All India Aakash Test Series for Medical - 2018

TEST - 7 (Code A)

Test Date : 21/01/2018

ANSWERS

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

HINTS

PHYSICS

1. $\frac{\rho}{P} \propto \frac{1}{T}$

$$\frac{\left(\frac{\rho}{P}\right)_{10°C}}{\left(\frac{\rho}{P}\right)_{110°C}} = \frac{383}{283} \Rightarrow \frac{5}{\left(\frac{\rho}{P}\right)_{110°C}} = \frac{383}{283}$$

$$\therefore \quad \left(\frac{\rho}{P}\right)_{110°C} = \frac{283}{383} \times 5 = 3.69$$

2. $v_{max} = |A\omega| = p(2\pi q)$

$v_\omega = \frac{q}{r}$

$v_{max} = 2v_\omega$

$p(2\pi q) = 2\left(\frac{q}{r}\right)$

$\pi p = \frac{1}{r}$

3. $\frac{n_1 + n_2}{\gamma_{mix} - 1} = \frac{n_1}{\gamma_1 - 1} + \frac{n_2}{\gamma_2 - 1}$

4. $v_{rms} = \sqrt{\frac{v_1^2 + v_2^2 + v_3^2 + v_4^2}{4}}$

$= \sqrt{\frac{1^2 + 2^2 + 6^2 + 8^2}{4}} = \sqrt{\frac{105}{4}}$

5. For a given gas $P \propto M$

$\frac{P_1}{P_2} = \frac{M_1}{M_2} \Rightarrow M_2 = M_1 \times \frac{P_2}{P_1}$

$M_2 = 12 \times \frac{3 \times 10^6}{10^7} \Rightarrow M_2 = 3.6$ kg

Quantity of gas taken out from the cylinder,

$\Delta M = M_1 - M_2 = 12 - 3.6$

$\Delta M = 8.4$ kg

7. $y = A\left(\frac{1 - \cos 2(\omega t - kx)}{2}\right)$

$y = \frac{A}{2}[1 - \cos(2\omega t - 2kx)]$

Amplitude = $\frac{A}{2}$

Frequency = $\frac{\omega}{\pi}$

8. $\Delta Q_v = nC_v\, dT$ (V = const)

$n = \frac{PV}{RT} = \frac{10^5 \times 0.2}{8.31 \times 300} = 8$ mol

$\Delta Q_1 = 8\left(\frac{5}{2}R\right)(600 - 300)$

9. $T_i = 300k$, $T_f = 700k$

$Q = \int_{T_i}^{T_f} nCdT = \int_{T_i}^{T_f} n(a + bT)dT$

$= \int_{300}^{700} 2(27.2 + 4 \times 10^{-3}T)dT$

$= \left[54.4T + 4 \times 10^{-3}T^2\right]_{300}^{700} = 23{,}360$ J

10. $v_{rms} = \sqrt{\frac{3RT}{M}} \Rightarrow \frac{v_{H_2}}{v_{He}} = \sqrt{\frac{M_{He}}{M_{H_2}}}$

$v_{H_2} = \sqrt{\frac{4}{2}}\, v_{He} \Rightarrow v_{H_2} = \sqrt{2}\, v_{He}$

$\therefore \frac{v_{H_2}}{v_{He}} = \sqrt{2}$

12. From conservation of mechanical energy,

$\frac{1}{2}KA^2 = \frac{1}{2}mv^2$

$A = v\sqrt{\frac{m}{K}} = 12\sqrt{\frac{0.2}{20}} = 1.2$ m

13. $y = kt^2 = \frac{1}{2}at^2$

$\frac{1}{2}at^2 = kt^2$

$a = 2k$,

$a = 4$ m/s^2

$\frac{T_1}{T_2} = \frac{2\pi\sqrt{\frac{l}{g}}}{2\pi\sqrt{\frac{l}{g+a}}} = \sqrt{\frac{g+a}{g}} = \sqrt{\frac{14}{10}}$

$\frac{T_1^2}{T_2^2} = \frac{14}{10} = \frac{7}{5}$

15. As $y_2 = 4\left[\sin 3\pi t + \sqrt{3}\cos 3\pi t\right]$

$= 4\sin 3\pi t + 4\sqrt{3}\cos 3\pi t$

$\therefore A = \sqrt{4^2 + \left(4\sqrt{3}\right)^2} = \sqrt{16 + 48} = 8$

$\tan\theta = \frac{4\sqrt{3}}{4} = \sqrt{3} \Rightarrow \phi = \pi/3$

The above equation becomes $y_2 = 8\sin\left(3\pi t + \frac{\pi}{3}\right)$

$\therefore \frac{A_1}{A_2} = \frac{4}{8} = \frac{1}{2}$

16. $f(x, t) = f(x - vt)$

17. As m_1 is removed, the mass m_2 will oscillate and so

$T = 2\pi\sqrt{\frac{m_1}{k}} \Rightarrow \omega = \frac{2\pi}{T} = \sqrt{\frac{k}{m_2}}$

Furthermore, the stretch produced by $m_1 g$ will set the amplitude, i.e., $m_1 g = KA \Rightarrow A = \frac{m_1 g}{k}$

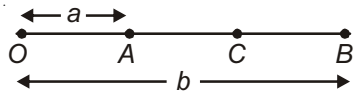
18. $T = 2\pi\sqrt{\frac{m_1 + m_2}{k}}$

For two blocks to move as a unit

$m_2\omega^2 A \le \mu m_2 g$

$A \le \frac{\mu g}{\omega^2}$

$A = \frac{\mu g(m_1 + m_2)}{k}$

19. 

From figure *C* is the mean position of SHM

The amplitude oscillations $A = \frac{b-a}{2}$

The velocity at the mean position '*C*' will be

$v = \omega A = \frac{2\pi}{T}\left(\frac{b-a}{2}\right)$

$T = \frac{\pi(b-a)}{v}$

20. Suppose the length of the parts are l_1 and l_2 then

$l_1 = 3\ l_2$

$l_1 + l_2 = l$

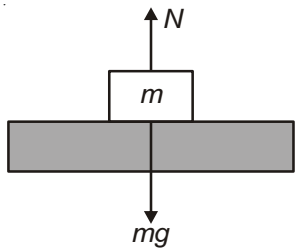
$l_2 = \frac{l}{4}, \quad l_1 = \frac{3l}{4}$

$\therefore k_1 = \frac{k}{3/4} = \frac{4k}{3}$

$k_2 = \frac{k}{1/4} = 4k$

21. $\frac{v}{4l_1} = \frac{2v}{2l_2}$

$\frac{l_1}{l_2} = \frac{1}{4}$

22. 

$mg - N = ma$

$mg - 0 = m\omega^2 A$

$A = \frac{mg}{m\omega^2} = \frac{g}{\omega^2}$

23. $t_1 = 2\pi\sqrt{\frac{m}{k_1}}$ and $t_2 = 2\pi\sqrt{\frac{m}{k_2}}$,

In series $k_e = \frac{k_1 k_2}{k_1 + k_2}$

$\therefore T = 2\pi\sqrt{\frac{m}{k_{eff}}} = 2\pi\sqrt{\frac{m}{(k_1 k_2 / k_1 + k_2)}}$

$k_1 = \frac{4\pi^2 m}{t_1^2}$ and $k_2 = \frac{4\pi^2 m}{t_2^2}$

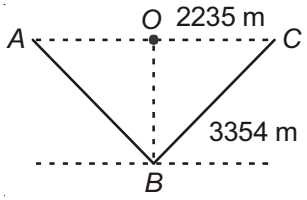
On simplification, $T^2 = t_1^2 + t_2^2$

24. $v_1 = \sqrt{\frac{4RT}{M}}$

$v_2 = \sqrt{\frac{3RT}{M}}$

25. Time for echo = $10\sqrt{5}$ s (i.e. for sound to travel *ABC*)

Velocity of the aeroplane = 200 m/s



$OC = 200 \times 5\sqrt{5} = 2236$ m

BC = velocity of sound × $5\sqrt{5}$

$= 300 \times 5\sqrt{5} = 3354$

$\therefore OB = \sqrt{BC^2 - OC^2} = 2500$ m

26. From the given equation $K = 0.2\pi$

$\frac{2\pi}{\lambda} = 0.2\pi \Rightarrow \lambda = 10$ cm

$\Delta\phi = \frac{2\pi}{\lambda} \cdot \Delta x = \frac{2\pi}{10} \times 2 = \frac{2\pi}{5} = 72°$

27. 425 : 595 : 765
85 × 5 : 85 × 7 : 85 × 9 = 5 : 7 : 9
Fundamental tone = 85 Hz

28. Let n be the frequency of fork 'C' then

$$n_A = n + \frac{5n}{100} = \frac{105n}{100} \text{ and } n_B = n - \frac{4n}{100} = \frac{96n}{100}$$

but $n_A - n_B = 9$

$$\frac{105n}{100} - \frac{96n}{100} = 9$$

$$\frac{9n}{100} = 9$$

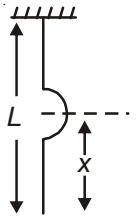
$$n = \frac{9\times100}{9} = 100 \text{ Hz}$$

$$n_A = \frac{105\times100}{100} = 105 \text{ Hz}$$

29. $$8 = \frac{1}{\lambda}\sqrt{\frac{T}{\mu}}$$

$$\Delta\gamma\% = \frac{1}{2}\Delta T\%$$

Here $n = \frac{5\times200}{2} = 500$ Hz

30. 

Pulse at distance x from free end

Mass per unit length $= \frac{M}{L}$

Tension $= \frac{M}{L}xg$

$$\therefore v = \sqrt{\frac{T}{\mu}} = \sqrt{\frac{Mgx/L}{M/L}} = \sqrt{gx}$$

$$\therefore v \propto \sqrt{x}$$

31. In closed organ pipe, If $y_{incident} = a\sin(\omega t - kx)$
then $y_{reflected} = a\sin(\omega t + kx + \pi) = -a\sin(\omega t + kx)$
Superposition of these two waves give the required stationary wave.

32. For end correction, $\frac{\ell_2 + x}{\ell_1 + x} = \frac{3\lambda/4}{\lambda/4} = 3$

$$x = \frac{\ell_2 - 3\ell_1}{2} = \frac{72.3 - 3(23.7)}{2} = \frac{1.2}{2} = 0.6 \text{ cm}$$

33. $n' = \frac{nv}{v - u_s}$ Since, source is moving towards the listener so $n' > n$
If $n = 100$ then $n' = 102.5$

$$102.5 = \frac{100\times320}{320 - v_s} \Rightarrow v_s = 8 \text{ m/s.}$$

34. $I = 2\pi^2a^2n^2vp \Rightarrow I \propto a^2n^2$

$$\frac{I_1}{I_2} = \left(\frac{a_1}{a_2}\right)^2\cdot\left(\frac{n_1}{n_2}\right)^2 = \left(\frac{1}{2}\right)^2\times\left(\frac{1}{1/4}\right)^2 \Rightarrow I_2 = \frac{I_1}{4}$$

35. $$I \propto \frac{1}{r^2} \Rightarrow \frac{I_2}{I_1} = \frac{r_1^2}{r_2^2} = \frac{2^2}{40^2} = \frac{1}{400} \Rightarrow I_1 = 400I_2$$

$$L_1 - L_2 = 10\log\frac{I_1}{I_2} = 10\log_{10}400$$

$L_1 - L_2 = 10 \times 2.602 = 26$
$L_2 = L_1 - 26 = 80 - 26 = 54$ dB

36. Here v_A = 72 kmph = 20 m/s
v_B = 36 kmph = 10 m/s

$$n' = n\left(\frac{v + v_B\cos45°}{v - v_B\cos45°}\right)$$

$$n' = 300\left(\frac{330 + 10/\sqrt{2}}{330 - 20/\sqrt{2}}\right) = 320 \text{ Hz}$$

37. $$n = \frac{P}{2l}\sqrt{\frac{T}{m}} \Rightarrow P\sqrt{T} = \text{Const}$$

$$\frac{P_1}{P_2} = \sqrt{\frac{T_2}{T_1}} = \sqrt{\frac{M_2}{M_1}}$$

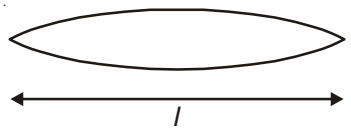
$$\frac{4}{6} = \sqrt{\frac{M_2}{(50+15)}} \Rightarrow M_2 = 28.8 \text{ g}$$

$\therefore$ Mass removed from the pan
$M_1 - M_2 = 65 - 28.8 = 36.2$ g

38. When pulse is reflected from a rigid support, the pulse is inverted both lengthwise and sidewise.

39. $n_Q = 341 \pm 3 = 344$ Hz (or) 338 Hz
On waxing Q, the number of beats decreases hence $(n_Q > n_P)$
$\therefore \quad n_Q = 344$ Hz.

40. On comparing with standard equation $\omega = 2\pi$ and $k = 2\pi$

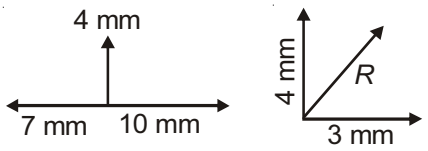


$$\therefore \frac{2\pi}{\lambda} = 2\pi \Rightarrow \lambda = 1$$

$l = \frac{\lambda}{2} = 0.5$ m

41. $f = \frac{1}{2l}\sqrt{\frac{F}{\mu}}$, $\mu = A\rho$

$\therefore f = \frac{1}{2l}\sqrt{\frac{\text{stress}}{\rho}} = \frac{1}{2\times 0.75}\sqrt{\frac{8.1\times 10^8}{9\times 10^3}} = 200$ Hz

42. 

$R = \sqrt{3^2 + 4^2} = 5$ mm

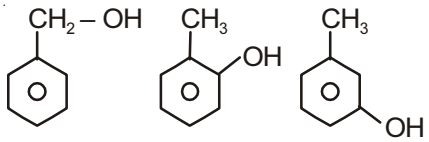
43. $I = \frac{P}{2\pi rL} = \frac{1.0\times 10^4}{2\pi\times 10\times 10} = 16$ W/m^2

44. $\Delta\phi = \frac{2\pi}{\lambda}\cdot\Delta x$ So phase difference between the vibrations of two such particles varies with distance between them.

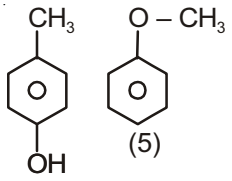
CHEMISTRY

47. $-CH_2$ present between two strong electron withdrawing group has more acidic hydrogen, its enolic content will be more stable, due to intramolecular H-bond, chelation and resonance.

48. Carbenes are electrophilic in nature.

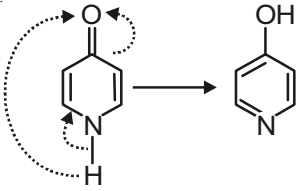
49. 

(1) (2) (3)

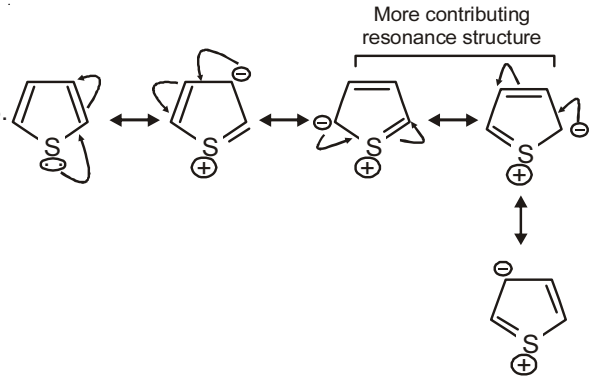


(5) (4)

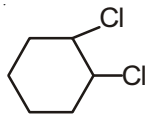
50. Degree of unsaturation is 2. Hence, 5 cyclic are possible.

51. 

52. Fact

53. 

54. $CH_2 = C = CH_2$ – Allene
RCH = N – OH – Aldoxime
PhN = N – Ph – Azobenzene



– 1,2-Dichlorohexane

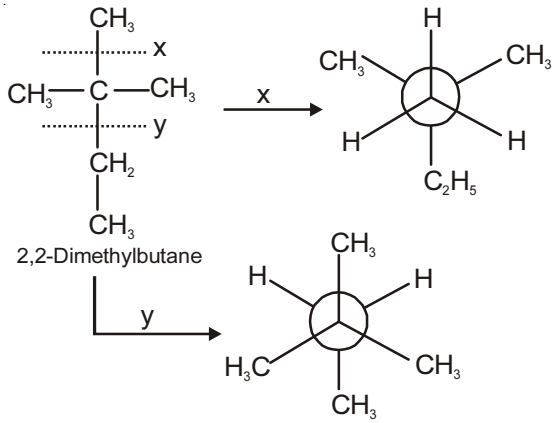
55. IHD = degree of unsaturation
= double bond equivalent

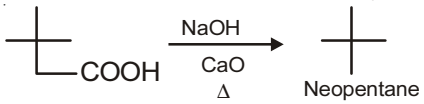
IHD = $(C+1) - \left[\frac{H-N}{2}\right] = (20+1) - \left(\frac{20-0}{2}\right) = 11$

56. Anti or Staggered.

57. In (iii) – due to aromaticity, lone pair of e^- are not available
In (i) – Mesomeric effect of $-NH_2$

58. Fact

59. 

60. 

61. Fact – Orthoeffect

62. 3°alkyl halide will not give Wurtz's reaction in good yield.

63. Neutral species with complete octet in the structure.

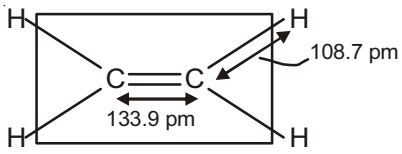
64. After losing H^+, it will become aromatic.

68. % of Br = $\frac{80}{(108+80)}\times\frac{0.11}{0.18}\times 100 = 26\%$

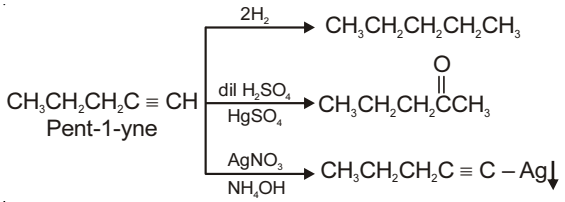
69. $2CH_3COONa + 2H_2O \xrightarrow{I} C_2H_6 + 2CO_2 + 2NaOH + H_2$

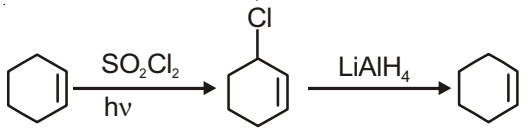
70. Branching decreases the boiling point

71. Fact

72. 

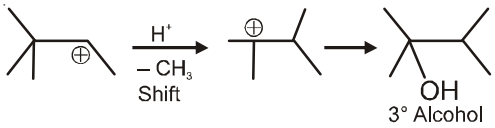
73. (ii) is not planar.

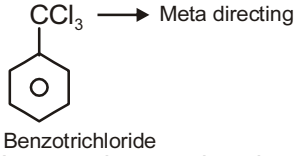
75. 

76. 

77. $-OCH_3$ group activates more to the benzene ring.

78. More the stability of alkene lesser will be enthalpy of hydrogenation.

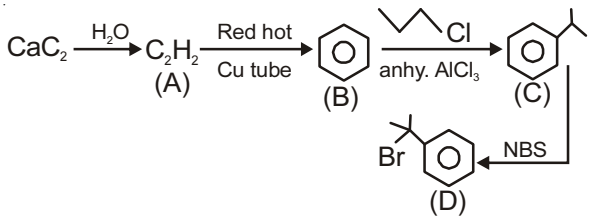
79. 

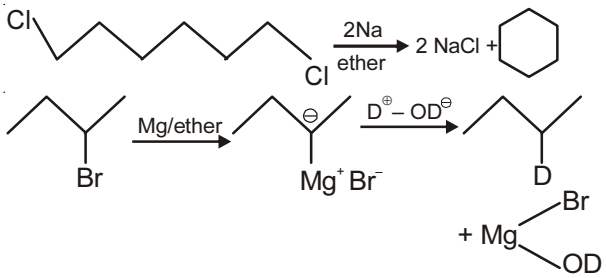
80. 

Benzotrichloride

82. Isopropyl group has less α–H than methyl group. Hence, it is less activating in nature.

83. $-NO_2$ is – I and – M group.

84. 

86. 

88. Fact

89. Fact

90. Fact

BIOLOGY

91. O_2 is used in chloroplast and peroxisome whereas transamination occurs in peroxisome.

92. It is the type of facilitated diffusion.

93. A - Corns plant absorbs = 3 L in 1 day
B - Not dependent on living cells
D - Pure water has maximum water potential

94. Plant cell shows exosmosis.

95. Concentration of minerals in soil is less than the root cell.

98. Water passes through living continuum of cell.

101. Ca has role in synthesis of middle lamella.

102. Cu is found in plastocyanin

103. N, P, K available in very less amount and required in most metabolic activity.

106. • Inhibiting of Ca^{+2} translocation in shoot apex.
• Mn competes with Mg $\rightarrow$ Binding with enzymes

108. *Nitrococcus* is nitrifying bacteria, converts NH_3 into NO_2^-

110. One glucose molecule produces two molecules of NADH during glycolysis.

112. In the Krebs' cycle oxaloacetic acid and acetyl CoA form citric acid in presence of water in first step.

113. Ubiquinone receives reducing equivalents via $FADH_2$ (complex II) that is generated during oxidation of succinate in the Krebs' cycle.

115. H_2S is electron donor.

116. Reaction centre has a single chl. a molecule.

119. PEPCase is in cytosol of mesophyll cells.

121. i. reduction
ii. 2
iii. 6
iv. 6
v. 1
vi. 3
vii. 9
viii. ATP
ix. NADP

122. Sugarcane is C_4 plant so bundle sheath cells chloroplast do not have grana.

124. One sucrose = one glucose and one fructose.
One glucose or fructose require 18 ATP and 12 NADPH
So 18 × 4 = 72 ATP
12 × 4 = 48 NADPH

127. IAA is a natural auxin. Apical hook formation occurs by ethylene.

131. Ethylene promotes abscission and senescence.

134. Vernalization site is apical meristem.

136. PCT, DCT, Glomerulus and Bowman's Capsule are present in cortical area of kidney
137. Two ATP molecules are used inside mitochondria and one ATP molecule is used in cytosol during urea cycle in liver.
138. Zero threshold solutes are not reabsorbed at all.
140. 'D' is PCT which is lined with brush bordered cuboidal epithelium.
141. A fall in GFR and renin can activate RAAS.
142. PCT keeps the filtrate isotonic to blood plasma and ascending limb of Henle's loop is permeable to electrolytes.
143. The two halves meet ventrally.
146 Filling of bladder is not affected.
147. *Manatee* and sloth do not have seven cervical vertebrae. Each vertebra has a neural canal.
148. Pumping of Ca^{2+} back into sacroplasmic reticulum lowers availability of calcium for muscle contraction.
149. Myosin head acts as ATPase and it breaks ATP into ADP and Pi. Actin binding site is present on head of myosin only.
150. Ethmoid is cranial bone while remaining are facial bones.
151. Between carpal bones, gliding joints are found. Between radius and ulna just below the elbow, pivot joint is present.
152. Ribs are called as bicephalic because they have two articulation points on dorsal ends.

    True ribs are ventrally connected to sternum directly with the help of hyaline cartilages.
153. Bipolar neurons have one distinct axon and dendrites.

    Multipolar neurons have numerous dendrites and one axon.
154. Medulla oblongata is the centre for control of breathing, cardiovascular reflex and gastric secretions.
156. Trigeminal is mixed nerve. Oculomotor controls both eyeball movements and accommodation whereas Abducens is responsible for movement of lateral rectus of eye. Hypoglossal arises from medulla.
157. Otolith organ maintains static equilibrium of body. Third ventricle is connected to fourth by duct of Sylvius. Pacinian corpuscles respond to pressure changes.
160. Cyton and dendrites contain Nissl's granules.
161. Medulla oblongata is the gastric secretion control centre. Pneumotaxic centre is present in pons.
164. Blind spot lacks photoreceptor cells.

    Macula lutea forms yellow spot of the eye.
165. It is located on basilar membrane.
167. Knee jerk is an example of monosynaptic reflex.
168. Cushing's syndrome occurs due to excess secretion of cortisol.
169. Adrenal gland (Adrenal cortex) is common source of steroidal hormones.
170. Thymosin from thymus gland helps in immune system.
171. Calcitriol is synthesized from cholesterol from subsequent action of enzyme in skin, liver and kidney.
172. Cretinism is hypothyroidism. It occurs due to hyposecretion of thyroxine.
173. Cortisol produces anti inflammatory reactions and suppresses the immune response.
174. Aldosterone stimulates the renal tubules to reabsorb Na^+ and water.
175. PTH is parathormone. TCT is thyrocalcitonin. PTH and TCT are antagonistic w.r.t. calcium metabolism.
176. Lipolysis is promoted by glucocorticoids.
178. ADH prevents diuresis, increases blood pressure and concentrates urine.
179. Estrogen and progesterone are lipid soluble hormones.

❑ ❑ ❑

All India Aakash Test Series for Medical - 2018

TEST - 7 (Code B)

Test Date : 21/01/2018

ANSWERS

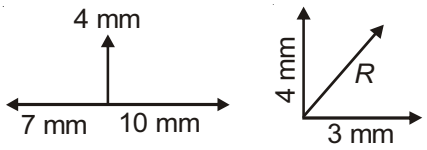
1.	(4)	37.	(2)	73.	(3)	109.	(3)	145.	(3)
2.	(3)	38.	(2)	74.	(2)	110.	(3)	146.	(3)
3.	(1)	39.	(4)	75.	(1)	111.	(2)	147.	(1)
4.	(2)	40.	(4)	76.	(2)	112.	(4)	148.	(2)
5.	(1)	41.	(2)	77.	(4)	113.	(2)	149.	(2)
6.	(3)	42.	(3)	78.	(2)	114.	(4)	150.	(3)
7.	(3)	43.	(2)	79.	(2)	115.	(1)	151.	(1)
8.	(4)	44.	(3)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

HINTS

PHYSICS

2. $\Delta\phi = \frac{2\pi}{\lambda}\cdot\Delta x$ So phase difference between the vibrations of two such particles varies with distance between them.

3. $I = \frac{P}{2\pi rL} = \frac{1.0\times10^4}{2\pi\times10\times10} = 16$ W/m^2

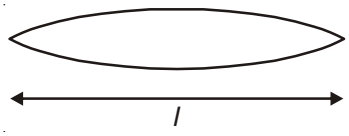
4. 

$R = \sqrt{3^2+4^2} = 5$ mm

5. $f = \frac{1}{2l}\sqrt{\frac{F}{\mu}}$, $\mu = A\rho$

$\therefore f = \frac{1}{2l}\sqrt{\frac{\text{stress}}{\rho}} = \frac{1}{2\times0.75}\sqrt{\frac{8.1\times10^8}{9\times10^3}} = 200$ Hz

6. On comparing with standard equation $\omega = 2\pi$ and $k = 2\pi$



$\therefore \frac{2\pi}{\lambda} = 2\pi \Rightarrow \lambda = 1$

$l = \frac{\lambda}{2} = 0.5$ m

7. $n_Q = 341 \pm 3 = 344$ Hz (or) 338 Hz
On waxing Q, the number of beats decreases hence ($n_Q > n_P$)
$\therefore$ $n_Q = 344$ Hz.

8. When pulse is reflected from a rigid support, the pulse is inverted both lengthwise and sidewise.

9. $n = \frac{P}{2l}\sqrt{\frac{T}{m}} \Rightarrow P\sqrt{T} = \text{Const}$

$\frac{P_1}{P_2} = \sqrt{\frac{T_2}{T_1}} = \sqrt{\frac{M_2}{M_1}}$

$\frac{4}{6} = \sqrt{\frac{M_2}{(50+15)}} \Rightarrow M_2 = 28.8$ g

$\therefore$ Mass removed from the pan
$M_1 - M_2 = 65 - 28.8 = 36.2$ g

10. Here $v_A = 72$ kmph = 20 m/s
$v_B = 36$ kmph = 10 m/s

$n' = n\left(\frac{v + v_B\cos45^\circ}{v - v_B\cos45^\circ}\right)$

$n' = 300\left(\frac{330 + 10/\sqrt{2}}{330 - 20/\sqrt{2}}\right) = 320$ Hz

11. $I \propto \frac{1}{r^2} \Rightarrow \frac{I_2}{I_1} = \frac{r_1^2}{r_2^2} = \frac{2^2}{40^2} = \frac{1}{400} \Rightarrow I_1 = 400I_2$

$L_1 - L_2 = 10\log\frac{I_1}{I_2} = 10\log_{10}400$

$L_1 - L_2 = 10 \times 2.602 = 26$
$L_2 = L_1 - 26 = 80 - 26 = 54$ dB

12. $I = 2\pi^2a^2n^2\nu p \Rightarrow I \propto a^2n^2$

$\frac{I_1}{I_2} = \left(\frac{a_1}{a_2}\right)^2\cdot\left(\frac{n_1}{n_2}\right)^2 = \left(\frac{1}{2}\right)^2\times\left(\frac{1}{1/4}\right)^2 \Rightarrow I_2 = \frac{I_1}{4}$

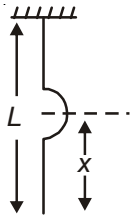
13. $n' = \frac{nv}{v - u_s}$ Since, source is moving towards the listener so $n' > n$
If $n = 100$ then $n' = 102.5$

$102.5 = \frac{100\times320}{320 - v_s} \Rightarrow v_s = 8$ m/s.

14. For end correction, $\frac{\ell_2 + x}{\ell_1 + x} = \frac{3\lambda/4}{\lambda/4} = 3$

$x = \frac{\ell_2 - 3\ell_1}{2} = \frac{72.3 - 3(23.7)}{2} = \frac{1.2}{2} = 0.6$ cm

15. In closed organ pipe, If $y_{\text{incident}} = a\sin(\omega t - kx)$
then $y_{\text{reflected}} = a\sin(\omega t + kx + \pi) = -a\sin(\omega t + kx)$
Superposition of these two waves give the required stationary wave.

16. 

Pulse at distance x from free end

Mass per unit length $= \frac{M}{L}$

Tension $= \frac{M}{L}xg$

$\therefore v = \sqrt{\frac{T}{\mu}} = \sqrt{\frac{Mgx/L}{M/L}} = \sqrt{gx}$

$\therefore v \propto \sqrt{x}$

17. $8 = \frac{1}{\lambda}\sqrt{\frac{T}{\mu}}$

$\Delta\gamma\% = \frac{1}{2}\Delta T\%$

Here $n = \frac{5\times 200}{2} = 500$ Hz

18. Let n be the frequency of fork 'C' then

$n_A = n + \frac{5n}{100} = \frac{105n}{100}$ and $n_B = n - \frac{4n}{100} = \frac{96n}{100}$

but $n_A - n_B = 9$

$\frac{105n}{100} - \frac{96n}{100} = 9$

$\frac{9n}{100} = 9$

$n = \frac{9\times 100}{9} = 100$ Hz

$n_A = \frac{105\times 100}{100} = 105$ Hz

19. 425 : 595 : 765

85 × 5 : 85 × 7 : 85 × 9 = 5 : 7 : 9

Fundamental tone = 85 Hz

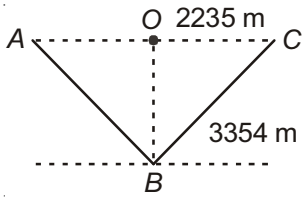
20. From the given equation $K = 0.2\pi$

$\frac{2\pi}{\lambda} = 0.2\pi \Rightarrow \lambda = 10$ cm

$\Delta\phi = \frac{2\pi}{\lambda}\cdot\Delta x = \frac{2\pi}{10}\times 2 = \frac{2\pi}{5} = 72°$

21. Time for echo = $10\sqrt{5}$ s (*i.e.,* for sound to travel *ABC*)

Velocity of the aeroplane = 200 m/s



$OC = 200\times 5\sqrt{5} = 2236$ m

BC = velocity of sound × $5\sqrt{5}$

$= 300\times 5\sqrt{5} = 3354$

$\therefore OB = \sqrt{BC^2 - OC^2} = 2500$ m

22. $v_1 = \sqrt{\frac{4RT}{M}}$

$v_2 = \sqrt{\frac{3RT}{M}}$

23. $t_1 = 2\pi\sqrt{\frac{m}{k_1}}$ and $t_2 = 2\pi\sqrt{\frac{m}{k_2}}$,

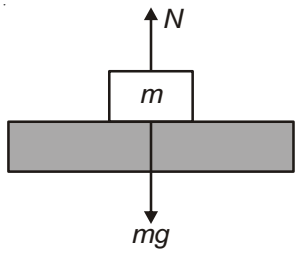
In series $k_e = \frac{k_1k_2}{k_1+k_2}$

$\therefore T = 2\pi\sqrt{\frac{m}{k_{eff}}} = 2\pi\sqrt{\frac{m}{(k_1k_2/k_1+k_2)}}$

$k_1 = \frac{4\pi^2m}{t_1^2}$ and $k_2 = \frac{4\pi^2m}{t_2^2}$

On simplification, $T^2 = t_1^2 + t_2^2$

24.



$mg - N = ma$

$mg - 0 = m\omega^2 A$

$A = \frac{mg}{m\omega^2} = \frac{g}{\omega^2}$

25. $\frac{v}{4l_1} = \frac{2v}{2l_2}$

$\frac{l_1}{l_2} = \frac{1}{4}$

26. Suppose the length of the parts are l_1 and l_2 then

$l_1 = 3\ l_2$

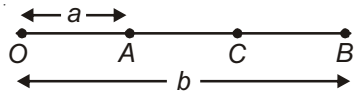
$l_1 + l_2 = l$

$l_2 = \frac{l}{4}$, $l_1 = \frac{3l}{4}$

$\therefore k_1 = \frac{k}{3/4} = \frac{4k}{3}$

$k_2 = \frac{k}{1/4} = 4k$

27.



From figure 'C' is the mean position of SHM

The amplitude oscillations $A = \frac{b-a}{2}$

The velocity at the mean position 'C' will be

$v = \omega A = \frac{2\pi}{T}\left(\frac{b-a}{2}\right)$

$T = \frac{\pi(b-a)}{v}$

28. $T = 2\pi\sqrt{\dfrac{m_1 + m_2}{k}}$

For two blocks to move as a unit

$m_2\omega^2 A \le \mu m_2 g$

$A \le \dfrac{\mu g}{\omega^2}$

$A = \dfrac{\mu g(m_1 + m_2)}{k}$

29. As m_1 is removed, the mass m_2 will oscillate and so

$T = 2\pi\sqrt{\dfrac{m_1}{K}} \Rightarrow \omega = \dfrac{2\pi}{T} = \sqrt{\dfrac{k}{m_2}}$

Furthermore, the stretch produced by m_1g will set the amplitude, *i.e.,* $m_1 g = kA \Rightarrow A = \dfrac{m_1 g}{k}$

30. $f(x, t) = f(x - vt)$

31. As $y_2 = 4\left[\sin 3\pi t + \sqrt{3}\cos 3\pi t\right]$

$= 4\sin 3\pi t + 4\sqrt{3}\cos 3\pi t$

$\therefore A = \sqrt{4^2 + \left(4\sqrt{3}\right)^2} = \sqrt{16 + 48} = 8$

$\tan\theta = \dfrac{4\sqrt{3}}{4} = \sqrt{3} \Rightarrow \phi = \pi/3$

The above equation becomes $y_2 = 8\sin\left(3\pi t + \dfrac{\pi}{3}\right)$

$\therefore \dfrac{A_1}{A_2} = \dfrac{4}{8} = \dfrac{1}{2}$

33. $y = kt^2 = \dfrac{1}{2}at^2$

$\dfrac{1}{2}at^2 = kt^2$

$a = 2k$,

$a = 4$ m/s^2

$\dfrac{T_1}{T_2} = \dfrac{2\pi\sqrt{\dfrac{l}{g}}}{2\pi\sqrt{\dfrac{l}{g+a}}} = \sqrt{\dfrac{g+a}{g}} = \sqrt{\dfrac{14}{10}}$

$\dfrac{T_1^2}{T_2^2} = \dfrac{14}{10} = \dfrac{7}{5}$

34. From conservation of mechanical energy,

$\dfrac{1}{2}KA^2 = \dfrac{1}{2}mv^2$

$A = v\sqrt{\dfrac{m}{K}} = 12\sqrt{\dfrac{0.2}{20}} = 1.2$ m

36. $v_{rms} = \sqrt{\dfrac{3RT}{M}} \Rightarrow \dfrac{v_{H_2}}{v_{He}} = \sqrt{\dfrac{M_{He}}{M_{H_2}}}$

$v_{H_2} = \sqrt{\dfrac{4}{2}}\, v_{He} \Rightarrow v_{H_2} = \sqrt{2}\, v_{He}$

$\therefore \dfrac{v_{H_2}}{v_{He}} = \sqrt{2}$

37. $T_i = 300k$, $T_f = 700k$

$Q = \int_{T_i}^{T_f} nC dT = \int_{T_i}^{T_f} n(a + bT)dT$

$= \int_{300}^{700} 2(27.2 + 4\times10^{-3}T)dT$

$= \left[54.4T + 4\times10^{-3}T^2\right]_{300}^{700} = 23{,}360$ J

38. $\Delta Q_v = nC_v\, dT$ (V = const)

$n = \dfrac{PV}{RT} = \dfrac{10^5 \times 0.2}{8.31\times300} = 8$ mol

$\Delta Q_1 = 8\left(\dfrac{5}{2}R\right)(600 - 300)$

39. $y = A\left(\dfrac{1 - \cos 2(\omega t - kx)}{2}\right)$

$y = \dfrac{A}{2}[1 - \cos(2\omega t - 2kx)]$

Amplitude = $\dfrac{A}{2}$

Frequency = $\dfrac{\omega}{\pi}$

41. For a given gas $P \propto M$

$\dfrac{P_1}{P_2} = \dfrac{M_1}{M_2} \Rightarrow M_2 = M_1 \times \dfrac{P_2}{P_1}$

$M_2 = 12 \times \dfrac{3\times10^6}{10^7} \Rightarrow M_2 = 3.6$ kg

Quantity of gas taken out from the cylinder,

$\Delta M = M_1 - M_2 = 12 - 3.6$

$\Delta M = 8.4$ kg

42. $v_{rms} = \sqrt{\dfrac{v_1^2 + v_2^2 + v_3^2 + v_4^2}{4}}$

$= \sqrt{\dfrac{1^2 + 2^2 + 6^2 + 8^2}{4}} = \sqrt{\dfrac{105}{4}}$

43. $\dfrac{n_1 + n_2}{\gamma_{mix} - 1} = \dfrac{n_1}{\gamma_1 - 1} + \dfrac{n_2}{\gamma_2 - 1}$

44. $v_{max} = |A\omega| = p(2\pi q)$

$v_\omega = \frac{q}{r}$

$v_{max} = 2v_\omega$

$p(2\pi q) = 2\left(\frac{q}{r}\right)$

$\pi p = \frac{1}{r}$

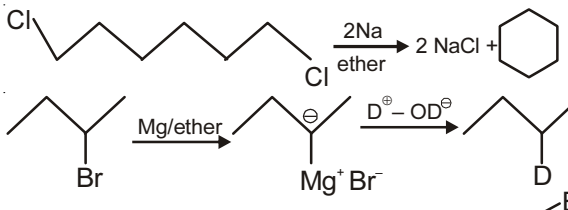
45. $\frac{\rho}{P} \propto \frac{1}{T}$

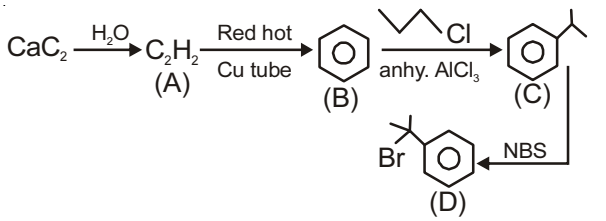
$$\frac{\left(\frac{\rho}{P}\right)_{10°C}}{\left(\frac{\rho}{P}\right)_{110°C}} = \frac{383}{283} \Rightarrow \frac{5}{\left(\frac{\rho}{P}\right)_{110°C}} = \frac{383}{283}$$

$$\therefore \quad \left(\frac{\rho}{P}\right)_{110°C} = \frac{283}{383} \times 5 = 3.69$$

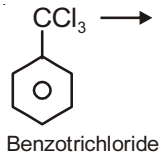
CHEMISTRY

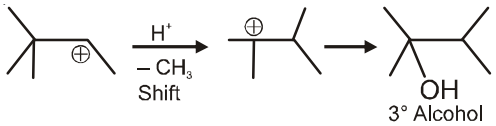
46. Fact
47. Fact
48. Fact

50. 

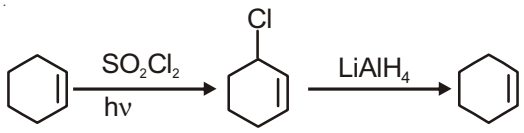
52. 

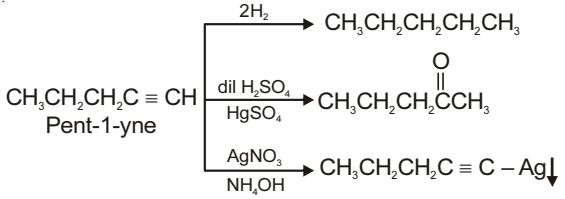
53. $-NO_2$ is – I and – M group.
54. Isopropyl group has less α–H than methyl group. Hence, it is less activating in nature.

56. 

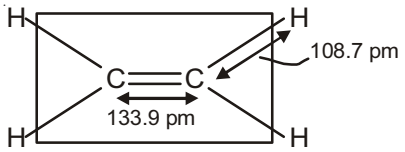
57. 

58. More the stability of alkene lesser will be enthalpy of hydrogenation.
59. $-OCH_3$ group activates more to the benzene ring.

60. 

61. 

63. (ii) is not planar.

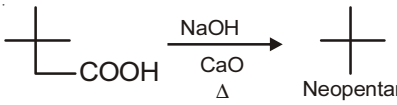
64. 

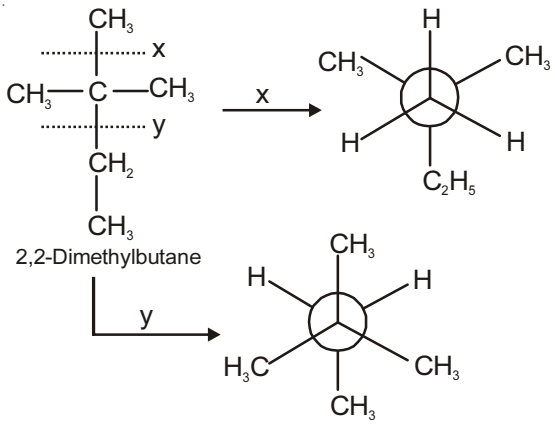
65. Fact
66. Branching decreases the boiling point

67. $2CH_3COONa + 2H_2O \xrightarrow{I} C_2H_6 + 2CO_2 + 2NaOH + H_2$

68. % of Br = $\frac{80}{(108+80)} \times \frac{0.11}{0.18} \times 100 = 26\%$

72. After losing H^+, it will become aromatic.
73. Neutral species with complete octet in the structure.
74. 3°alkyl halide will not give Wurtz's reaction in good yield.
75. Fact – Orthoeffect

76. 

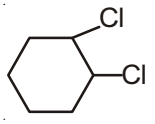
77. 

78. Fact
79. In (iii) – due to aromaticity, lone pair of e^- are not available
In (i) – Mesomeric effect of $-NH_2$
80. Anti or Staggered.

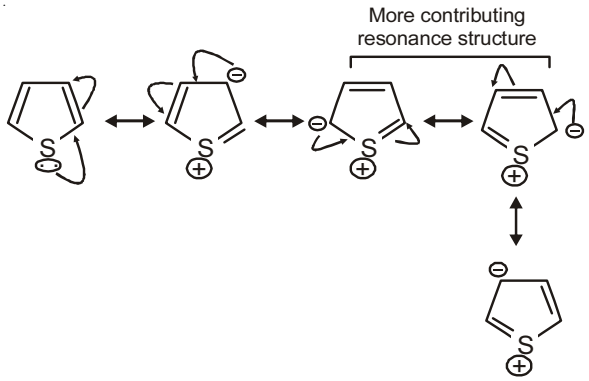
81. IHD = degree of unsaturation
= double bond equivalent

$$IHD = (C+1)-\left[\frac{H-N}{2}\right] = (20+1)-\left(\frac{20-0}{2}\right) = 11$$

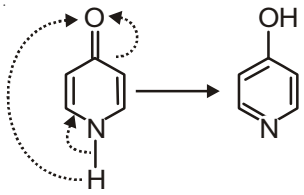
82. $CH_2 = C = CH_2$ – Allene
RCH = N – OH – Aldoxime
PhN = N – Ph – Azobenzene



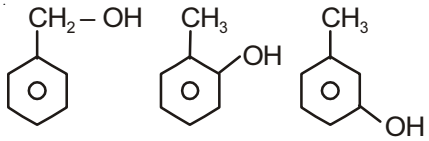
– 1,2-Dichlorohexane

83. 

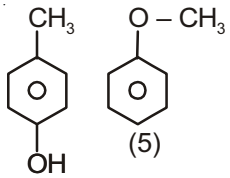
84. Fact

85. 

86. Degree of unsaturation is 2. Hence, 5 cyclic are possible.

87. 

(1) (2) (3)



(5)

(4)

88. Carbenes are electrophilic in nature.

89. $-CH_2$ present between two strong electron withdrawing group has more acidic hydrogen, its enolic content will be more stable, due to intramolecular H-bond, chelation and resonance.

BIOLOGY

92. Vernalization site is apical meristem.

95. Ethylene promotes abscission and senescence.

99. IAA is a natural auxin. Apical hook formation occurs by ethylene.

102. One sucrose = one glucose and one fructose.
One glucose or fructose require 18 ATP and 12 NADPH
So 18 × 4 = 72 ATP
12 × 4 = 48 NADPH

104. Sugarcane is C_4 plant so bundle sheath cells chloroplast do not have grana.

105. i. Reduction
ii. 2
iii. 6
iv. 6
v. 1
vi. 3
vii. 9
viii. ATP
ix. NADP

107. PEPCase is in cytosol of mesophyll cells.

110. Reaction centre has a single chl. a molecule.

111. H_2S is electron donor.

113. Ubiquinone receives reducing equivalents via $FADH_2$ (complex II) that is generated during oxidation of succinate in the Krebs' cycle.

114. In the Krebs' cycle oxaloacetic acid and acetyl CoA form citric acid in presence of water in first step.

116. One glucose molecule produces two molecules of NADH during glycolysis.

118. *Nitrococcus* is nitrifying bacteria, converts NH_3 into NO_2^-

120. • Inhibiting of Ca^{+2} translocation in shoot apex.
• Mn competes with Mg $\rightarrow$ Binding with enzymes

123. N, P, K available in very less amount and required in most metabolic activity.

124. Cu is found in plastocyanin

125. Ca has role in synthesis of middle lamella.

128. Water passes through living continuum of cell.

131. Concentration of minerals in soil is less than the root cell.

132. Plant cell shows exosmosis.

133. A – Corns plant absorbs = 3 L in 1 day
B – Not dependent on living cells
D – Pure water has maximum water potential

134. It is the type of facilitated diffusion.

135. O_2 is used in chloroplast and peroxisome whereas

transamination occurs in peroxisome.

137. Estrogen and progesterone are lipid soluble hormones.

138. ADH prevents diuresis, increases blood pressure and concentrates urine.

140. Lipolysis is promoted by glucocorticoids.

141. PTH is parathormone. TCT is thyrocalcitonin. PTH and TCT are antagonistic w.r.t. calcium metabolism.

142. Aldosterone stimulates the renal tubules to reabsorb Na^+ and water.

143. Cortisol produces anti inflammatory reactions and suppresses the immune response.

144. Cretinism is hypothyroidism. It occurs due to hyposecretion of thyroxine.

145. Calcitriol is synthesized from cholesterol from subsequent action of enzyme in skin, liver and kidney.

146. Thymosin from thymus gland helps in immune system.

147. Adrenal gland (Adrenal cortex) is common source of steroidal hormones.

148. Cushing's syndrome occurs due to excess secretion of cortisol.

149. Knee jerk is an example of monosynaptic reflex.

151. It is located on basilar membrane.

152. Blind spot lacks photoreceptor cells.

Macula lutea forms yellow spot of the eye.

155. Medulla oblongata is the gastric secretion control centre. Pneumotaxic centre is present in pons.

156. Cyton and dendrites contain Nissl's granules.

159. Otolith organ maintains static equilibrium of body. Third ventricle is connected to fourth by duct of Sylvius. Pacinian corpuscles respond to pressure changes.

160. Trigeminal is mixed nerve. Oculomotor controls both eyeball movements and accommodation whereas Abducens is responsible for movement of lateral rectus of eye. Hypoglossal arises from medulla.

162. Medulla oblongata is the centre for control of breathing, cardiovascular reflex and gastric secretions.

163. Bipolar neurons have one distinct axon and dendrites.

Multipolar neurons have numerous dendrites and one axon.

164. Ribs are called as bicephalic because they have two articulation points on dorsal ends.

True ribs are ventrally connected to sternum directly with the help of hyaline cartilages.

165. Between carpal bones, gliding joints are found. Between radius and ulna just below the elbow, pivot joint is present.

166. Ethmoid is cranial bone while remaining are facial bones.

167. Myosin head acts as ATPase and it breaks ATP into ADP and Pi. Actin binding site is present on head of myosin only.

168. Pumping of Ca^{2+} back into sacroplasmic reticulum lowers availability of calcium for muscle contraction.

169. *Manatee* and sloth do not have seven cervical vertebrae. Each vertebra has a neural canal.

170 Filling of bladder is not affected.

173. The two halves meet ventrally.

174. PCT keeps the filtrate isotonic to blood plasma and ascending limb of Henle's loop is permeable to electrolytes.

175. A fall in GFR and renin can activate RAAS.

176. 'D' is PCT which is lined with brush bordered cuboidal epithelium.

178. Zero threshold solutes are not reabsorbed at all.

179. Two ATP molecules are used inside mitochondria and one ATP molecule is used in cytosol during urea cycle in liver.

180. PCT, DCT, Glomerulus and Bowman's Capsule are present in cortical area of kidney

❑ ❑ ❑