportionation reaction one of the reacting substance is always present in three different oxidation state.

$$\overset{0}{P_4} + 3NaOH + 3H_2O \rightarrow 3Na\overset{+1}{H_2}P\overset{-3}{O_2} + \overset{-3}{PH_3}$$

$$\overset{0}{3Cl_2} + 6NaOH \rightarrow 5Na\overset{-1}{Cl} + Na\overset{+5}{Cl}O_3 + 3H_2O$$

$$3\overset{+3}{H}NO_2 \rightarrow 2\overset{+2}{N}O + \overset{+5}{H}NO_3 + H_2O$$

$$2K\overset{-1}{Cl}\overset{-2}{O_3} \rightarrow 2K\overset{-1}{Cl} + 2\overset{0}{O_2}$$

79. Answer (1)

Hint: CrO_5 has two peroxy linkage in with oxygen is of –1 oxidation state.

Sol.:

(Species)	(Oxidation state of underlined element)
$\underline{Cr}O_5$	+6
$NH_4\underline{N}O_3$	+5
$H\underline{C}N$	+2
$K_3[\underline{Fe}(CN)_6]$	+3

80. Answer (2)

Hint :

(a) $[Co(NH_3)_5(NO_2)]Cl_2$ and $[Co(NH_3)_5(ONO)]Cl_2 \rightarrow$ Linkage isomers.

Sol.:

(b) $[Cu(NH_3)_4][PtCl_4]$ and $[Pt(NH_3)_4][CuCl_4] \rightarrow$ Coordination isomers.

(c) $[PtCl_2(NH_3)_4]Br_2$ and $[PtBr_2(NH_3)_4]Cl_2 \rightarrow$ ionisation isomers.

81. Answer (4)

Hint: Oxidation state of Fe in $[Fe(CO)_5]$ complex is zero.

Sol.: In carbonyl complex synergic bonding takes place. CO donates electrons to metal atoms/ions by σ bond and accept electron from metal by π-bond.

82. Answer (2)

Hint: In molecules of same hybridization as no. of lone pairs on central atom increase, bond angle decrease.

Sol.:

Species	Bond angle
CO_2	180°
CH_4	109° 28'
NH_3	107°
H_2O	104.5°

83. Answer (3)

Hint: Hydrogen bond strength depends on difference of electronegativity of covalently attached atom with hydrogen. Higher the electronegativity larger will be H-bond strength.

Sol.: Therefore, HF will show strongest hydrogen bonding.

84. Answer (2)

Hint: Electron gain enthalpy is the energy change when an electron is added to a neutral isolated gaseous atom to form a negative ion.

Sol.: The second electron gain enthalpy of oxygen atom is positive because there is a large repulsion between the uni-negatively charged oxygen atom and added electron.

85. Answer (2)

Hint: Shape of species depends on the bond pair of electrons.

Sol.:

Species	Shape
NH_3	Trigonal pyramidal
BrF_3	Bent T-shaped
PCl_5	Trigonal bipyramidal
IF_5	Square pyramidal

86. Answer (4)

Hint: When $CuSO_4$ reacts with $K_4[Fe(CN)_6]$ a chocolate brown precipitate of copper (II) ferrocyanide is formed.

Sol.: $2CuSO_4 + K_4[Fe(CN)_6] \rightarrow Cu_2[Fe(CN)_6] + 2K_2SO_4$.

87. Answer (2)

Hint: For Ni^{2+}, group reagent is H_2S in the presence of NH_4OH

Sol.:

Cu^{2+}	H_2S in the presence of dil. HCl
Ba^{2+}	$(NH_4)_2CO_3$ in the presence of NH_4OH
Fe^{3+}	NH_4OH in the presence of NH_4Cl

88. Answer (1)

Hint: $4Zn + 10HNO_3(\text{dilute}) \rightarrow 4Zn(NO_3)_2 + 5H_2O + N_2O$

Sol.: $Zn + 4HNO_3(\text{Conc.}) \rightarrow Zn(NO_3)_2 + 2H_2O + 2NO_2$

89. Answer (3)

Hint: In Mohr's salt $[FeSO_4 \cdot (NH_4)_2SO_4 \cdot 6H_2O]$

Fe is of +2 oxidation state

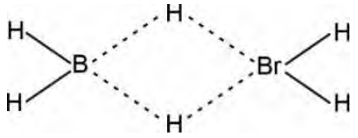
Sol.: $XeF_6 + 3H_2O \rightarrow XeO_3 + 6HF$

$2SO_2 + O_2 \xrightarrow{V_2O_5} 2SO_3$

90. Answer (4)

Hint: $\underset{\text{Orthoboric acid}}{H_3BO_3} \xrightarrow[\Delta]{370\,K} \underset{\text{Metaboric acid}}{HBO_2}$

Sol.:



Four terminal hydrogen and two boron atoms may lie in one plane.

[BIOLOGY]

91. Answer (1)

Hint: *Clarias gariepinus* is a threat to the indigenous catfishes in our rivers.

Sol.: The Nile perch introduced into Lake Victoria in east Africa led eventually to the extinction of an ecologically unique assemblage of more than 200 species of cichlid fish in the lake.

92. Answer (2)

Hint: Each trophic level has a certain mass of living material at a particular time called as the standing crop.

Sol.: The standing crop is measured as the mass of living organisms (biomass) or the number in a

unit area. The biomass of a species is expressed in terms of fresh or dry weight.

93. Answer (1)

Hint: r is a very important parameter chosen for assessing impacts of any biotic or abiotic factor on population growth.

Sol.: In exponential growth equation, dN/dt = rN; 'r' is called the 'intrinsic rate of natural increase'.

94. Answer (2)

Hint: Commensalism is the interaction in which one species benefits and the other is neither harmed nor benefited.

Sol.: An orchid growing as an epiphyte on a mango branch is an example of commensalism.

95. Answer (1)

Hint: Blood cholesterol lowering agents are formed, using a fungus.

Sol.: Streptokinase produced by the bacterium *Streptococcus* and modified by genetic engineering is used as a 'clot buster' for removing clots from the blood vessels of patients who have undergone myocardial infarction leading to heart attack.

96. Answer (3)

Hint: Cyanobacteria can fix both atmospheric CO_2 and N_2.

Sol.: *Anabaena, Nostoc* and *Oscillatoria* can fix both atmospheric CO_2 and N_2. *Azospirillum* can fix only atmospheric N_2.

97. Answer (2)

Hint: The principle of complementarity governs both the processes of replication and transcription.

Sol.: Transcription and replication can be differentiated from each other as the former is facilitated by only a single enzyme in prokaryotes, which transiently attach with other factors, while the latter is facilitated by a series of enzymes. In the former, only one strand of DNA can act as a template, while in the latter, both act as templates. In both of them, main polymerising enzyme can perform the synthesis only in 5'$\rightarrow$ 3' direction. In the latter, during synthesis, adenine pairs with 5-methyl uracil, while in the former, it pairs with uracil.

98. Answer (1)

Hint: The replication occurs within replication fork.

Sol.: For long DNA molecules, since the two strands of DNA cannot be separated in its entire length (due to very high energy requirement), the replication occur within a small opening of the DNA helix, referred to as replication fork.

99. Answer (4)

Hint: *lac i* produces repressor protein. *lac z* produces beta-galactosidase enzyme. *lac a* produces transacetylase. *lac y* produces permease enzyme.

Sol.: The product of *lac i* interacts with operator region of the *lac* operon. The product of *lac a* is required for metabolism of lactose. The product of *lac y* increases permeability of the cell to β-galactosides. The product of *lac z* is responsible for the hydrolysis of the disaccharide.

100. Answer (3)

Hint: The basis of genetic mapping of human genome as well as of DNA fingerprinting is DNA polymorphism.

Sol.: The basis of genetic mapping of human genome as well as of DNA fingerprinting can be described as an inheritable mutation that is observed in a population at high frequency.

101. Answer (4)

Hint: The pitch of the DNA helix according to Watson and Crick is 34 Å.

Sol.: The pitch of the DNA helix according to Watson and Crick is 3.4 nm.

102. Answer (1)

Hint: This pedigree shows the inheritance pattern of autosomal recessive trait.

Sol.: This pedigree shows the inheritance pattern of thalassemia and cystic fibrosis (autosomal recessive traits). This pedigree is not true for X-linked recessive disorder (colour blindness). This pedigree is true for phenylketonuria, and the parents can be heterozygous for the trait. This pedigree is true for sickle cell anaemia and mating of individual II 1 with normal female will produce all unaffected individuals. All the affected individuals are homozygous for the trait under study.

103. Answer (2)

Hint: In case of incomplete dominance, F_2 generation shows same phenotypic and genotypic ratio.

Sol.:

Parents:	LL	×	II
	Large starch grain		Small starch grain
Gametes:	L		I
F_1 generation:	LI	×	LI
	Intermediate sized starch grain		Intermediate sized starch grain
Gametes:	L I		L I

F_2 generation:	L	I
L	LL Large starch grain	LI Intermediate sized starch grain
I	LI Intermediate sized starch grain	II Small starch grain

104. Answer (1)

Hint: In an individual, only two alleles can be present.

Sol.: Since in an individual only two alleles can be present, multiple alleles can be found only when population studies are made. ABO blood group system can exhibit complete dominance, co-dominance and recessive inheritance pattern.

105. Answer (2)

Hint: This organism exhibits haplo-diploid type of sex determination.

Sol.: In honey bees, males have half the number of chromosomes than that of females. The females are diploid having 32 chromosomes and males are haploid, i.e., having 16 chromosomes only.

106. Answer (2)

Hint: Coelenterates exhibit metagenesis.

Sol.: Cnidarians exhibit two basic body forms called polyp and medusa. The former is a sessile and cylindrical form like *Hydra*, whereas, the latter is umbrella-shaped and free-swimming like *Aurelia*. Those cnidarians which exist in both forms exhibit alternation of generation called metagenesis, *i.e.*, polyps produce medusae asexually and medusae form the polyps sexually (*e.g.*, *Obelia*).

107. Answer (4)

Hint: Human heart is myogenic.

Sol.: Cardiac muscle tissue is a contractile tissue present only in the heart. Cell junctions fuse the plasma membranes of cardiac muscle cells and make them stick together. Communication junctions (intercalated disc) at some fusion points allow the cells to contract as a unit, *i.e.*, when one cell receives a signal to contract, its neighbours are also stimulated to contract.

Cardiac muscle cells are autorhythmic, *i.e.*, human heart is myogenic.

108. Answer (3)

Hint: The structures that help in gaseous exchange.

Sol.: • Blood vascular system of cockroach is of open type.

• Blood vessels are poorly developed and open into space called haemocoel.

• There are 12 pairs of alary muscles in cockroach. There are 13 heart chambers in cockroach in which first chamber opens into anterior aorta.

• Haemolymph is composed of colourless plasma and haemocytes.

• The respiratory system consists of a network of tracheae, that open through 10 pairs of small holes called spiracles.

109. Answer (4)

Hint: Identify the birth hormone

Sol.:

Hormone	Source gland
Prolactin	Pars distalis
Gonadotrophins (LH and FSH)	Pars distalis
TSH	Pars distalis

110. Answer (2)

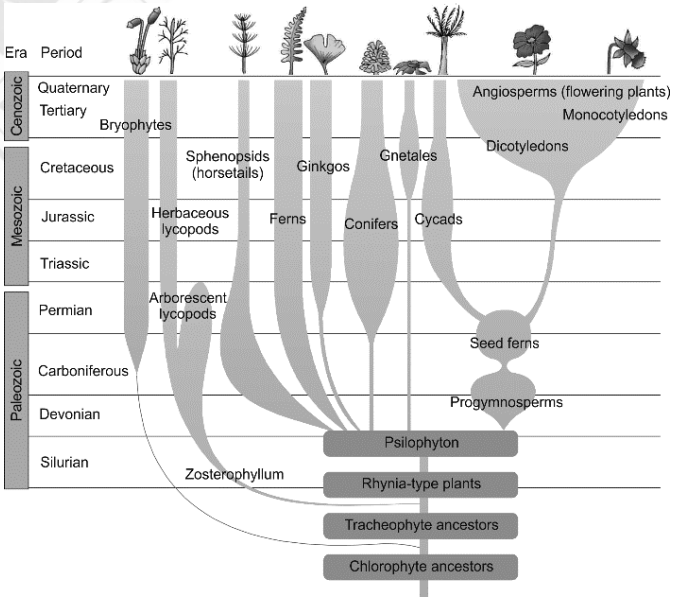
Hint: Quadri refers to four.

Sol.: The dorsal portion of midbrain consists mainly of four round swellings (lobes) called corpora quadrigemina. Cerebral aqueduct is a canal passing through midbrain. Limbic system and amygdala are parts of forebrain.

111. Answer (3)

Hint: Late Devonian to early Carboniferous period.

Sol.:



112. Answer (4)

Hint: Endometrium is the inner lining of uterus.

Sol.: The menstrual flow results due to breakdown of endometrial lining of the uterus and its blood

vessels. Menstruation occurs only if released ovum is not fertilised.

113. Answer (3)

Hint: Different host is required for expression of desired gene.

Sol.: Recombinant protein – Protein encoding gene is expressed in heterologous host.

• Agarose gel electrophoresis is employed to check progression of restriction enzyme digestion.

• A probe is allowed to hybridise to its complementary DNA in clone of cells followed by detection using autoradiography.

• Making multiple identical copies of any template DNA is called cloning.

114. Answer (2)

Hint: Belongs to the class Osteichthyes.

Sol.: *Pterophyllum* (Angel fish) belongs to the class Osteichthyes. This class includes both marine and fresh water fishes with bony endoskeleton. Their heart is two-chambered.

Sexes are separate. They are mostly oviparous and development is direct.

115. Answer (2)

Hint: Adipose tissue is present beneath the skin.

Sol.: Connective tissues are most abundant and widely distributed in the body of complex animals.

Cells of connective tissue secrete modified polysaccharides, which accumulate between cells and fibres and act as matrix (ground substance).

Junctions are absent between the cells of connective tissues.

Fibroblasts are absent in blood and lymph.

116. Answer (2)

Hint: Dioecious plants can prevent both autogamy and geitonogamy.

Sol.: Maize is a monoecious plant; it prevents autogamy but not geitonogamy.

117. Answer (2)

Hint: The body of the ovule fuses with funicle in the region called hilum.

Sol.: Hilum represents the junction between ovule and funicle.

118. Answer (3)

Hint: *Yucca* is pollinated by insects.

Sol.: Moth and *Yucca* plant cannot complete their life cycles without each other. The moth deposits its eggs in the locule of the ovary and the flower, in turn, gets pollinated by the moth. The larvae of the moth come out of the eggs as the seeds start developing.

119. Answer (2)

Hint: Cytokinin is a growth promoting hormone.

Sol.: Cytokinin promotes nutrient mobilisation which helps in the delay of leaf senescence.

120. Answer (4)

Hint: The growth rate shows an increase that may be arithmetic or geometrical.

Sol.: Following mitotic cell division, only one daughter cell continues to divide while the other matures in arithmetic growth. Arithmetic growth shows a linear curve.

121. Answer (3)

Hint: ATP formation occurs during substrate level phosphorylation.

Sol.: Conversion of phosphoenolpyruvate into pyruvate results in substrate level phosphorylation.

122. Answer (1)

Hint: Nucleosomes and nucleus are not found in prokaryotes.

Sol.: *E. coli* has smaller cytoplasmic ribosome in comparison to the one found in the experimental organism (*Vicia faba*) used by Taylor et al. *E. coli* have polycistronic structural genes to metabolise lactose (disaccharide made up of glucose and galactose).

123. Answer (4)

Hint: The Hatch and Slack pathway begins with carboxylation reaction.

Sol.: The correct sequence of events is

(d) $\rightarrow$ (b) $\rightarrow$ (c) $\rightarrow$ (e) $\rightarrow$ (a)

124. Answer (3)

Hint: Both PS I and PS II are used during non-cyclic photophosphorylation.

Sol.: During non-cyclic photophosphorylation, external electron donor (H_2O) is required.

125. Answer (3)

Hint: The last sub-stage of prophase I of meiosis I is diakinesis.

Sol.: Diakinesis is marked by terminalisation of chiasmata. By the end of diakinesis, the nucleolus disappears and the nuclear envelope breaks down.

126. Answer (3)

Hint: G_2 phase is the pre-mitotic phase of the cell cycle.

Sol.: The pre-mitotic phase of cell cycle exhibits duplication of semi-autonomous organelles.

127. Answer (3)

Hint: Cytokinesis in plant cells is facilitated by the formation of cell plate.

Sol.: Cytokinesis in animal cells is facilitated by the formation of furrow.

128. Answer (1)

Hint: It occurs during the first stage of karyokinesis.

Sol.: In prophase, centrosome which had undergone duplication during interphase, begins to move towards opposite poles of the cell.

129. Answer (4)

Hint: Label A represents Golgi apparatus. Label B represents centrioles. Label C represents smooth endoplasmic reticulum. Label D represents nucleolus. Label E represents mitochondria.

Sol.: Golgi apparatus principally performs the function of packaging materials. Centriole has nine triplets of evenly spaced peripheral fibrils of tubulin protein. SER is major site for synthesis of lipid. Nucleolus is the site of rRNA formation.

Mitochondria whose matrix possesses single circular DNA molecule, a few RNA molecules, ribosomes (70S) and the components required for the synthesis of proteins.

130. Answer (1)

Hint: In bacteria, the innermost layer of cell envelope is plasma membrane.

Sol.: The plasma membrane is selectively permeable in nature and interacts with the outside world. This membrane is structurally similar to that of the eukaryotes.

131. Answer (3)

Hint: Some members of class Reptilia shed scales as skin casts

Sol.: Snakes and lizards shed their scales as skin cast.

Chelone, Testudo and *Crocodilus* are reptiles but are not lizards.

132. Answer (1)

Hint: Frog has 3 chambers in its heart.

Sol.:

- Frog has 3 chambers in its heart but humans have four chambers in their heart.
- Both frogs and humans have lungs for breathing, but frogs also have other respiratory organs like skin.
- Special venous connection between liver and intestine is present in both, known as hepatic portal system.
- 3 types of formed elements RBCs, WBCs and platelets are present in both.

133. Answer (4)

Hint: Proteins are made up of different amino acids.

Sol.: RuBisCO is the most abundant protein in whole of the biosphere and collagen is the most abundant protein in animal world.

Each protein is a polymer of amino acids. As there are 20 types of amino acids, a protein is a heteropolymer and not a homopolymer.

134. Answer (4)

Hint: Increase the Ca^{+2} levels of blood

Sol.: A trophic hormone is the one secreted by the pituitary gland that stimulates the secretion of hormones by a target organ. Parathyroid hormone (PTH) is secreted by parathyroid gland.

Trophic hormones are secreted by anterior pituitary *e.g.*, ACTH, FSH, LH, *etc*.

135. Answer (1)

Hint: pCO_2 in alveoli = 40 mm Hg

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

136. Answer (2)

Hint: Rapid influx of Na^+

Sol.: When a stimulus is applied at a site on the polarised membrane, the membrane at that site becomes freely permeable to Na^+. This leads to a rapid influx of Na^+ followed by the reversal of the polarity at that site, *i.e.*, the outer surface of the membrane becomes negatively charged and the inner side becomes positively charged. The polarity of the membrane at that site is thus reversed and hence depolarised.

137. Answer (2)

Hint: Micturition occurs when it gets filled with urine.

Sol.: Urine formed by the nephrons is carried to the urinary bladder where it is stored till a voluntary signal is given by the CNS. This signal is initiated by the stretching of the urinary bladder as it gets filled with urine.

138. Answer (3)

Hint: Least abundant among all types of WBCs.

Sol.: Basophils secrete histamine, serotonin, heparin, *etc*., and are involved in inflammatory reactions.

Lymphocytes are responsible for immune response of the body. Eosinophils resist infection and are also associated with allergic responses. Neutrophils are phagocytic cells which destroy foreign organisms entering the body.

139. Answer (4)

Hint: Equal to the number of bones in pectoral girdle of humans.

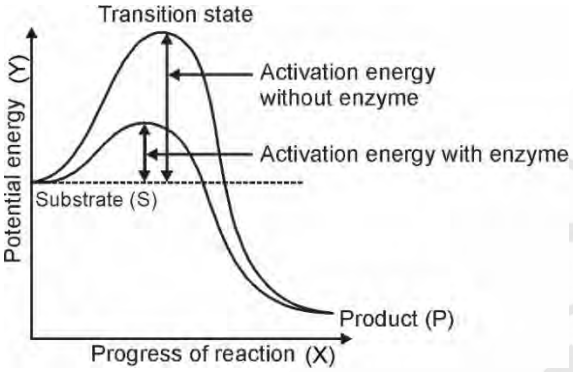
Sol.:

Pigments	Carotenoids, Anthocyanins, *etc.*
Alkaloids	Morphine, Codeine, *etc.*
Terpenoids	Monoterpenes, Diterpenes, *etc.*
Essential oils	Lemongrass oil, *etc.*
Toxins	Abrin, Ricin
Lectins	Concanavalin A
Drugs	Vinblastin, curcumin, *etc.*
Polymeric substances	Rubber, gums, cellulose

140. Answer (3)

Hint: Transition state is an unstable state.

Sol.:



141. Answer (2)

Hint: Expiration stage

Sol.: Expiration takes place when the intra pulmonary pressure is higher than the atmospheric pressure.

Relaxation of the diaphragm and the external inter-costal muscles return the diaphragm and sternum to their normal position and reduce the thoracic volume and thereby the pulmonary volume.

This leads to an increase in intra-pulmonary pressure to slightly above the atmospheric pressure causing the expulsion of air from the lungs, *i.e.*, expiration.

142. Answer (2)

Hint: Combination of odd numbers.

Sol.: A patch of nodal tissue is present in the right upper corner of the right atrium called sino-atrial node (SAN). It can generate the maximum number of action potentials. It is responsible for initiating and maintaining the rhythmic contractile activity of the heart. Another mass of this tissue is present in the lower left corner of the right atrium close to the atrio-ventricular septum called the AVN.

A bundle of nodal fibres, called AV bundle, continues from the AVN which passes through atrio-ventricular septa.

143. Answer (3)

Hint: Angina is acute chest pain.

Sol.: The state of heart when it is not pumping blood effectively enough to meet the needs of the body is heart failure.

Cardiac arrest – When heart stops beating.

Heart attack – When the heart muscles are suddenly damaged by inadequate blood supply.

144. Answer (2)

Hint: Gene migration for many times is called gene flow.

Sol.: When migration of a section of population to another place and population occurs, gene frequencies change in the original as well as new population.

145. Answer (3)

Hint: Same size fragments will appear as one on gel.

Sol.: Since, the student is performing restriction digestion only with *Eco*R I, *Bam*H I and *Sal* I, only 4 DNA fragment will obtain. These obtained DNA fragments will be of the sizes 2 kb, 3 kb and 8 kb and 2 kb respectively.

The DNA fragments of sizes 2 kb will travel equal distance on the gel while the 3 kb and 8 kb DNA fragments will appear separately.

2 kb size will be close to anode and 8 kb sized DNA will be present close to the cathode.

146. Answer (1)

Hint: Degenerated in old individuals.

Sol.: The thymus gland is a lobular structure located between lungs behind sternum on the ventral side of aorta. This gland secretes peptide hormone thymosin.

- TCT plays a significant role in calcium balance of the body.
- Overproduction of thyroid hormone causes Graves' disease.
- In adult women, hypothyroidism may cause menstrual cycle to become irregular.

147. Answer (2)

Hint: 100 mL of oxygenated blood delivers around 5 mL of O_2 to the tissues

Sol.: Every 100 mL of deoxygenated blood delivers approximately 4 mL of CO_2 to the alveoli.

So, 200 mL will deliver 8 mL of CO_2 to the alveoli.

148. Answer (3)

Hint: Flat skull bones fuse with the help of dense fibrous connective tissue.

Sol.:

Gliding joint	Between the carpals
Cartilaginous joint	Between adjacent vertebrae
Fibrous joint	Form sutures between flat skull bones
Saddle joint	Between carpal and metacarpal of thumb

149. Answer (4)

Hint: Theory of spontaneous generation.

Sol.: For a long time, it was believed that life came out of decaying and rotting matter like straw, mud, *etc*. This was the theory of spontaneous generation. Three connotations of theory of special creation is

(1) The Earth is about 4000 years old.
(2) The diversity was always the same since creation and will be the same in future also.
(3) All living organisms that we see today were created as such.

150. Answer (2)

Hint: Genetic change is main cause.

Sol.: Tumor cells have been shown to avoid detection and destruction by immune system. As these cells develop genetic changes like loss of some surface protein that help them to escape our immune system.

The cancer patients are given substance called biological response modifiers such as α-interferons which activate their immune system and help in destroying the tumor.

151. Answer (3)

Hint: The exaggerated response of the immune system to certain antigens is called allergy.

Sol.: Addiction is a psychological attachment to certain effects-such as euphoria and temporary feeling of well-being-associated with drugs and alcohol.

Dependence is tendency of body to manifest a characteristic and unpleasant withdrawal syndrome if regular dosage of drug is abruptly discontinued.

152. Answer (2)

Hint: For the formation of DNA, DNA polymerase is needed.

Sol.: Reverse transcriptase is a RNA dependent DNA polymerase enzyme because it uses RNA as a template to synthesise a complementary DNA strand.

153. Answer (3)

Hint: Water loving

Sol.: Since DNA is hydrophilic molecule, it cannot pass through cell membrane until cell is made competent for transformation.

154. Answer (2)

Hint: Ureter emerges from it

Sol.: Kidneys are situated between the levels of last thoracic and third lumbar vertebra close to the dorsal inner wall of the abdominal cavity.

Towards the centre of the inner concave surface of the kidney is a notch called hilum through which ureter, blood vessels and nerves enter.

155. Answer (3)

Hint: Counter current mechanism.

Sol.: Osmolarity of interstitium in kidneys increase from 300 mOsmol L^{-1} in the cortex to about 1200 mOsmol L^{-1} in the inner medulla.

The proximity between the Henle's loop and vasa recta, as well as the counter current in them help in maintaining an increasing osmolarity towards the inner medullary interstitium.

156. Answer (4)

Hint: It is a Leucoplast.

Sol.: Amyloplasts store carbohydrates (starch), e.g., potato; Elaioplasts store oils and fats whereas the Aleuroplasts store proteins. Chromoplasts have carotenoids.

157. Answer (2)

Hint: This structure is bound by tonoplast.

Sol.: Inclusion bodies are not bound by any membrane system and lie free in the cytoplasm, e.g., phosphate granules, cyanophycean granules and glycogen granules.

158. Answer (4)

Hint: The ground tissue of monocot stem is not differentiated.

Sol.: Hypodermis of dicot stem is made up of collenchyma.

159. Answer (3)

Hint: Large, empty, colorless cells are bulliform cells found in isobilateral leaves.

Sol.: In dorsiventral leaf, the adaxially placed palisade parenchyma is made up of elongated cells, which are arranged vertically and parallel to each other.

160. Answer (4)

Hint: Roots are usually underground.

Sol.: Cuticle (waxy thick layer) is absent in roots.

161. Answer (4)

Hint: They differ in the arrangement of ovules within the ovary.

Sol.:

Features	China rose	Mustard
Type of flower based on the position of calyx, corolla and androecium w.r.t. the ovary on thalamus	Hypogynous flower	Hypogynous flower
Type of phyllotaxy	Alternate	Alternate
Type of flower based on symmetry	Actinomorphic	Actinomorphic
Type of placentation	Axile	Parietal

162. Answer (4)

Hint: Belladonna belongs to Solanaceae family.

Sol.: Members of Solanaceae family show the presence of superior ovary, endospermic seeds and valvate aestivation of corolla.

163. Answer (4)

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

Sol.: *Datura* shows the presence of actinomorphic flowers.

164. Answer (4)

Hint: This type of leaf is palmately compound leaf.

Sol.: In palmately compound leaves, the leaflets are attached at a common point, i.e., the tip of petiole, as in silk cotton.

165. Answer (1)

Hint: Members of Rhodophyceae lack flagella.

Sol.: All three classes of algae exhibit fragmentation as the mode of vegetative reproduction.

166. Answer (4)

Hint: This plant shows the presence of cones.

Sol.: The member of Sphenopsida class of Pteridophytes is *Equisetum.*

167. Answer (2)

Hint: *Aspergillus* belongs to the class Ascomycetes and *Puccinia* belongs to the class Basidiomycetes.

Sol.: *Aspergillus* reproduces asexually via conidia. *Puccinia* generally does not show the presence of asexual spores.

168. Answer (4)

Hint: Slime moulds are saprophytic protists.

Sol.: During unfavourable conditions, the plasmodium of slime moulds differentiates and forms fruiting bodies bearing spores at their tips.

169. Answer (3)

Hint: This organism is the smallest living cells known.

Sol.: *Mycoplasma* are the organisms that completely lack a cell wall.

170. Answer (1)

Hint: Lower the taxa, more are the characteristics that the members within a taxon share.

Sol.: Higher the category, greater is the difficulty of determining the relationship to other taxa at the same level. Hence, the problem of classification becomes more complex.

171. Answer (3)

Hint: It is an embryological evidence.

Sol.: Embryological support for evolution was proposed by Ernst Heckel based upon the observation of certain features during embryonic stage common to all vertebrates that are absent in adults. For example, the embryos of all vertebrates including human develop a row of vestigial gill slit just behind the head but it is functional organ only in fish and not found in any other adult vertebrate.

172. Answer (4)

Hint: Action same as birth control pills

Sol.: Consists of progestin and estrogen or progestin alone to prevent pregnancy following unprotected sexual intercourse.

High levels of progestin and estrogen in emergency contraceptive pills inhibit FSH and LH secretion.

Loss of stimulating effects of gonadotropic hormones cause the ovaries to cease secretion of their own estrogen and progesterone.

Declining levels of estrogen and progesterone induce shedding of uterine lining, thereby preventing implantation.

Copper releasing IUDs prevent implantation and sperm motility but do not prevent ovulation.

173. Answer (1)

Hint: Prostate gland has alkaline secretions.

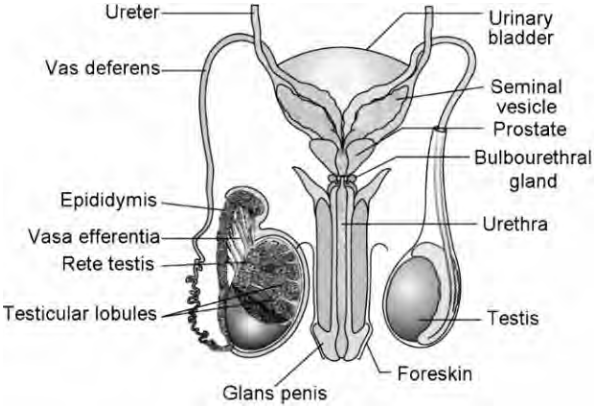
Sol.: A-Seminal vesicle

B- Prostate gland

C-Bulbourethral gland

D-Foreskin

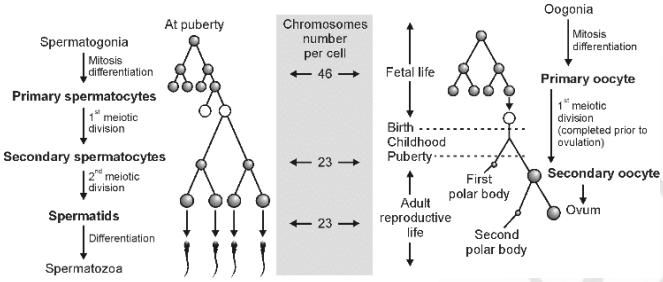
Secretions of male accessory sex glands is called seminal plasma. Secretion of bulbourethral glands help in lubrication of penis. Glans penis is covered by a loose fold of skin called foreskin.



174. Answer (1)

Hint: First meiosis occurs in primary oocyte.

Sol.: Both primary oocyte and spermatogonia are diploid (2n). Spermatids, spermatozoa and polar body are haploid (n).



175. Answer (3)

Hint: Protoplast fusion

Sol.: Scientists have isolated single cells from plants and after digesting their cell walls, they have been able to isolate naked protoplasts which is surrounded by plasma membranes.

Isolated protoplasts from two different varieties of plants – each having a desirable character – can be fused to get hybrid protoplasts, which can be further grown to form a new plant. These hybrids are called somatic hybrids while the process is called somatic hybridization.

176. Answer (2)

Hint: Sacrum and coccyx are dorsally present between two coxal bones.

Sol.: Pelvic girdle consists of two coxal bones. Each coxal bone is formed by the fusion of three bones – ilium, ischium and pubis. At the point of fusion of the above bones is a cavity called acetabulum to which the thigh bone articulates.

The two halves of the pelvic girdle meet ventrally to form the pubic symphysis containing fibrous cartilage.

177. Answer (3)

Hint: This zone is present in middle of a sarcomere.

Sol.: In a resting state of muscle, the edges of thin filament on either side of thick filament partially overlap the free ends of thick filament leaving the central part of the thick filament, this part is not overlapped by thin filament called 'H' zone.

178. Answer (3)

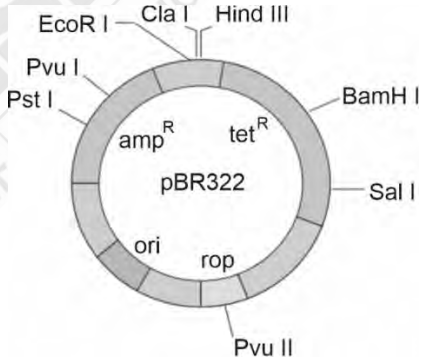
Hint: Zona pellucida formed by secondary oocyte.

Sol.: Spermatogenesis begins at puberty. Oogenesis is initiated during embryonic development stage in females.

179. Answer (3)

Hint: 2 are present within *amp*^{R}

Sol.:



180. Answer (4)

Hint: Less than 5 grams per litre.

Sol.: In 1997, the first transgenic cow, Rosie, produced human protein-enriched milk (2.4 grams per litre).

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All India Aakash Test Series for NEET - 2026

OPEN MOCK TEST - 2

Test Date : 12/04/2026

ANSWERS

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

HINTS & SOLUTIONS

[PHYSICS]

1. Answer (4)

Hint & Sol.: Let length of water column in inclined tube = l

$l\cos\theta = h$

$l\cos 45^\circ = \frac{l}{\sqrt{2}} = h = 10$ cm

$l = 10\sqrt{2}$ cm

2. Answer (3)

Hint: $Y = \frac{\text{stress}}{\text{strain}}$

Sol.: Elongation, $\Delta L = \frac{FL}{AY} = \frac{200\times 2}{1\times 10^{-6}\times 2\times 10^{11}}$

= 2 mm

3. Answer (1)

Hint: $g = \frac{GM}{R^2}$

Sol.: $g' = \frac{GM}{r^2}$, where $r = 3R$

$\therefore$ Acceleration in orbit = $g' = \frac{GM}{9R^2} = \frac{g}{9}$

4. Answer (2)

Hint: Work done $= \vec{F}.\vec{s}$

Sol.: $W_{net} = W_F + W_{mg} + W_{friction}$

$= (20 \times 5) - \left(mg\times 5\times\frac{1}{2}\right) - \left(\mu mg\times\frac{\sqrt{3}}{2}\times 5\right)$

= 100 – 50 – 17.32 $\simeq$ 33 J

5. Answer (2)

Hint: Relative velocity of A w.r.t. B, $v_{AB} = v_A - v_B$.

Sol.: $a_{AB} = 0$

$d_{AB} = 100$ m

$v_{AB} = 10 - (-15) = 25$ m/s

Time taken, $t = \frac{d_{AB}}{v_{AB}}$

$\therefore t = 4$ s

6. Answer (1)

Hint: Vertical height, $H = ut + \frac{1}{2}at^2$

Sol.: $\therefore\ H = 0 + \frac{1}{2}gT^2$

$T = \sqrt{\frac{2H}{g}} = \sqrt{\frac{2\times 4500}{10}}$ = 30 s

7. Answer (1)

Hint: Energy density = $\frac{1}{2}\varepsilon_0 E^2$

Sol.: [Energy density] = $[ML^{-1}T^{-2}]$

[Pressure] = $[ML^{-1}T^{-2}]$

8. Answer (1)

Hint & Sol: Barrier potential at room temperature:

Silicon ≈ 0.7 V

Germanium ≈ 0.3 V

9. Answer (1)

Hint: $R_{eq} = \frac{R}{n}$ for n equal resistors in parallel connection and apply KVL

Sol.: $I = \frac{V}{R_{eq}} = \frac{4-0.3}{10} = 0.37$ A

10. Answer (2)

Hint & Sol.: Mass of constituents = $2m_p + 2m_n$

= 2 × 1.0073 + 2 × 1.0087 = 2.0146 + 2.0174

= 4.032 u

Δm = 4.032 – 4.0015 = 0.0305 u

$B.E = \Delta m \times 931.5 \approx 28.4$ MeV

B.E. per nucleon = $\frac{28.4}{4} = 7.1$ MeV

11. Answer (2)

Hint: For hydrogen atom, $\frac{1}{\lambda} = R\left[\frac{1}{n_f^2} - \frac{1}{n_i^2}\right]$

Sol.: $\frac{1}{\lambda} = 1.097\times 10^7\left[\frac{1}{3^2} - \frac{1}{5^2}\right]$

$= 1.097\times 10^7\left(\frac{1}{9} - \frac{1}{25}\right) = \left(\frac{1.097\times 16}{22500}\right)\times 10^9$

$\lambda \simeq$ 1282 nm

12. Answer (2)

Hint: Kinetic energy acquired by the electron, K.E. = eV

Sol.: $P = \sqrt{2meV}$

de-Broglie wavelength, $\lambda = \frac{h}{P}$

$$= \frac{h}{\sqrt{2meV}} = \frac{6.63\times10^{-34}}{\sqrt{2\times9.1\times10^{-31}\times1.6\times10^{-19}\times180}}$$

$\lambda \approx 0.9\times10^{-10}$ m

13. Answer (1)

Hint: Refractive index $\mu = \tan i_p$

Sol.: Polarising angle $i_p = 60°$

$\mu = \tan i_p = \sqrt{3}$

$$\mu = \frac{1}{\sin i_c} \Rightarrow i_c = \sin^{-1}\left(\frac{1}{\sqrt{3}}\right)$$

$$v = \frac{c}{\mu} = \sqrt{3}\times10^8 \text{ m/s}$$

14. Answer (3)

Hint: Angular width of central maxima, $\omega = \frac{2\lambda}{a}$

Sol.: $\lambda = 6 \times 10^{-7}$ m

Slit width, $a = 2 \times 10^{-4}$ m

$$\omega = \frac{2\lambda}{a} = \frac{2\times6\times10^{-7}}{2\times10^{-4}} \text{ radian}$$

$= 6 \times 10^{-3}$ radian

15. Answer (1)

Hint: Induced emf in secondary coil, $e = -M\frac{dI_1}{dt}$

Sol.: $e = I_2R_2 = \frac{5}{2} = -10^{-2}\frac{dI_1}{dt}$

$$\left|\frac{dI_1}{dt}\right| = 2.5\times10^2 \text{ A/s}$$

16. Answer (3)

Hint: Net magnetic flux, $\phi_{net} = \oint \vec{B}.\vec{dA}$

Sol.: Net magnetic flux through a closed surface in uniform magnetic field is always zero.

17. Answer (3)

Hint: Magnetic moment of a current carrying loop, $M = NIA$

Sol.: The loop can be divided into two square loops.

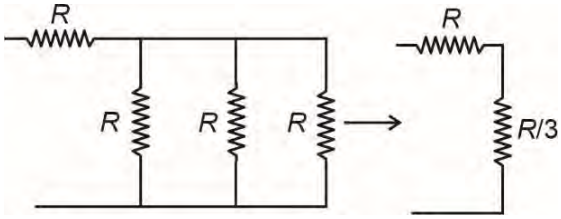
$M_1 = M_2 = Ia^2$

$$M_{net} = \sqrt{M_1^2 + M_2^2} = \sqrt{2}Ia^2$$

18. Answer (2)

Hint: Total power delivered to the bulbs, $P = \frac{V^2}{R_{eq}}$

Sol.:



$$R_{eq} = R + \frac{R}{3} = \frac{4R}{3}$$

$$R = \frac{120\times120}{60} \Rightarrow R = 240\ \Omega$$

$$P = \frac{V^2}{R_{eq}} = \frac{120\times120\times3}{4\times240} \Rightarrow P = 45 \text{ W}$$

19. Answer (4)

Hint: Apply KCL at point A

Sol.: $(V - 0)2 + (V - 10)2 + (V - 10) \times 1 = 0$

$2V + 2V - 20 + V - 10 = 0$

$5V - 30 = 0 \Rightarrow V = 6$ V

20. Answer (3)

Hint & Sol: Inside a conductor in electrostatic equilibrium, electric field is zero. This holds even if there's cavity with a charge inside.

When charge $+q$ is placed in cavity, then charge $-q$ is induced on inner surface of cavity.

To conserve charge, $+q$ gets induced on outer surface of main sphere.

Total charge on outer surface of conductor

$= Q + q$

21. Answer (4)

Hint & Sol.:

Frequency (f) is determined by source of wave and doesn't change at the boundary between two media.

Speed decreases as $v = \frac{c}{n}$, where n = refractive index of medium

As $\lambda = \frac{v}{f}$, thus λ must also decrease.

For perfectly absorbing surface, pressure $P = \frac{I}{c}$

and for perfectly reflecting surface, $P = \frac{2I}{c}$

22. Answer (3)

Hint & Sol.: Gauss's law in electrostatics is

$$\oint \vec{E}.\vec{ds} = \frac{q}{\varepsilon_0}$$

Faraday's law is $\oint \vec{E}.\vec{dl} = -\frac{d\phi_B}{dt}$

Gauss's law in magnetism is $\oint \vec{B}.\vec{dA} = 0$

Ampere-Maxwell law is

$$\oint \vec{B}.\vec{dl} = \left(\mu_0 i_c + \mu_0\varepsilon_0 \frac{d\phi_E}{dt}\right)$$

23. Answer (3)

Hint: In case 1 : $\tan\phi' = \frac{X_c}{R}$;

In case 2 : $\tan\phi = \frac{X_L}{R}$

Sol.: When L is removed, $\tan\phi' = \frac{X_c}{R}$;

$\Rightarrow \tan 45^\circ = \frac{X_C}{R}$ …(i)

When C is removed, $\tan\phi = \frac{X_L}{R}$

$\Rightarrow \tan 45^\circ = \frac{X_L}{R}$ …(ii)

From (i) and (ii),

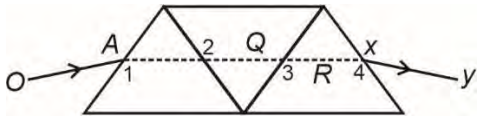
$X_L = X_C$

$\therefore$ Circuit is at resonance

$$i_{rms} = \frac{E_{rms}}{z} = \frac{100}{20} = 5 \text{ A}$$

24. Answer (1)

Hint: In an equilateral prism, when a ray undergoes minimum deviation, the refracted ray inside the prism travels parallel to its base.



Sol.: Since prisms are identical, so prism P and Q results no deviation. Then it incident on R same as P. So, same deviation will occur as P.

25. Answer (1)

Hint: Gauge pressure = ρgh

Sol.: $\rho gh = 2000$ Pa

$2000 = 1.06 \times 10^3 \times 10 \times h$

$$h = \frac{2000}{1.06\times10^4} \simeq 0.19 \text{ m}$$

26. Answer (2)

Hint: Total distance travelled in all possible collisions,

$$s = \frac{u^2}{g}(1+e^2+e^4+....) = \frac{u^2}{g}\left[\frac{1}{1-e^2}\right]$$

Sol.: u = 30 m/s

e = 0.5

$$s = \frac{u^2}{g}\left[\frac{1}{1-e^2}\right]$$

$$= \frac{900}{10}\left[\frac{1}{1-0.25}\right]$$

$$= \frac{900}{10}\times\frac{4}{3} \Rightarrow s = 120 \text{ m}$$

27. Answer (2)

Hint: $x_{cm} = \frac{Mx - mx'}{M-m}$, $y_{cm} = \frac{My - my'}{M-m}$

Sol.: $x_{cm} = \frac{[\sigma(2)^2]\times1 - [\sigma(1)^2]\times\frac{3}{2}}{(\sigma\times2^2) - [\sigma\times(1)^2]} = \frac{4-\frac{3}{2}}{4-1} = \frac{5}{6}\text{m}$

Similarly; $y_{cm} = \frac{5}{6}\text{m}$

$\therefore$ Position of COM of remaining portion is $(x_{cm}, y_{cm}) = \left(\frac{5}{6}, \frac{5}{6}\right)\text{m}$

28. Answer (3)

Hint: Speed of a transverse wave in a stretched wire, $v = \sqrt{\frac{T}{\mu}} = \sqrt{\frac{T}{AS}}$

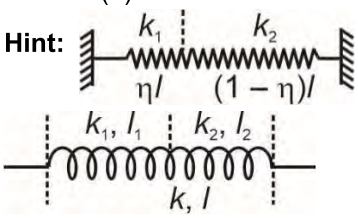
Sol.: μ = mass per unit length

$\mu_{hollow} < \mu_{solid} \Rightarrow v_{hollow} > v_{solid}$

$\mu_{thin} < \mu_{thick} \Rightarrow v_{thin} > v_{thick}$

29. Answer (3)

Hint:



$$T = 2\pi\sqrt{\frac{m}{k_{eq}}}$$

Sol.: For any part of spring

$k_1l_1 = k_2l_2 = kl$ = constant

$\Rightarrow k_1\eta l = k_2(1-\eta)l = kl$

$$\Rightarrow k_1 = \frac{k}{\eta} \text{ and } k_2 = \frac{k}{1-\eta}$$

Now, both springs are in parallel combination

$\therefore\ T = 2\pi\sqrt{\frac{m}{k_{eq}}}$

$= 2\pi\sqrt{\frac{m}{k_1 + k_2}} \Rightarrow 2\pi\sqrt{\frac{m\eta(1-\eta)}{k}}$

30. Answer (1)

Hint: K.E. $= \frac{1}{2}k(A^2 - x^2)$ and P.E. $= \frac{1}{2}kx^2$

Sol.: At $t = \frac{T}{12}$,

$x = A\sin\omega t = A\sin\left(\frac{2\pi}{T} \times \frac{T}{12}\right) = \frac{A}{2}$

K.E. $= \frac{1}{2}k(A^2 - x^2) = \frac{3}{4} \times \frac{1}{2}kA^2$

P.E. $= \frac{1}{2}kx^2 = \frac{1}{4} \times \frac{1}{2}kA^2$

$\therefore\ \frac{\text{K.E.}}{\text{P.E.}} = \frac{3}{1}$

31. Answer (1)

Hint & Sol.: Average translational kinetic energy = $\frac{3}{2}KT$, which depends only on temperature.

32. Answer (2)

Hint & Sol.: T_r = Thermometer reading

T_a = Actual reading

$\frac{T_r - T_1}{T_2 - T_1} = \frac{T_a - A_1}{A_2 - A_1}$

$T_1 = 15°C$

$T_2 = 165°C$

$\frac{T_r - 15}{165 - 15} = \frac{75 - 0}{100 - 0} \Rightarrow \frac{T_r - 15}{150} = \frac{75}{100}$

$T_r - 15 = \frac{75 \times 3}{2} \Rightarrow T_r = 127.5°C$

33. Answer (3)

Hint & Sol.: For polytropic process,

PV^x = constant

$C_v = \frac{3R}{2}$ (Monoatomic gas)

$\frac{1}{T} = \tan\theta\gamma$

$dV = V\gamma dT$

$\frac{1}{T} = \tan\theta\frac{dV}{V\,dT}$

$\int_{T_1}^{T_2}\frac{dT}{T} = \tan\theta\int_{V_1}^{V_2}\frac{dV}{V}$

$\ln\left(\frac{T_2}{T_1}\right) = \ln\left(\frac{V_2}{V_1}\right)^{\tan\theta}$

$\frac{T_2}{T_1} = \left(\frac{V_2}{V_1}\right)^{\tan\theta}$

$\frac{V^{\tan\theta}}{T} = C$

$PV = nRT$

$\frac{V^{\tan\theta}}{PV} = C'$

$PV^{1-\tan\theta}$ = constant

34. Answer (1)

Hint & Sol.: Final velocity at bottom of well,

$v = \sqrt{u^2 + 2g(5)}$

$= \sqrt{u^2 + 100}$

After bouncing from the bottom,

$v' = \frac{1}{2}\left(\sqrt{u^2 + 100}\right)$

In order to reach point B,

$v^2 = u^2 - 2gh$

$0 = v'^2 - 2g(6.5)$

$v'^2 = 130$

$\left(\frac{1}{2}\sqrt{u^2 + 100}\right)^2 = 130$

$\frac{1}{4}(u^2 + 100) = 130$

$u^2 + 100 = 520$

$u^2 = 420$

$\Rightarrow u = 20.49$ m/s

35. Answer (1)

Hint & Sol.: At equilibrium,

$P_0A = Mg$

Let piston be displaced by small displacement x, then new volume of gas

$V = V_0 - Ax = V_0\left[1 - \frac{Ax}{V_0}\right]$

Adiabatic relation PV^γ = constant = $P_0V_0^\gamma$

$P = P_0\left(\frac{V_0}{V}\right)^\gamma = P_0\left(1 - \frac{Ax}{V_0}\right)^{-\gamma}$

By binomial expansion, $P \approx P_0\left[1+\frac{\gamma Ax}{V_0}\right]$

Force on piston due to pressure change

$F = -(PA - Mg) = -A(P - P_0) = -A.\ P_0\gamma.\ \frac{Ax}{V_0}$ (since displacement is downward and restoring force is upwards)

So $\vec{F} = -\left(\frac{\gamma A^2 P_0}{V_0}\right)\vec{x} \Rightarrow$ This is SHM

$\vec{F} = -k\vec{x} \Rightarrow k = \frac{\gamma A^2 P_0}{V_0} \Rightarrow \omega = \sqrt{\frac{k}{M}} = \sqrt{\frac{\gamma A^2 P_0}{MV_0}}$

$f = \frac{\omega}{2\pi} = \frac{1}{2\pi}\sqrt{\frac{\gamma A^2 P_0}{MV_0}}$

36. Answer (2)

Hint: Force per unit length on current carrying wire C, $F = \frac{\mu_0 I_1 I_2}{2\pi d}$

Sol.: $F = \frac{\mu_0}{2\pi}\frac{I_1 I_2}{d}$

$F_{CB} = \frac{\mu_0}{2\pi} \times \frac{20 \times 5}{x}$ (towards left)

$F_{CD} = \frac{\mu_0}{2\pi} \times \frac{5 \times 10}{(20 - x)}$ (towards right)

$F_{CB} = F_{CD}$

$\Rightarrow \frac{\mu_0}{2\pi} \times \frac{100}{x} = \frac{\mu_0}{2\pi} \times \frac{50}{(20 - x)}$

$40 - 2x = x \Rightarrow x = \frac{40}{3}$ cm

37. Answer (2)

Hint: Magnetic moment, $M = mL$

Sol.: $M_{net} = \sqrt{\left(\frac{M}{2}\right)^2 + \left(\frac{M}{2}\right)^2} = \frac{M}{\sqrt{2}}$

38. Answer (3)

Hint: Lorentz force on charged particle, $\vec{F}_{net} = q\vec{E} + q(\vec{v} \times \vec{B})$

Sol.: $\vec{F}_B = q(\vec{v} \times \vec{B})$

$\vec{F}_E = q\vec{E}$

$\vec{F}_{net} = \text{zero} \Rightarrow \vec{E} = -(\vec{v} \times \vec{B})$

$|\vec{E}| = vB\sin\theta$

This condition ensures force due to electric and magnetic forces cancel out completely.

39. Answer (3)

Hint & Sol.: T.E. of simple harmonic oscillator is $\frac{1}{2}m\omega^2 A^2$ or $\frac{1}{2}kA^2$

40. Answer (3)

Hint: Phase difference, $\Delta\phi = k\Delta x$

Sol.: $\Delta\phi = \frac{2\pi}{\lambda}\Delta x = \frac{2\pi}{\lambda} \times \frac{\lambda}{4}$

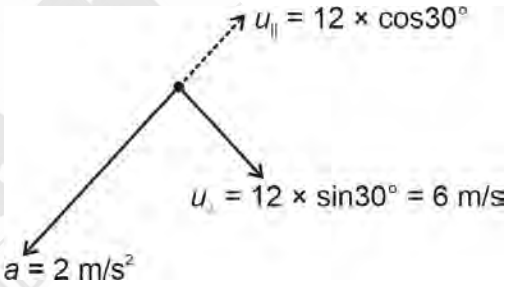
$\Delta\phi = \frac{\pi}{2}$

$\therefore$ Resultant amplitude, $A = \sqrt{a_1^2 + a_2^2}$

$= \sqrt{\frac{a^2}{4} + \frac{a^2}{4}} = \sqrt{\frac{2a^2}{4}} = \frac{a}{\sqrt{2}}$

41. Answer (3)

Hint: The acceleration vector shall change the component of velocity parallel to it while radius of curvature $r = \frac{v^2}{a_n}$



Sol.: The radius of curvature r_{min} occurs when v is minimum and a_n is maximum. This is at the point when component of velocity parallel to acceleration vector ($v_{\parallel}$) becomes zero.

$\therefore r_{min} = \frac{6^2}{2} = \frac{36}{2} = 18$ m

42. Answer (3)

Hint: $v = \sqrt{2gh} \Rightarrow \vec{P} = m\vec{v}$

Sol.: $v = \sqrt{2gh} = \sqrt{2 \times 10 \times 20}$

= 20 m/s

At position A, $(p_i)_x = mv\cos\theta$

$= 2 \times 20 \times \frac{1}{2} = 20$ kg m/s

$(p_i)_y = 2 \times 20 \times \frac{\sqrt{3}}{2} = 20\sqrt{3}$ kg m/s

When particle reaches point C,

$(p_f)_x = mv = 2 \times 20 = 40$ kg m/s

$(p_f)_y = 0$

$\Delta p_x = (p_f)_x - (p_i)_x$

$= 40 - 20 = 20$ kg m/s

$\Delta p_y = 0 - 20\sqrt{3} = -20\sqrt{3}$ kg m/s

$\Delta \vec{p} = \sqrt{(20)^2 + (-20\sqrt{3})^2}$

$= \sqrt{400 + 1200} = \sqrt{1600} \Rightarrow$ = 40 kg m/s

43. Answer (3)

Hint: For horizontal projection, $u_y = 0$

Sol.: Time taken, $T = \sqrt{\frac{2h}{g}} = \sqrt{\frac{2\times 80}{10}} = 4$ s

44. Answer (3)

Hint: Magnitude of resultant,

$R = \sqrt{P^2 + Q^2 + 2PQ\cos\theta}$

Sol.: $R_{max} = P + Q = 20$ …(i)

$R_{min} = P - Q = 8$ …(ii)

Adding (i) and (ii),

$2P = 28$

$P = 14$

Subtracting (i) and (ii),

$2Q = 12 \Rightarrow Q = 6$

$\frac{P}{Q} = \frac{14}{6} = \frac{7}{3}$

45. Answer (4)

Hint: Induced emf across the ends, $E = \frac{1}{2}B\omega L_{eff}^2$

Sol.: $L_{eff}^2 = 16x^2 + 9x^2$

$L_{eff}^2 = 25x^2$

$E = \frac{1}{2}B\omega \times 25x^2$

$= \frac{25}{2}B\omega x^2$

[CHEMISTRY]

46. Answer (3)

Hint: Steam distillation technique is applied to separate substances which are steam volatile and are immiscible with water.

Sol.: Chloroform and aniline are easily separated by the distillation method because they have large difference in boiling point.

47. Answer (1)

Hint: molarity = $\frac{\text{No. of mole}}{\text{Volume in litre}}$

Sol.: Given, molarity of solution = 2.5 M

Volume of solution $= \frac{300}{1000} = \frac{3}{10}$L

Weight of HNO_3 = 2.5 × 63 × $\frac{3}{10}$ g

Given that concentrated HNO_3 is 70% (w/w)

70 g HNO_3 is present in 100 g solution

2.5 × 63 × $\frac{3}{10}$ g HNO_3 will be present in

$= \frac{100}{70} \times 2.5 \times 63 \times \frac{3}{10}$

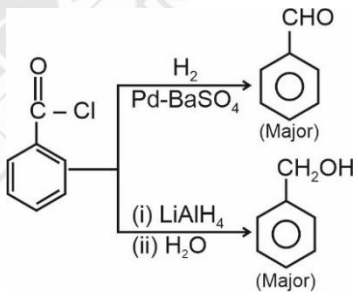
$= \frac{10}{7} \times 2.5 \times 63 \times \frac{3}{10}$

= 67.5 g

48. Answer (2)

Hint: H_2/Pd-$BaSO_4$ reduces acid halide (acid chloride) to aldehyde.

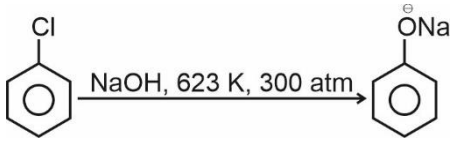
Sol.:



49. Answer (1)

Hint: C – X bond acquires partial double bond character due to resonance in haloarenes. As a result, the bond cleavage in haloarenes is difficult than haloalkanes. Therefore, haloarenes are less reactive towards nucleophilic substitution reaction than haloalkanes.

Sol.:



50. Answer (1)

Hint: +ve charge adjacent to heteroatom with lone pair involved in resonance.

Sol.: (a) and (b) are more stable than (c) and (d) due to resonance therefore correct order will be

(a) > (b) > (c) > (d)

51. Answer (3)

Hint: $\frac{1}{\lambda} = R_H\left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right]$

$\frac{hc}{\lambda} = hcR_H\left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right]$

$\Delta E = E_0\left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right]$, where $n_2 > n_1$.

Sol.: Therefore among the given option, the highest energetic photon will be emitted when electron make transition from n = 5 to n = 1

52. Answer (2)

Hint: $R-OH + SOCl_2 \rightarrow R-Cl + SO_2(g) + HCl(g)$

Sol.: In this reaction both the products are gaseous and they will escape out and we will get pure alkyl chloride.

53. Answer (2)

Hint: In polar protic solvent ions are solvated as

$F^- > Cl^- > Br^- > I^-$

Sol.: Therefore, the correct order of nucleophilicity will be $I^- > Br^- > Cl^- > F^-$

54. Answer (2)

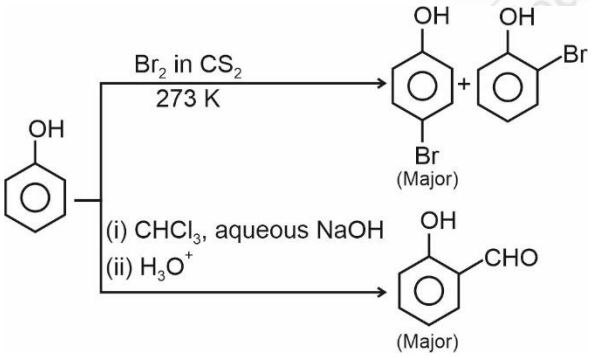
Hint: In hydrocarbons, boiling point increases with increase in molecular mass.

Sol.: This is due to the fact that the intermolecular van der Waals force increase with increase of the molecular size or the surface area of the molecule.

55. Answer (2)

Hint: Phenol react with chloroform in the presence of sodium hydroxide, CHO group is introduced at ortho position of benzene ring.

Sol.:



56. Answer (2)

Hint: Electron donating group decreases the stability of carbanion.

Sol.: As the electronegativity increases, stability of carbanions also increases therefore the correct order will be a > b > c.

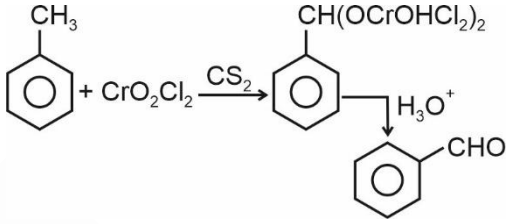
57. Answer (3)

Hint: Compound having $-\overset{O}{\overset{\|}{C}}-CH_3$ or $CH_3-\overset{OH}{\overset{|}{CH}}-$ group will give iodoform test.

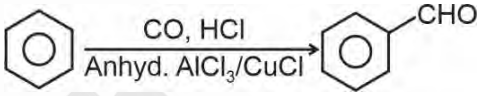
Sol.: $CH_3-\overset{OH}{\overset{|}{CH}}-CH_3$ and $CH_3 - CH_2 - OH$ will give yellow precipitate on reaction with I_2/NaOH.

58. Answer (3)

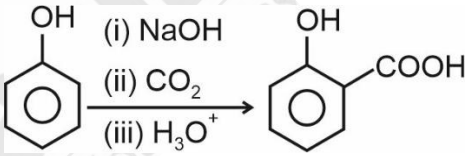
Hint: Etard reaction:



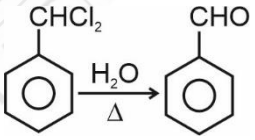
Sol.: Gatterman-Koch reaction



Kolbe's reaction



Hydrolysis of benzal chloride



59. Answer (4)

Hint: pH = –log[H⁺]

Sol.: Milliequivalent of HCl in 75 mL $\frac{M}{5}$ HCl

$= \frac{1}{5} \times 75 = 15$

Milliequivalent of NaOH in 25 mL $\frac{M}{5}$ NaOH

$= \frac{1}{5} \times 25 = 5$

Milliequivalent of HCl left unreacted = 15 – 5 = 10

Volume of solution = 100 mL

$= [H^+] = \frac{10}{100} = \frac{1}{10}$

pH = –log[H⁺] = –log10^{-1} = 1

60. Answer (1)

Hint: $CH_3-CH_2-Br \xrightarrow{AgNO_2} CH_2-CH_2-NO_2$

Sol.: $CH_3-CH_2-NO_2 \xrightarrow{Sn+HCl} CH_3-CH_2-NH_2$

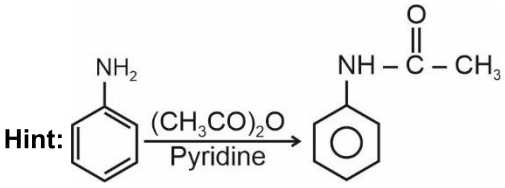
61. Answer (1)

Hint & Sol.:

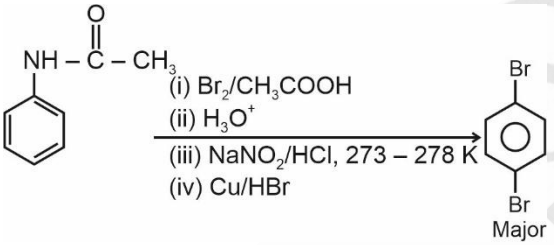
List-I (Deficiency diseases)	List-II (Name of vitamins)
Scurvy	Vitamin C
Beri beri	Vitamin B_1
Convulsions	Vitamin B_6
Increased fragility of RBCs	Vitamin E

62. Answer (2)

Hint:



Sol.:



63. Answer (4)

Hint: The correct balanced chemical equation is given as

$$2MnO_4^- + 5C_2O_4^{2-} + 16H^+ \rightarrow 2Mn^{2+} + 10CO_2 + 8H_2O$$

Sol.: The correct coefficient of the given reactants and product will be.

$MnO_4^- \rightarrow 2$

$H^+ \rightarrow 16$

$CO_2 \rightarrow 10$

64. Answer (1)

Hint: 1 mole of MnO_4^- requires 5 F electricity to get converted into Mn^{2+}.

2 moles of MnO_4^- will requires 10 F to get converted into Mn^{2+}.

Sol.: 2.5 moles of molten $CaCl_2$ requires 5 F to get converted into Ca.

1 mole of FeO to Fe_2O_3 requires 1 F

1 mole of H_2O to O_2 requires 2 F.

65. Answer (4)

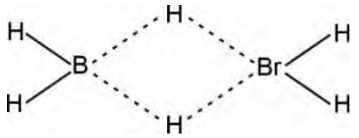
Hint: $K_b = \frac{R \times M_1 \times T_b^2}{1000 \times \Delta_{vap}H}$.

Sol.: The value of molal elevation constant (K_b) does not depend on the concentration of solute of the dilute solution.

66. Answer (4)

Hint: $\underset{\text{Orthoboric acid}}{H_3BO_3} \xrightarrow[\Delta]{370\ K} \underset{\text{Metaboric acid}}{HBO_2}$

Sol.:



Four terminal hydrogen and two boron atoms may lie in one plane.

67. Answer (3)

Hint: In Mohr's salt $[FeSO_4 \cdot (NH_4)_2SO_4 \cdot 6H_2O]$

Fe is of +2 oxidation state

Sol.: $XeF_6 + 3H_2O \rightarrow XeO_3 + 6HF$

$2SO_2 + O_2 \xrightarrow{V_2O_5} 2SO_3$

68. Answer (1)

Hint: $4Zn + 10HNO_3(\text{dilute}) \rightarrow 4Zn(NO_3)_2 + 5H_2O + N_2O$

Sol.: $Zn + 4HNO_3(\text{Conc.}) \rightarrow Zn(NO_3)_2 + 2H_2O + 2NO_2$

69. Answer (2)

Hint: For Ni^{2+}, group reagent is H_2S in the presence of NH_4OH

Sol.:

Cu^{2+}	H_2S in the presence of dil. HCl
Ba^{2+}	$(NH_4)_2CO_3$ in the presence of NH_4OH
Fe^{3+}	NH_4OH in the presence of NH_4Cl

70. Answer (4)

Hint: When $CuSO_4$ reacts with $K_4[Fe(CN)_6]$ a chocolate brown precipitate of copper (II) ferrocyanide is formed.

Sol.: $2CuSO_4 + K_4[Fe(CN)_6] \rightarrow Cu_2[Fe(CN)_6] + 2K_2SO_4$.

71. Answer (2)

Hint: Shape of species depends on the bond pair of electrons.

Sol.:

Species	Shape
NH_3	Trigonal pyramidal
BrF_3	Bent T-shaped
PCl_5	Trigonal bipyramidal
IF_5	Square pyramidal

72. Answer (2)

Hint: Electron gain enthalpy is the energy change when an electron is added to a neutral isolated gaseous atom to form a negative ion.

Sol.: The second electron gain enthalpy of oxygen atom is positive because there is a large repulsion between the uni-negatively charged oxygen atom and added electron.

73. Answer (3)

Hint: Hydrogen bond strength depends on difference of electronegativity of covalently attached atom with hydrogen. Higher the electronegativity larger will be H-bond strength.

Sol.: Therefore, HF will show strongest hydrogen bonding.

74. Answer (2)

Hint: In molecules of same hybridization as no. of lone pairs on central atom increase, bond angle decrease.

Sol.:

Species	Bond angle
CO_2	180°
CH_4	109° 28'
NH_3	107°
H_2O	104.5°

75. Answer (4)

Hint: Oxidation state of Fe in $[Fe(CO)_5]$ complex is zero.

Sol.: In carbonyl complex synergic bonding takes place. CO donates electrons to metal atoms/ions by σ bond and accept electron from metal by π-bond.

76. Answer (2)

Hint :

(a) $[Co(NH_3)_5(NO_2)]Cl_2$ and $[Co(NH_3)_5(ONO)]Cl_2 \rightarrow$ Linkage isomers.

Sol.:

(b) $[Cu(NH_3)_4][PtCl_4]$ and $[Pt(NH_3)_4][CuCl_4] \rightarrow$ Coordination isomers.

(c) $[PtCl_2(NH_3)_4]Br_2$ and $[PtBr_2(NH_3)_4]Cl_2 \rightarrow$ ionisation isomers.

77. Answer (1)

Hint: CrO_5 has two peroxy linkage in with oxygen is of –1 oxidation state.

Sol.:

(Species)	(Oxidation state of underlined element)
$\underline{Cr}O_5$	+6
$NH_4\underline{N}O_3$	+5
$H\underline{C}N$	+2
$K_3[\underline{Fe}(CN)_6]$	+3

78. Answer (4)

Hint: In a disproportionation reaction an element is simultaneously oxidised and reduced.

Sol.: In disproportionation reaction one of the reacting substance is always present in three different oxidation state.

$$\overset{0}{P_4} + 3NaOH + 3H_2O \rightarrow 3Na\overset{+1}{H_2}P\overset{}{O_2} + \overset{-3}{PH_3}$$

$$\overset{0}{3Cl_2} + 6NaOH \rightarrow 5Na\overset{-1}{Cl} + Na\overset{+5}{Cl}O_3 + 3H_2O$$

$$\overset{+3}{3HNO_2} \rightarrow 2\overset{+2}{NO} + \overset{+5}{HNO_3} + H_2O$$

$$2K\overset{-1}{Cl}\overset{-2}{O_3} \rightarrow 2K\overset{-1}{Cl} + 2\overset{0}{O_2}$$

79. Answer (2)

Hint: On heating of a sample of pure water K_w increases as the dissociation of water is an endothermic process.

Sol.: $\underset{\substack{C \\ C-C\alpha}}{H_2O} \rightleftharpoons \underset{C\alpha}{H^+} + \underset{C\alpha}{OH^-}$

Concentration (H^+) will increase that will result into decrease in pH.

80. Answer (4)

Hint: Condition For the precipitation of $Mg(OH)_2$.

Ionic product of $Mg(OH)_2 \geq K_{SP}$ of $Mg(OH)_2$.

Sol.: $\underset{S}{Mg(OH)_2(s)} \rightleftharpoons \underset{S}{Mg^{2+}(aq)} + \underset{2S}{2OH^-}$

$K_{SP} = [Mg^{2+}][OH^-]^2$

$1 \times 10^{-11} \leq 10^{-3} \times [OH^-]^2$

$[OH^-] \geq \sqrt{10^{-8}} \geq 10^{-4}$

$\log[OH^-] \geq -4$

$-\log[OH^-] \leq 4$

$pOH \leq 4$

$pH \geq 10$

81. Answer (4)

Hint: In period as the Z_{eff} increases ionization enthalpy increases.

Sol.: From the given electronic configurations the elements will be

$1s^2, 2s^2, 2p^3 \rightarrow$ N

$1s^2, 2s^2, 2p^4 \rightarrow$ O

$1s^2, 2s^2, 2p^2 \rightarrow$ C

$1s^2, 2s^2, 2p^5 \rightarrow$ F

Therefore, the correct order of first ionisation energy will be F > N > O > C.

82. Answer (4)

Hint: Formula used for the calculation of activation energy.

$$\log\frac{K_2}{K_1} = \frac{E_a}{2.303\,R}\left[\frac{1}{T_1} - \frac{1}{T_2}\right]$$

Sol.: $\log\frac{4}{1} = \frac{E_a}{2.303\,R}\left[\frac{1}{300} - \frac{1}{340}\right]$

$$0.6 = \frac{E_a}{2.303 \times R}\left[\frac{40}{300 \times 340}\right]$$

$$E_a = \frac{0.6 \times 2.303 \times R \times 300 \times 34}{4}$$

$= 0.6 \times 2.303 \times 8.314 \times 75 \times 34$

$= 29.29$ kJ mol^{-1}.

83. Answer (1)

Hint: Diamagnetic species do not have unpaired electron.

Sol.: Lu^{3+} : [Xe] $4f^{14}$ Pm^{3+} : [Xe] $4f^4$

Ce^{4+} : [Xe] $4f^0$ Sm^{3+} : [Xe] $4f^5$

Eu^{3+} : [Xe] $4f^6$ Gd^{3+} : [Xe] $4f^7$

Yb^{2+} : [Xe] $4f^{14}$ Tb^{4+} : [Xe] $4f^7$

84. Answer (1)

Hint: Isotonic solutions have same osmotic pressure.

Sol.: Osmotic pressure is used to determine molar mass of macromolecules.

85. Answer (2)

Hint: Rate of reaction will be (r) = $k[P]^1[Q]^{1/2}$

Sol.: $r_1 = k[P]^1[Q]^{1/2}$ … (i)

$r_2 = k[4P]^1[4Q]^{1/2}$

$r_2 = 8k[P][Q]^{1/2}$ … (ii)

on dividing equation (ii) by equation (i)

$$\frac{r_2}{r_1} = 8K[P]\,[Q]^{1/2}$$

$\frac{r_2}{r_1} = 8 \Rightarrow r_2 = 8r_1$

86. Answer (3)

Hint: For the feasibility of cell reaction, $E^\circ_{cell} > 0$

Sol.:

(a) $CuSO_4(aq) + Fe(s) \rightarrow FeSO_4(aq) + Cu(s)$

$E^\circ_{cell} = 0.78$ V

(b) $CuSO_4(aq) + Ni(s) \rightarrow NiSO_4(aq) + Cu(s)$

$E^\circ_{cell} = 0.59$ V

(c) $CuSO_4(aq) + 2Ag(s) \rightarrow Ag_2SO_4(aq) + 2Cu(s)$

$E^\circ_{cell} = -0.46$ V

(d) $Ag_2SO_4(aq) + Fe(s) \rightarrow FeSO_4(aq) + 2Ag(s)$

$E^\circ_{cell} = 1.24$ V

87. Answer (2)

Hint & Sol.:

N = N	418
C = C	611
C = O	741
C = N	615

88. Answer (4)

Hint: Work in isothermal and reversible process is

$= -nRT\ln\frac{V_2}{V_1}$

Sol.: $\Delta H = nC_p\Delta T = 0$

89. Answer (4)

Hint: For 2s orbital the probability density of electron first decreases sharply to zero and again starts increasing.

Sol.: For 1s orbital the probability density of electron is maximum at the nucleus and it decreases sharply as we move away from it.

Number of angular nodes = Azimuthal quantum number (l).

90. Answer (4)

Hint: The reactant which gets consumed first, limits the amount of product formed in the reaction and is called limiting reagent.

Sol.: $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$

From the balanced chemical reaction 28 g of Nitrogen reacts with 6 g Hydrogen therefore 56 g of Nitrogen will react with 12 g of hydrogen.

But mass of H_2 is given only 10 g therefore in option (4) H_2 acts as limiting reagent.

[BIOLOGY]

91. Answer (2)

Hint: This organism exhibits haplo-diploid type of sex determination.

Sol.: In honey bees, males have half the number of chromosomes than that of females. The females are diploid having 32 chromosomes and males are haploid, i.e., having 16 chromosomes only.

92. Answer (1)

Hint: In an individual, only two alleles can be present.

Sol.: Since in an individual only two alleles can be present, multiple alleles can be found only when population studies are made. ABO blood group system can exhibit complete dominance, co-dominance and recessive inheritance pattern.

93. Answer (2)

Hint: In case of incomplete dominance, F_2 generation shows same phenotypic and genotypic ratio.

Sol.:

Parents:	LL Large starch grain	×	II Small starch grain
Gametes:	L		I
F_1 generation:	LI Intermediate sized starch grain	×	LI Intermediate sized starch grain
Gametes:	L I		L I

F_2 generation:	L	I
L	LL Large starch grain	LI Intermediate sized starch grain
I	LI Intermediate sized starch grain	II Small starch grain

94. Answer (1)

Hint: This pedigree shows the inheritance pattern of autosomal recessive trait.

Sol.: This pedigree shows the inheritance pattern of thalassemia and cystic fibrosis (autosomal recessive traits). This pedigree is not true for X-linked recessive disorder (colour blindness). This pedigree is true for phenylketonuria, and the parents can be heterozygous for the trait. This pedigree is true for sickle cell anaemia and mating of individual II 1 with normal female will produce all unaffected individuals. All the affected individuals are homozygous for the trait under study.

95. Answer (4)

Hint: The pitch of the DNA helix according to Watson and Crick is 34 Å.

Sol.: The pitch of the DNA helix according to Watson and Crick is 3.4 nm.

96. Answer (3)

Hint: The basis of genetic mapping of human genome as well as of DNA fingerprinting is DNA polymorphism.

Sol.: The basis of genetic mapping of human genome as well as of DNA fingerprinting can be described as an inheritable mutation that is observed in a population at high frequency.

97. Answer (4)

Hint: *lac i* produces repressor protein. *lac z* produces beta-galactosidase enzyme. *lac a* produces transacetylase. *lac y* produces permease enzyme.

Sol.: The product of *lac i* interacts with operator region of the *lac* operon. The product of *lac a* is required for metabolism of lactose. The product of *lac y* increases permeability of the cell to β-galactosides. The product of *lac z* is responsible for the hydrolysis of the disaccharide.

98. Answer (1)

Hint: The replication occurs within replication fork.

Sol.: For long DNA molecules, since the two strands of DNA cannot be separated in its entire length (due to very high energy requirement), the replication occur within a small opening of the DNA helix, referred to as replication fork.

99. Answer (2)

Hint: The principle of complementarity governs both the processes of replication and transcription.

Sol.: Transcription and replication can be differentiated from each other as the former is facilitated by only a single enzyme in prokaryotes, which transiently attach with other factors, while the latter is facilitated by a series of enzymes. In the former, only one strand of DNA can act as a template, while in the latter, both act as templates. In both of them, main polymerising enzyme can perform the synthesis only in 5'→ 3' direction. In the latter, during synthesis, adenine pairs with 5-methyl uracil, while in the former, it pairs with uracil.

100. Answer (3)

Hint: Cyanobacteria can fix both atmospheric CO_2 and N_2.

Sol.: *Anabaena, Nostoc* and *Oscillatoria* can fix both atmospheric CO_2 and N_2. *Azospirillum* can fix only atmospheric N_2.

101. Answer (1)

Hint: Blood cholesterol lowering agents are formed, using a fungus.

Sol.: Streptokinase produced by the bacterium *Streptococcus* and modified by genetic engineering is used as a 'clot buster' for removing clots from the blood vessels of patients who have undergone myocardial infarction leading to heart attack.

102. Answer (2)

Hint: Commensalism is the interaction in which one species benefits and the other is neither harmed nor benefited.

Sol.: An orchid growing as an epiphyte on a mango branch is an example of commensalism.

103. Answer (1)

Hint: r is a very important parameter chosen for assessing impacts of any biotic or abiotic factor on population growth.

Sol.: In exponential growth equation, $dN/dt = rN$; 'r' is called the 'intrinsic rate of natural increase'.

104. Answer (2)

Hint: Each trophic level has a certain mass of living material at a particular time called as the standing crop.

Sol.: The standing crop is measured as the mass of living organisms (biomass) or the number in a unit area. The biomass of a species is expressed in terms of fresh or dry weight.

105. Answer (1)

Hint: *Clarias gariepinus* is a threat to the indigenous catfishes in our rivers.

Sol.: The Nile perch introduced into Lake Victoria in east Africa led eventually to the extinction of an ecologically unique assemblage of more than 200 species of cichlid fish in the lake.

106. Answer (2)

Hint: Adipose tissue is present beneath the skin.

Sol.: Connective tissues are most abundant and widely distributed in the body of complex animals.

Cells of connective tissue secrete modified polysaccharides, which accumulate between cells and fibres and act as matrix (ground substance).

Junctions are absent between the cells of connective tissues.

Fibroblasts are absent in blood and lymph.

107. Answer (2)

Hint: Belongs to the class Osteichthyes.

Sol.: *Pterophyllum* (Angel fish) belongs to the class Osteichthyes. This class includes both marine and fresh water fishes with bony endoskeleton. Their heart is two-chambered.

Sexes are separate. They are mostly oviparous and development is direct.

108. Answer (3)

Hint: Different host is required for expression of desired gene.

Sol.: Recombinant protein – Protein encoding gene is expressed in heterologous host.

• Agarose gel electrophoresis is employed to check progression of restriction enzyme digestion.

• A probe is allowed to hybridise to its complementary DNA in clone of cells followed by detection using autoradiography.

• Making multiple identical copies of any template DNA is called cloning.

109. Answer (4)

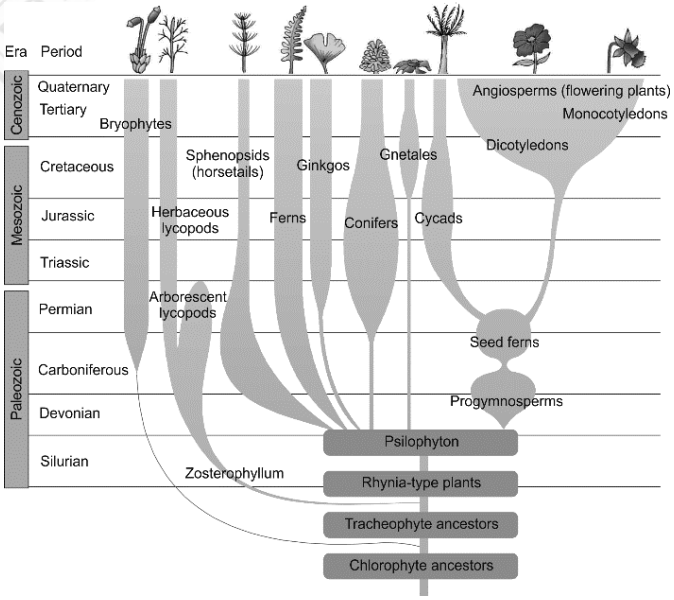
Hint: Endometrium is the inner lining of uterus.

Sol.: The menstrual flow results due to breakdown of endometrial lining of the uterus and its blood vessels. Menstruation occurs only if released ovum is not fertilised.

110. Answer (3)

Hint: Late Devonian to early Carboniferous period.

Sol.:



111. Answer (2)

Hint: Quadri refers to four.

Sol.: The dorsal portion of midbrain consists mainly of four round swellings (lobes) called corpora quadrigemina. Cerebral aqueduct is a canal passing through midbrain. Limbic system and amygdala are parts of forebrain.

112. Answer (4)

Hint: Identify the birth hormone

Sol.:

Hormone	Source gland
Prolactin	Pars distalis
Gonadotrophins (LH and FSH)	Pars distalis
TSH	Pars distalis

113. Answer (3)

Hint: The structures that help in gaseous exchange.

Sol.: • Blood vascular system of cockroach is of open type.

• Blood vessels are poorly developed and open into space called haemocoel.

• There are 12 pairs of alary muscles in cockroach. There are 13 heart chambers in cockroach in which first chamber opens into anterior aorta.

• Haemolymph is composed of colourless plasma and haemocytes.

• The respiratory system consists of a network of tracheae, that open through 10 pairs of small holes called spiracles.

114. Answer (4)

Hint: Human heart is myogenic.

Sol.: Cardiac muscle tissue is a contractile tissue present only in the heart. Cell junctions fuse the plasma membranes of cardiac muscle cells and make them stick together. Communication junctions (intercalated disc) at some fusion points allow the cells to contract as a unit, *i.e.*, when one cell receives a signal to contract, its neighbours are also stimulated to contract.

Cardiac muscle cells are autorhythmic, *i.e.*, human heart is myogenic.

115. Answer (2)

Hint: Coelenterates exhibit metagenesis.

Sol.: Cnidarians exhibit two basic body forms called polyp and medusa. The former is a sessile and cylindrical form like *Hydra*, whereas, the latter is umbrella-shaped and free-swimming like *Aurelia*. Those cnidarians which exist in both forms exhibit alternation of generation called metagenesis, *i.e.*, polyps produce medusae asexually and medusae form the polyps sexually (*e.g.*, *Obelia*).

116. Answer (1)

Hint: In bacteria, the innermost layer of cell envelope is plasma membrane.

Sol.: The plasma membrane is selectively permeable in nature and interacts with the outside world. This membrane is structurally similar to that of the eukaryotes.

117. Answer (4)

Hint: Label A represents Golgi apparatus. Label B represents centrioles. Label C represents smooth endoplasmic reticulum. Label D represents nucleolus. Label E represents mitochondria.

Sol.: Golgi apparatus principally performs the function of packaging materials. Centriole has nine triplets of evenly spaced peripheral fibrils of tubulin protein. SER is major site for synthesis of lipid. Nucleolus is the site of rRNA formation.

Mitochondria whose matrix possesses single circular DNA molecule, a few RNA molecules, ribosomes (70S) and the components required for the synthesis of proteins.

118. Answer (1)

Hint: It occurs during the first stage of karyokinesis.

Sol.: In prophase, centrosome which had undergone duplication during interphase, begins to move towards opposite poles of the cell.

119. Answer (3)

Hint: Cytokinesis in plant cells is facilitated by the formation of cell plate.

Sol.: Cytokinesis in animal cells is facilitated by the formation of furrow.

120. Answer (3)

Hint: G_2 phase is the pre-mitotic phase of the cell cycle.

Sol.: The pre-mitotic phase of cell cycle exhibits duplication of semi-autonomous organelles.

121. Answer (3)

Hint: The last sub-stage of prophase I of meiosis I is diakinesis.

Sol.: Diakinesis is marked by terminalisation of chiasmata. By the end of diakinesis, the nucleolus disappears and the nuclear envelope breaks down.

122. Answer (3)

Hint: Both PS I and PS II are used during non-cyclic photophosphorylation.

Sol.: During non-cyclic photophosphorylation, external electron donor (H_2O) is required.

123. Answer (4)

Hint: The Hatch and Slack pathway begins with carboxylation reaction.

Sol.: The correct sequence of events is

(d) → (b) → (c) → (e) → (a)

124. Answer (1)

Hint: Nucleosomes and nucleus are not found in prokaryotes.

Sol.: *E. coli* has smaller cytoplasmic ribosome in comparison to the one found in the experimental organism (*Vicia faba*) used by Taylor et al. *E. coli* have polycistronic structural genes to metabolise lactose (disaccharide made up of glucose and galactose).

125. Answer (3)

Hint: ATP formation occurs during substrate level phosphorylation.

Sol.: Conversion of phosphoenolpyruvate into pyruvate results in substrate level phosphorylation.

126. Answer (4)

Hint: The growth rate shows an increase that may be arithmetic or geometrical.

Sol.: Following mitotic cell division, only one daughter cell continues to divide while the other matures in arithmetic growth. Arithmetic growth shows a linear curve.

127. Answer (2)

Hint: Cytokinin is a growth promoting hormone.

Sol.: Cytokinin promotes nutrient mobilisation which helps in the delay of leaf senescence.

128. Answer (3)

Hint: *Yucca* is pollinated by insects.

Sol.: Moth and *Yucca* plant cannot complete their life cycles without each other. The moth deposits its eggs in the locule of the ovary and the flower, in turn, gets pollinated by the moth. The larvae of the moth come out of the eggs as the seeds start developing.

129. Answer (2)

Hint: The body of the ovule fuses with funicle in the region called hilum.

Sol.: Hilum represents the junction between ovule and funicle.

130. Answer (2)

Hint: Dioecious plants can prevent both autogamy and geitonogamy.

Sol.: Maize is a monoecious plant; it prevents autogamy but not geitonogamy.

131. Answer (3)

Hint: Counter current mechanism.

Sol.: Osmolarity of interstitium in kidneys increase from 300 mOsmol L^{-1} in the cortex to about 1200 mOsmol L^{-1} in the inner medulla.

The proximity between the Henle's loop and vasa recta, as well as the counter current in them help in maintaining an increasing osmolarity towards the inner medullary interstitium.

132. Answer (2)

Hint: Ureter emerges from it

Sol.: Kidneys are situated between the levels of last thoracic and third lumbar vertebra close to the dorsal inner wall of the abdominal cavity.

Towards the centre of the inner concave surface of the kidney is a notch called hilum through which ureter, blood vessels and nerves enter.

133. Answer (3)

Hint: Water loving

Sol.: Since DNA is hydrophilic molecule, it cannot pass through cell membrane until cell is made competent for transformation.

134. Answer (2)

Hint: For the formation of DNA, DNA polymerase is needed.

Sol.: Reverse transcriptase is a RNA dependent DNA polymerase enzyme because it uses RNA as a template to synthesise a complementary DNA strand.

135. Answer (3)

Hint: The exaggerated response of the immune system to certain antigens is called allergy.

Sol.: Addiction is a psychological attachment to certain effects-such as euphoria and temporary feeling of well-being-associated with drugs and alcohol.

Dependence is tendency of body to manifest a characteristic and unpleasant withdrawal syndrome if regular dosage of drug is abruptly discontinued.

136. Answer (2)

Hint: Genetic change is main cause.

Sol.: Tumor cells have been shown to avoid detection and destruction by immune system. As these cells develop genetic changes like loss of some surface protein that help them to escape our immune system.

The cancer patients are given substance called biological response modifiers such as α-interferons which activate their immune system and help in destroying the tumor.

137. Answer (4)

Hint: Theory of spontaneous generation.

Sol.: For a long time, it was believed that life came out of decaying and rotting matter like straw, mud, *etc*. This was the theory of spontaneous generation. Three connotations of theory of special creation is

(1) The Earth is about 4000 years old.

(2) The diversity was always the same since creation and will be the same in future also.

(3) All living organisms that we see today were created as such.

138. Answer (3)

Hint: Flat skull bones fuse with the help of dense fibrous connective tissue.

Sol.:

Gliding joint	Between the carpals
Cartilaginous joint	Between adjacent vertebrae
Fibrous joint	Form sutures between flat skull bones
Saddle joint	Between carpal and metacarpal of thumb

139. Answer (2)

Hint: 100 mL of oxygenated blood delivers around 5 mL of O_2 to the tissues

Sol.: Every 100 mL of deoxygenated blood delivers approximately 4 mL of CO_2 to the alveoli.

So, 200 mL will deliver 8 mL of CO_2 to the alveoli.

140. Answer (1)

Hint: Degenerated in old individuals.

Sol.: The thymus gland is a lobular structure located between lungs behind sternum on the ventral side of aorta. This gland secretes peptide hormone thymosin.

- TCT plays a significant role in calcium balance of the body.
- Overproduction of thyroid hormone causes Graves' disease.
- In adult women, hypothyroidism may cause menstrual cycle to become irregular.

141. Answer (3)

Hint: Same size fragments will appear as one on gel.

Sol.: Since, the student is performing restriction digestion only with *Eco*R I, *Bam*H I and *Sal* I, only 4 DNA fragment will obtain. These obtained DNA fragments will be of the sizes 2 kb, 3 kb and 8 kb and 2 kb respectively.

The DNA fragments of sizes 2 kb will travel equal distance on the gel while the 3 kb and 8 kb DNA fragments will appear separately.

2 kb size will be close to anode and 8 kb sized DNA will be present close to the cathode.

142. Answer (2)

Hint: Gene migration for many times is called gene flow.

Sol.: When migration of a section of population to another place and population occurs, gene frequencies change in the original as well as new population.

143. Answer (3)

Hint: Angina is acute chest pain.

Sol.: The state of heart when it is not pumping blood effectively enough to meet the needs of the body is heart failure.

Cardiac arrest – When heart stops beating.

Heart attack – When the heart muscles are suddenly damaged by inadequate blood supply.

144. Answer (2)

Hint: Combination of odd numbers.

Sol.: A patch of nodal tissue is present in the right upper corner of the right atrium called sino-atrial node (SAN). It can generate the maximum number of action potentials. It is responsible for initiating and maintaining the rhythmic contractile activity of the heart. Another mass of this tissue is present in the lower left corner of the right atrium close to the atrio-ventricular septum called the AVN.

A bundle of nodal fibres, called AV bundle, continues from the AVN which passes through atrio-ventricular septa.

145. Answer (2)

Hint: Expiration stage

Sol.: Expiration takes place when the intra pulmonary pressure is higher than the atmospheric pressure.

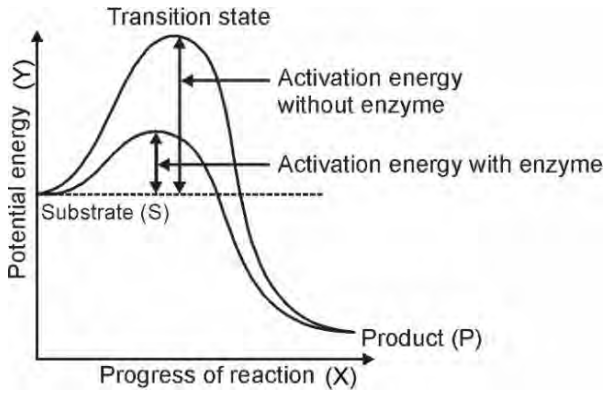
Relaxation of the diaphragm and the external inter-costal muscles return the diaphragm and sternum to their normal position and reduce the thoracic volume and thereby the pulmonary volume.

This leads to an increase in intra-pulmonary pressure to slightly above the atmospheric pressure causing the expulsion of air from the lungs, *i.e.*, expiration.

146. Answer (3)

Hint: Transition state is an unstable state.

Sol.:



147. Answer (4)

Hint: Equal to the number of bones in pectoral girdle of humans.

Sol.:

Pigments	Carotenoids, Anthocyanins, *etc.*
Alkaloids	Morphine, Codeine, *etc.*
Terpenoids	Monoterpenes, Diterpenes, *etc.*
Essential oils	Lemongrass oil, *etc.*
Toxins	Abrin, Ricin
Lectins	Concanavalin A
Drugs	Vinblastin, curcumin, *etc.*
Polymeric substances	Rubber, gums, cellulose

148. Answer (3)

Hint: Least abundant among all types of WBCs.

Sol.: Basophils secrete histamine, serotonin, heparin, *etc.*, and are involved in inflammatory reactions.

Lymphocytes are responsible for immune response of the body. Eosinophils resist infection and are also associated with allergic responses. Neutrophils are phagocytic cells which destroy foreign organisms entering the body.

149. Answer (2)

Hint: Micturition occurs when it gets filled with urine.

Sol.: Urine formed by the nephrons is carried to the urinary bladder where it is stored till a voluntary signal is given by the CNS. This signal is initiated by the stretching of the urinary bladder as it gets filled with urine.

150. Answer (2)

Hint: Rapid influx of Na^+

Sol.: When a stimulus is applied at a site on the polarised membrane, the membrane at that site becomes freely permeable to Na^+. This leads to a rapid influx of Na^+ followed by the reversal of the polarity at that site, *i.e.*, the outer surface of the membrane becomes negatively charged and the inner side becomes positively charged. The polarity of the membrane at that site is thus reversed and hence depolarised.

151. Answer (1)

Hint: pCO_2 in alveoli = 40 mm Hg

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

152. Answer (4)

Hint: Increase the Ca^{+2} levels of blood

Sol.: A trophic hormone is the one secreted by the pituitary gland that stimulates the secretion of hormones by a target organ. Parathyroid hormone (PTH) is secreted by parathyroid gland.

Trophic hormones are secreted by anterior pituitary *e.g.*, ACTH, FSH, LH, *etc.*

153. Answer (4)

Hint: Proteins are made up of different amino acids.

Sol.: RuBisCO is the most abundant protein in whole of the biosphere and collagen is the most abundant protein in animal world.

Each protein is a polymer of amino acids. As there are 20 types of amino acids, a protein is a heteropolymer and not a homopolymer.

154. Answer (1)

Hint: Frog has 3 chambers in its heart.

Sol.:

- Frog has 3 chambers in its heart but humans have four chambers in their heart.
- Both frogs and humans have lungs for breathing, but frogs also have other respiratory organs like skin.
- Special venous connection between liver and intestine is present in both, known as hepatic portal system.
- 3 types of formed elements RBCs, WBCs and platelets are present in both.

155. Answer (3)

Hint: Some members of class Reptilia shed scales as skin casts

Sol.: Snakes and lizards shed their scales as skin cast.

Chelone, Testudo and *Crocodilus* are reptiles but are not lizards.

156. Answer (1)
Hint: Lower the taxa, more are the characteristics that the members within a taxon share.
Sol.: Higher the category, greater is the difficulty of determining the relationship to other taxa at the same level. Hence, the problem of classification becomes more complex.

157. Answer (3)
Hint: This organism is the smallest living cells known.
Sol.: *Mycoplasma* are the organisms that completely lack a cell wall.

158. Answer (4)
Hint: Slime moulds are saprophytic protists.
Sol.: During unfavourable conditions, the plasmodium of slime moulds differentiates and forms fruiting bodies bearing spores at their tips.

159. Answer (2)
Hint: *Aspergillus* belongs to the class Ascomycetes and *Puccinia* belongs to the class Basidiomycetes.
Sol.: *Aspergillus* reproduces asexually via conidia. *Puccinia* generally does not show the presence of asexual spores.

160. Answer (4)
Hint: This plant shows the presence of cones.
Sol.: The member of Sphenopsida class of Pteridophytes is *Equisetum.*

161. Answer (1)
Hint: Members of Rhodophyceae lack flagella.
Sol.: All three classes of algae exhibit fragmentation as the mode of vegetative reproduction.

162. Answer (4)
Hint: This type of leaf is palmately compound leaf.
Sol.: In palmately compound leaves, the leaflets are attached at a common point, i.e., the tip of petiole, as in silk cotton.

163. Answer (4)
Hint: When the flower can be divided into two similar halves only in one particular vertical plane, it is zygomorphic.
Sol.: *Datura* shows the presence of actinomorphic flowers.

164. Answer (4)
Hint: Belladonna belongs to Solanaceae family.
Sol.: Members of Solanaceae family show the presence of superior ovary, endospermic seeds and valvate aestivation of corolla.

165. Answer (4)
Hint: They differ in the arrangement of ovules within the ovary.
Sol.:

Features	China rose	Mustard
Type of flower based on the position of calyx, corolla and androecium w.r.t. the ovary on thalamus	Hypogynous flower	Hypogynous flower
Type of phyllotaxy	Alternate	Alternate
Type of flower based on symmetry	Actinomorphic	Actinomorphic
Type of placentation	Axile	Parietal

166. Answer (4)
Hint: Roots are usually underground.
Sol.: Cuticle (waxy thick layer) is absent in roots.

167. Answer (3)
Hint: Large, empty, colorless cells are bulliform cells found in isobilateral leaves.
Sol.: In dorsiventral leaf, the adaxially placed palisade parenchyma is made up of elongated cells, which are arranged vertically and parallel to each other.

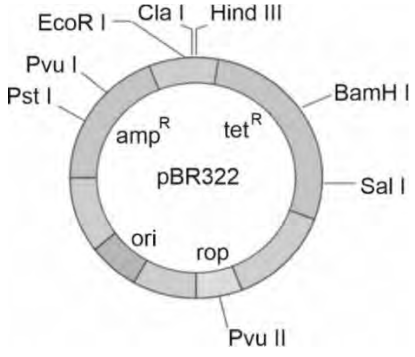
168. Answer (4)
Hint: The ground tissue of monocot stem is not differentiated.
Sol.: Hypodermis of dicot stem is made up of collenchyma.

169. Answer (2)
Hint: This structure is bound by tonoplast.
Sol.: Inclusion bodies are not bound by any membrane system and lie free in the cytoplasm, e.g., phosphate granules, cyanophycean granules and glycogen granules.

170. Answer (4)
Hint: It is a Leucoplast.
Sol.: Amyloplasts store carbohydrates (starch), e.g., potato; Elaioplasts store oils and fats whereas the Aleuroplasts store proteins. Chromoplasts have carotenoids.

171. Answer (4)
Hint: Less than 5 grams per litre.
Sol.: In 1997, the first transgenic cow, Rosie, produced human protein-enriched milk (2.4 grams per litre).

172. Answer (3)
Hint: 2 are present within amp^R
Sol.:



173. Answer (3)

Hint: Zona pellucida formed by secondary oocyte.

Sol.: Spermatogenesis begins at puberty. Oogenesis is initiated during embryonic development stage in females.

174. Answer (3)

Hint: This zone is present in middle of a sarcomere.

Sol.: In a resting state of muscle, the edges of thin filament on either side of thick filament partially overlap the free ends of thick filament leaving the central part of the thick filament, this part is not overlapped by thin filament called 'H' zone.

175. Answer (2)

Hint: Sacrum and coccyx are dorsally present between two coxal bones.

Sol.: Pelvic girdle consists of two coxal bones. Each coxal bone is formed by the fusion of three bones – ilium, ischium and pubis. At the point of fusion of the above bones is a cavity called acetabulum to which the thigh bone articulates.

The two halves of the pelvic girdle meet ventrally to form the pubic symphysis containing fibrous cartilage.

176. Answer (3)

Hint: Protoplast fusion

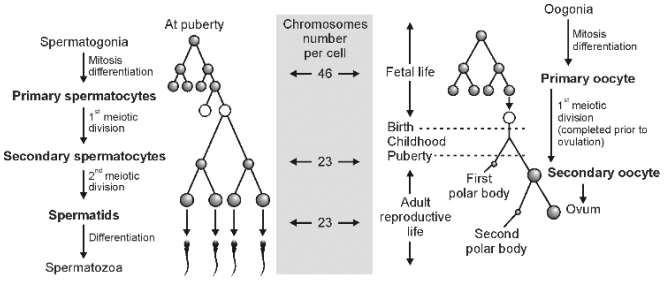
Sol.: Scientists have isolated single cells from plants and after digesting their cell walls, they have been able to isolate naked protoplasts which is surrounded by plasma membranes.

Isolated protoplasts from two different varieties of plants – each having a desirable character – can be fused to get hybrid protoplasts, which can be further grown to form a new plant. These hybrids are called somatic hybrids while the process is called somatic hybridization.

177. Answer (1)

Hint: First meiosis occurs in primary oocyte.

Sol.: Both primary oocyte and spermatogonia are diploid (2n). Spermatids, spermatozoa and polar body are haploid (n).



178. Answer (1)

Hint: Prostate gland has alkaline secretions.

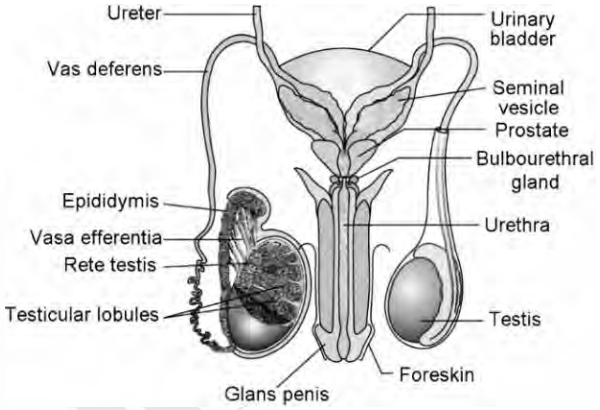
Sol.: A-Seminal vesicle

B- Prostate gland

C-Bulbourethral gland

D-Foreskin

Secretions of male accessory sex glands is called seminal plasma. Secretion of bulbourethral glands help in lubrication of penis. Glans penis is covered by a loose fold of skin called foreskin.



179. Answer (4)

Hint: Action same as birth control pills

Sol.: Consists of progestin and estrogen or progestin alone to prevent pregnancy following unprotected sexual intercourse.

High levels of progestin and estrogen in emergency contraceptive pills inhibit FSH and LH secretion.

Loss of stimulating effects of gonadotropic hormones cause the ovaries to cease secretion of their own estrogen and progesterone.

Declining levels of estrogen and progesterone induce shedding of uterine lining, thereby preventing implantation.

Copper releasing IUDs prevent implantation and sperm motility but do not prevent ovulation.

180. Answer (3)

Hint: It is an embryological evidence.

Sol.: Embryological support for evolution was proposed by Ernst Heckel based upon the observation of certain features during embryonic stage common to all vertebrates that are absent in adults. For example, the embryos of all vertebrates including human develop a row of vestigial gill slit just behind the head but it is functional organ only in fish and not found in any other adult vertebrate.

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