

## All India Aakash Test Series for NEET - 2021

**TEST - 6 (Code-C)**

Test Date : 01/03/2020

**ANSWERS**

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

**HINTS & SOLUTIONS****[PHYSICS]**

1. Answer (3)

**Hint:**  $T = 2\pi\sqrt{\frac{m}{K}}$ , where  $F = -Kx$

**Sol.:**  $K =$  magnitude of slope of Force – position graph

$$= -1 \times \left( \frac{-20}{10 \times 10^{-2}} \right) = 200 \text{ N/m}$$

$$T = 2\pi\sqrt{\frac{0.08}{200}} = 0.04\pi \text{ s}$$

2. Answer (3)

**Hint & Sol.:** Sound wave, being a longitudinal wave, does not exhibit phenomenon of polarization as polarization is only showcased by transverse waves.

3. Answer (4)

**Hint:**  $A = \sqrt{A_1^2 + A_2^2 + 2A_1A_2 \cos \theta}$

**Sol.:**  $A_1 = A$

$$A_2 = 2A$$

$$\theta = 120^\circ$$

$$A' = \sqrt{A^2 + (2A)^2 + 2(A)(2A)\cos(120^\circ)}$$

$$A' = \sqrt{A^2 + 4A^2 - 2A^2}$$

$$A' = \sqrt{3}A$$

4. Answer (1)

**Hint & Sol.:** Acceleration of a body in SHM is maximum at extreme position and minimum (zero) at mean position.

5. Answer (2)

**Hint:**  $T = 2\pi\sqrt{\frac{m}{K_{\text{eff}}}}$

**Sol.:** All springs are in parallel

$$\therefore K_{\text{eff}} = \Sigma K = 300 \text{ N/m}$$

$$T = 2\pi\sqrt{\frac{5}{300}} = \frac{\pi}{\sqrt{15}} \text{ s}$$

6. Answer (1)

**Hint:** For constructive interference, path difference  $\Delta x = n\lambda$

**Sol.:**  $ABCD = 30 + 40 + 30 = 100 \text{ cm}$

$$AFED = 20 + x + 40 = 60 + x$$

$$\Delta x = AFED - ABCD$$

$$= 60 + x - 100$$

$$n\lambda = x - 40$$

$$\text{for } n = 1 \Rightarrow x = 60 \text{ cm}$$

7. Answer (4)

**Hint:** Beat frequency =  $|f_1 - f_2|$

**Sol.:** Let velocity of sound =  $v$

$$f_1 = \frac{v}{\lambda_1}, f_2 = \frac{v}{\lambda_2}$$

$$f_1 = \frac{v}{160}; f_2 = \frac{v}{164}$$

$$f_1 - f_2 = \frac{v}{160} - \frac{v}{164} = v \left( \frac{4}{160 \times 164} \right)$$

$$\frac{20}{4} = v \times \frac{4}{160 \times 164}$$

$$v = \frac{20 \times 160 \times 164}{4 \times 4} \Rightarrow 20 \times 10 \times 164$$

$$= 32800 \text{ cm/s} = 328 \text{ m/s}$$

8. Answer (2)

**Hint:** Doppler's effect

**Sol.:**  $f_{(\text{app})} = f_0 \left( \frac{V_{\text{sound}} + V_{\text{observer}}}{V_{\text{sound}}} \right)$

$$= 100 \left( \frac{330}{300} \right) = \frac{330}{3} = 110 \text{ Hz}$$

9. Answer (3)

**Hint:**  $v = \sqrt{\frac{T}{\mu}}$

**Sol.:**  $T_{\text{final}} = 1.21 T_{\text{initial}}$

$$v_{\text{final}} = \sqrt{1.21 \frac{T_{\text{initial}}}{\mu}} = \frac{11}{10} v_{\text{initial}}$$

$$\frac{\Delta v}{v} \times 100 = \frac{v_{\text{final}} - v_{\text{initial}}}{v_{\text{initial}}} \times 100 = \left( \frac{11}{10} - 1 \right) \times 100 = 10\%$$

10. Answer (4)

**Hint:** Fundamental frequency =  $\frac{v}{2l}$

**Sol.:**  $v = \sqrt{\frac{\gamma P}{S}}$

$$f_A = \frac{\sqrt{\frac{\gamma P}{\rho}}}{l} = \frac{\sqrt{3P}}{l}$$

Similarly

$$f_B = \frac{\sqrt{\frac{7P}{2\rho}}}{2l} \Rightarrow f_A : f_B = 10 : \sqrt{21}$$

11. Answer (1)

**Hint & Sol.:** Time period of small oscillation of a spring mass system is independent of acceleration due to gravity while time period of oscillations of a simple pendulum depends on the effective value of acceleration due to gravity.

12. Answer (2)

**Hint & Sol.:** On a humid day, sound in air travels faster than that on a dry day. Sound waves, being mechanical waves, require medium to propagate and hence they do not propagate in vacuum.

13. Answer (3)

**Hint:** Beat frequency =  $f_1 \sim f_2$ . On waxing, the frequency reduces.

**Sol.:** On waxing the tuning fork, its frequency decreases and the beat frequency also decreases.

$\therefore f_{\text{unknown}} < 212 \text{ Hz}$

Also,  $212 - f_A = 8$

$f_A = 204 \text{ Hz}$

14. Answer (3)

**Hint:**  $v = \omega\sqrt{A^2 - x^2}$

**Sol.:**  $4v^2 = 25 - x^2$

$$v = \sqrt{\frac{1}{4}(25 - x^2)} = \frac{1}{2}\sqrt{25 - x^2}$$

$\therefore \omega = \frac{1}{2} \text{ rad/s} \quad A = 5 \text{ m}$

$T = \frac{2\pi}{\omega} = 4\pi \text{ s}$

15. Answer (1)

**Hint:** Acceleration  $a = -\omega^2x$

**Sol.:**  $\omega = \frac{2\pi}{T}$

$\Rightarrow |a| = \omega^2x$

$$= \frac{4\pi^2}{T^2} \times \frac{A}{4} = \frac{\pi^2 A}{T^2}$$

16. Answer (1)

**Hint & Sol.:** In case of damped oscillation, both amplitude and energy decreases.

17. Answer (2)

**Hint & Sol.:** Since a circular motion is not an example of to and fro motion, hence it is not an oscillatory motion.

A uniform circular motion repeats itself after a fixed time interval. Therefore it is periodic.

18. Answer (3)

**Hint:**  $l_{\text{max}} = (\sqrt{l_1} + \sqrt{l_2})^2$

$l_{\text{min}} = (\sqrt{l_1} - \sqrt{l_2})^2$

**Sol.:**  $l_{\text{max}} : l_{\text{min}} = 4 : 1$

$$\Rightarrow \frac{(\sqrt{l_1} + \sqrt{l_2})^2}{(\sqrt{l_1} - \sqrt{l_2})^2} = \frac{4}{1}$$

$$\Rightarrow \sqrt{l_1} + \sqrt{l_2} = 2(\sqrt{l_1} - \sqrt{l_2})$$

$$\Rightarrow \sqrt{l_1} = 3\sqrt{l_2} \Rightarrow \frac{l_1}{l_2} = \frac{9}{1}$$

19. Answer (4)

**Hint:** Closed organ pipe exhibits only odd harmonics of the fundamental frequency.

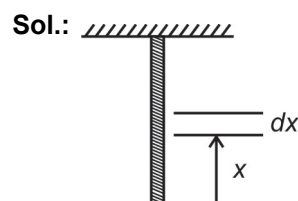
**Sol.:** First overtone = 3<sup>rd</sup> harmonic =  $3 \times 200 = 600 \text{ Hz}$

Third overtone = 7<sup>th</sup> harmonic =  $7 \times 200 = 1400 \text{ Hz}$

$\therefore x = 1400 - 600 = 800 \text{ Hz}$

20. Answer (1)

**Hint:** Speed of wave on a string =  $\sqrt{\frac{T}{\mu}}$



Tension at distance x from lower end

$$T = \frac{m}{l} xg = \mu gx$$

$$v = \sqrt{\frac{\mu gx}{\mu}} = \sqrt{gx}$$

$$\Rightarrow \frac{dx}{dt} = \sqrt{gx} \Rightarrow \int_0^l \frac{dx}{\sqrt{x}} = \int_0^t \sqrt{g} dt$$

$$\Rightarrow 2\sqrt{l} = \sqrt{g} t$$

$$\Rightarrow t = 2\sqrt{\frac{l}{g}} = \sqrt{2} \text{ s}$$

21. Answer (2)

**Hint:** Energy  $\frac{1}{2}m\omega^2 A^2$  and  $a = -\omega^2 y$

$$\text{Sol.: } 25 \frac{d^2 y}{dt^2} + 16y = 0$$

$$\frac{d^2 y}{dt^2} = -\left(\frac{4}{5}\right)^2 y \Rightarrow \omega = \frac{4}{5}$$

$$\frac{1}{2} \times m\omega^2 A^2 = E$$

$$\frac{1}{2} \times 1 \times \frac{16}{25} \times A^2 = 0.64$$

$$A^2 = \frac{50 \times 0.64}{16} = 2$$

$$\Rightarrow A = \sqrt{2} \text{ m}$$

22. Answer (4)

$$\text{Hint: } T = 2\pi \sqrt{\frac{l}{mgd}}$$

$$\text{Sol.: } T = 2\pi \sqrt{\frac{\frac{mR^2}{2} + mR^2}{mg(R)}} = 2\pi \sqrt{\frac{3R}{2g}}$$

23. Answer (4)

$$\text{Hint & Sol.: } v = \sqrt{\frac{\gamma RT}{M}}$$

At a constant temperature, the velocity remains constant and does not vary with pressure.

24. Answer (1)

**Hint & Sol.:** On a stretched string, at nodes, the strain is maximum. While it is minimum at antinodes.

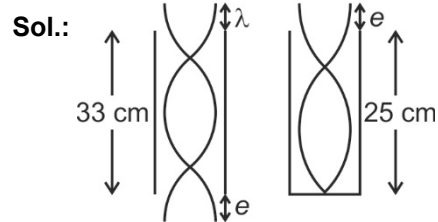
25. Answer (3)

**Hint:** The frequency of oscillation of kinetic energy is twice the frequency of oscillation of motion for a particle executing SHM.

$$\text{Sol.: } f = \frac{2}{T} = \frac{2}{4} = 0.5 \text{ Hz}$$

26. Answer (1)

**Hint:** In first overtone  $\lambda = L_0 + 2e$  and  $\frac{3\lambda}{4} = L_c + e$



$$\lambda = 33 + 2e \quad \dots(1)$$

$$\frac{3\lambda}{4} = 25 + e \quad \dots(2)$$

$$\lambda = 33 + 2e$$

$$\lambda = \frac{4}{3} \times 25 + \frac{4}{3} e$$

$$0 = 33 - \frac{4}{3} \times 25 + 2e - \frac{4}{3} e$$

$$e = \frac{100 - 99}{2} = 0.5 \text{ cm}$$

27. Answer (1)

**Hint:** Beat frequency  $= \Delta f = \frac{v}{2l_1} - \frac{v}{2l_2}$

$$\text{Sol.: } \Delta f = \frac{v}{2l_1} - \frac{v}{2l_2}$$

$$\text{as } v = \sqrt{\frac{\gamma RT}{M}}$$

$$v_{400} \left( \frac{1}{2l_1} - \frac{1}{2l_2} \right) = 4$$

$$v_{800} \left( \frac{1}{2l_1} - \frac{1}{2l_2} \right) = x$$

By taking ratio

$$\frac{x}{4} = \sqrt{\frac{800}{400}}$$

$$x = 4\sqrt{2}$$

28. Answer (3)

**Hint:**  $\Delta x = \frac{\lambda}{2\pi} \Delta\phi$

**Sol.:**  $\Delta x = \frac{\lambda}{2\pi} \times \frac{\pi}{6} = \frac{\lambda}{12}$

29. Answer (3)

**Hint & Sol.:** The apparent frequency may be equal, greater or less than original frequency depending on velocities of observer and source.

30. Answer (1)

**Hint:** Beat frequency =  $f_1 \sim f_2$

**Sol.:**  $f_1 = \frac{400\pi}{2\pi} = 200 \text{ Hz}$

$f_2 = \frac{398\pi}{2\pi} = 199 \text{ Hz}$

Beat frequency = 1 Hz

Beats per minute = 60

31. Answer (3)

**Hint:**  $t = \frac{2d}{v}$  ( $t$ : time,  $d$ : distance of hill,  $v$ : speed of sound)

**Sol.:**  $t = \frac{2d}{v}$

$1.5 = \frac{2d}{330}$

$\Rightarrow d = 1.5 \times \frac{330}{2} = 247.5 \text{ m}$

32. Answer (4)

**Hint & Sol.:** In a closed organ pipe, only odd harmonics are present. Hence, frequency of 200 Hz would be absent.

33. Answer (1)

**Hint:**  $n = \frac{v}{2l}$  and beat frequency =  $n_1 \sim n_2$

**Sol.:** 1<sup>st</sup> case

$\frac{v}{2l_1} - n = 5 \quad \dots(1)$

In second case

$n - \frac{v}{2l_2} = 5 \quad \dots(2)$

$\frac{v}{2l_1} = \frac{n+5}{1}$   
 $\frac{v}{2l_2} = \frac{n-5}{1}$

$\frac{l_2}{l_1} = \frac{n+5}{n-5}$

$\frac{21}{20} = \frac{n+5}{n-5}$

$n = 205 \text{ Hz}$

34. Answer (2)

**Hint:**  $f = \frac{1}{2l} \sqrt{\frac{T}{\mu}} = \frac{1}{2l} \sqrt{\frac{T}{\rho(\pi r^2)}}$

**Sol.:**  $\Rightarrow f \propto \frac{1}{lr} \sqrt{\frac{T}{\rho}}$

$\frac{f_A}{f_B} = \frac{l_B r_B}{l_A r_A} \sqrt{\frac{T_A \rho_B}{T_B \rho_A}} = \frac{1}{4 \times 4} \sqrt{\frac{4}{4}} = \frac{1}{16}$

35. Answer (2)

**Hint:**  $f_{\text{app}} = f_0 \left( \frac{v+v_o}{v-v_s} \right)$

**Sol.:**  $f_{\text{app}} = 160 \left( \frac{300+20}{300-50} \right) = 160 \times \frac{320}{250}$

$f_{\text{app}} = \frac{160 \times 32}{25} = 204.8 \text{ Hz}$

36. Answer (4)

**Hint:** Audible range of sound frequency for human is 20 Hz to 20 kHz

**Sol.:**  $f = \frac{300}{4 \times 10^{-3}} = \frac{3 \times 10^5}{4} = 0.75 \times 10^5$

$= 75 \text{ kHz (inaudible)}$

Also sound wave is a longitudinal wave.

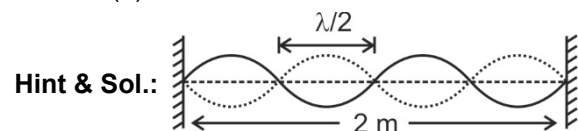
37. Answer (1)

**Hint & Sol.:** In fundamental mode, string will vibrate in one segment.

Hence  $\frac{\lambda}{2} = l$

$\lambda = 2 \times 40 \text{ cm} = 80 \text{ cm}$

38. Answer (4)



**Hint & Sol.:**

$4 \times \frac{\lambda}{2} = 2 \text{ m}$

$\Rightarrow \frac{\lambda}{2} = 0.5 \text{ m}$

39. Answer (1)

**Hint:**  $v = \sqrt{\frac{\gamma RT}{M}}$

**Sol.:**  $\gamma_{N_2} = \frac{7}{5} = \gamma_{O_2}$

$$\frac{v_{N_2}}{v_{O_2}} = \sqrt{\frac{T_{N_2} M_{O_2}}{M_{N_2} T_{O_2}}} = \sqrt{\frac{T_{N_2} \times 32}{28 \times (400)}}$$

$$T_2 = \frac{400 \times 28}{32} = 350 \text{ K}$$

$$= 77^\circ\text{C}$$

40. Answer (4)

**Hint:** Ratio of speeds =  $\sqrt{\text{Ratio of tensions}}$

**Sol.:** Torque about R would be zero



$$T_1(PR) = T_2(RQ)$$

$$\frac{T_1}{T_2} = \frac{RQ}{PR} = \frac{1}{2}$$

$$\therefore \text{Ratio of speeds} = 1 : \sqrt{2}$$

41. Answer (1)

**Hint:**  $y = f(\omega t + kx)$ ;  $v = \frac{\omega}{k}$

**Sol.:**  $y = e^{-(\sqrt{a}x + \sqrt{b}t)^2}$

$\therefore$  Wave pulse is moving along negative x direction

with speed =  $\sqrt{\frac{b}{a}}$

42. Answer (4)

**Hint:** Maximum resultant intensity =  $4I$  ( $I$  : Intensity of individual waves) and  $\text{dB} = 10 \log_{10} \left( \frac{I}{I_0} \right)$

**Sol.:**  $I_{\text{net}} = 4I$

$$\text{Total loudness (dB)} = 10 \log_{10} \left( \frac{4I}{I_0} \right)$$

$$\text{Individual loudness (dB)} = 10 \log_{10} \left( \frac{I}{I_0} \right)$$

$$10 \log \left( \frac{I}{I_0} \right) + n = 10 \log \left( \frac{4I}{I_0} \right)$$

$$n = 10 \left\{ \log_{10} \left( \frac{4I}{I_0} \right) - \log_{10} \left( \frac{I}{I_0} \right) \right\}$$

$$n = 10 \log_{10} (4)$$

43. Answer (1)

**Hint:** Maximum particle velocity =  $A\omega$

**Sol.:**  $y = A \sin(\omega t - kx)$

$$v_P = \frac{dy}{dt} = A\omega \cos(\omega t - kx)$$

$$\Rightarrow v_{P, \text{max}} = A\omega$$

44. Answer (4)

**Hint:** Acceleration ( $a$ ) =  $\frac{d^2y}{dt^2} = -2 \sin(50\pi t - 20\pi t)$

**Sol.:** At  $x = 10 \text{ cm}$  and  $t = 4 \text{ s}$ .

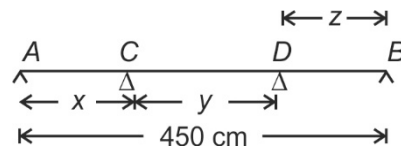
$$= \frac{d^2y}{dt^2} = -2 \sin(200\pi - 200\pi) = 0$$

45. Answer (3)

**Hint:** Fundamental frequency =  $\frac{v}{2l}$

**Sol.:** As tension remains same, speed also remains same.

$$\therefore f \propto \frac{1}{l}$$



$$x + y + z = 450$$

$$x : y : z = 1 : \frac{1}{3} : \frac{1}{6}$$

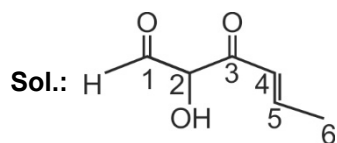
$$x : y : z = 6 : 2 : 1$$

$$x = \frac{6}{9} \times 450 = 300 \text{ cm}$$

$$(x + y) = \frac{(6+2)}{9} \times 450 = 400 \text{ cm}$$

## [CHEMISTRY]

46. Answer (1)

**Hint:** Aldehyde is given more priority over ketone.

2-hydroxy-3-oxohex-4-enal

47. Answer (4)

**Hint:** In naphthalene, all carbon atoms are  $sp^2$  hybridised.

48. Answer (2)

**Hint:** Higher the electronegativity, lesser is the +I effect.

49. Answer (3)

**Hint:** % of N =  $\frac{1.4 \times \text{meq of NH}_3}{\text{mass of compound}}$ **Sol.:** meq of  $\text{NH}_3$  = meq of  $\text{H}_2\text{SO}_4$   
=  $15 \times 1 \times 2 = 30$  $\therefore$  % of N in soil sample =  $\frac{1.4 \times 30}{1} = 42\%$ 

50. Answer (1)

**Hint:** Common branched groups have specific trivial names.**Sol.:**  $-\text{CH}_2\text{C}(\text{CH}_3)_3$  is called neopentyl group.

51. Answer (3)

**Hint:** Greater is the +R effect, greater is the ring activation.

52. Answer (4)

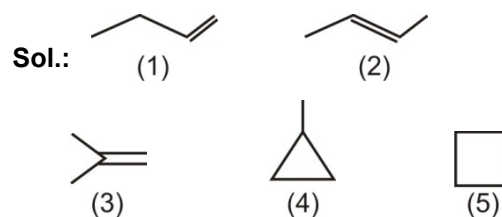
**Hint:** No double bond is possible at bridge head position**Sol.:**

- shows hyperconjugation due to 3 $\alpha$  hydrogen
- In carbanion, hyperconjugation is not possible.

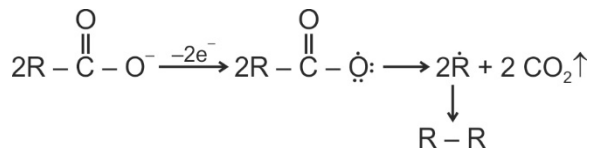
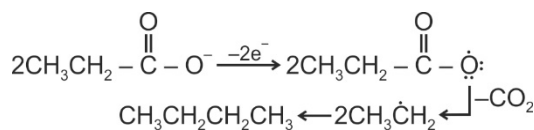
53. Answer (2)

**Hint:** 233 g  $\text{BaSO}_4$  contains 32 g S**Sol.:** Sulphur in 0.466 g  $\text{BaSO}_4 = \frac{32 \times 0.466}{233}$   
= 0.064 gPercentage of sulphur =  $\frac{0.064}{0.2} \times 100 = 32\%$ 

54. Answer (3)

**Hint:**  $\text{C}_4\text{H}_8$  has degree of unsaturation equal to one.There are total five structural isomers possible for  $\text{C}_4\text{H}_8$ .

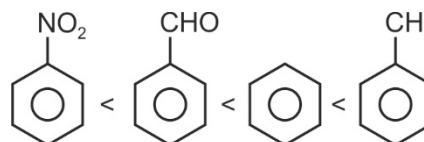
55. Answer (2)

**Hint:****Sol.:** Reaction at anode:

56. Answer (1)

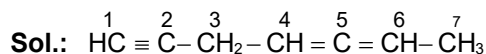
**Hint:**  $\text{H}_3\text{O}^+$  is not a nucleophile.**Sol.:** Nucleophile are electron rich species.

57. Answer (4)

**Hint:**  $-\text{NO}_2$  is an electron withdrawing group.**Sol.:** Greater is the electron density on the ring, greater is the rate towards electrophilic substitution.

58. Answer (1)

**Hint:** Carbon atom forming two pi bonds is  $sp$  hybridised.



$\text{C}_2$  :  $sp$  hybridised       $\text{C}_5$  :  $sp$  hybridised

$\text{C}_3$  :  $sp^3$  hybridised       $\text{C}_6$  :  $sp^2$  hybridised

59. Answer (1)

**Hint:** Greater is the % s-character, greater is the electronegativity.

**Sol.:**  $\text{R} - \text{C} \equiv \overset{\ominus}{\text{C}}$  is most stable among the following as the carbon atom carrying the negative charge is  $sp$  - hybridised.

60. Answer (2)

**Hint:** Blue colour is of ferri ferrocyanide.

**Sol.:**  $\text{Fe}_4[\text{Fe}(\text{CN})_6]_3$  is prussian blue.

61. Answer (2)

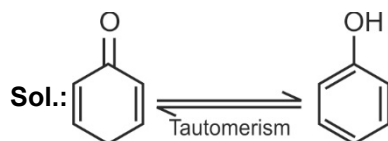
**Hint:** Aniline water mixture is separated by steam distillation.

62. Answer (3)

**Hint:** Greater is the +R effect of substituent at para position, greater the stability of carbonium ion.

63. Answer (1)

**Hint:** Enolisable H participates in tautomerism.

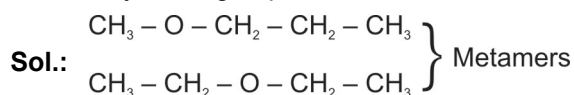


64. Answer (1)

**Hint:**  $(\text{CH}_3)_2\text{O}$  is electron rich so can not behave as electrophile.

65. Answer (2)

**Hint:** Polyvalent group can show metamerism.



66. Answer (3)

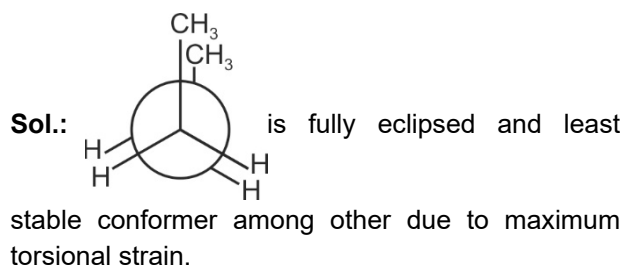
**Hint:** Conjugated carbanion is  $sp^2$  hybridised.

67. Answer (2)

**Hint:** Alkanol is  $\text{R} - \text{OH}$ .

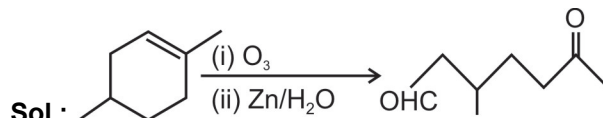
68. Answer (3)

**Hint:** Dihedral angle is  $0^\circ$  in eclipsed conformer.



69. Answer (3)

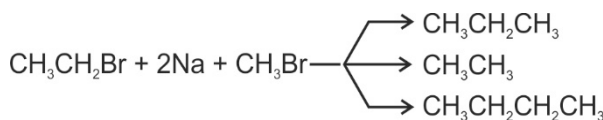
**Hint:** Reductive ozonolysis of cyclic compound give dicarbonyl compounds.



70. Answer (4)

**Hint:**  $\text{R} - \text{X} + 2\text{Na} + \text{X} - \text{R}' \xrightarrow[\text{Ether}]{\text{Dry}} \text{R} - \text{R}' + 2\text{NaX}$

**Sol.:**

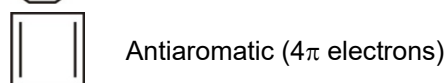
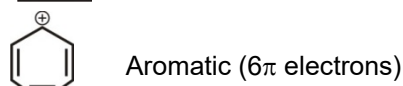
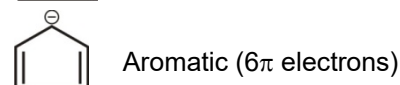


71. Answer (4)

**Hint:** Hydrogen attached to  $sp$  hybridised carbon atom is acidic in nature.

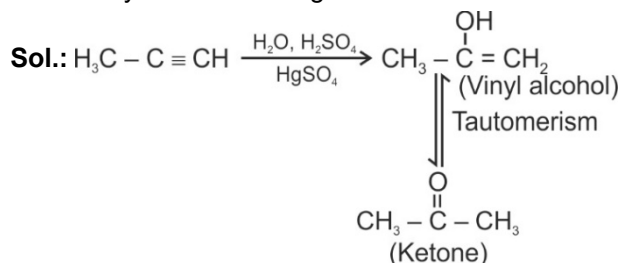
72. Answer (4)

**Hint:** Aromatic molecules/ions contain  $(4n + 2) \pi$  electrons



73. Answer (2)

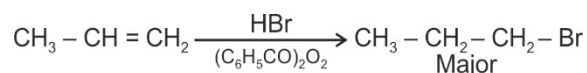
**Hint:** Vinyl alcohol undergoes tautomerisation





74. Answer (4)

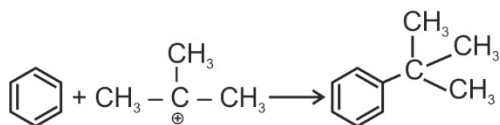
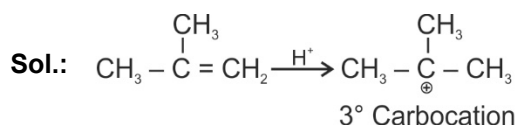
**Hint:** Peroxide effect is applicable to HBr.

**Sol.:**


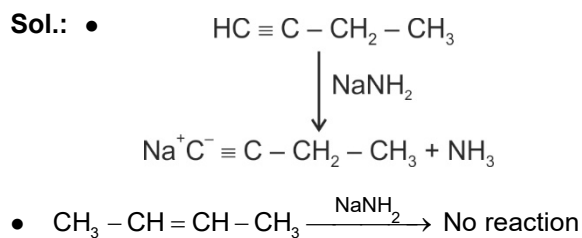
75. Answer (4)

**Hint:** Halogen attached with  $sp^3$  hybridised carbon of alkyl chain gives Friedel Craft reaction most easily.

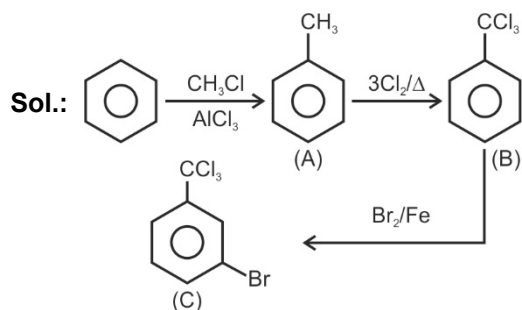
76. Answer (1)

**Hint:** Addition of  $\text{H}^+$  over alkene is governed by the stability of carbocation formed.


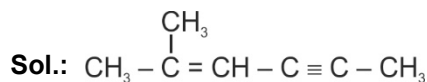
77. Answer (4)

**Hint:**  $\text{NaNH}_2$  reacts with acidic hydrogen and forms ammonia.


78. Answer (3)

**Hint:**  $-\text{CCl}_3$  is meta directing group


79. Answer (2)

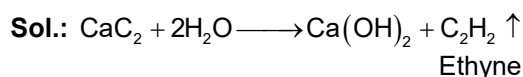
**Hint:** Double bond contains  $1\pi$  bond and triple bond contains  $2\pi$  bond

 Total no. of  $\sigma$  bonds = 16

 Total no. of  $\pi$  bonds = 3

80. Answer (3)

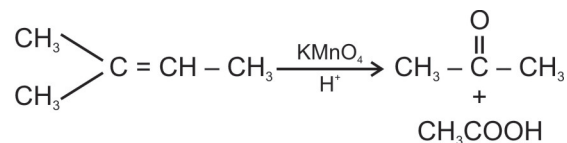
**Hint:** Geometric isomers differ in spatial arrangement of atoms.

81. Answer (4)

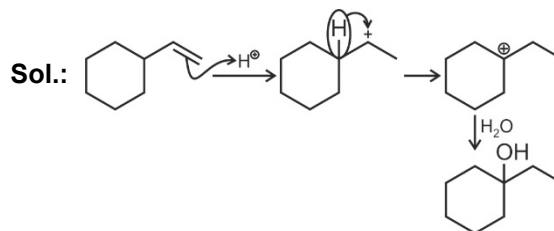
**Hint:** Unsaturated hydrocarbon is obtained.


82. Answer (4)

**Hint:** In acidified  $\text{KMnO}_4$  solution, aldehydes are oxidised to carboxylic acids.

**Sol.:**


83. Answer (4)

**Hint:** Protonation of alkene takes place followed by carbonium ion rearrangement.


84. Answer (4)

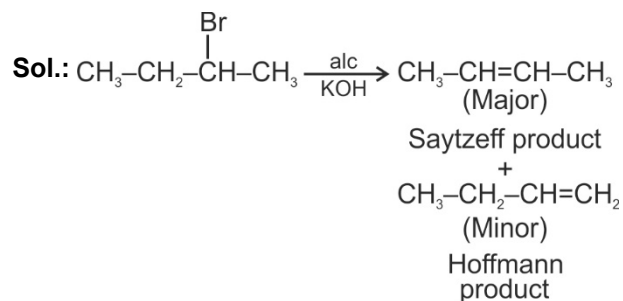
**Hint:** Minimum the surface area of alkane, lower will be the boiling point.

85. Answer (3)

**Hint:** Prescribed upper limit of lead in drinking water is 50 ppb.

86. Answer (1)

**Hint:** alc KOH gives  $\beta$  elimination reaction by Saytzeff elimination.



87. Answer (1)

**Hint:** Nitrate poisoning causes blue baby syndrome

88. Answer (4)

**Hint:** Photochemical smog contains formaldehyde, Acrolein and PAN.

89. Answer (4)

**Hint:** Nitrous oxide, carbon dioxide and ozone cause green house effect.

90. Answer (1)

**Hint:** Excess of fluoride causes brown mottling of teeth.

## [BIOLOGY]

91. Answer (4)

**Hint:** Site of glycolysis is cytoplasm

**Sol.:** Glycolysis is a ten step process in which glucose is finally converted into pyruvic acid. It involves utilisation of 2ATP molecules in initial steps. Oxygen is not required at any step of glycolysis.

92. Answer (4)

**Hint:** EMP pathway is common in both aerobic and anaerobic respiration.

**Sol.:** Glucose is converted into glucose-6-phosphate with the help of an enzyme hexokinase. This step utilises one ATP molecule.

93. Answer (2)

**Hint:** Substrate level phosphorylation results in formation of ATP.

**Sol.:** Substrate level phosphorylation is a metabolic reaction that results in formation of ATP/GTP by direct transfer of phosphate group to ADP/GDP from another phosphorylated compound.

94. Answer (1)

**Hint:** Glyceraldehyde-3-phosphate is an intermediate of glycolysis.

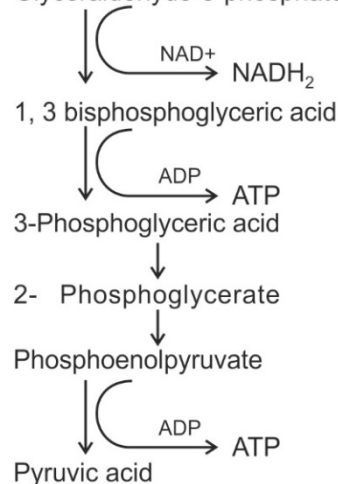
**Sol.:** Oxidation of glyceraldehyde-3-phosphate finally yields

Pyruvic acid = 1

ATP = 2

$\text{NADH}_2 = 1$

Glyceraldehyde-3-phosphate



95. Answer (4)

**Hint:** Pyruvic acid is not completely oxidised during anaerobic respiration.

**Sol.:** In anaerobic respiration, pyruvic acid is partially oxidised into alcohol &  $\text{CO}_2$  is liberated. Pyruvic acid decarboxylase needs  $\text{Mg}^{++}$  as a cofactor.

96. Answer (2)

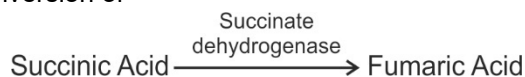
**Hint:** Both lactic acid and alcohol fermentation are comparatively less efficient than aerobic respiration.

**Sol.:** In fermentation there is net gain of 2 ATP only.

97. Answer (4)

**Hint:** All enzymes of citric acid cycle are present in matrix of mitochondria except succinate dehydrogenase.

**Sol.:** Succinate dehydrogenase catalyse conversion of



98. Answer (4)

**Hint:** In each turn of TCA cycle 3 NADH<sub>2</sub>, 1 FADH<sub>2</sub> & 1 GTP are produced.

**Sol.:** In one turn of citric acid cycle, total ATP molecules produced are

$$3 \text{ NADH}_2 = 9 \text{ ATP}$$

$$1 \text{ FADH}_2 = 2 \text{ ATP}$$

$$1 \text{ ATP/GTP} = 1 \text{ ATP}$$

$$\text{Total} = 12 \text{ ATP}$$

For oxidation of one molecule of glucose there will be 2 turns of citric acid cycle.

Hence total number of ATP produced are =  $12 \times 2 = 24 \text{ ATP}$

99. Answer (4)

**Hint:** Complex IV of ETS contains copper.

**Sol.:** Cytochrome c oxidase contains cytochrome a<sub>1</sub>, a<sub>3</sub> and two copper centres.

100. Answer (2)

**Hint:** One ATP yields about 34 kJ/mol

**Sol.:** 1 glucose = 38 ATP

$$38 \text{ ATPs} = 1292 \text{ kJ/mol}$$

Total energy stored in one molecule of glucose = 2870 kJ

$$\text{Efficiency} = \frac{1292}{2870} \times 100 = 45\%$$

101. Answer (3)

**Sol.:** Respiratory pathway is mainly a catabolic process. Since many intermediates formed during this process are precursor of various compounds. Thus, this pathway involves both anabolism and catabolism, that is why it is considered as amphibolic pathway.

102. Answer (2)

$$\text{Hint: } RQ = \frac{\text{Volume of CO}_2 \text{ evolved}}{\text{Volume of O}_2 \text{ consumed}}$$

**Sol.:** In anaerobic respiration, volume of O<sub>2</sub> consumed is zero. Thus RQ = ∞.

103. Answer (4)

**Sol.:** Accumulation of alcohol beyond 13% kills the yeast. Maximum ethyl alcohol concentration obtained is 13%.

104. Answer (3)

**Hint:** Proton gradient is required for phosphorylation.

**Sol.:** The passage of protons through the channel is coupled to the catalytic site of the F<sub>1</sub> component for the production of ATP. For each ATP produced, 2H<sup>+</sup> pass through F<sub>0</sub> from intermembranal space to matrix of mitochondria.

105. Answer (1)

**Hint:** Value of RQ varies according to substrate.

**Sol.:** The respiratory quotient depends upon the type of respiratory substrate used during respiration. eg. value of RQ for carbohydrate, proteins and fats is 1, 0.9 and 0.7 respectively.

106. Answer (1)

**Sol.:** Oxygen acts as terminal electron acceptor & combines with protons to form metabolic water.

107. Answer (1)

**Hint:** Auxin causes apical dominance in plants.

**Sol.:** Tryptophan (an amino acid) is precursor of auxin synthesis.

108. Answer (1)

**Sol.:** After receiving sunlight by the tip of coleoptiles, auxin is transmitted to sub-apical part which bend towards direction of sunlight.

109. Answer (2)

**Hint:** Auxin induces apical dominance

**Sol.:** Apical buds secretes auxin which inhibits growth of lateral buds. If the apical bud is removed (decapitation) the lateral buds starts growing.

110. Answer (1)

**Hint:** Gibberellins are used to speed up the malting process in brewing industries.

**Sol.:** Gibberellins stimulate stem elongation.

111. Answer (3)

**Sol.:** There are more than 100 gibberellins reported in fungi and higher plants. Gibberellic acid (GA<sub>3</sub>) is the most intensively studied form.

112. Answer (1)

| <b>Sol.: Composition</b> | <b>Phytohormones</b>                               |
|--------------------------|--|
| Indole compounds         | – IAA, IBA (Auxins)                                |
| Terpenes                 | – Gibberellic Acid                                 |
| Adenine derivatives      | – Kinetin (Cytokinin)                              |
| Gas                      | – Ethylene<br>(CH <sub>2</sub> = CH <sub>2</sub> ) |

113. Answer (3)

**Hint:** Yield of sugarcane can be increased by increasing its internodal length.

**Sol.:** Spraying sugarcane crop with gibberellins increases the length of stem, thus increase the yield by as much as 20 tonnes per acre.

114. Answer (4)

**Hint:** Ethylene induces femaleness.

**Sol.:** Ethylene promotes sprouting of potato tubers, rapid internodal elongation in deep water rice plants and also thinning of cotton fruit but in cucumber it promotes female flowers.

115. Answer (4)

**Sol.:** In rosette plants like cabbage, gibberellin induces internode elongation causing a marked increase in stem height. This phenomenon is known as bolting.

116. Answer (3)

**Sol.:** A hypothetical hormonal substance known as florigen which is responsible for flowering is found in leaves. It migrates from leaves to shoot apices to induce flowering.

117. Answer (2)

**Hint.:** Cytokinins along with auxins are essential in tissue culture as they are required for callus morphogenesis.

**Sol.:** Cytokinin promotes shoot formation in callus. Thus its absence will result in lack of shoot in callus.

118. Answer (2)

**Hint:** Cytokinin promotes nutrient mobilisation.

**Sol.:** Cytokinins delay senescence of leaves by controlling protein synthesis and mobilisation of nutrients.

119. Answer (2)

**Sol.:** The phenomena of exposing plants to low temperature to promote flowering, is termed as vernalisation.

120. Answer (1)

**Hint:** Short day plants flower when they receive photoperiod shorter than critical period.

**Sol.:** If the dark period of short day plant is interrupted by flash of light, these plants do not show flowering, as it exceeds the photoperiod.

121. Answer (2)

**Hint:** The phenomena in which differentiated cells regain their capacity to divide, is called dedifferentiation.

**Sol.:** Interfascicular cambium, cork cambium and wound cambium are formed from fully differentiated parenchyma cells. Intrafascicular cambium is a primary meristematic tissue.

122. Answer (1)

**Sol.:** Inactive form of phytochrome (Pr) absorb light of 660 nm and gets rapidly converted into P<sub>fr</sub> form.

123. Answer (4)

**Sol.:** Cytokinin delays senescence whereas ABA induces it.

124. Answer (3)

**Sol.:** This type of growth is called arithmetic growth and it gives linear growth curve.

125. Answer (2)

**Hint:** Auxin causes apical dominance.

**Sol.:** Auxin and cytokinin both promotes cell division. Auxin promotes the apical growth whereas cytokinin promotes the lateral growth of shoot.

126. Answer (2)

**Hint:** Auxin is present at the tips of shoots.

**Sol.:** Removal of apical bud is done for preparation of dense hedges. When the apical bud of plant is removed, the lateral bud starts developing into branches.

127. Answer (3)

**Sol.:** Auxin was first isolated from human urine.

2, 4-D is used to remove broad leaved weeds or dicotyledonous weeds in cereal crops.

128. Answer (3)

**Hint:** The process where dedifferentiated cells again loose their ability to divide further is called redifferentiation.

**Sol.:** Secondary phloem is formed by the activity of vascular cambium through redifferentiation.

129. Answer (4)

**Sol.:** Arithmetic growth rate can be expressed by following equation:  $L_t = L_0 + rt$

Where,

$L_t$  = length of the organ at time 't'.

$L_0$  = length of the organ at time 'zero'.

r = growth rate or elongation per unit time.

130. Answer (2)

**Sol.:** In viviparous plants fruits/seeds do not fall on surface of earth rather they germinate on parent plant.

131. Answer (3)

**Hint:** Dormancy is under endogenous control.

**Sol.:** Dormancy is the condition of seed when it is unable to germinate inspite of availability of all environmental conditions suitable for germination.

132. Answer (2)

**Hint:** Abscisic acid functions as growth inhibitor.

**Sol.:** The synthesis of ABA is stimulated by drought, water logging and other adverse environmental conditions. Therefore, it is known as stress hormone.

133. Answer (1)

**Hint:** Long day plant needs light for longer period than critical day length.

**Sol.:** Raddish is a long day plant. Soyabean and tobacco are short day plants and tomato is a day neutral plant.

134. Answer (3)

**Sol.:** Rice seedlings grow excessively tall and become weak and sterile due to fungal infection (*Gibberella fujikuroi*). This fungus induces synthesis of gibberellins.

135. Answer (4)

**Sol.:** Zeatin is a naturally occurring cytokinin in maize plant.

IBA and IAA are naturally occurring auxins while NAA is a synthetic auxin.

136. Answer (2)

**Hint:** Figure (c) represents an echinoderm.

**Sol.:** *Asterias* (echinoderm) and prawn (arthropod) show organ system-level of organisation.

137. Answer (2)

**Hint:** Select a structure which is located dorsally.

**Sol.:** Notochord is formed on the dorsal or upper side of the body of an embryo and defines its primitive axis. In some chordates, notochord is replaced by the vertebral column and these chordates are called vertebrates

138. Answer (4)

**Hint:** Phylum which has pseudocoelom.

**Sol.:** Most animals from aschelminthes to chordates possess complete digestive system. Coelenterates, Ctenophores and Platyhelminthes possess incomplete digestive system. Complete digestive system has two openings-mouth and anus.

139. Answer (1)

**Hint:** Cell aggregate body plan.

**Sol.:** In poriferans, cells are arranged as loose cell aggregates but they do not form any tissue. Cellular level of organisation is exhibited by poriferans.

140. Answer (4)

**Hint:** The largest phylum of kingdom Animalia.

**Sol.:** Arthropods have an open circulatory system. In open type circulatory system, the body cells and tissues are directly bathed in blood pumped out of the heart as the blood flows in open spaces.

141. Answer (1)

**Hint:** They are called spiny bodied animals.

**Sol.:** Radial symmetry is exhibited by some sponges, coelenterates, ctenophores and adult echinoderms. First phylum of animal kingdom to exhibit bilateral symmetry is platyhelminthes.

142. Answer (4)

**Hint:** Repeating segments.

**Sol.:** Cockroach and earthworm both have metameric segmentation. Chitinous exoskeleton is present in cockroach. Jointed appendages are locomotory structures in cockroach. Both of these animals are protostomes.

143. Answer (2)

**Hint:** *Ascaris* belongs to this phylum.

**Sol.:** In pseudocoelomates, the body cavity is present but it is not completely lined by mesoderm, instead the mesoderm is present as scattered pouches in between the ectoderm and endoderm. Such a body cavity is called pseudocoelom (pseudo – false, coelom – body cavity). e.g., Aschelminthes.

144. Answer (3)

**Hint:** Body of molluscs is unsegmented.

**Sol.:** Segmentation is defined as the division of body into parts or segments. These body segments are called metameres. Segmentation is seen in annelids, arthropods and chordates.

145. Answer (3)

**Hint:** Fertilisation occurs within the body of a poriferan.

**Sol.:** Sponges undergo internal fertilisation. The development in sponges is mediated by an intermediate free swimming flagellated larval stage for dispersal of species. Larval stage is morphologically distinct from adult. Thus, the development in sponges is indirect. Both asexual and sexual reproduction occur in sponges.

146 Answer (4)

**Hint:** Sponges are sessile organisms.

**Sol.:** Functions of canal system or water transport system in sponges are:

- Food gathering
- Respiratory exchange
- Removal of waste
- Transfer of sperms

147. Answer (2)

**Hint:** These structures help in movement from one place to another.

**Sol.:** The external surface of the body of ctenophores bears eight comb plates. These comb plates bear cilia which are fused to make these plates ciliated. Skeletal, circulatory, respiratory and excretory systems are absent in ctenophores.

148. Answer (4)

**Hint:** *In-vivo* fusion of gametes.

**Sol.:** Fertilisation is external in ctenophores. Zygote develops into a free swimming larva called cydippid larva.

149. Answer (4)

**Hint:** Parasitic worms are exposed to digestive juices of host.

**Sol.:** The body of endoparasitic flatworms is externally covered with a thick tegument, a protective layer that protects the parasitic worms from the digestive juices of host. Hooks and suckers act as the organs of attachment, present in

*Taenia*. In endoparasites, soluble food materials directly diffuse through their body surface.

150. Answer (1)

**Hint:** Phylum which has blood sinuses.

**Sol.:** Body of some molluscs (e.g., *Pila*) are covered by a calcareous shell. Body of roundworms is circular in cross section.

Molluscs are mostly oviparous.

151. Answer (2)

**Hint:** Leeches feed on the blood of fishes, frogs, cattles and other animals.

**Sol.:** Annelids may be aquatic (marine and fresh water) or terrestrial, for e.g., *Nereis* is marine, earthworm is terrestrial and *Hirudinaria* is a fresh water annelid.

152. Answer (3)

**Hint:** Bony fish found in aquarium.

**Sol.:** *Pteropus* – Mammal

*Petromyzon* – Cyclostome

*Pristis* – *Chondrichthyes*

153. Answer (3)

**Hint:** Select an echinoderm.

**Sol.:** *Loligo* and *Pinctada* are members of Phylum Mollusca whereas *Antedon* is an echinoderm.

154. Answer (1)

**Hint:** It is also called brittle star.

**Sol.:** Echinoderms show the presence of ossicles and are thus called spiny bodied. e.g., *Asterias*, *Echinus*, *Antedon*, *Cucumaria* and *Ophiura*. *Euspongia* belongs to porifera and has spongin fibres. *Meandrina* are coelenterates. *Octopus* lacks internal and external shell.

155. Answer (2)

**Hint:** Hemichordates are exclusively marine.

**Sol.:** Fertilisation in hemichordates takes place in the sea water.

156. Answer (1)

**Hint:** This animal is a urochordate.

**Sol.:** In urochordates, notochord is only present in the tail of the larva (hence named Urochordates) and disappears in the adult. e.g., *Ascidia*, *Salpa*, *Doliolum*.

In cephalochordates, notochord extends from head to tail region and it persists throughout the life. In vertebrates, notochord is replaced by a cartilaginous or bony vertebral column in the adult.

157. Answer (3)

**Hint:** Vector for diseases.

**Sol.:** Female *Culex* is vector for elephantiasis. *Ctenoplana* lacks a coelom, *Cucumaria* has enterocoel and *Sepia* has closed circulatory system.

158. Answer (2)

**Hint:** These structures take part in circulation of water for respiration.

**Sol.:** Gill slits are absent in non-chordates. Chordates have paired pharyngeal gill slits. In higher chordates, they occur only in embryonic stage.

159. Answer (2)

**Hint:** Chitinous exoskeleton.

**Sol.:** *Hydra* lacks metagenesis and shows direct development. Leech lacks both parapodia and setae. *Unio* lacks radula.

160. Answer (4)

**Hint:** This is an arthropod.

**Sol.:** Silver fish, *Lepisma* is ametabolous showing direct development. *Planula* & *Ephyra* are larvae of Jelly fish. While brachiolaria is larva of starfish. Tornaria larva is formed during life cycle of tonguworm.

161. Answer (4)

**Hint:** Free living worm.

**Sol.:** *Planaria* is not an endoparasite but is found in streams and rivers.

162. Answer (1)

**Hint:** Endoskeleton is made up of cartilage.

**Sol.:** Examples of chondrichthyes include – *Scoliodon*, *Pristis*, *Trygon*, *Torpedo* and *Carcharodon*.

Examples of osteichthyes include *Exocoetus*, *Hippocampus*, *Pterophyllum*, *Betta*, *Labeo* and *Catla*.

163. Answer (2)

**Hint:** Animals which have no syrinx.

**Sol.:** *Neophron* is vulture, *Psittacula* is parrot and *Pavo* is peacock. Ostrich, penguins and kiwi are few examples of flightless birds.

164. Answer (4)

**Hint:** Select a structure which supplements respiration.

**Sol.:** Respiration is carried out by lungs in birds. Air sacs connected to lungs are non-vascular and supplement respiration.

165. Answer (2)

**Hint:** Select a Chondrichthyes.

**Sol.:** The skin of *Pristis* is tough and contains minute placoid scales.

166. Answer (2)

**Hint:** All aves are oviparous.

**Sol.:** Erythrocytes of aves are oval, biconvex and nucleated. Erythrocytes of mammals are circular, biconcave and non-nucleated.

167. Answer (3)

**Hint:** Bony fishes

**Sol.:** Scales are absent in Hag fish. Swim bladder is not present in sting ray. Tree frog (*Hyla*) is tail less amphibian.

168. Answer (4)

**Hint:** Identify a mollusca.

**Sol.:** Sea lily and sea urchin are echinoderms sea fan is a coelenterate.

Sea hare (*Aplysia*) belongs to phylum mollusca characterised by presence of distinct mantle.

169. Answer (3)

**Hint:** This is a product of ornithine cycle.

**Sol.:** Excretion is uricotelic in snakes and crocodiles.

170. Answer (4)

**Hint:** Select the group involving all mammals.

**Sol.:** Ostrich, platypus and kiwi are oviparous. Horse, whale, monkey, lemur and tiger are viviparous.

171. Answer (1)

**Hint:** Respiratory system of cockroach.

**Sol.:** Respiration through skin (cutaneous), gills (branchial) and lungs (pulmonary) is seen in amphibians.

172. Answer (3)

**Hint:** They are genus of hag fish.

**Sol.:** *Eptatretus* and *Neo Myxine* (Hag fish) are cyclostomes. Their mouth does not possess jaws hence are named Agnatha.

173. Answer (4)

**Hint:** Pneumatic bones with air sacs help in flight.

**Sol.:** Endoskeleton of aves is fully ossified (bony) and the long bones are hollow with air cavities. Such bones are called pneumatic bones and lack bone marrow.

174. Answer (4)

**Hint:** Choose the amphibian.

**Sol.:** In frog, sperms produced by testes are passed into Bidder's canal via vasa efferentia and then carried finally to the urinogenital duct.

175. Answer (1)

**Hint:** Select a genus of aves.

**Sol.:** *Columba* comprises species of pigeons. *Hemidactylus* is a reptile. *Exocoetus* (flying fish) belongs to osteichthyes. *Calotes* is a lizard.

Presence of crop and gizzard is the characteristic feature of arthropods and aves.

176. Answer (3)

**Hint:** Structure that projects from the sides of 9<sup>th</sup> sternites.

**Sol.:** Anal styles are paired and thin small unjointed outgrowths, present in male cockroaches only. They are sensitive to touch.

177. Answer (1)

**Hint:** Tegmina are attached to mesothorax.

**Sol.:** Forewings are called tegmina/elytra and they are attached to mesothorax.

178. Answer (1)

**Hint:** *Pheretima* exhibits a closed type of blood vascular system.

**Sol.:** There are two pairs of testis sacs in the 10<sup>th</sup> and 11<sup>th</sup> segments. Development is direct in earthworms. Haemoglobin is present in plasma.

179. Answer (4)

**Hint:** It is used to pass sperms to the exterior.

**Sol.:** The cloaca is a small, median chamber that is used to pass faecal matter, urine and sperms to the exterior.

180. Answer (4)

**Hint:** All female reproductive organs are confined to abdomen.

**Sol.:** A pair of yellow-coloured ovaries lie laterally in 2<sup>nd</sup> to 6<sup>th</sup> abdominal segments, one on either side of hindgut, and embedded in fat bodies.





## All India Aakash Test Series for NEET - 2021

**TEST - 6 (Code-D)**

Test Date : 01/03/2020

**ANSWERS**

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

# HINTS & SOLUTIONS

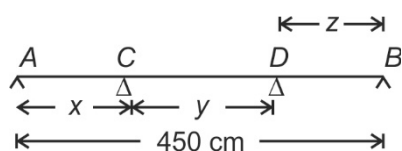
## [PHYSICS]

1. Answer (3)

**Hint:** Fundamental frequency =  $\frac{v}{2l}$

**Sol.:** As tension remains same, speed also remains same.

$$\therefore f \propto \frac{1}{l}$$



$$x + y + z = 450$$

$$x : y : z = 1 : \frac{1}{3} : \frac{1}{6}$$

$$x : y : z = 6 : 2 : 1$$

$$x = \frac{6}{9} \times 450 = 300 \text{ cm}$$

$$(x + y) = \frac{(6 + 2)}{9} \times 450 = 400 \text{ cm}$$

2. Answer (4)

**Hint:** Acceleration (a) =  $\frac{d^2y}{dt^2} = -2\sin(50\pi t - 20\pi t)$

**Sol.:** At  $x = 10 \text{ cm}$  and  $t = 4 \text{ s}$ .

$$= \frac{d^2y}{dt^2} = -2\sin(200\pi - 200\pi) = 0$$

3. Answer (1)

**Hint:** Maximum particle velocity =  $A\omega$

**Sol.:**  $y = A\sin(\omega t - kx)$

$$v_P = \frac{dy}{dt} = A\omega \cos(\omega t - kx)$$

$$\Rightarrow v_{P, \max} = A\omega$$

4. Answer (4)

**Hint:** Maximum resultant intensity =  $4I$  ( $I$  : Intensity of individual waves) and  $\text{dB} = 10\log_{10}\left(\frac{I}{I_0}\right)$

**Sol.:**  $I_{\text{net}} = 4I$

$$\text{Total loudness (dB}_1) = 10\log_{10}\left(\frac{4I}{I_0}\right)$$

$$\text{Individual loudness (dB}_2) = 10\log_{10}\left(\frac{I}{I_0}\right)$$

$$10\log\left(\frac{I}{I_0}\right) + n = 10\log\left(\frac{4I}{I_0}\right)$$

$$n = 10\left\{\log_{10}\left(\frac{4I}{I_0}\right) - \log_{10}\left(\frac{I}{I_0}\right)\right\}$$

$$n = 10\log_{10}(4)$$

5. Answer (1)

**Hint:**  $y = f(\omega t + kx)$ ;  $v = \frac{\omega}{k}$

**Sol.:**  $y = e^{-(\sqrt{a}x + \sqrt{b}t)^2}$

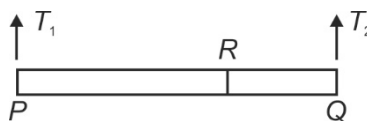
$\therefore$  Wave pulse is moving along negative  $x$  direction

with speed =  $\sqrt{\frac{b}{a}}$

6. Answer (4)

**Hint:** Ratio of speeds =  $\sqrt{\text{Ratio of tensions}}$

**Sol.:** Torque about  $R$  would be zero



$$T_1(PR) = T_2(RQ)$$

$$\frac{T_1}{T_2} = \frac{RQ}{PR} = \frac{1}{2}$$

$\therefore$  Ratio of speeds =  $1 : \sqrt{2}$

7. Answer (1)

**Hint:**  $v = \sqrt{\frac{\gamma RT}{M}}$

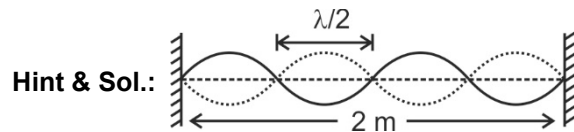
**Sol.:**  $\gamma_{N_2} = \frac{7}{5} = \gamma_{O_2}$

$$\frac{v_{N_2}}{v_{O_2}} = \sqrt{\frac{T_{N_2} M_{O_2}}{M_{N_2} T_{O_2}}} = \sqrt{\frac{T_{N_2} \times 32}{28 \times (400)}}$$

$$T_2 = \frac{400 \times 28}{32} = 350 \text{ K}$$

$$= 77^\circ\text{C}$$

8. Answer (4)



$$4 \times \frac{\lambda}{2} = 2 \text{ m}$$

$$\Rightarrow \frac{\lambda}{2} = 0.5 \text{ m}$$

9. Answer (1)

**Hint & Sol.:** In fundamental mode, string will vibrate in one segment.

Hence  $\frac{\lambda}{2} = l$

$$\lambda = 2 \times 40 \text{ cm} = 80 \text{ cm}$$

10. Answer (4)

**Hint:** Audible range of sound frequency for human is 20 Hz to 20 kHz

**Sol.:**  $f = \frac{300}{4 \times 10^{-3}} = \frac{3 \times 10^5}{4} = 0.75 \times 10^5$

$$= 75 \text{ kHz (inaudible)}$$

Also sound wave is a longitudinal wave.

11. Answer (2)

**Hint:**  $f_{\text{app}} = f_0 \left( \frac{v + v_0}{v - v_s} \right)$

**Sol.:**  $f_{\text{app}} = 160 \left( \frac{300 + 20}{300 - 50} \right) = 160 \times \frac{320}{250}$

$$f_{\text{app}} = \frac{160 \times 32}{25} = 204.8 \text{ Hz}$$

12. Answer (2)

**Hint:**  $f = \frac{1}{2l} \sqrt{\frac{T}{\mu}} = \frac{1}{2l} \sqrt{\frac{T}{\rho(\pi r^2)}}$

**Sol.:**  $\Rightarrow f \propto \frac{1}{lr} \sqrt{\frac{T}{\rho}}$

$$\frac{f_A}{f_B} = \frac{l_B r_B}{l_A r_A} \sqrt{\frac{T_A \rho_B}{\rho_A T_B}} = \frac{1}{4 \times 4} \sqrt{\frac{4}{4}} = \frac{1}{16}$$

13. Answer (1)

**Hint:**  $n = \frac{v}{2l}$  and beat frequency =  $n_1 \sim n_2$

**Sol.:** 1<sup>st</sup> case

$$\frac{v}{2l_1} - n = 5 \quad \dots(1)$$

In second case

$$n - \frac{v}{2l_2} = 5 \quad \dots(2)$$

$$\frac{v}{2l_1} = \frac{n+5}{n-5}$$

$$\frac{l_2}{l_1} = \frac{n+5}{n-5}$$

$$\frac{21}{20} = \frac{n+5}{n-5}$$

$$n = 205 \text{ Hz}$$

14. Answer (4)

**Hint & Sol.:** In a closed organ pipe, only odd harmonics are present. Hence, frequency of 200 Hz would be absent.

15. Answer (3)

**Hint:**  $t = \frac{2d}{v}$  ( $t$  : time,  $d$  : distance of hill,  $v$  : speed of sound)

**Sol.:**  $t = \frac{2d}{v}$

$$1.5 = \frac{2d}{330}$$

$$\Rightarrow d = 1.5 \times \frac{330}{2} = 247.5 \text{ m}$$

16. Answer (1)

**Hint:** Beat frequency =  $f_1 \sim f_2$

**Sol.:**  $f_1 = \frac{400\pi}{2\pi} = 200 \text{ Hz}$

$f_2 = \frac{398\pi}{2\pi} = 199 \text{ Hz}$

Beat frequency = 1 Hz

Beats per minute = 60

17. Answer (3)

**Hint & Sol.:** The apparent frequency may be equal, greater or less than original frequency depending on velocities of observer and source.

18. Answer (3)

**Hint:**  $\Delta x = \frac{\lambda}{2\pi} \Delta\phi$

**Sol.:**  $\Delta x = \frac{\lambda}{2\pi} \times \frac{\pi}{6} = \frac{\lambda}{12}$

19. Answer (1)

**Hint:** Beat frequency =  $\Delta f = \frac{v}{2l_1} - \frac{v}{2l_2}$

**Sol.:**  $\Delta f = \frac{v}{2l_1} - \frac{v}{2l_2}$

as  $v = \sqrt{\frac{\gamma RT}{M}}$

$v_{400} \left( \frac{1}{2l_1} - \frac{1}{2l_2} \right) = 4$

$v_{800} \left( \frac{1}{2l_1} - \frac{1}{2l_2} \right) = x$

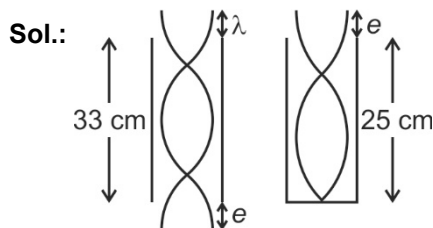
By taking ratio

$\frac{x}{4} = \sqrt{\frac{800}{400}}$

$x = 4\sqrt{2}$

20. Answer (1)

**Hint:** In first overtone  $\lambda = L_o + 2e$  and  $\frac{3\lambda}{4} = L_c + e$



$\lambda = 33 + 2e$

...(1)

$\frac{3\lambda}{4} = 25 + e$  ... (2)

$\lambda = 33 + 2e$

$\lambda = \frac{4}{3} \times 25 + \frac{4}{3}e$

$0 = 33 - \frac{4}{3} \times 25 + 2e - \frac{4}{3}e$

$e = \frac{100 - 99}{2} = 0.5 \text{ cm}$

21. Answer (3)

**Hint:** The frequency of oscillation of kinetic energy is twice the frequency of oscillation of motion for a particle executing SHM.

**Sol.:**  $f = \frac{2}{T} = \frac{2}{4} = 0.5 \text{ Hz}$

22. Answer (1)

**Hint & Sol.:** On a stretched string, at nodes, the strain is maximum. While it is minimum at antinodes.

23. Answer (4)

**Hint & Sol.:**  $v = \sqrt{\frac{\gamma RT}{M}}$

At a constant temperature, the velocity remains constant and does not vary with pressure.

24. Answer (4)

**Hint:**  $T = 2\pi \sqrt{\frac{l}{mgd}}$

**Sol.:**  $T = 2\pi \sqrt{\frac{\frac{mR^2}{2} + mR^2}{mg(R)}} = 2\pi \sqrt{\frac{3R}{2g}}$

25. Answer (2)

**Hint:** Energy  $\frac{1}{2}m\omega^2 A^2$  and  $a = -\omega^2 y$

**Sol.:**  $25 \frac{d^2 y}{dt^2} + 16y = 0$

$\frac{d^2 y}{dt^2} = -\left(\frac{4}{5}\right)^2 y \Rightarrow \omega = \frac{4}{5}$

$\frac{1}{2} \times m\omega^2 A^2 = E$

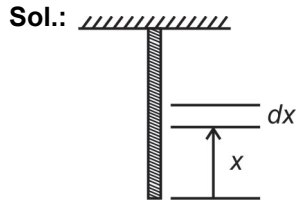
$\frac{1}{2} \times 1 \times \frac{16}{25} \times A^2 = 0.64$

$$A^2 = \frac{50 \times 0.64}{16} = 2$$

$$\Rightarrow A = \sqrt{2} \text{ m}$$

26. Answer (1)

**Hint:** Speed of wave on a string =  $\sqrt{\frac{T}{\mu}}$



Tension at distance x from lower end

$$T = \frac{m}{l} xg = \mu gx$$

$$v = \sqrt{\frac{\mu gx}{\mu}} = \sqrt{gx}$$

$$\Rightarrow \frac{dx}{dt} = \sqrt{gx} \Rightarrow \int_0^x \frac{dx}{\sqrt{x}} = \int_0^t \sqrt{g} dt$$

$$\Rightarrow 2\sqrt{l} = \sqrt{g} t$$

$$\Rightarrow t = 2\sqrt{\frac{l}{g}} = \sqrt{2} \text{ s}$$

27. Answer (4)

**Hint:** Closed organ pipe exhibits only odd harmonics of the fundamental frequency.

**Sol.:** First overtone = 3<sup>rd</sup> harmonic =  $3 \times 200 = 600 \text{ Hz}$

Third overtone = 7<sup>th</sup> harmonic =  $7 \times 200 = 1400 \text{ Hz}$

$$\therefore x = 1400 - 600 = 800 \text{ Hz}$$

28. Answer (3)

**Hint:**  $I_{\max} = (\sqrt{I_1} + \sqrt{I_2})^2$

$$I_{\min} = (\sqrt{I_1} - \sqrt{I_2})^2$$

**Sol.:**  $I_{\max} : I_{\min} = 4 : 1$

$$\Rightarrow \frac{(\sqrt{I_1} + \sqrt{I_2})^2}{(\sqrt{I_1} - \sqrt{I_2})^2} = \frac{4}{1}$$

$$\Rightarrow \sqrt{I_1} + \sqrt{I_2} = 2(\sqrt{I_1} - \sqrt{I_2})$$

$$\Rightarrow \sqrt{I_1} = 3\sqrt{I_2} \Rightarrow \frac{I_1}{I_2} = \frac{9}{1}$$

29. Answer (2)

**Hint & Sol.:** Since a circular motion is not an example of to and fro motion, hence it is not an oscillatory motion.

A uniform circular motion repeats itself after a fixed time interval. Therefore it is periodic.

30. Answer (1)

**Hint & Sol.:** In case of damped oscillation, both amplitude and energy decreases.

31. Answer (1)

**Hint:** Acceleration  $a = -\omega^2 x$

**Sol.:**  $\omega = \frac{2\pi}{T}$

$$\Rightarrow |a| = \omega^2 x$$

$$= \frac{4\pi^2}{T^2} \times \frac{A}{4} = \frac{\pi^2 A}{T^2}$$

32. Answer (3)

**Hint:**  $v = \omega\sqrt{A^2 - x^2}$

**Sol.:**  $4v^2 = 25 - x^2$

$$v = \sqrt{\frac{1}{4}(25 - x^2)} = \frac{1}{2}\sqrt{25 - x^2}$$

$$\therefore \omega = \frac{1}{2} \text{ rad/s} \quad A = 5 \text{ m}$$

$$T = \frac{2\pi}{\omega} = 4\pi \text{ s}$$

33. Answer (3)

**Hint:** Beat frequency =  $f_1 \sim f_2$ . On waxing, the frequency reduces.

**Sol.:** On waxing the tuning fork, its frequency decreases and the beat frequency also decreases.

$$\therefore f_{\text{unknown}} < 212 \text{ Hz}$$

$$\text{Also, } 212 - f_A = 8$$

$$f_A = 204 \text{ Hz}$$

34. Answer (2)

**Hint & Sol.:** On a humid day, sound in air travels faster than that on a dry day. Sound waves, being mechanical waves, require medium to propagate and hence they do not propagate in vacuum.

35. Answer (1)

**Hint & Sol.:** Time period of small oscillation of a spring mass system is independent of acceleration due to gravity while time period of oscillations of a simple pendulum depends on the effective value of acceleration due to gravity.

36. Answer (4)

**Hint:** Fundamental frequency =  $\frac{v}{2l}$ 

**Sol.:**  $v = \sqrt{\frac{\gamma P}{S}}$

$$f_A = \frac{\sqrt{\frac{\gamma P}{\rho}}}{l} = \frac{\sqrt{3P}}{l}$$

Similarly

$$f_B = \frac{\sqrt{\frac{7P}{5\rho}}}{2l} \Rightarrow f_A : f_B = 10 : \sqrt{21}$$

37. Answer (3)

**Hint:**  $v = \sqrt{\frac{T}{\mu}}$

**Sol.:**  $T_{\text{final}} = 1.21 T_{\text{initial}}$

$$v_{\text{final}} = \sqrt{1.21 \frac{T_{\text{initial}}}{\mu}} = \frac{11}{10} v_{\text{initial}}$$

$$\frac{\Delta v}{v} \times 100 = \frac{v_{\text{final}} - v_{\text{initial}}}{v_{\text{initial}}} \times 100 = \left(\frac{11}{10} - 1\right) \times 100 = 10\%$$

38. Answer (2)

**Hint:** Doppler's effect

**Sol.:**  $f_{(\text{app})} = f_0 \left( \frac{v_{\text{sound}} + v_{\text{observer}}}{v_{\text{sound}}} \right)$

$$= 100 \left( \frac{330}{300} \right) = \frac{330}{3} = 110 \text{ Hz}$$

39. Answer (4)

**Hint:** Beat frequency =  $|f_1 - f_2|$ **Sol.:** Let velocity of sound =  $v$ 

$$f_1 = \frac{v}{\lambda_1}, f_2 = \frac{v}{\lambda_2}$$

$$f_1 = \frac{v}{160}; f_2 = \frac{v}{164}$$

$$f_1 - f_2 = \frac{v}{160} - \frac{v}{164} = v \left( \frac{4}{160 \times 164} \right)$$

$$\frac{20}{4} = v \times \frac{4}{160 \times 164}$$

$$v = \frac{20 \times 160 \times 164}{4 \times 4} \Rightarrow 20 \times 10 \times 164$$

$$= 32800 \text{ cm/s} = 328 \text{ m/s}$$

40. Answer (1)

**Hint:** For constructive interference, path difference  $\Delta x = n\lambda$ 

**Sol.:**  $ABCD = 30 + 40 + 30 = 100 \text{ cm}$

$$AFED = 20 + x + 40 = 60 + x$$

$$\Delta x = AFED - ABCD$$

$$= 60 + x - 100$$

$$n\lambda = x - 40$$

$$\text{for } n = 1 \Rightarrow x = 60 \text{ cm}$$

41. Answer (2)

**Hint:**  $T = 2\pi \sqrt{\frac{m}{K_{\text{eff}}}}$

**Sol.:** All springs are in parallel

$$\therefore K_{\text{eff}} = \Sigma K = 300 \text{ N/m}$$

$$T = 2\pi \sqrt{\frac{5}{300}} = \frac{\pi}{\sqrt{15}} \text{ s}$$

42. Answer (1)

**Hint & Sol.:** Acceleration of a body in SHM is maximum at extreme position and minimum (zero) at mean position.

43. Answer (4)

**Hint:**  $A = \sqrt{A_1^2 + A_2^2 + 2A_1A_2 \cos \theta}$

**Sol.:**  $A_1 = A$

$$A_2 = 2A$$

$$\theta = 120^\circ$$

$$A' = \sqrt{A^2 + (2A)^2 + 2(A)(2A)\cos(120^\circ)}$$

$$A' = \sqrt{A^2 + 4A^2 - 2A^2}$$

$$A' = \sqrt{3}A$$

44. Answer (3)

**Hint & Sol.:** Sound wave, being a longitudinal wave, does not exhibit phenomenon of polarization as polarization is only showcased by transverse waves.

45. Answer (3)

**Hint:**  $T = 2\pi \sqrt{\frac{m}{K}}$ , where  $F = -Kx$

**Sol.:**  $K =$  magnitude of slope of Force – position graph

$$= -1 \times \left( \frac{-20}{10 \times 10^{-2}} \right) = 200 \text{ N/m}$$

$$T = 2\pi \sqrt{\frac{0.08}{200}} = 0.04\pi \text{ s}$$

**[CHEMISTRY]**

46. Answer (1)

**Hint:** Excess of fluoride causes brown mottling of teeth.

47. Answer (4)

**Hint:** Nitrous oxide, carbon dioxide and ozone cause green house effect.

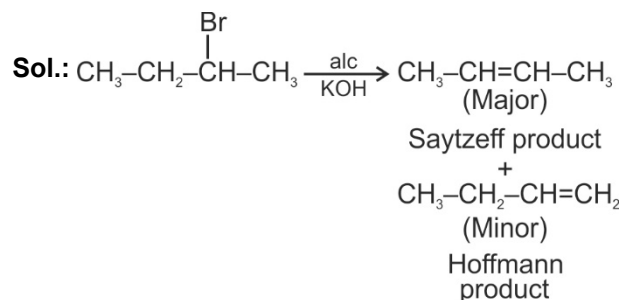
48. Answer (4)

**Hint:** Photochemical smog contains formaldehyde, Acrolein and PAN.

49. Answer (1)

**Hint:** Nitrate poisoning causes blue baby syndrome

50. Answer (1)

**Hint:** alc KOH gives  $\beta$  elimination reaction by Saytzeff elimination.

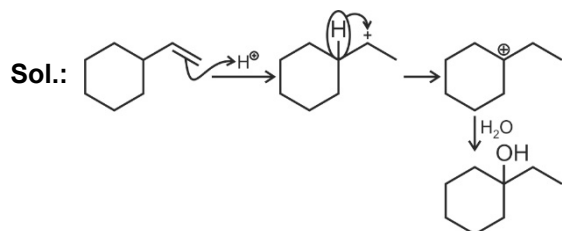
51. Answer (3)

**Hint:** Prescribed upper limit of lead in drinking water is 50 ppb.

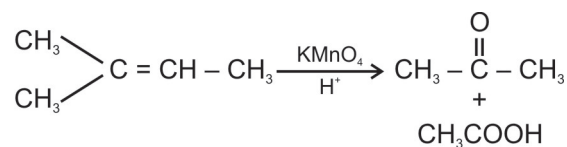
52. Answer (4)

**Hint:** Minimum the surface area of alkane, lower will be the boiling point.

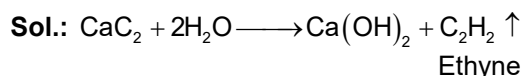
53. Answer (4)

**Hint:** Protonation of alkene takes place followed by carbonium ion rearrangement.

54. Answer (4)

**Hint:** In acidified  $\text{KMnO}_4$  solution, aldehydes are oxidised to carboxylic acids.**Sol.:**

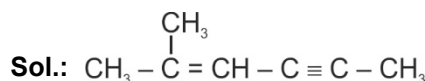
55. Answer (4)

**Hint:** Unsaturated hydrocarbon is obtained.

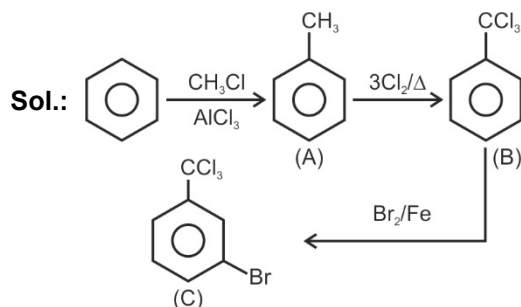
56. Answer (3)

**Hint:** Geometric isomers differ in spatial arrangement of atoms.

57. Answer (2)

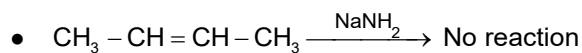
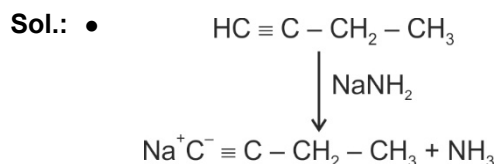
**Hint:** Double bond contains  $1\pi$  bond and triple bond contains  $2\pi$  bondTotal no. of  $\sigma$  bonds = 16Total no. of  $\pi$  bonds = 3

58. Answer (3)

**Hint:**  $-\text{CCl}_3$  is meta directing group

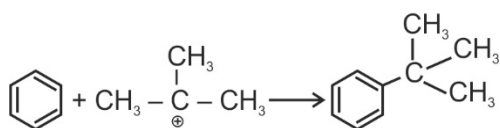
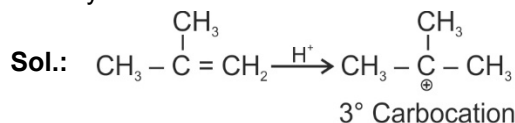
59. Answer (4)

**Hint:**  $\text{NaNH}_2$  reacts with acidic hydrogen and forms ammonia.



60. Answer (1)

**Hint:** Addition of  $\text{H}^+$  over alkene is governed by the stability of carbocation formed.



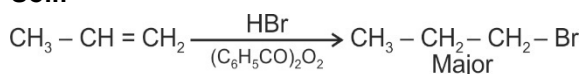
61. Answer (4)

**Hint:** Halogen attached with  $sp^3$  hybridised carbon of alkyl chain gives Friedel Craft reaction most easily.

62. Answer (4)

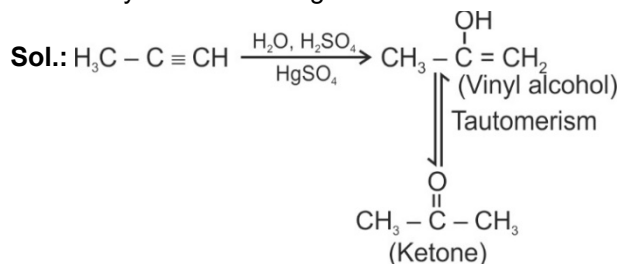
**Hint:** Peroxide effect is applicable to HBr.

**Sol.:**



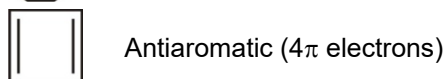
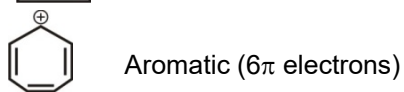
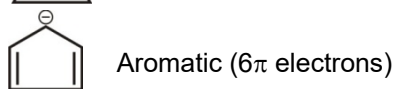
63. Answer (2)

**Hint:** Vinyl alcohol undergoes tautomerisation



64. Answer (4)

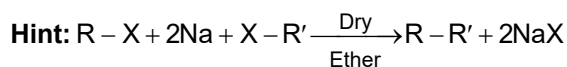
**Hint:** Aromatic molecules/ions contain  $(4n + 2)$   $\pi$  electrons



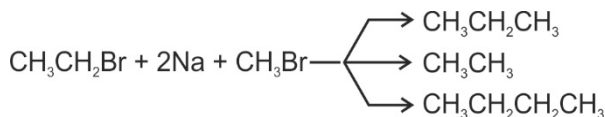
65. Answer (4)

**Hint:** Hydrogen attached to  $sp$  hybridised carbon atom is acidic in nature.

66. Answer (4)

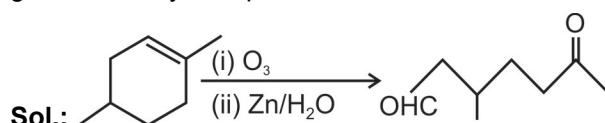


**Sol.:**



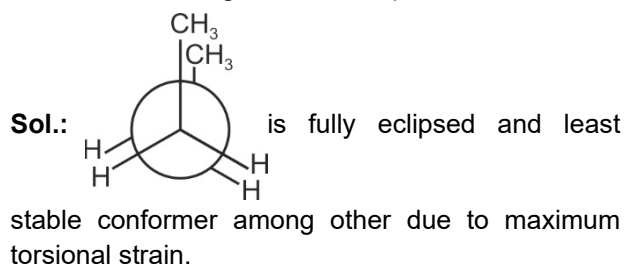
67. Answer (3)

**Hint:** Reductive ozonolysis of cyclic compound give dicarbonyl compounds.



68. Answer (3)

**Hint:** Dihedral angle is  $0^\circ$  in eclipsed conformer.



69. Answer (2)

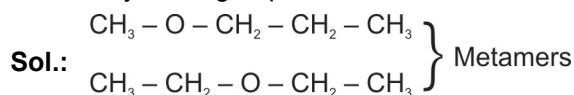
**Hint:** Alkanol is  $\text{R} - \text{OH}$ .

70. Answer (3)

**Hint:** Conjugated carbanion is  $sp^2$  hybridised.

71. Answer (2)

**Hint:** Polyvalent group can show metamerism.

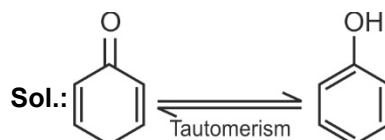


72. Answer (1)

**Hint:**  $(\text{CH}_3)_2\text{O}$  is electron rich so can not behave as electrophile.

73. Answer (1)

**Hint:** Enolisable H participates in tautomerism.





74. Answer (3)

**Hint:** Greater is the +R effect of substituent at para position, greater the stability of carbonium ion.

75. Answer (2)

**Hint:** Aniline water mixture is separated by steam distillation.

76. Answer (2)

**Hint:** Blue colour is of ferri ferrocyanoide.

**Sol.:**  $\text{Fe}_4[\text{Fe}(\text{CN})_6]_3$  is prussian blue.

77. Answer (1)

**Hint:** Greater is the % s-character, greater is the electronegativity.

**Sol.:**  $\text{R}-\text{C}\equiv\text{C}^\ominus$  is most stable among the following as the carbon atom carrying the negative charge is  $sp$ -hybridised.

78. Answer (1)

**Hint:** Carbon atom forming two pi bonds is  $sp$  hybridised.

**Sol.:**  $\text{HC}\equiv\overset{1}{\text{C}}-\overset{2}{\text{C}}-\overset{3}{\text{CH}_2}-\overset{4}{\text{CH}}=\overset{5}{\text{C}}=\overset{6}{\text{CH}}-\overset{7}{\text{CH}_3}$

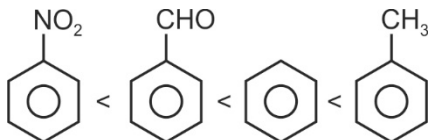
$\text{C}_2$  :  $sp$  hybridised       $\text{C}_5$  :  $sp$  hybridised

$\text{C}_3$  :  $sp^3$  hybridised       $\text{C}_6$  :  $sp^2$  hybridised

79. Answer (4)

**Hint:**  $-\text{NO}_2$  is an electron withdrawing group.

**Sol.:** Greater is the electron density on the ring, greater is the rate towards electrophilic substitution.



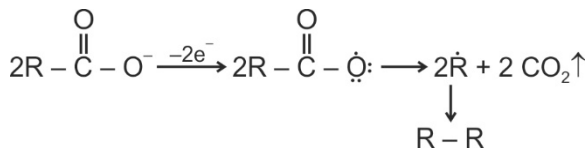
80. Answer (1)

**Hint:**  $\text{H}_3\text{O}^+$  is not a nucleophile.

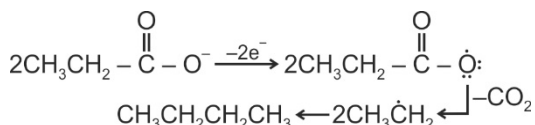
**Sol.:** Nucleophile are electron rich species.

81. Answer (2)

**Hint:**

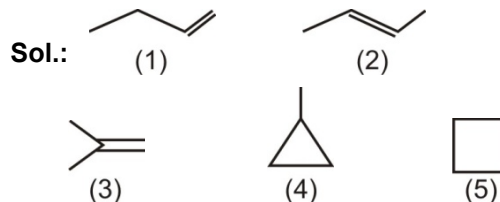


**Sol.:** Reaction at anode:



82. Answer (3)

**Hint:**  $\text{C}_4\text{H}_8$  has degree of unsaturation equal to one.



There are total five structural isomers possible for  $\text{C}_4\text{H}_8$ .

83. Answer (2)

**Hint:** 233 g  $\text{BaSO}_4$  contains 32 g S

**Sol.:** Sulphur in 0.466 g  $\text{BaSO}_4 = \frac{32 \times 0.466}{233} = 0.064$  g

Percentage of sulphur =  $\frac{0.064}{0.2} \times 100 = 32\%$

84. Answer (4)

**Hint:** No double bond is possible at bridge head position

**Sol.:**

- shows hyperconjugation due to  $3\alpha$  hydrogen
- In carbanion, hyperconjugation is not possible.

85. Answer (3)

**Hint:** Greater is the +R effect, greater is the ring activation.

86. Answer (1)

**Hint:** Common branched groups have specific trivial names.

**Sol.:**  $-\text{CH}_2\text{C}(\text{CH}_3)_3$  is called neopentyl group.

87. Answer (3)

**Hint:** % of N =  $\frac{1.4 \times \text{meq of NH}_3}{\text{mass of compound}}$

**Sol.:** meq of  $\text{NH}_3 = \text{meq of H}_2\text{SO}_4 = 15 \times 1 \times 2 = 30$

$\therefore$  % of N in soil sample =  $\frac{1.4 \times 30}{1} = 42\%$

88. Answer (2)

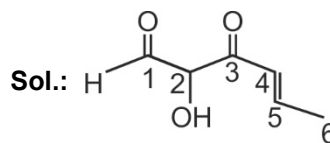
**Hint:** Higher the electronegativity, lesser is the + effect.

89. Answer (4)

**Hint:** In naphthalene, all carbon atoms are  $sp^2$  hybridised.

90. Answer (1)

**Hint:** Aldehyde is given more priority over ketone.



2-hydroxy-3-oxohex-4-enal

## [BIOLOGY]

91. Answer (4)

**Sol.:** Zeatin is a naturally occurring cytokinin in maize plant.

IBA and IAA are naturally occurring auxins while NAA is a synthetic auxin.

92. Answer (3)

**Sol.:** Rice seedlings grow excessively tall and become weak and sterile due to fungal infection (*Gibberella fujikuroi*). This fungus induces synthesis of gibberellins.

93. Answer (1)

**Hint:** Long day plant needs light for longer period than critical day length.

**Sol.:** Raddish is a long day plant. Soyabean and tobacco are short day plants and tomato is a day neutral plant.

94. Answer (2)

**Hint:** Absciscic acid functions as growth inhibitor.

**Sol.:** The synthesis of ABA is stimulated by drought, water logging and other adverse environmental conditions. Therefore, it is known as stress hormone.

95. Answer (3)

**Hint:** Dormancy is under endogenous control.

**Sol.:** Dormancy is the condition of seed when it is unable to germinate inspite of availability of all environmental conditions suitable for germination.

96. Answer (2)

**Sol.:** In viviparous plants fruits/seeds do not fall on surface of earth rather they germinate on parent plant.

97. Answer (4)

**Sol.:** Arithmetic growth rate can be expressed by following equation:  $L_t = L_0 + rt$

Where,

$L_t$  = length of the organ at time 't'.

$L_0$  = length of the organ at time 'zero'.

r = growth rate or elongation per unit time.

98. Answer (3)

**Hint:** The process where dedifferentiated cells again lose their ability to divide further is called redifferentiation.

**Sol.:** Secondary phloem is formed by the activity of vascular cambium through redifferentiation.

99. Answer (3)

**Sol.:** Auxin was first isolated from human urine.

2, 4-D is used to remove broad leaved weeds or dicotyledonous weeds in cereal crops.

100. Answer (2)

**Hint:** Auxin is present at the tips of shoots.

**Sol.:** Removal of apical bud is done for preparation of dense hedges. When the apical bud of plant is removed, the lateral bud starts developing into branches.

101. Answer (2)

**Hint:** Auxin causes apical dominance.

**Sol.:** Auxin and cytokinin both promotes cell division. Auxin promotes the apical growth whereas cytokinin promotes the lateral growth of shoot.

102. Answer (3)

**Sol.:** This type of growth is called arithmetic growth and it gives linear growth curve.

103. Answer (4)

**Sol.:** Cytokinin delays senescence whereas ABA induces it.

104. Answer (1)

**Sol.:** Inactive form of phytochrome (Pr) absorb light of 660 nm and gets rapidly converted into P<sub>fr</sub> form.

105. Answer (2)

**Hint:** The phenomena in which differentiated cells regain their capacity to divide, is called dedifferentiation.

**Sol.:** Interfascicular cambium, cork cambium and wound cambium are formed from fully differentiated parenchyma cells. Intrafascicular cambium is a primary meristematic tissue.

106. Answer (1)

**Hint:** Short day plants flower when they receive photoperiod shorter than critical period.

**Sol.:** If the dark period of short day plant is interrupted by flash of light, these plants do not show flowering, as it exceeds the photoperiod.

107. Answer (2)

**Sol.:** The phenomena of exposing plants to low temperature to promote flowering, is termed as vernalisation.

108. Answer (2)

**Hint:** Cytokinin promotes nutrient mobilisation.

**Sol.:** Cytokinins delay senescence of leaves by controlling protein synthesis and mobilisation of nutrients.

109. Answer (2)

**Hint.:** Cytokinins along with auxins are essential in tissue culture as they are required for callus morphogenesis.

**Sol.:** Cytokinin promotes shoot formation in callus. Thus its absence will result in lack of shoot in callus.

110. Answer (3)

**Sol.:** A hypothetical hormonal substance known as florigen which is responsible for flowering is found in leaves. It migrates from leaves to shoot apices to induce flowering.

111. Answer (4)

**Sol.:** In rosette plants like cabbage, gibberellin induces internode elongation causing a marked increase in stem height. This phenomenon is known as bolting.

112. Answer (4)

**Hint:** Ethylene induces femaleness.

**Sol.:** Ethylene promotes sprouting of potato tubers, rapid internodal elongation in deep water rice plants and also thinning of cotton fruit but in cucumber it promotes female flowers.

113. Answer (3)

**Hint:** Yield of sugarcane can be increased by increasing its internodal length.

**Sol.:** Spraying sugarcane crop with gibberellins increases the length of stem, thus increase the yield by as much as 20 tonnes per acre.

114. Answer (1)

| <b>Sol.:</b> Composition | <b>Phytohormones</b>                               |
|--------------------------|--|
| Indole compounds         | – IAA, IBA (Auxins)                                |
| Terpenes                 | – Gibberellic Acid                                 |
| Adenine derivatives      | – Kinetin (Cytokinin)                              |
| Gas                      | – Ethylene<br>(CH <sub>2</sub> = CH <sub>2</sub> ) |

115. Answer (3)

**Sol.:** There are more than 100 gibberellins reported in fungi and higher plants. Gibberellic acid (GA<sub>3</sub>) is the most intensively studied form.

116. Answer (1)

**Hint:** Gibberellins are used to speed up the malting process in brewing industries.

**Sol.:** Gibberellins stimulate stem elongation.

117. Answer (2)

**Hint:** Auxin induces apical dominance

**Sol.:** Apical buds secrete auxin which inhibits growth of lateral buds. If the apical bud is removed (decapitation) the lateral buds start growing.

118. Answer (1)

**Sol.:** After receiving sunlight by the tip of coleoptiles, auxin is transmitted to sub-apical part which bend towards direction of sunlight.

119. Answer (1)

**Hint:** Auxin causes apical dominance in plants.

**Sol.:** Tryptophan (an amino acid) is precursor of auxin synthesis.

120. Answer (1)

**Sol.:** Oxygen acts as terminal electron acceptor & combines with protons to form metabolic water.

121. Answer (1)

**Hint:** Value of RQ varies according to substrate.**Sol.:** The respiratory quotient depends upon the type of respiratory substrate used during respiration. eg. value of RQ for carbohydrate, proteins and fats is 1, 0.9 and 0.7 respectively.

122. Answer (3)

**Hint:** Proton gradient is required for phosphorylation.**Sol.:** The passage of protons through the channel is coupled to the catalytic site of the  $F_1$  component for the production of ATP. For each ATP produced,  $2H^+$  pass through  $F_0$  from intermembranal space to matrix of mitochondria.

123. Answer (4)

**Sol.:** Accumulation of alcohol beyond 13% kills the yeast. Maximum ethyl alcohol concentration obtained is 13%.

124. Answer (2)

**Hint:**  $RQ = \frac{\text{Volume of } CO_2 \text{ evolved}}{\text{Volume of } O_2 \text{ consumed}}$ **Sol.:** In anaerobic respiration, volume of  $O_2$  consumed is zero. Thus  $RQ = \infty$ .

125. Answer (3)

**Sol.:** Respiratory pathway is mainly a catabolic process. Since many intermediates formed during this process are precursor of various compounds. Thus, this pathway involves both anabolism and catabolism, that is why it is considered as amphibolic pathway.

126. Answer (2)

**Hint:** One ATP yields about 34 kJ/mol**Sol.:** 1 glucose = 38 ATP

$$38 \text{ ATPs} = 1292 \text{ kJ/mol}$$

Total energy stored in one molecule of glucose = 2870 kJ

$$\text{Efficiency} = \frac{1292}{2870} \times 100 = 45\%$$

127. Answer (4)

**Hint:** Complex IV of ETS contains copper.**Sol.:** Cytochrome c oxidase contains cytochrome  $a_1$ ,  $a_3$  and two copper centres.

128. Answer (4)

**Hint:** In each turn of TCA cycle 3  $NADH_2$ , 1  $FADH_2$  & 1 GTP are produced.**Sol.:** In one turn of citric acid cycle, total ATP molecules produced are

$$3 \text{ } NADH_2 = 9 \text{ ATP}$$

$$1 \text{ } FADH_2 = 2 \text{ ATP}$$

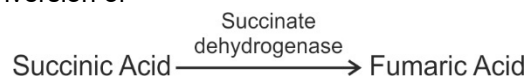
$$1 \text{ ATP/GTP} = 1 \text{ ATP}$$

$$\text{Total} = 12 \text{ ATP}$$

For oxidation of one molecule of glucose there will be 2 turns of citric acid cycle.

Hence total number of ATP produced are =  $12 \times 2 = 24 \text{ ATP}$ 

129. Answer (4)

**Hint:** All enzymes of citric acid cycle are present in matrix of mitochondria except succinate dehydrogenase.**Sol.:** Succinate dehydrogenase catalyse conversion of

130. Answer (2)

**Hint:** Both lactic acid and alcohol fermentation are comparatively less efficient than aerobic respiration.**Sol.:** In fermentation there is net gain of 2 ATP only.

131. Answer (4)

**Hint:** Pyruvic acid is not completely oxidised during anaerobic respiration.**Sol.:** In anaerobic respiration, pyruvic acid is partially oxidised into alcohol &  $CO_2$  is liberated. Pyruvic acid decarboxylase needs  $Mg^{++}$  as a cofactor.

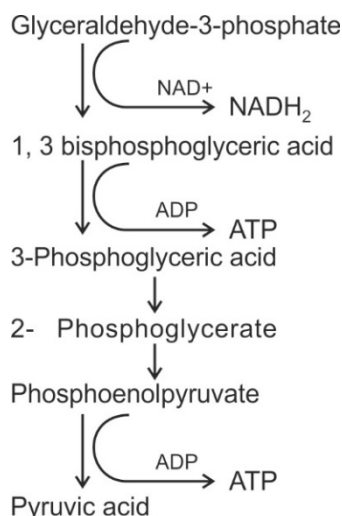
132. Answer (1)

**Hint:** Glyceraldehyde-3-phosphate is an intermediate of glycolysis.**Sol.:** Oxidation of glyceraldehyde-3-phosphate finally yields

$$\text{Pyruvic acid} = 1$$

$$\text{ATP} = 2$$

$$NADH_2 = 1$$



133. Answer (2)

**Hint:** Substrate level phosphorylation results in formation of ATP.

**Sol.:** Substrate level phosphorylation is a metabolic reaction that results in formation of ATP/GTP by direct transfer of phosphate group to ADP/GDP from another phosphorylated compound.

134. Answer (4)

**Hint:** EMP pathway is common in both aerobic and anaerobic respiration.

**Sol.:** Glucose is converted into glucose-6-phosphate with the help of an enzyme hexokinase. This step utilises one ATP molecule.

135. Answer (4)

**Hint:** Site of glycolysis is cytoplasm

**Sol.:** Glycolysis is a ten step process in which glucose is finally converted into pyruvic acid. It involves utilisation of 2ATP molecules in initial steps. Oxygen is not required at any step of glycolysis.

136. Answer (4)

**Hint:** All female reproductive organs are confined to abdomen.

**Sol.:** A pair of yellow-coloured ovaries lie laterally in 2<sup>nd</sup> to 6<sup>th</sup> abdominal segments, one on either side of hindgut, and embedded in fat bodies.

137. Answer (4)

**Hint:** It is used to pass sperms to the exterior.

**Sol.:** The cloaca is a small, median chamber that is used to pass faecal matter, urine and sperms to the exterior.

138. Answer (1)

**Hint:** *Pheretima* exhibits a closed type of blood vascular system.

**Sol.:** There are two pairs of testis sacs in the 10<sup>th</sup> and 11<sup>th</sup> segments. Development is direct in earthworms. Haemoglobin is present in plasma.

139. Answer (1)

**Hint:** Tegmina are attached to mesothorax.

**Sol.:** Forewings are called tegmina/elytra and they are attached to mesothorax.

140. Answer (3)

**Hint:** Structure that projects from the sides of 9<sup>th</sup> sternites.

**Sol.:** Anal styles are paired and thin small unjointed outgrowths, present in male cockroaches only. They are sensitive to touch.

141. Answer (1)

**Hint:** Select a genus of aves.

**Sol.:** *Columba* comprises species of pigeons. *Hemidactylus* is a reptile. *Exocoetus* (flying fish) belongs to osteichthyes. *Calotes* is a lizard.

Presence of crop and gizzard is the characteristic feature of arthropods and aves.

142. Answer (4)

**Hint:** Choose the amphibian.

**Sol.:** In frog, sperms produced by testes are passed into Bidder's canal via vasa efferentia and then carried finally to the urinogenital duct.

143. Answer (4)

**Hint:** Pneumatic bones with air sacs help in flight.

**Sol.:** Endoskeleton of aves is fully ossified (bony) and the long bones are hollow with air cavities. Such bones are called pneumatic bones and lack bone marrow.

144. Answer (3)

**Hint:** They are genus of hag fish.

**Sol.:** *Eptatretus* and *Neo Myxine* (Hag fish) are cyclostomes. Their mouth does not possess jaws hence are named Agnatha.

145. Answer (1)

**Hint:** Respiratory system of cockroach.

**Sol.:** Respiration through skin (cutaneous), gills (branchial) and lungs (pulmonary) is seen in amphibians.

146. Answer (4)

**Hint:** Select the group involving all mammals.

**Sol.:** Ostrich, platypus and kiwi are oviparous. Horse, whale, monkey, lemur and tiger are viviparous.

147. Answer (3)

**Hint:** This is a product of ornithine cycle.

**Sol.:** Excretion is uricotelic in snakes and crocodiles.

148. Answer (4)

**Hint:** Identify a mollusca.

**Sol.:** Sea lily and sea urchin are echinoderms sea fan is a coelenterate.

Sea hare (*Aplysia*) belongs to phylum mollusca characterised by presence of distinct mantle.

149. Answer (3)

**Hint:** Bony fishes

**Sol.:** Scales are absent in Hag fish. Swim bladder is not present in sting ray. Tree frog (*Hyla*) is tail less amphibian.

150. Answer (2)

**Hint:** All aves are oviparous.

**Sol.:** Erythrocytes of aves are oval, biconvex and nucleated. Erythrocytes of mammals are circular, biconcave and non-nucleated.

151. Answer (2)

**Hint:** Select a Chondrichthyes.

**Sol.:** The skin of *Pristis* is tough and contains minute placoid scales.

152. Answer (4)

**Hint:** Select a structure which supplements respiration.

**Sol.:** Respiration is carried out by lungs in birds. Air sacs connected to lungs are non-vascular and supplement respiration.

153. Answer (2)

**Hint:** Animals which have no syrinx.

**Sol.:** *Neophron* is vulture, *Psittacula* is parrot and *Pavo* is peacock. Ostrich, penguins and kiwi are few examples of flightless birds.

154. Answer (1)

**Hint:** Endoskeleton is made up of cartilage.

**Sol.:** Examples of chondrichthyes include – *Scoliodon*, *Pristis*, *Trygon*, *Torpedo* and *Carcharodon*.

Examples of osteichthyes include *Exocoetus*, *Hippocampus*, *Pterophyllum*, *Betta*, *Labeo* and *Catla*.

155. Answer (4)

**Hint:** Free living worm.

**Sol.:** *Planaria* is not an endoparasite but is found in streams and rivers.

156. Answer (4)

**Hint:** This is an arthropod.

**Sol.:** Silver fish, *Lepisma* is ametabolous showing direct development. *Planula* & *Ephyra* are larvae of Jelly fish. While brachiolaria is larva of starfish. Tornaria larva is formed during life cycle of tongueworm.

157. Answer (2)

**Hint:** Chitinous exoskeleton.

**Sol.:** *Hydra* lacks metagenesis and shows direct development. Leech lacks both parapodia and setae. *Unio* lacks radula.

158. Answer (2)

**Hint:** These structures take part in circulation of water for respiration.

**Sol.:** Gill slits are absent in non-chordates. Chordates have paired pharyngeal gill slits. In higher chordates, they occur only in embryonic stage.

159. Answer (3)

**Hint:** Vector for diseases.

**Sol.:** Female *Culex* is vector for elephantiasis. *Ctenoplana* lacks a coelom, *Cucumaria* has enterocoel and *Sepia* has closed circulatory system.

160. Answer (1)

**Hint:** This animal is a urochordate.

**Sol.:** In urochordates, notochord is only present in the tail of the larva (hence named Urochordates) and disappears in the adult. e.g., *Ascidia*, *Salpa*, *Doliolum*.

In cephalochordates, notochord extends from head to tail region and it persists throughout the life. In vertebrates, notochord is replaced by a cartilaginous or bony vertebral column in the adult.

161. Answer (2)

**Hint:** Hemichordates are exclusively marine.

**Sol.:** Fertilisation in hemichordates takes place in the sea water.

162. Answer (1)

**Hint:** It is also called brittle star.

**Sol.:** Echinoderms show the presence of ossicles and are thus called spiny bodied. e.g., *Asterias*, *Echinus*, *Antedon*, *Cucumaria* and *Ophiura*. *Euspongia* belongs to porifera and has spongin fibres. *Meandrina* are coelenterates. *Octopus* lacks internal and external shell.

163. Answer (3)

**Hint:** Select an echinoderm.

**Sol.:** *Loligo* and *Pinctada* are members of Phylum Mollusca whereas *Antedon* is an echinoderm.

164. Answer (3)

**Hint:** Bony fish found in aquarium.

**Sol.:** *Pteropus* – Mammal

*Petromyzon* – Cyclostome

*Pristis* – *Chondrichthyes*

165. Answer (2)

**Hint:** Leeches feed on the blood of fishes, frogs, cattles and other animals.

**Sol.:** Annelids may be aquatic (marine and fresh water) or terrestrial, for e.g., *Nereis* is marine, earthworm is terrestrial and *Hirudinaria* is a fresh water annelid.

166. Answer (1)

**Hint:** Phylum which has blood sinuses.

**Sol.:** Body of some molluscs (e.g., *Pila*) are covered by a calcareous shell. Body of roundworms is circular in cross section.

Molluscs are mostly oviparous.

167. Answer (4)

**Hint:** Parasitic worms are exposed to digestive juices of host.

**Sol.:** The body of endoparasitic flatworms is externally covered with a thick tegument, a protective layer that protects the parasitic worms from the digestive juices of host. Hooks and suckers act as the organs of attachment, present in *Taenia*. In endoparasites, soluble food materials directly diffuse through their body surface.

168. Answer (4)

**Hint:** *In-vivo* fusion of gametes.

**Sol.:** Fertilisation is external in ctenophores. Zygote develops into a free swimming larva called cydippid larva.

169. Answer (2)

**Hint:** These structures help in movement from one place to another.

**Sol.:** The external surface of the body of ctenophores bears eight comb plates. These comb plates bear cilia which are fused to make these plates ciliated. Skeletal, circulatory, respiratory and excretory systems are absent in ctenophores.

170 Answer (4)

**Hint:** Sponges are sessile organisms.

**Sol.:** Functions of canal system or water transport system in sponges are:

- Food gathering
- Respiratory exchange
- Removal of waste
- Transfer of sperms

171. Answer (3)

**Hint:** Fertilisation occurs within the body of a poriferan.

**Sol.:** Sponges undergo internal fertilisation. The development in sponges is mediated by an intermediate free swimming flagellated larval stage for dispersal of species. Larval stage is morphologically distinct from adult. Thus, the development in sponges is indirect. Both asexual and sexual reproduction occur in sponges.

172. Answer (3)

**Hint:** Body of molluscs is unsegmented.

**Sol.:** Segmentation is defined as the division of body into parts or segments. These body segments are called metameres. Segmentation is seen in annelids, arthropods and chordates.

173. Answer (2)

**Hint:** *Ascaris* belongs to this phylum.

**Sol.:** In pseudocoelomates, the body cavity is present but it is not completely lined by mesoderm, instead the mesoderm is present as scattered pouches in between the ectoderm and endoderm. Such a body cavity is called pseudocoelom (pseudo – false, coelom – body cavity). e.g., *Aschelminthes*.

174. Answer (4)

**Hint:** Repeating segments.

**Sol.:** Cockroach and earthworm both have metameric segmentation. Chitinous exoskeleton is present in cockroach. Jointed appendages are locomotory structures in cockroach. Both of these animals are protostomes.

175. Answer (1)

**Hint:** They are called spiny bodied animals.

**Sol.:** Radial symmetry is exhibited by some sponges, coelenterates, ctenophores and adult echinoderms. First phylum of animal kingdom to exhibit bilateral symmetry is platyhelminthes.

176. Answer (4)

**Hint:** The largest phylum of kingdom Animalia.

**Sol.:** Arthropods have an open circulatory system. In open type circulatory system, the body cells and tissues are directly bathed in blood pumped out of the heart as the blood flows in open spaces.

177. Answer (1)

**Hint:** Cell aggregate body plan.

**Sol.:** In poriferans, cells are arranged as loose cell aggregates but they do not form any tissue. Cellular level of organisation is exhibited by poriferans.

178. Answer (4)

**Hint:** Phylum which has pseudocoelom.

**Sol.:** Most animals from aschelminthes to chordates possess complete digestive system. Coelenterates, Ctenophores and Platyhelminthes possess incomplete digestive system. Complete digestive system has two openings-mouth and anus.

179. Answer (2)

**Hint:** Select a structure which is located dorsally.

**Sol.:** Notochord is formed on the dorsal or upper side of the body of an embryo and defines its primitive axis. In some chordates, notochord is replaced by the vertebral column and these chordates are called vertebrates

180. Answer (2)

**Hint:** Figure (c) represents an echinoderm.

**Sol.:** *Asterias* (echinoderm) and prawn (arthropod) show organ system-level of organisation.

