All India Aakash Test Series for NEET - 2026

Test-7_(Code-E)

Click here for Code-F Sol.

Test Date: 22/03/2026

ANSWERS

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

HINTS & SOLUTIONS

[PHYSICS]

1. Answer (3)

Hint: Minimum magnifying power, $\gamma = \frac{v_0}{u_0} \times \frac{D}{f_e}$

Sol.: For objective lens,

$v_0 = \frac{u_0 f_0}{u_0 + f_0} = \frac{(-6)(4)}{-6+4} = \frac{(-6)(4)}{-2} = 12$ cm

$|m_0| = \frac{v_0}{u_0} = \frac{12}{6} = 2$

$\therefore \quad \gamma = 2 \times \frac{D}{f_e} = 2 \times \frac{25}{6.25} = 8$

2. Answer (3)

Hint: For n^{th} resonance, $L = (2n-1)\frac{\lambda}{4}$

Sol.: $v = f\lambda$

$\Rightarrow \quad \lambda = \frac{v}{f} = \frac{320}{1280} = \frac{1}{4}$ m

$\Rightarrow \quad \lambda = 25$ cm

$\Rightarrow$ Now, let number of resonance possible be n

$\therefore \quad 140 \geq (2n-1)\frac{\lambda}{4}$

$\Rightarrow \quad 140 \geq (2n-1)\frac{25}{4}$

$\Rightarrow \quad \frac{140 \times 4}{25} \geq 2n-1$

$2n \leq 1 + 22.4 \leq 23.4$

$n \leq 11.7$

i.e., $n = 11$

3. Answer (4)

Hint: If amplitude become half in time t, then after time nt, its amplitude is $\frac{A_0}{2^n}$

Sol.: Amplitude gets halved in time $T = 2$ s

then, $t = 6$ s, i.e., $t = 3T$

$A = \frac{A_0}{2^3}$

$= \frac{A_0}{8}$

4. Answer (2)

Hint: End correction, $e = 0.6R$

Sol.: $e = 0.6R$

$\Delta e = 0.6\Delta R$

$\Rightarrow \quad \frac{\Delta e}{e} \times 100 = \frac{0.6 \times 0.1}{0.6 \times 2} \times 100 = 5\%$

5. Answer (3)

Hint: de-Broglie wavelength λ is given by,

$\lambda = \frac{h}{p} = \frac{h}{\sqrt{2mqV}}$

Sol.: $\frac{\lambda_\alpha}{\lambda_p} = \sqrt{\frac{m_p q_p V_p}{m_\alpha q_\alpha V_\alpha}} = \sqrt{\frac{m_p q_p (400)}{4m_p \times 2q_p (100)}} = \frac{1}{\sqrt{2}}$

$\Rightarrow \quad \lambda_p = \sqrt{2}\lambda_\alpha = \sqrt{2}\lambda_0$

6. Answer (1)

Hint: For no parallax, image should be formed on the place of object itself.

Sol.: For lens,

$v = \frac{uf}{u+f} = \frac{(-15)(10)}{-15+10} = \frac{(-15)(10)}{-5} = +30$ cm

$\Rightarrow$ Now, image formed by convex lens should be formed on centre of curvature of mirror.

$\therefore \quad R + 10 = 30 \quad \Rightarrow \quad R = 20$ cm

and $f = 10$ cm

7. Answer (4)

Hint and Sol.: If a component has two terminals, it could be a resistor, a capacitor, a diode, or a LED. A transistor is a three-terminal device.

8. Answer (3)

Hint: Reading = MSR + CSR – 6 × L.C.

Sol.: $d = 2 + 24 \times 0.005 - 6 \times 0.005$

$= 2 + 0.120 - 0.030$

$= 2.090$ mm

9. Answer (2)

Hint and Sol.: According to Bohr's model,

$r \propto \frac{n^2}{z}$

$v \propto \frac{z}{n}$

$T \propto \frac{r}{v} \propto \frac{n^3}{z^2}$

$E \propto \frac{z^2}{n^2}$

10. Answer (2)

Hint: Electrons coming from metal plate have kinetic energy ranging from zero to $(KE)_{max}$.

Sol.: $(KE)_{max} = \frac{12420}{2484} - 2 = 3$ eV

$\Rightarrow$ The electrons emitted with K.E. varying from zero to 3 eV. When accelerated with 10 V their energies increase by 10 eV.

Therefore, hydrogen atom will get photons of energies from 10 eV to 13 eV.

$\Rightarrow$ For energy 12.75 eV, maximum possible transitions to $n = 4$

$\therefore$ number of spectral lines $= \frac{n(n-1)}{2}$

$= \frac{4 \times 3}{2} = 6$

11. Answer (1)

Hint: Apply conservation of momentum

Sol.: $\vec{P}_i = 0$

$\vec{P}_i = \vec{P}_f$

$0 = \vec{P}_Q + \vec{P}_\alpha$

$\left|\vec{P}_Q\right| = \left|\vec{P}_\alpha\right| = P$(let)

$\frac{k_1}{k_2} = \frac{P^2/2m_1}{P^2/2m_2} = \frac{m_2}{m_1}$

12. Answer (3)

Hint: Conserve mass number and atomic number.

Sol.: Let atomic number of δ be a and mass number be b $\left({}_a\delta^b\right)$

$\therefore$ $z + 2 = z + 1 + a \quad \Rightarrow \quad a = 1$

and $A + 4 = A + 3 + b \quad \Rightarrow \quad b = 1$

$\therefore$ δ is a proton

13. Answer (3)

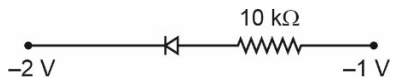
Hint and Sol.: Higher binding energy per nucleon implies higher stability.

Nuclear force is a non-central type force.

14. Answer (1)

Hint: Resistance of ideal p-n junction diode is nearly zero when forward biased.

Sol.:



$i = \frac{\Delta V}{R} = \frac{1}{10 \times 10^{+3}}$

= 0.1 mA

15. Answer (2)

Hint and Sol.: Photo diode is used in reverse bias and LED is used in forward bias for proper functioning.

Solar cell works in no biasing condition

16. Answer (2)

Hint: For dynamic resistance, use $R = \frac{\Delta V}{\Delta I}$

Sol.: $R = \frac{\Delta V}{\Delta I}$

$= \frac{2}{0.4 \times 10^{-6}}$

$= 5 \times 10^6\ \Omega$

17. Answer (4)

Hint and Sol.: To get output $Y = 1$, both inputs of AND gate must be 1.

18. Answer (4)

Hint and Sol.: $i = \frac{\text{P.D. across resistance}}{\text{resistance}}$

$= \frac{10 - 0.7}{100} = \frac{9.3}{100}$ = 93 mA

19. Answer (2)

Hint and Sol.: Electrons diffuse from n-region to p-region due to concentration difference.

20. Answer (2)

Hint: de-Broglie wavelength (λ) is given by, $\lambda = \frac{h}{p}$

Sol.: $\lambda = \frac{h}{p}$

$\Rightarrow \frac{\lambda_p}{\lambda_\alpha} = \frac{P_\alpha}{P_p} = \sqrt{\frac{m_\alpha k_\alpha}{m_p k_p}} = \frac{m_\alpha v_\alpha}{m_p v_p}$

21. Answer (2)

Hint: Use Einstein's photoelectric equation,

$(K.E.)_{max} = h\nu - \phi$

Sol.: $(K.E.)_{max} = eV_0 = 8.5$ eV

Energy of incident photon $h\nu = (KE)_{max} + \phi$

= 8.5 + 1.5 = 10 eV

$\Rightarrow \lambda = \frac{12400}{10}$ Å $= 1240$ Å

22. Answer (2)

Hint: de-Broglie wavelength, $\lambda = \frac{h}{p}$

Sol.: $\lambda = \frac{h}{p}$

$\Rightarrow \frac{\Delta\lambda}{\lambda} \times 100 = \frac{-\Delta P}{P_i} \times 100$

$\Rightarrow \frac{1}{100} = \frac{\Delta P}{P_i}$

$\Rightarrow P_i = 100\,\Delta P$

$|P_i| = 100P$

23. Answer (2)

Hint: Path difference between light coming from S_1 and S_2 at point P is $\Delta x = d\sin\theta$

Sol.: $\Delta\phi = k\Delta x$

$\Rightarrow \pi = \frac{2\pi}{\lambda} \times d\sin\theta$

$\Rightarrow \sin\theta = \frac{\lambda}{2d} \Rightarrow \theta = \sin^{-1}\left(\frac{\lambda}{2d}\right)$

24. Answer (2)

Hint: The maximum number of interference maxima: $n = 2\left[\frac{d}{\lambda}\right] + 1$

Sol.: $n = 2\left[\frac{d}{\lambda}\right] + 1$

$n = 2\left[\frac{4.2\lambda}{\lambda}\right] + 1 = 9$

25. Answer (3)

Hint: By law of Malus, $I = I_0\cos^2\theta$

Sol.: $\theta = 37°$

$I = I_0\cos^2 37°$

$I = I_0\left(\frac{4}{5}\right)^2$

and $I \propto A^2$

$A^2 = A_0^2\left(\frac{4}{5}\right)^2$

$A = \frac{4A_0}{5}$

26. Answer (2)

Hint: In far field diffraction pattern,

Distance of first secondary bright fringe, $y_1 = \frac{3\lambda D}{2d}$

and distance of third dark fringe, $y_2 = \frac{3\lambda D}{d}$

Sol.: $y_1 = y_2$

$\Rightarrow \frac{3\lambda_1 D}{2d} = \frac{3\lambda_2 D}{d}$

$\Rightarrow \frac{\lambda_1}{2} = \lambda_2$

$\Rightarrow \lambda_1 = 2\lambda_2$

27. Answer (1)

Hint: When light is incident at Brewster's angle, then reflected and refracted rays are perpendicular to each other and reflected beam is completely polarized

Sol.: $\tan\theta = \mu$

$\mu = \tan 60°$

$= \sqrt{3} = 1.73$

28. Answer (3)

Hint and Sol.: The angular width in diffraction pattern is proportional to wavelength. As the wavelength increases the diffraction pattern becomes broader and farther.

29. Answer (2)

Hint: $N = \frac{360}{\theta}$

Number of images $n = N - 1$, if N is even

Sol.: $N = \frac{360}{45} = 8$

$n = 8 - 1 = 7$

30. Answer (2)

Hint: Angle of deviation $\delta = 180° - 2i$

Sol.: $i = 90° - 30° = 60°$

$\delta = 180° - 2i$

$= 180° - 2 \times 60° = 60°$

31. Answer (2)

Hint: Use mirror formula with proper sign convention.

$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$

Sol.: $\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$

$\Rightarrow \frac{1}{v} + \frac{1}{20} = \frac{1}{40}$

$\Rightarrow v = \frac{20 \times 40}{20 - 40} = -40$ cm

$m = \frac{-v}{u} \Rightarrow$ +ve

So, image will be erect

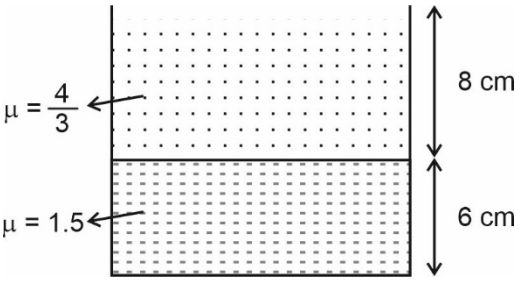
32. Answer (3)

Hint and Sol.: For a real object, image formed by convex mirror is always erect, diminished and virtual.

33. Answer (2)

Hint: Apparent depth, $d = \frac{d_1}{\mu_1} + \frac{d_2}{\mu_2}$

Sol.:



$d = \frac{8}{\frac{4}{3}} + \frac{6}{1.5}$

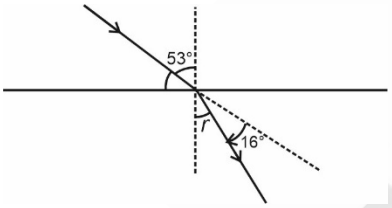
= 6 + 4

= 10 cm

34. Answer (3)

Hint: Use Snell's law,

Sol.:



By Snell's law

$1 \times \sin 53° = \mu \sin 37°$

$\frac{4}{5} = \mu \times \frac{3}{5} \Rightarrow \mu = \frac{4}{3}$

35. Answer (1)

Hint: $v = f\lambda \Rightarrow \frac{c}{\mu} = f\lambda \Rightarrow \mu \propto \frac{1}{\lambda}$

Sol.: $\theta_C = \sin^{-1}\left(\frac{\mu_2}{\mu_1}\right) = \sin^{-1}\left(\frac{\lambda_1}{\lambda_2}\right)$

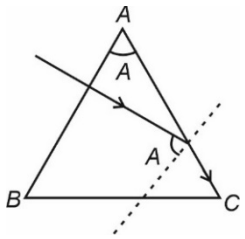
$\theta_C = \sin^{-1}\left(\frac{5000}{6000}\right)$

$= \sin^{-1}\left(\frac{5}{6}\right)$

36. Answer (2)

Hint: If the ray just fails to emerge, then $e = 90°$

Sol.:



$\Rightarrow A = \theta_C = \sin^{-1}\left(\frac{1}{\mu}\right)$

$\Rightarrow A = \sin^{-1}\left(\frac{3}{5}\right)$

$A = 37°$

37. Answer (3)

Hint: For combination of lens and mirror,

$\frac{1}{f_{eq}} = \frac{-2}{f_L} + \frac{1}{f_m}$

Sol.: Since the mirror is plane, therefore $f_m = \infty$

$\therefore \quad f_{eq} = \frac{-f_L}{2}$

$\Rightarrow \frac{1}{f_L} = (\mu - 1)\left(\frac{1}{R}\right)$

$\Rightarrow \frac{1}{f_L} = \frac{1}{2} \times \frac{1}{20} \quad \Rightarrow f_L = 40$ cm

$f_{eq} = \frac{-40}{2} = -20$ cm

$\therefore$ For an image to form on object itself, object should be placed at centre of curvature of the combination, hence the object distance = 2 × 20 = 40 cm.

38. Answer (4)

Hint: Q-value of reaction = (BE) of product – (BE) of reactant

Sol.: $Q = (4 \times 7.2) - (2 \times 2 \times 1.12)$

= 28.8 – 4.48

= 24.32 MeV

39. Answer (4)

Hint and Sol.: Nuclear density of all the nucleus is almost same.

40. Answer (2)

Hint: α-decay reaction, $X^A \rightarrow Y^{A-4} + {}^4_2He + Q$-value

Sol.: Let Q-value of reaction is Q, then kinetic energy of α- particle, $E_0 = \left(\frac{A-4}{A}\right)Q$

$\Rightarrow Q = \frac{AE_0}{A-4}$

41. Answer (2)

Hint: Number of photons emitted per second,

$$n = \frac{\text{Power of source}}{\text{Energy of one photon}}$$

Sol.: Energy of photon $= \frac{P}{n} = \frac{1.28\times10^{-3}}{4\times10^{15}}$ J

$$= \frac{1.28\times10^{-3}}{4\times10^{15}\times1.6\times10^{-19}} \text{ eV}$$

= 2 eV

$\Rightarrow$ Stopping potential $V_0 = 2 - 1.5 = 0.5$ V

42. Answer (4)

Hint and Sol.: All given type semiconductors are electrically neutral.

43. Answer (2)

Hint: Power, $P = \frac{dN}{dt}\times\frac{hc}{\lambda}$

and $F = \frac{dN}{dt}\frac{h}{\lambda}$

Sol.: $F = \frac{dN}{dt}\frac{h}{\lambda} = ma$

$$a = \frac{P}{mc}$$

$$S = \frac{1}{2}at^2 = \frac{1}{2}\frac{P}{mc}t^2$$

$$S = \frac{1}{2}\times\frac{2\times10^{-3}}{25\times10^{-3}\times3\times10^{8}}\times(30\times60)^2$$

S = 432 μm

44. Answer (1)

Hint: Energy of photon emitted,

$$\Delta E = 13.6\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right) \text{ eV}$$

Sol.: $\Delta E = 13.6\left[1 - \frac{1}{25}\right]$

$= 13.6\times\frac{24}{25}$ = 13.06 eV

45. Answer (2)

Hint: Energy required to remove an electron from ground state, $E = 13.6 \times Z^2$ eV

Sol.: $E = 13.6 \times (4)^2$

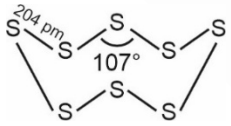
= 217.6 eV

[CHEMISTRY]

46. Answer (3)

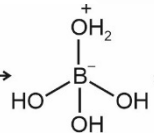
Hint: In vapour state sulphur partly exists as S_2 molecule and exhibits paramagnetism.

Sol.: S_8 ring in rhombic and monoclinic forms.



47. Answer (4)

Hint: H_3BO_3 is a weak monobasic Lewis acid.

Sol.: H_2O (Base) + $B(OH)_3$ (Acid) $\rightarrow$  $\rightleftharpoons [B(OH)_4]^- + H^+$

48. Answer (2)

Hint: Copper bead is blue in colour.

Sol.: $Na_2B_4O_7\cdot10H_2O \xrightarrow{\Delta} Na_2B_4O_7 \xrightarrow{\Delta} 2NaBO_2 + B_2O_3$

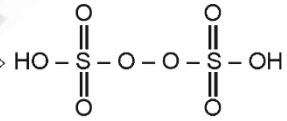
$B_2O_3 + CaO \longrightarrow \underset{\text{(Blue bead)}}{Co(BO_2)_2}$

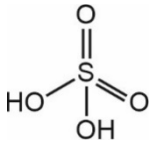
49. Answer (2)

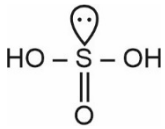
Hint: Phosphorus trichloride is obtained by action of thionyl chloride with white phosphorus.

Sol.: $P_4 + 8SOCl_2 \longrightarrow 4PCl_3 + 4SO_2 + 2S_2Cl_2$

50. Answer (3)

Hint: $H_2S_2O_8 \Rightarrow$  4π bonds

Sol.: H_2SO_4  2π bonds

H_2SO_3  1π bond

51. Answer (2)

Hint: Phosgene gas = $COCl_2$

Sol.: Tear gas = CCl_3NO_2

Laughing gas = N_2O

Mustard gas = $ClCH_2CH_2SCH_2CH_2Cl$

52. Answer (2)

Hint: For H_2SO_4, $Ka_1 >> Ka_2$

Sol.: In Contact process, during absorption of SO_3 in H_2SO_4, oleum (pyrosulphuric acid) is obtained with 1 (S–O–S) bond.

53. Answer (2)

Hint

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

Sol.: 4 moles Zn reacts with 10 moles of HNO_3

$\therefore$ 3 moles of Zn will react with 7.5 moles of HNO_3.

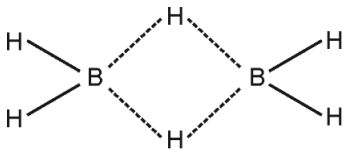
54. Answer (4)

Hint: Pale yellow ppt of AgBr is partially soluble in ammonium hydroxide

Sol.: $(CH_3COO)_2Pb + H_2S \rightarrow \underset{(Black)}{PbS} + CH_3COOH$

55. Answer (3)

Hint:



Sol.: 4 bonds of 2c – $2e^-$

2 bonds of 3c – $2e^-$

56. Answer (3)

Hint: $NH_4NO_3 \xrightarrow{\Delta} \underset{\substack{\text{Colourless}\\ \text{gas, neutral}}}{N_2O} + 2H_2O$

Sol.: $2NaNO_2 + 2FeSO_4 + 3H_2SO_4 \longrightarrow$

$$Fe(SO_4)_3 + 2NaHSO_4 + 2H_2O + \underset{\substack{\text{Colourless gas}\\ \text{neutral}}}{2NO}$$

57. Answer (2)

Hint and Sol.: Group II – Cu^{2+}

Group reagent of group II cations is H_2S gas in presence of dil. HCl.

58. Answer (4)

Hint: On heating metal carbonates in a charcoal cavity, the carbonates are converted to metal oxide, which are coloured residues.

Sol.:

Charcoal cavity test.

Observation	Ion
Yellow residue when hot and white when cold	Zn^{2+}

59. Answer (2)

Hint: Insulin is soluble in water.

Sol.: Keratin and myosin have fibre-like structure and are held together by hydrogen and sulphide bonds.

60. Answer (1)

Hint: Cellulose is a straight chain polysaccharide

Sol.: Cellulose is a linear polymer of β-D-glucose.

61. Answer (2)

Hint: Sucrose is a disaccharide, which on hydrolysis gives equimolar mixture of D – (+) – Glucose and D – (–) fructose.

Sol.: The monosaccharides of sucrose are hold together by a glycosidic linkage between C1 of α-D-glucose and C2 of β-D-fructose.

62. Answer (2)

Hint: Glucose on treatment with bromine water gives gluconic acid.

Sol.: Cellulose is a linear polymer of β-D-glucose units held together by glycosidic linkage.

63. Answer (1)

Hint: The α-form of glucose (m.p 419 K) is obtained by crystallisation from concentrated solution of glucose at 303 K.

Sol.: The pentaacetate of glucose does not react with hydroxylamine indicating the absence of free –CHO group.

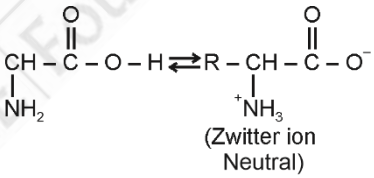
64. Answer (2)

Hint: Lactose is composed of β-D-Galactose and β-D-Glucose.

Sol.: The linkage in lactose is between C1 of galactose and C4 of glucose.

65. Answer (4)

Hint:



Sol.: Except glycine, all other naturally occurring α-amino acids are optically active.

66. Answer (3)

Hint: When conc. H_2SO_4 is poured slowly in a mixture of nitrate salt solution and freshly prepared $FeSO_4$ solution, a brown ring is observed at the junction of two liquids.

Sol.: $2NO_3^- + 4H_2SO_4 + 6Fe^{2+} \rightarrow 6Fe^{3+} + 2NO\uparrow + 4SO_4^{2-} + 4H_2O$

$$\left[Fe(H_2O)_6\right]^{2+} + NO \rightarrow \left[Fe(H_2O)_5NO\right]^{2+} + H_2O$$

67. Answer (1)

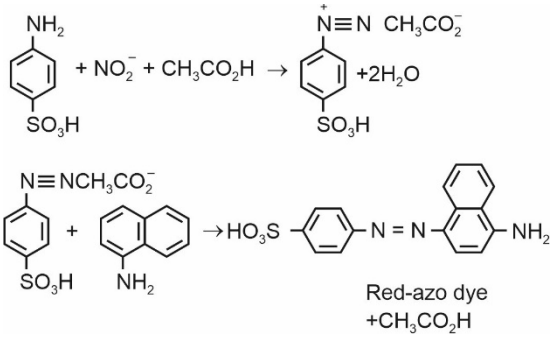
Hint: $\Delta_{neut}H$ for WA + SB is less than 57.1 kJ mol^{-1}.

Sol.: Since acetic acid is a weak acid, hence some amount of heat is used in ionisation of acetic acid.

68. Answer (4)

Hint: This test is based upon the diazo-coupling reaction of sulphanillic acid. This test is specific for nitrite radical.

Sol.:



69. Answer (1)

Hint and Sol.: Cu^{2+} belongs to group-(II) cation hence it will give precipitate.

70. Answer (1)

Hint: Colour of methyl orange in acidic medium is orange red

Colour of methyl orange in basic medium is yellow

Sol.: Phenol red in acidic medium = Yellow

Phenol red in basic medium = Red

71. Answer (2)

Hint: Number of g equivalent of oxalic acid = number of g equivalent of $KMnO_4$

Sol.: Molarity of $H_2C_2O_4 \cdot 2H_2O = \frac{12.6 \times 1000}{126 \times 100}$

$= 1M$

g equivalent of oxalic acid = g equivalent of $KMnO_4$

Mole × 4 = mole × n-factor

$1 \times \frac{100}{1000} \times 2$ = mole × 5

$\frac{1}{25}$ = mole of $KMnO_4$

0.04 = moles of $KMnO_4$

72. Answer (1)

Hint: $PbSO_4 + 4CH_3COONH_4 \rightarrow$

$$(NH_4)_2[Pb(CH_3COO)_4] + (NH_4)_2SO_4$$

Ammonium tetraacetoplumbate(II)

Sol.: $2NaI + MnO_2 + 2H_2SO_4 \rightarrow$

$I_2 + MnSO_4 + Na_2SO_4 + 2H_2O$

73. Answer (1)

Hint and Sol.: Sr^{2+} imparts purple colour in flame test, when observed through blue glass and crimson red when observed by naked eye.

74. Answer (1)

Hint: Mn^{2+} belongs to group-IV

Sol.: Group-IV cations are Co^{2+}, Ni^{2+}, Mn^{2+}, Zn^{2+}

75. Answer (1)

Hint: When dimethylglyoxime is added to the aqueous solution of nickel chloride and is made alkaline, a brilliant red ppt is obtained.

Sol.: $NiCl_2 + 2NH_4OH + 2dmg \rightarrow [Ni(dmg)_2] + 2NH_4Cl + 2H_2O$

76. Answer (1)

Hint: Starch and gum are lyophilic sols

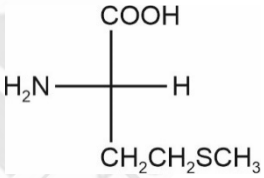
Sol.: Egg albumin is a lyophilic sol.

Arsenic sulphide and ferric hydroxide are lyophobic sols.

77. Answer (3)

Hint: Tryptophan, proline and threonine do not contain sulphur.

Sol.: Methionine,



78. Answer (3)

Hint: During denaturation of proteins, only primary structure remains intact.

Sol.: The polypeptide chains of β-pleated sheet structure are held together by intermolecular hydrogen bonds.

79. Answer (3)

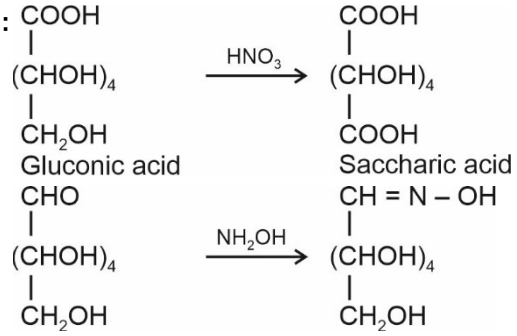
Hint: Amino acids, which can be synthesised in the body, are known as non-essential amino acids.

Sol.: Glutamine, Asparagine and Alanine are non-essential amino acids.

80. Answer (1)

Hint: Glucose is also known as dextrose

Sol.:



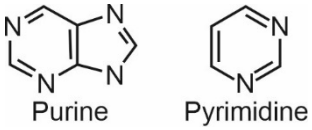
81. Answer (2)

Hint: Niacin (Vitamin B_3) causes pellagra upon deficiency.

Sol.:

Vitamin	Deficiency disease
Retinol	Xerophthalmia
Cyanocobalamine	Pernicious anaemia
Pyridoxine	Convulsions

82. Answer (4)

Hint: 

Sol.: Purine bases are Adenine (A) and Guanine (G)

Pyrimidine bases are Cytosine (C) and Thymine (T) and Uracil (U)

83. Answer (4)

Hint and Sol.: DNA contains four bases *i.e.*, adenine, guanine, cytosine and thymine.

84. Answer (3)

Hint and Sol.: Sucrose upon hydrolysis forms fructose and glucose. Cyclic form of glucose and fructose have 5 and 4 chiral carbons respectively.

85. Answer (4)

Hint: $XeF_6 + H_2O \longrightarrow \underset{\text{(Square pyramidal)}}{XeOF_4} + 2HF$

Sol.: Helium has lowest boiling point.

Ne has most positive electron gain enthalpy.

86. Answer (1)

Hint: $2XeF_2(s) + 2H_2O(l) \rightarrow 2Xe(g) + 4HF(aq) + O_2(g)$

Sol.: BrF_3 has sp^3d hybridisation with two lone pair of electrons hence it is bent 'T' shaped molecule.

87. Answer (3)

Hint: $pK_a \propto \frac{1}{\text{Acidity}}$

Sol.: Melting point; HI > HF > HBr > HCl

Boiling point; HF > HI > HBr > HCl

pK_a; HF > HCl > HBr > HI

88. Answer (2)

Hint: Dinitrogen is prepared by treating an aqueous solution of ammonium chloride and sodium nitrite.

Sol.:

$$2NH_4Cl + Ca(OH)_2 \longrightarrow 2NH_3 + 2H_2O + CaCl_2$$

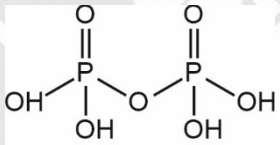
$$(NH_4)_2SO_4 + 2NaOH \longrightarrow 2NH_3 + 2H_2O + Na_2SO_4$$

$$NH_2CONH_2 + 2H_2O \longrightarrow (NH_4)_2CO_3 \rightleftharpoons 2NH_3 + H_2O + CO_2$$

$$NH_4Cl(aq) + NaNO_2(aq) \longrightarrow N_2(g) + 2H_2O(l) + NaCl(aq)$$

89. Answer (4)

Hint: Pyrophosphoric acid is $H_4P_2O_7$

Sol.: 
(Pyrophosphoric acid)

90. Answer (4)

Hint: Halic (III) acid of iodine does not exist.

Sol.: In oxyacids of Iodine HOIO does not exist.

[BOTANY]

91. Answer (3)

Hint: First order consumers are also called as key industry animals.

Sol.: Lizard is a second order consumer and feeds on herbivores.

92. Answer (3)

Hint: Producers are also called as transducers.

Sol.: Transducers convert solar energy into chemical energy stored in the bonds of sugar.

93. Answer (4)

Hint: Decomposers convert complex organic matter into simpler ones.

Sol.: Decomposers reduce the organic remains on earth and also replenish the soil naturally with minerals.

94. Answer (2)

Hint: Oceans occupy 70 per cent of the earth's surface.

Sol.: Despite occupying about 70 per cent of the earth's surface, the productivity of oceans are only 55 billion tons.

95. Answer (2)

Hint: Warm and moist environment favour decomposition.

Sol.: The factors that are not favourable for the decomposition process are lignin rich detritus, low temperature, dry environment and anaerobiosis.

96. Answer (4)

Hint: Bottom layer of strata in a forest ecosystem is occupied by grasses and herbs.

Sol.: Shrubs occupy the middle strata (second layer) in a forest ecosystem.

97. Answer (4)

Hint: Gross primary productivity (GPP) is the total amount of biomass produced by autotrophs.

Sol.: The available biomass for the consumption for heterotrophs is present in stored form in the body of producers.

98. Answer (3)

Hint: Saprophytes and decomposers are not given any place in ecological pyramids.

Sol.: Energy flow in an ecosystem is always unidirectional.

99. Answer (1)

Hint: In a food web/chain, energy transfer takes place from one organism to another.

Sol.: Herbivores feed on producers and further become food for the other organisms. Energy never gets trapped in an organism forever, but passes from one organism to another.

100. Answer (3)

Hint and Sol.: Among the given options, deep sea ecosystem is the least productive one due to the deficiency of sunlight.

101. Answer (2)

Hint: Ecological pyramids do not take into account insectivorous plants.

Sol.: In terrestrial ecosystems, a much larger fraction of energy flows through DFC than through GFC.

102. Answer (1)

Hint: During the transfer of biomass at any trophic level, 90% of the biomass is either lost in wastage or broken down during cellular respiration for providing energy for various life activities.

Sol.: During transfer of biomass at any trophic level, only 10% of the food present in one trophic level becomes part of the next trophic level. Thus, the number of top carnivores is too small to support the next trophic level and to act as prey to the other organism.

103. Answer (4)

Hint: Phytoplanktons act as producers in an aquatic ecosystem.

Sol.: Wolf can never occupy the second trophic level as; it is a carnivore.

104. Answer (4)

Hint: Pyramid of energy for any ecosystem is always upright.

Sol.: Pyramid of biomass in a grassland ecosystem is usually upright.

105. Answer (3)

Hint: Anthropogenic ecosystem is also known as man-made ecosystem.

Sol.: The tidal mouth of a large river, where the tide meets the stream is called as estuary. It is a natural ecosystem.

106. Answer (4)

Hint: Phosphorylation is an anabolic process.

Sol.: Catabolism is carried out by saprotrophic organisms, which by releasing digestive enzymes, change the complex organic matter into inorganic substances and hence it results into mineralisation.

107. Answer (3)

Hint: The amount of energy stored and fixed at one trophic level passes to the next trophic level.

Sol.: $\text{Sun} \rightarrow \underset{(100\ J)}{\text{Grass}} \rightarrow \underset{(10\ J)}{\text{Rabbit}} \rightarrow \underset{(1\ J)}{\text{Fox}} \rightarrow \underset{(0.1\ J)}{\text{Lion}}$

Fox stores and fixes 0.1 J of energy in the given food chain, which is passed on to the lion.

108. Answer (1)

Hint and Sol.: Primary productivity can be expressed in terms of $gm^{-2}\ yr^{-1}$ or $(k\ cal\ m^{-2})\ yr^{-1}$.

109. Answer (3)

Hint: Plants capture 2-10% of PAR.

Sol.: Plants capture 1-5% of the incident solar radiations.

110. Answer (3)

Hint: Herbivores occupy the second trophic level.

Sol.: Sparrow can feed on seeds as well as insects and hence, can occupy more than one trophic level.

111. Answer (2)

Hint: Logistic growth curve is an S-shaped curve which shows an asymptote when the population density reaches the carrying capacity.

Sol.: Since resources for growth for most animal populations are finite and become limiting sooner or later, the logistic growth model is considered a more realistic one.

112. Answer (4)

Hint: One of the roles of predators is to keep the prey population under control.

Sol.: Predators maintain species diversity in a community.

113. Answer (2)

Hint: In a logistic growth curve, 'K' represents the carrying capacity of nature.

Sol.: Logistic growth curve reaches an asymptote when the population density reaches the carrying capacity (K = N).

114. Answer (4)

Hint: An individual is either a male or a female but a population has a sex ratio.

Sol.: An individual may have birth and death, but a population has birth rates and death rates.

115. Answer (2)

Hint: The density of a population in a given habitat during a given period fluctuates due to changes in natality, mortality, immigration and emigration.

Sol.: Size of a population for any species is not a static parameter but it keeps changing with time.

116. Answer (1)

Hint: He is known as the father of ecology in India.

Sol.: Government of India established the National Committee for Environmental Planning and Coordination in 1972, due to the efforts of Ramdeo Misra.

117. Answer (4)

Hint: Emigration refers to the number of individuals of the population who left the habitat and went elsewhere during the time period under consideration.

Sol.: Evolutionary changes through natural selection take place at the population level.

118. Answer (1)

Hint and Sol.: Mean annual temperature in a tropical rain forest ranges between 20°-30°C.

119. Answer (4)

Hint: Barnacles growing on the back of a whale is an example of commensalism.

Sol.: Clown fish and sea anemone show commensalism.

120. Answer (4)

Hint: Ectoparasites feed on the external surface of the host organism.

Sol.: Human liver fluke is an endoparasite that depends on two intermediate hosts (a snail and a fish) to complete its life cycle.

121. Answer (1)

Hint: The given pyramid shows almost zero growth rate.

Sol.: A population represented by the given pyramid is said to be mature or stable.

122. Answer (2)

Hint: Vital index for a population is represented as: B/D × 100

Sol.: $dN/dt = rN(K - N)/K \rightarrow$ Verhulst Pearl logistic growth equation.

$N_{(t+1)} = N_t + [(B + I) - (D + E)] \rightarrow$ Calculates the density of a population in a given period.

123. Answer (2)

Hint: Totally unrelated species can compete for the same resource.

Sol.: Competition is best defined as a population interaction in which the fitness of one species is relatively lower in the presence of another species.

124. Answer (3)

Hint: Biodiversity hotspots show higher species richness. Many of them are confined to that area and are not found anywhere else.

Sol.: Biodiversity hotspots cover less than 2% of the earth's land area.

125. Answer (4)

Hint: *In situ* conservation strategy focuses on protecting the organisms in their natural habitat.

Sol.: National Park is an example of *in situ* conservation strategy.

126. Answer (4)

Hint: Sacred groves refer to the tracts of forest that are set aside and all the trees and wildlife within are venerated and given total protection.

Sol.: *Eichhornia* in India is an example of alien species. Thylacine got extinct from Australia.

127. Answer (3)

Hint: For very large areas like the entire continent, the value of 'Z' ranges from 0.6 to 1.2

Sol.: Value of 'Z' for molluscs in New York state, plants in Britain or birds in California ranges from 0.1 to 0.2.

128. Answer (3)

Hint: *Parthenium* is a weed which is invasive in India and exterminate many native herbs and shrubs.

Sol.: Cichlid fish is an example of endemic species in Lake Victoria of East Africa.

129. Answer (3)

Hint: Key species drive major ecosystem functions.

Sol.: The given species can be best described as the key species.

130. Answer (3)

Hint: Increased biodiversity contributes to higher productivity.

Sol.: A stable community shows resilience to occasional natural and man-made disturbances.

131. Answer (3)

Hint: According to the records, per cent of birds species are less vulnerable to extinction than the per cent of mammals species.

Sol.: Careful analysis of records shows that extinction across taxa is not random and some groups like amphibians appear to be more vulnerable to extinction.

32% of all amphibian species are facing the threat of extinction.

132. Answer (4)

Hint: Core zone represents the innermost zone of a biosphere reserve.

Sol.: Transition zone is the outermost zone of a biosphere reserve which is an area of active cooperation between reserve management and local people.

133. Answer (4)

Hint: Ecosystem services provided by the biodiversity are called as broadly utilitarian services.

Sol.: Khasi and Jaintia hills are located in Meghalaya.

134. Answer (2)

Hint: Out of 10 animals on this planet, 7 are insects.

Sol.: Amazonian rain forest is a home to about 1300 species of birds and 427 species of amphibians.

135. Answer (4)

Hint: The given curve represents the species-area relationship.

Sol.: Species-area relationship becomes a straight line when represented by the equation

$\log S = \log C + Z \log A$

[ZOOLOGY]

136. Answer (1)

Hint: Also used as host in the synthesis of human insulin by Eli Lilly.

Sol.: By 1969, Boyer performed studies on a couple of restriction enzymes of the *E.coli* bacterium with especially useful properties. *Salmonella typhimurium* was used in genetic engineering to form the first recombinant DNA in the year 1972. *Thermus aquaticus* bacterium has the DNA polymerase which can resist comparatively high temperature. The Ti-plasmid in *Agrobacterium tumefaciens* has T-DNA which causes plant tumour.

137. Answer (2)

Hint: Cohen had been studying extra-chromosomal DNA.

Sol.: Cohen had been studying small ringlets of DNA called plasmids which float about freely in the cytoplasm of certain bacterial cells and replicate independently from the coding strand of the host DNA. They are double-stranded, circular and extra- chromosomal DNA.

138. Answer (2)

Hint: Equal to the number of cranial bones in a man

Sol.: Total number of DNA fragments obtained after 'n' cycles = 2^n

So, $256 = 2^n$

So n = 8 and $2^8 = 256$ DNA fragments.

139. Answer (3)

Hint: Acts as an intracellular messenger.

Sol.: RNAi is a cellular defence mechanism in eukaryotes in which silencing of specific messenger RNA is possible *via* RNAi because of complementary dsRNA.

140. Answer (4)

Hint: Only 'A' chain has an intrachain disulphide bond.

Sol.: In both proinsulin and insulin, total three disulphide bonds are present in which only one intra-chain disulphide bond is present in 'A' chain and two interchain disulphide bonds are present between 'A' and 'B' chains.

141. Answer (2)

Hint: Choose a conventional method of diagnosis.

Sol.: Advanced methods are useful for early detection and diagnosis of diseases. These are RDT, PCR, ELISA and probe followed by autoradiography. Early detection and diagnosis of a disease is not possible by using conventional methods such as serum analysis, urine analysis, *etc*.

142. Answer (4)

Hint: It is a heat-stable DNA polymerase.

Sol.: Thermostable DNA polymerase used in PCR was isolated from *Thermus aquaticus* and is commonly known as *Taq* polymerase. *Taq* polymerase is a DNA dependent DNA polymerase whereas reverse transcriptase is a RNA dependent DNA polymerase.

143. Answer (3)

Hint: Most commonly used matrix is gel.

Sol.: DNA fragments or DNA of interest used in cloning, can be separated by gel electrophoresis. Separation of DNA from gel piece is called elution and removal of precipitated DNA strands from a solution with the help of a glass rod is called spooling. Transformation is introduction of foreign DNA into a bacterial cell.

144. Answer (2)

Hint: Cells are maintained in their exponential phase.

Sol.: Bioreactors can process 100-1000 litres of culture.

- They can be thought of as vessels in which raw materials are biologically converted into specific products, individual enzymes, *etc.,* using microbial plant, animal or human cells.
- A bioreactor provides the optimal conditions for achieving the desired product by providing optimum growth conditions, (temperature, pH, substrate, salts, vitamins, oxygen).

  The cells can be multiplied in a continuous culture system wherein the cells are maintained in their physiologically most active log/ exponential phase.

145. Answer (1)

Hint: Eliminate the methods used for plants

Sol.: In micro-injection, recombinant DNA is directly injected into the nucleus of an animal cell. In gene gun/biolistics, cells are bombarded with high velocity micro-particles of gold or tungsten coated with DNA.

146. Answer (3)

Hint: Biotechnology overcomes the disadvantage of traditional methods.

Sol.: The definition of modern biotechnology encompasses both traditional view and modern molecular biotechnology.

Traditional hybridisation procedure used in plant and animal breeding, very often lead to inclusion and multiplication of undesirable genes along with the desired genes.

147. Answer (2)

Hint: The process of isolation and purification

Sol.: The basic steps involved in genetically modifying an organism are given in the options. Downstream processing includes separation and purification. It is performed post biosynthetic stage.

148. Answer (3)

Hint: Includes adenine and guanine.

Sol.: The recognition sequence of *Eco* RI is $\overset{\downarrow}{5'G}AATTC3'$ / $3'CTTAA\underset{\uparrow}{G}5'$ and always cuts between adenine (A) and guanine (G). Adenine (A) and guanine (G) are substituted purines. On restriction digestion, *Eco* RI produces sticky ends.

149. Answer (3)

Hint: Principle of insertional inactivation

Sol.: β-galactosidase produces blue coloured colonies in the presence of the chromogenic substrate. Because site of *Bam* HI in this plasmid is present in coding sequence of tet^R gene and gene for enzyme β-galactosidase is present at the site of *Eco* RI, so there is no insertional inactivation of β-galactosidase. So, for recombinant transformants, blue coloured colonies growing on ampicillin containing medium and showing sensitivity to tetracycline will be selected.

150. Answer (4)

Hint: Restriction enzymes which produce sticky ends cut the DNA a little away from the centre of palindrome.

Sol.: Some restriction endonucleases which cut the DNA in the centre of palindrome, produces blunt ends whereas some restriction endonucleases which cut DNA slightly away from the centre of palindrome, produces overhanging or sticky ends.

151. Answer (3)

Hint: Plasmids are usually circular DNA.

Sol.: Plasmids are extra-chromosomal double stranded circular DNA which are used as vectors in biotechnology. Mosquito acts as the insect vector and transfers the parasite in the human body. In the same way, a plasmid can be used as a vector to deliver an alien piece of DNA into the host organism.

Aedes transmits the pathogen causing dengue, chikungunya, *etc*.

152. Answer (4)

Hint: Enzymes that belong to class Hydrolases.

Sol.: Besides *Hin*d II, today, we know more than 900 restriction on enzymes that have been isolated from over 230 strains of bacteria, each of which recognise different recognition sequences.

153. Answer (2)

Hint: Identical copies of biological entity.

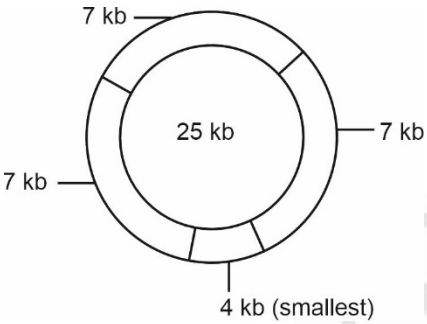
Sol.: Making multiple identical copies of any template DNA is called cloning. DNA is a hydrophilic molecule and restriction site for *Hin*d II is not present in the plasmid pBR322.

In PCR, primers anneal at the 3′ end of a complementary single-stranded DNA template.

154. Answer (3)

Hint: For circular DNA, the number of restriction fragments obtained is equal to the number of restriction sites present for the endonuclease.

Sol.:



On complete restriction digestion, 3 fragments of 7 kb will be obtained and one smallest segment of 4 kb will be obtained. In gel electrophoresis, DNA bands move over the gel based on their sizes. So, all the three DNA fragments (each of 7 kb) will form only one band and the smallest one (4 kb) will form another band closer to anode.

155. Answer (3)

Hint: Plants produced through tissue culture.

Sol.: The method of producing thousands of plants through tissue culture is called micro-propagation. Each of these plants will be genetically identical to the original plant from which they were grown *i.e.,* they are somaclones. Any part of a plant taken out and grown in a test tube under sterile conditions in special nutrient media is called explant. The capacity to generate whole plant from any cell/explant is called totipotency. Hybrid protoplasts are grown to form somatic hybrids.

156. Answer (4)

Hint: Transgenic models exist for many human diseases.

Sol.: Transgenic animals are designed to increase our understanding of how genes contribute to the development of diseases. Today, transgenic models exist for many human diseases such as cancer, cystic fibrosis, rheumatoid arthritis and Alzheimer's disease.

157. Answer (3)

Hint: Nations have laws to prevent unauthorised exploitation of bio-resources.

Sol.: GEAC makes decisions regarding validity of GM research and the safety of introducing GM-organisms for public services.

The Indian Parliament has recently cleared the 2nd amendment of the Indian Patent Bill, that takes issues into consideration such as emergency provisions, research and development initiative.

158. Answer (4)

Hint: Nutritionally a more balanced product.

Sol.: In 1997, the first transgenic cow, 'Rosie', produced human protein-enriched milk (2.4 gm/L). The milk contained human α-lactalbumin and was nutritionally a more balanced product for human babies than the natural cow milk. In 1997, an American company got patent rights on Basmati rice through the US Patent and Trademark Office.

159. Answer (3)

Hint: Genetic defects can be cured only at embryonic stage.

Sol.: ADA deficiency can be cured permanently by introducing gene for ADA, isolated from marrow cells into cells at early embryonic stages. Gene therapy at adult stage and bone marrow transplantation are not completely curative. Because lymphocytes are not immortal, the patient requires periodic infusion of such genetically engineered lymphocytes.

160. Answer (3)

Hint: dsRNA initiates RNAi

Sol.: In RNAi, the introduction of DNA is such that it produces both sense and anti-sense RNA in the host cells. These two RNAs being complementary to each other, formes a double stranded RNA that initiates RNAi and thus, silences the specific mRNA.

RNAi is a post-transcriptional gene silencing technique.

161. Answer (3)

Hint: Loss of minerals from the soil decreases fertility of soil.

Sol.: Genetic modification has

1. Made crops more tolerant to abiotic stresses
2. Reduced reliance on chemical pesticides
3. Helped to reduce post-harvest losses
4. Increased efficiency of mineral usage by plants
5. Enhanced nutritional value of food.

162. Answer (4)

Hint: Bt-toxin is produced by some strains of *Bacillus thuringiensis.*

Sol.: Some strains of *Bacillus thuringiensis* produce proteins that kill certain insects such as lepidopterans, dipterans and coleopterans. Bt toxin is synthesized in *Bacillus* in an inactive form, so, no effect is seen on it. But when insects ingest this toxin, it gets activated in alkaline pH of their midgut and forms pores in epithelium of midgut which leads to lysis and cell death.

163. Answer (2)

Hint: Mobile genetic elements are also called transposons.

Sol.: Silencing of mRNA is possible *via* RNAi because of complimentary dsRNA. The source of this complimentary RNA could be from an infection by viruses having RNA genomes or mobile genetic elements (transposons) that replicate *via* an RNA intermediate.

164. Answer (4)

Hint: Restriction endonucleases cut after recognising a specific nucleotide sequence.

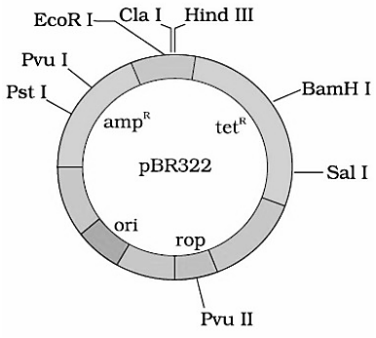
Sol.: Each restriction endonuclease functions by inspecting the length of a DNA sequence. It cuts each of the two strands of DNA at specific points in their sugar-phosphate backbones. They either cut the DNA strands a little away from the centre or in the centre of palindrome but between the same two bases on the opposite strands.

Restriction endonucleases are produced by prokaryotes.

165. Answer (2)

Hint: Closer to the part which codes for proteins involved in replication.

Sol.: In a chromosome, there is a specific DNA sequence called the origin of replication, which is responsible for initiating replication. For multiplication of any alien piece of DNA in an organism, it needs to be a part of chromosome which has origin of replication/*ori*. *rop* codes for the proteins involved in replication of plasmids.



166. Answer (3)

Hint: Extension is the last step of PCR.

Sol.: PCR stands for polymerase chain reaction which includes three steps. The correct sequence of all these three steps is

(1) Denaturation, (2) Annealing and (3) Extension

167. Answer (2)

Hint: Ti plasmid of *A. tumefaciens*

Sol.: The specific palindromic sequence of *Hind* II consists of 6 base pairs. A piece of DNA called 'T-DNA' is present in Ti-plasmid of *A. tumefaciens* which transforms normal plant cells into tumor cells when it is delivered in plant cell. When gene of interest is introduced into an alien organism, it may get integrated into the genome of the recipient and may multiply and be inherited along with the host DNA.

168. Answer (4)

Hint: Detection of a disease can be done by detecting antibodies.

Sol.: ELISA is based on the principle of antigen-antibody interaction. Infection by a pathogen can be detected by the presence of antigens or by detecting the antibodies synthesized against the pathogen.

169. Answer (4)

Hint: Desired plants can be produced by genetic modifications.

Sol.: Genetically modified plants have been used to create tailor-made plants to supply alternating resources to industries in the form of starches, fuels and pharmaceuticals.

170. Answer (4)

Hint: Transgenic animals carry alien gene.

Sol.: For chemical safety testing, transgenic animals are made that carry genes which make them more sensitive to toxic substances than non-transgenic animals.

171. Answer (3)

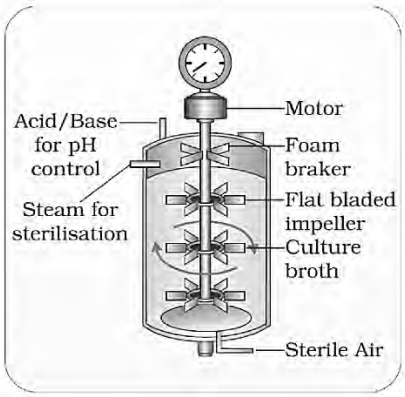
Hint: Spooling is the removal of precipitated DNA with the help of glass rod.

Sol.: After gel electrophoresis, the separated bands of DNA are cut out from the agarose gel. The site in a DNA molecule which is hydrolysed with the help of a particular restriction endonuclease is called recognition site. Maintenance of sterile ambience in chemical engineering process to enable the growth of only the desirable cells for the manufacture of biotechnological products is called bioprocess engineering.

172. Answer (2)

Hint: Former is responsible for breaking foam

Sol.:



173. Answer (1)

Hint: Restriction enzymes cut DNA at specific points.

Sol.: In biotechnology, restriction endonucleases and DNA ligases act as tools in which former cuts DNA at specific points in recognition site. So, it is considered as a molecular scissor. DNA polymerase joins two nucleotides by forming phosphodiester bonds, so, it is considered as a molecular glue.

174. Answer (4)

Hint: Smaller fragments move faster than the longer DNA fragments.

Sol.: During agarose gel electrophoresis, DNA fragments separate according to their size because charge on each fragment remains the same. The smaller the DNA fragment, farther it moves towards the anode from the cathode.

Bromophenol blue is a tracking dye.

175. Answer (2)

Hint: Formation of multiple copies of a desired gene.

Sol.: The main steps in the formation of a recombinant DNA are mentioned below:

1. Fragmentation of DNA by using restriction enzymes.
2. Isolation of desired DNA fragment.
3. Ligation of DNA fragment into a vector.
4. Insertion of recombinant DNA into host cell.

176. Answer (3)

Hint: Chitinase digests the chitin present in the cell wall of fungi.

Sol.: For isolation of genetic material of plant cells, enzyme cellulase is used. For digestion of cell wall of fungi and bacteria, chitinase and lysozyme are used, respectively.

The causative agent of enteric fever is bacterium *Salmonella typhimurium.*

177. Answer (2)

Hint: Very minute quantity of DNA is required

Sol.: The amount of target DNA can be very small because PCR is extremely sensitive and will work with just a single starting molecule.

The polymerase chain reaction can be used to obtain a pure sample of gene. This is because the region of the starting DNA molecule that is copied during PCR is the segment whose boundaries are marked by the annealing positions of the two oligonucleotide primers.

PCR can also be used with DNA from forensic material such as hair and dried bloodstains or even from the bones of long dead humans.

178. Answer (2)

Hint: This gene is not present in pBR322.

Sol.:

a.	Gene therapy	–	Replacement of faulty gene by a normal healthy gene
b.	Genome	–	Total DNA in the cells of an organism
c.	*Bacillus thuringiensis*	–	'*cry*' gene
d.	Kanamycin^R gene	–	Antibiotic resistance

179. Answer (4)

Hint: Probe can have complementarity with any desired sequence.

Sol.: Single stranded DNA or RNA, tagged with a radioactive molecule is called probe that is allowed to hybridise to its complimentary DNA in a clone of cells followed by detection using autoradiography. The clone having mutated gene will hence not appear on the photographic film, because the probe will not have complementarity with mutated gene.

Probes can be designed to target mutated gene sequence.

180. Answer (1)

Hint: Some ethical standards are required to evaluate morality of all human activities.

Sol.: The laws and rules to prevent unauthorised exploitation of bio-resources are termed as bioethics. Biopiracy is the term used to refer to the use of bio-resources by any organisation without proper authorisation from the countries and people concerned without compensatory payment.

❑ ❑ ❑

All India Aakash Test Series for NEET - 2026

Test-7_(Code-F)

Click here for Code-E Sol.

Test Date: 22/03/2026

ANSWERS

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

HINTS & SOLUTIONS

[PHYSICS]

1. Answer (3)

Hint: Minimum magnifying power, $\gamma = \frac{v_0}{u_0} \times \frac{D}{f_e}$

Sol.: For objective lens,

$v_0 = \frac{u_0 f_0}{u_0 + f_0} = \frac{(-6)(4)}{-6+4} = \frac{(-6)(4)}{-2} = 12$ cm

$|m_0| = \frac{v_0}{u_0} = \frac{12}{6} = 2$

$\therefore \quad \gamma = 2 \times \frac{D}{f_e} = 2 \times \frac{25}{6.25} = 8$

2. Answer (3)

Hint: For n^{th} resonance, $L = (2n-1)\frac{\lambda}{4}$

Sol.: $v = f\lambda$

$\Rightarrow \quad \lambda = \frac{v}{f} = \frac{320}{1280} = \frac{1}{4}$ m

$\Rightarrow \quad \lambda = 25$ cm

$\Rightarrow$ Now, let number of resonance possible be n

$\therefore \quad 140 \geq (2n-1)\frac{\lambda}{4}$

$\Rightarrow \quad 140 \geq (2n-1)\frac{25}{4}$

$\Rightarrow \quad \frac{140 \times 4}{25} \geq 2n-1$

$2n \leq 1 + 22.4 \leq 23.4$

$n \leq 11.7$

i.e., $n = 11$

3. Answer (4)

Hint: If amplitude become half in time t, then after time nt, its amplitude is $\frac{A_0}{2^n}$

Sol.: Amplitude gets halved in time $T = 2$ s

then, $t = 6$ s, i.e., $t = 3T$

$A = \frac{A_0}{2^3}$

$= \frac{A_0}{8}$

4. Answer (2)

Hint: End correction, $e = 0.6R$

Sol.: $e = 0.6R$

$\Delta e = 0.6\Delta R$

$\Rightarrow \quad \frac{\Delta e}{e} \times 100 = \frac{0.6 \times 0.1}{0.6 \times 2} \times 100 = 5\%$

5. Answer (3)

Hint: de-Broglie wavelength λ is given by,

$\lambda = \frac{h}{p} = \frac{h}{\sqrt{2mqV}}$

Sol.: $\frac{\lambda_\alpha}{\lambda_p} = \sqrt{\frac{m_p q_p V_p}{m_\alpha q_\alpha V_\alpha}} = \sqrt{\frac{m_p q_p (400)}{4m_p \times 2q_p (100)}} = \frac{1}{\sqrt{2}}$

$\Rightarrow \quad \lambda_p = \sqrt{2}\lambda_\alpha = \sqrt{2}\lambda_0$

6. Answer (1)

Hint: For no parallax, image should be formed on the place of object itself.

Sol.: For lens,

$v = \frac{uf}{u+f} = \frac{(-15)(10)}{-15+10} = \frac{(-15)(10)}{-5} = +30$ cm

$\Rightarrow$ Now, image formed by convex lens should be formed on centre of curvature of mirror.

$\therefore \quad R + 10 = 30 \quad \Rightarrow \quad R = 20$ cm

and $f = 10$ cm

7. Answer (4)

Hint and Sol.: If a component has two terminals, it could be a resistor, a capacitor, a diode, or a LED. A transistor is a three-terminal device.

8. Answer (3)

Hint: Reading = MSR + CSR – 6 × L.C.

Sol.: $d = 2 + 24 \times 0.005 - 6 \times 0.005$

$= 2 + 0.120 - 0.030$

$= 2.090$ mm

9. Answer (2)

Hint and Sol.: According to Bohr's model,

$r \propto \frac{n^2}{z}$

$v \propto \frac{z}{n}$

$T \propto \frac{r}{v} \propto \frac{n^3}{z^2}$

$E \propto \frac{z^2}{n^2}$

10. Answer (2)

Hint: Electrons coming from metal plate have kinetic energy ranging from zero to $(KE)_{max}$.

Sol.: $(KE)_{max} = \frac{12420}{2484} - 2 = 3$ eV

$\Rightarrow$ The electrons emitted with K.E. varying from zero to 3 eV. When accelerated with 10 V their energies increase by 10 eV.

Therefore, hydrogen atom will get photons of energies from 10 eV to 13 eV.

$\Rightarrow$ For energy 12.75 eV, maximum possible transitions to $n = 4$

$\therefore$ number of spectral lines $= \frac{n(n-1)}{2}$

$= \frac{4 \times 3}{2} = 6$

11. Answer (1)

Hint: Apply conservation of momentum

Sol.: $\vec{P}_i = 0$

$\vec{P}_i = \vec{P}_f$

$0 = \vec{P}_Q + \vec{P}_\alpha$

$\left|\vec{P}_Q\right| = \left|\vec{P}_\alpha\right| = P$(let)

$\frac{k_1}{k_2} = \frac{P^2/2m_1}{P^2/2m_2} = \frac{m_2}{m_1}$

12. Answer (3)

Hint: Conserve mass number and atomic number.

Sol.: Let atomic number of δ be a and mass number be b $\left({}_a\delta^b\right)$

$\therefore$ $z + 2 = z + 1 + a \quad \Rightarrow \quad a = 1$

and $A + 4 = A + 3 + b \quad \Rightarrow \quad b = 1$

$\therefore$ δ is a proton

13. Answer (3)

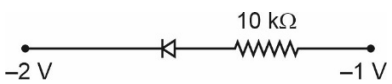
Hint and Sol.: Higher binding energy per nucleon implies higher stability.

Nuclear force is a non-central type force.

14. Answer (1)

Hint: Resistance of ideal p-n junction diode is nearly zero when forward biased.

Sol.:



$i = \frac{\Delta V}{R} = \frac{1}{10 \times 10^{+3}}$

= 0.1 mA

15. Answer (2)

Hint and Sol.: Photo diode is used in reverse bias and LED is used in forward bias for proper functioning.

Solar cell works in no biasing condition

16. Answer (2)

Hint: For dynamic resistance, use $R = \frac{\Delta V}{\Delta I}$

Sol.: $R = \frac{\Delta V}{\Delta I}$

$= \frac{2}{0.4 \times 10^{-6}}$

$= 5 \times 10^6\ \Omega$

17. Answer (4)

Hint and Sol.: To get output $Y = 1$, both inputs of AND gate must be 1.

18. Answer (4)

Hint and Sol.: $i = \frac{\text{P.D. across resistance}}{\text{resistance}}$

$= \frac{10 - 0.7}{100} = \frac{9.3}{100}$ = 93 mA

19. Answer (2)

Hint and Sol.: Electrons diffuse from n-region to p-region due to concentration difference.

20. Answer (2)

Hint: de-Broglie wavelength (λ) is given by, $\lambda = \frac{h}{p}$

Sol.: $\lambda = \frac{h}{p}$

$\Rightarrow \frac{\lambda_p}{\lambda_\alpha} = \frac{P_\alpha}{P_p} = \sqrt{\frac{m_\alpha k_\alpha}{m_p k_p}} = \frac{m_\alpha v_\alpha}{m_p v_p}$

21. Answer (2)

Hint: Energy required to remove an electron from ground state, $E = 13.6 \times Z^2$ eV

Sol.: $E = 13.6 \times (4)^2$

= 217.6 eV

22. Answer (1)

Hint: Energy of photon emitted,

$\Delta E = 13.6\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$ eV

Sol.: $\Delta E = 13.6\left[1 - \frac{1}{25}\right]$

$= 13.6 \times \frac{24}{25}$ = 13.06 eV

23. Answer (2)

Hint: Power, $P = \frac{dN}{dt} \times \frac{hc}{\lambda}$

and $F = \frac{dN}{dt}\frac{h}{\lambda}$

Sol.: $F = \frac{dN}{dt}\frac{h}{\lambda} = ma$

$a = \frac{P}{mc}$

$S = \frac{1}{2}at^2 = \frac{1}{2}\frac{P}{mc}t^2$

$S = \frac{1}{2} \times \frac{2\times10^{-3}}{25\times10^{-3}\times3\times10^{8}} \times (30\times60)^2$

S = 432 μm

24. Answer (4)

Hint and Sol.: All given type semiconductors are electrically neutral.

25. Answer (2)

Hint: Number of photons emitted per second,

$n = \frac{\text{Power of source}}{\text{Energy of one photon}}$

Sol.: Energy of photon $= \frac{P}{n} = \frac{1.28\times10^{-3}}{4\times10^{15}}$ J

$= \frac{1.28\times10^{-3}}{4\times10^{15}\times1.6\times10^{-19}}$ eV

= 2 eV

$\Rightarrow$ Stopping potential V_0 = 2 – 1.5 = 0.5 V

26. Answer (2)

Hint: α-decay reaction, $X^A \rightarrow Y^{A-4} + {}_2^4\text{He} + Q$-value

Sol.: Let Q-value of reaction is Q, then kinetic energy of α- particle, $E_0 = \left(\frac{A-4}{A}\right)Q$

$\Rightarrow Q = \frac{AE_0}{A-4}$

27. Answer (4)

Hint and Sol.: Nuclear density of all the nucleus is almost same.

28. Answer (4)

Hint: Q-value of reaction = (BE) of product – (BE) of reactant

Sol.: Q = (4 × 7.2) – (2 × 2 × 1.12)

= 28.8 – 4.48

= 24.32 MeV

29. Answer (3)

Hint: For combination of lens and mirror,

$\frac{1}{f_{eq}} = \frac{-2}{f_L} + \frac{1}{f_m}$

Sol.: Since the mirror is plane, therefore $f_m = \infty$

$\therefore \quad f_{eq} = \frac{-f_L}{2}$

$\Rightarrow \frac{1}{f_L} = (\mu - 1)\left(\frac{1}{R}\right)$

$\Rightarrow \frac{1}{f_L} = \frac{1}{2} \times \frac{1}{20} \quad \Rightarrow f_L = 40$ cm

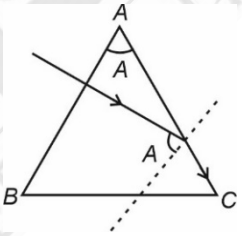
$f_{eq} = \frac{-40}{2} = -20$ cm

$\therefore$ For an image to form on object itself, object should be placed at centre of curvature of the combination, hence the object distance = 2 × 20 = 40 cm.

30. Answer (2)

Hint: If the ray just fails to emerge, then e = 90°

Sol.:



$\Rightarrow A = \theta_C = \sin^{-1}\left(\frac{1}{\mu}\right)$

$\Rightarrow A = \sin^{-1}\left(\frac{3}{5}\right)$

A = 37°

31. Answer (1)

Hint: $v = f\lambda \Rightarrow \frac{c}{\mu} = f\lambda \Rightarrow \mu \propto \frac{1}{\lambda}$

Sol.: $\theta_C = \sin^{-1}\left(\frac{\mu_2}{\mu_1}\right) = \sin^{-1}\left(\frac{\lambda_1}{\lambda_2}\right)$

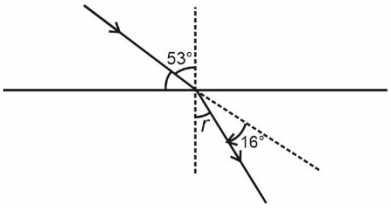
$\theta_C = \sin^{-1}\left(\frac{5000}{6000}\right)$

$= \sin^{-1}\left(\frac{5}{6}\right)$

32. Answer (3)

Hint: Use Snell's law,

Sol.:



By Snell's law

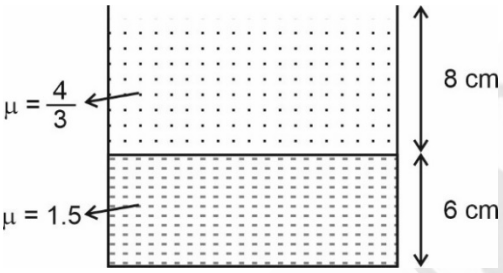
$1 \times \sin 53° = \mu \sin 37°$

$\frac{4}{5} = \mu \times \frac{3}{5} \Rightarrow \mu = \frac{4}{3}$

33. Answer (2)

Hint: Apparent depth, $d = \frac{d_1}{\mu_1} + \frac{d_2}{\mu_2}$

Sol.:



$d = \frac{8}{\frac{4}{3}} + \frac{6}{1.5}$

$= 6 + 4$

$= 10$ cm

34. Answer (3)

Hint and Sol.: For a real object, image formed by convex mirror is always erect, diminished and virtual.

35. Answer (2)

Hint: Use mirror formula with proper sign convention.

$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$

Sol.: $\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$

$\Rightarrow \frac{1}{v} + \frac{1}{20} = \frac{1}{40}$

$\Rightarrow v = \frac{20 \times 40}{20 - 40} = -40$ cm

$m = \frac{-v}{u} \Rightarrow +ve$

So, image will be erect

36. Answer (2)

Hint: Angle of deviation $\delta = 180° - 2i$

Sol.: $i = 90° - 30° = 60°$

$\delta = 180° - 2i$

$= 180° - 2 \times 60° = 60°$

37. Answer (2)

Hint: $N = \frac{360}{\theta}$

Number of images $n = N - 1$, if N is even

Sol.: $N = \frac{360}{45} = 8$

$n = 8 - 1 = 7$

38. Answer (3)

Hint and Sol.: The angular width in diffraction pattern is proportional to wavelength. As the wavelength increases the diffraction pattern becomes broader and farther.

39. Answer (1)

Hint: When light is incident at Brewster's angle, then reflected and refracted rays are perpendicular to each other and reflected beam is completely polarized

Sol.: $\tan\theta = \mu$

$\mu = \tan 60°$

$= \sqrt{3} = 1.73$

40. Answer (2)

Hint: In far field diffraction pattern,

Distance of first secondary bright fringe, $y_1 = \frac{3\lambda D}{2d}$

and distance of third dark fringe, $y_2 = \frac{3\lambda D}{d}$

Sol.: $y_1 = y_2$

$\Rightarrow \frac{3\lambda_1 D}{2d} = \frac{3\lambda_2 D}{d}$

$\Rightarrow \frac{\lambda_1}{2} = \lambda_2$

$\Rightarrow \lambda_1 = 2\lambda_2$

41. Answer (3)

Hint: By law of Malus, $I = I_0\cos^2\theta$

Sol.: $\theta = 37°$

$I = I_0\cos^2 37°$

$I = I_0\left(\frac{4}{5}\right)^2$

and $I \propto A^2$

$$A^2 = A_0^2\left(\frac{4}{5}\right)^2$$

$$A = \frac{4A_0}{5}$$

42. Answer (2)

Hint: The maximum number of interference maxima: $n = 2\left[\frac{d}{\lambda}\right] + 1$

Sol.: $n = 2\left[\frac{d}{\lambda}\right] + 1$

$n = 2\left[\frac{4.2\lambda}{\lambda}\right] + 1 = 9$

43. Answer (2)

Hint: Path difference between light coming from S_1 and S_2 at point P is $\Delta x = d\sin\theta$

Sol.: $\Delta\phi = k\Delta x$

$\Rightarrow \pi = \frac{2\pi}{\lambda} \times d\sin\theta$

$\Rightarrow \sin\theta = \frac{\lambda}{2d} \Rightarrow \theta = \sin^{-1}\left(\frac{\lambda}{2d}\right)$

44. Answer (2)

Hint: de-Broglie wavelength, $\lambda = \frac{h}{p}$

Sol.: $\lambda = \frac{h}{p}$

$\Rightarrow \frac{\Delta\lambda}{\lambda} \times 100 = \frac{-\Delta P}{P_i} \times 100$

$\Rightarrow \frac{1}{100} = \frac{\Delta P}{P_i}$

$\Rightarrow P_i = 100\ \Delta P$

$|P_i| = 100P$

45. Answer (2)

Hint: Use Einstein's photoelectric equation, $(K.E.)_{max} = h\nu - \phi$

Sol.: $(K.E.)_{max} = eV_0 = 8.5$ eV

Energy of incident photon $h\nu = (KE)_{max} + \phi$

$= 8.5 + 1.5 = 10$ eV

$\Rightarrow \lambda = \frac{12400}{10}$ Å $= 1240$ Å

[CHEMISTRY]

46. Answer (4)

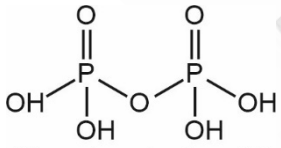
Hint: Halic (III) acid of iodine does not exist.

Sol.: In oxyacids of Iodine HOIO does not exist.

47. Answer (4)

Hint: Pyrophosphoric acid is $H_4P_2O_7$

Sol.:



(Pyrophosphoric acid)

48. Answer (2)

Hint: Dinitrogen is prepared by treating an aqueous solution of ammonium chloride and sodium nitrite.

Sol.:

$2NH_4Cl + Ca(OH)_2 \longrightarrow 2NH_3 + 2H_2O + CaCl_2$

$(NH_4)_2SO_4 + 2NaOH \longrightarrow 2NH_3 + 2H_2O + Na_2SO_4$

$NH_2CONH_2 + 2H_2O \longrightarrow (NH_4)_2CO_3 \rightleftharpoons 2NH_3 + H_2O + CO_2$

$NH_4Cl(aq) + NaNO_2(aq) \longrightarrow N_2(g) + 2H_2O(l) + NaCl(aq)$

49. Answer (3)

Hint: $pK_a \propto \frac{1}{\text{Acidity}}$

Sol.: Melting point; HI > HF > HBr > HCl

Boiling point; HF > HI > HBr > HCl

pK_a; HF > HCl > HBr > HI

50. Answer (1)

Hint: $2XeF_2(s) + 2H_2O(l) \rightarrow 2Xe(g) + 4HF(aq) + O_2(g)$

Sol.: BrF_3 has sp^3d hybridisation with two lone pair of electrons hence it is bent 'T' shaped molecule.

51. Answer (4)

Hint: $XeF_6 + H_2O \longrightarrow \underset{\text{(Square pyramidal)}}{XeOF_4} + 2HF$

Sol.: Helium has lowest boiling point.

Ne has most positive electron gain enthalpy.

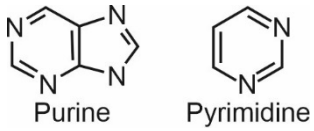
52. Answer (3)

Hint and Sol.: Sucrose upon hydrolysis forms fructose and glucose. Cyclic form of glucose and fructose have 5 and 4 chiral carbons respectively.

53. Answer (4)

Hint and Sol.: DNA contains four bases *i.e.*, adenine, guanine, cytosine and thymine.

54. Answer (4)

Hint: 

Sol.: Purine bases are Adenine (A) and Guanine (G)

Pyrimidine bases are Cytosine (C) and Thymine (T) and Uracil (U)

55. Answer (2)

Hint: Niacin (Vitamin B_3) causes pellagra upon deficiency.

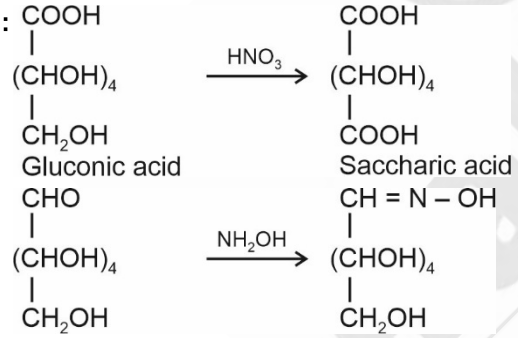
Sol.:

Vitamin	Deficiency disease
Retinol	Xerophthalmia
Cyanocobalamine	Pernicious anaemia
Pyridoxine	Convulsions

56. Answer (1)

Hint: Glucose is also known as dextrose

Sol.:



57. Answer (3)

Hint: Amino acids, which can be synthesised in the body, are known as non-essential amino acids.

Sol.: Glutamine, Asparagine and Alanine are non-essential amino acids.

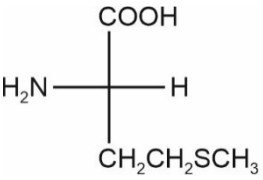
58. Answer (3)

Hint: During denaturation of proteins, only primary structure remains intact.

Sol.: The polypeptide chains of β-pleated sheet structure are held together by intermolecular hydrogen bonds.

59. Answer (3)

Hint: Tryptophan, proline and threonine do not contain sulphur.

Sol.: Methionine, 

60. Answer (1)

Hint: Starch and gum are lyophilic sols

Sol.: Egg albumin is a lyophilic sol.

Arsenic sulphide and ferric hydroxide are lyophobic sols.

61. Answer (1)

Hint: When dimethylglyoxime is added to the aqueous solution of nickel chloride and is made alkaline, a brilliant red ppt is obtained.

Sol.: $NiCl_2 + 2NH_4OH + 2dmg \rightarrow [Ni(dmg)_2] + 2NH_4Cl + 2H_2O$

62. Answer (1)

Hint: Mn^{2+} belongs to group-IV

Sol.: Group-IV cations are Co^{2+}, Ni^{2+}, Mn^{2+}, Zn^{2+}

63. Answer (1)

Hint and Sol.: Sr^{2+} imparts purple colour in flame test, when observed through blue glass and crimson red when observed by naked eye.

64. Answer (1)

Hint: $PbSO_4 + 4CH_3COONH_4 \rightarrow$

$$(NH_4)_2\underset{\text{Ammonium tetraacetoplumbate(II)}}{[Pb(CH_3COO)_4]} + (NH_4)_2SO_4$$

Sol.: $2NaI + MnO_2 + 2H_2SO_4 \rightarrow$

$$I_2 + MnSO_4 + Na_2SO_4 + 2H_2O$$

65. Answer (2)

Hint: Number of g equivalent of oxalic acid = number of g equivalent of $KMnO_4$

Sol.: Molarity of $H_2C_2O_4 \cdot 2H_2O = \dfrac{12.6 \times 1000}{126 \times 100}$

$= 1M$

g equivalent of oxalic acid = g equivalent of $KMnO_4$

Mole × 4 = mole × n-factor

$1 \times \dfrac{100}{1000} \times 2$ = mole × 5

$\dfrac{1}{25}$ = mole of $KMnO_4$

0.04 = moles of $KMnO_4$

66. Answer (1)

Hint: Colour of methyl orange in acidic medium is orange red

Colour of methyl orange in basic medium is yellow

Sol.: Phenol red in acidic medium = Yellow

Phenol red in basic medium = Red

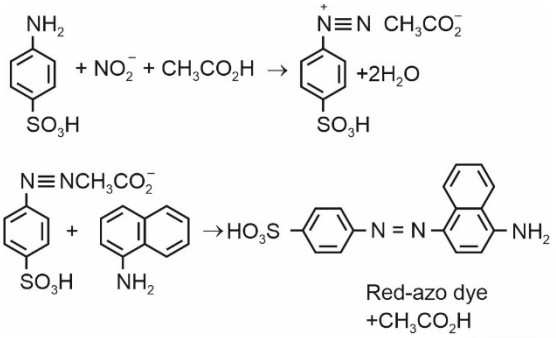
67. Answer (1)

Hint and Sol.: Cu^{2+} belongs to group-(II) cation hence it will give precipitate.

68. Answer (4)

Hint: This test is based upon the diazo-coupling reaction of sulphanillic acid. This test is specific for nitrite radical.

Sol.:



69. Answer (1)

Hint: $\Delta_{neut}H$ for WA + SB is less than 57.1 kJ mol^{-1}.

Sol.: Since acetic acid is a weak acid, hence some amount of heat is used in ionisation of acetic acid.

70. Answer (3)

Hint: When conc. H_2SO_4 is poured slowly in a mixture of nitrate salt solution and freshly prepared $FeSO_4$ solution, a brown ring is observed at the junction of two liquids.

Sol.: $2NO_3^- + 4H_2SO_4 + 6Fe^{2+} \rightarrow 6Fe^{3+} + 2NO\uparrow + 4SO_4^{2-} + 4H_2O$

$\left[Fe(H_2O)_6\right]^{2+} + NO \rightarrow \left[Fe(H_2O)_5NO\right]^{2+} + H_2O$

71. Answer (4)

Hint: $R-\underset{NH_2}{\underset{|}{CH}}-\overset{O}{\overset{\|}{C}}-O-H \rightleftharpoons R-\underset{{}^{+}NH_3}{\underset{|}{CH}}-\overset{O}{\overset{\|}{C}}-O^-$

(Zwitter ion Neutral)

Sol.: Except glycine, all other naturally occurring α-amino acids are optically active.

72. Answer (2)

Hint: Lactose is composed of β-D-Galactose and β-D-Glucose.

Sol.: The linkage in lactose is between C1 of galactose and C4 of glucose.

73. Answer (1)

Hint: The α-form of glucose (m.p 419 K) is obtained by crystallisation from concentrated solution of glucose at 303 K.

Sol.: The pentaacetate of glucose does not react with hydroxylamine indicating the absence of free –CHO group.

74. Answer (2)

Hint: Glucose on treatment with bromine water gives gluconic acid.

Sol.: Cellulose is a linear polymer of β-D-glucose units held together by glycosidic linkage.

75. Answer (2)

Hint: Sucrose is a disaccharide, which on hydrolysis gives equimolar mixture of D – (+) – Glucose and D – (–) fructose.

Sol.: The monosaccharides of sucrose are hold together by a glycosidic linkage between C1 of α-D-glucose and C2 of β-D-fructose.

76. Answer (1)

Hint: Cellulose is a straight chain polysaccharide

Sol.: Cellulose is a linear polymer of β-D-glucose.

77. Answer (2)

Hint: Insulin is soluble in water.

Sol.: Keratin and myosin have fibre-like structure and are held together by hydrogen and sulphide bonds.

78. Answer (4)

Hint: On heating metal carbonates in a charcoal cavity, the carbonates are converted to metal oxide, which are coloured residues.

Sol.:

Charcoal cavity test.

Observation	Ion
Yellow residue when hot and white when cold	Zn^{2+}

79. Answer (2)

Hint and Sol.: Group II – Cu^{2+}

Group reagent of group II cations is H_2S gas in presence of dil. HCl.

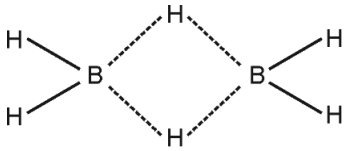
80. Answer (3)

Hint: $NH_4NO_3 \xrightarrow{\Delta} \underset{\text{Colourless gas, neutral}}{N_2O} + 2H_2O$

Sol.: $2NaNO_2 + 2FeSO_4 + 3H_2SO_4 \longrightarrow Fe(SO_4)_3 + 2NaHSO_4 + 2H_2O + \underset{\text{Colourless gas neutral}}{2NO}$

81. Answer (3)

Hint:



Sol.: 4 bonds of 2c – 2e⁻

2 bonds of 3c – 2e⁻

82. Answer (4)

Hint: Pale yellow ppt of AgBr is partially soluble in ammonium hydroxide

Sol.: $(CH_3COO)_2Pb + H_2S \rightarrow \underset{(Black)}{PbS} + CH_3COOH$

83. Answer (2)

Hint:

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

Sol.: 4 moles Zn reacts with 10 moles of HNO_3

$\therefore$ 3 moles of Zn will react with 7.5 moles of HNO_3.

84. Answer (2)

Hint: For H_2SO_4, $Ka_1 >> Ka_2$

Sol.: In Contact process, during absorption of SO_3 in H_2SO_4, oleum (pyrosulphuric acid) is obtained with 1 (S–O–S) bond.

85. Answer (2)

Hint: Phosgene gas = $COCl_2$

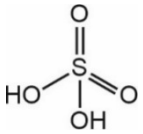
Sol.: Tear gas = CCl_3NO_2

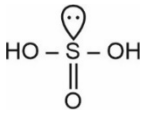
Laughing gas = N_2O

Mustard gas = $ClCH_2CH_2SCH_2CH_2Cl$

86. Answer (3)

Hint: $H_2S_2O_8 \Rightarrow HO-\overset{\overset{O}{\|}}{\underset{\underset{O}{\|}}{S}}-O-O-\overset{\overset{O}{\|}}{\underset{\underset{O}{\|}}{S}}-OH$ 4π bonds

Sol.: H_2SO_4  2π bonds

H_2SO_3  1π bond

87. Answer (2)

Hint: Phosphorus trichloride is obtained by action of thionyl chloride with white phosphorus.

Sol.: $P_4 + 8SOCl_2 \longrightarrow 4PCl_3 + 4SO_2 + 2S_2Cl_2$

88. Answer (2)

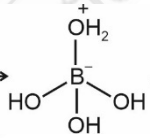
Hint: Copper bead is blue in colour.

Sol.: $Na_2B_4O_7 \cdot 10H_2O \xrightarrow{\Delta} Na_2B_4O_7 \xrightarrow{\Delta} 2NaBO_2 + B_2O_3$

$B_2O_3 + CaO \longrightarrow \underset{(Blue\ bead)}{Co(BO_2)_2}$

89. Answer (4)

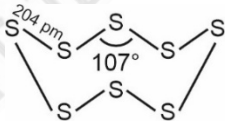
Hint: H_3BO_3 is a weak monobasic Lewis acid.

Sol.: $\underset{(Base)}{H_2O} + \underset{(Acid)}{B(OH)_3} \rightarrow$  $\rightleftharpoons [B(OH)_4]^- + H^+$

90. Answer (3)

Hint: In vapour state sulphur partly exists as S_2 molecule and exhibits paramagnetism.

Sol.: S_8 ring in rhombic and monoclinic forms.



[BOTANY]

91. Answer (4)

Hint: The given curve represents the species-area relationship.

Sol.: Species-area relationship becomes a straight line when represented by the equation

log S = log C + Z log A

92. Answer (2)

Hint: Out of 10 animals on this planet, 7 are insects.

Sol.: Amazonian rain forest is a home to about 1300 species of birds and 427 species of amphibians.

93. Answer (4)

Hint: Ecosystem services provided by the biodiversity are called as broadly utilitarian services.

Sol.: Khasi and Jaintia hills are located in Meghalaya.

94. Answer (4)

Hint: Core zone represents the innermost zone of a biosphere reserve.

Sol.: Transition zone is the outermost zone of a biosphere reserve which is an area of active cooperation between reserve management and local people.

95. Answer (3)

Hint: According to the records, per cent of birds species are less vulnerable to extinction than the per cent of mammals species.

Sol.: Careful analysis of records shows that extinction across taxa is not random and some groups like amphibians appear to be more vulnerable to extinction.

32% of all amphibian species are facing the threat of extinction.

96. Answer (3)

Hint: Increased biodiversity contributes to higher productivity.

Sol.: A stable community shows resilience to occasional natural and man-made disturbances.

97. Answer (3)

Hint: Key species drive major ecosystem functions.

Sol.: The given species can be best described as the key species.

98. Answer (3)

Hint: *Parthenium* is a weed which is invasive in India and exterminate many native herbs and shrubs.

Sol.: Cichlid fish is an example of endemic species in Lake Victoria of East Africa.

99. Answer (3)

Hint: For very large areas like the entire continent, the value of 'Z' ranges from 0.6 to 1.2

Sol.: Value of 'Z' for molluscs in New York state, plants in Britain or birds in California ranges from 0.1 to 0.2.

100. Answer (4)

Hint: Sacred groves refer to the tracts of forest that are set aside and all the trees and wildlife within are venerated and given total protection.

Sol.: *Eichhornia* in India is an example of alien species. Thylacine got extinct from Australia.

101. Answer (4)

Hint: *In situ* conservation strategy focuses on protecting the organisms in their natural habitat.

Sol.: National Park is an example of *in situ* conservation strategy.

102. Answer (3)

Hint: Biodiversity hotspots show higher species richness. Many of them are confined to that area and are not found anywhere else.

Sol.: Biodiversity hotspots cover less than 2% of the earth's land area.

103. Answer (2)

Hint: Totally unrelated species can compete for the same resource.

Sol.: Competition is best defined as a population interaction in which the fitness of one species is relatively lower in the presence of another species.

104. Answer (2)

Hint: Vital index for a population is represented as: B/D × 100

Sol.: $dN/dt = rN(K - N)/K \rightarrow$ Verhulst Pearl logistic growth equation.

$N_{(t+1)} = N_t + [(B + I) - (D + E)] \rightarrow$ Calculates the density of a population in a given period.

105. Answer (1)

Hint: The given pyramid shows almost zero growth rate.

Sol.: A population represented by the given pyramid is said to be mature or stable.

106. Answer (4)

Hint: Ectoparasites feed on the external surface of the host organism.

Sol.: Human liver fluke is an endoparasite that depends on two intermediate hosts (a snail and a fish) to complete its life cycle.

107. Answer (4)

Hint: Barnacles growing on the back of a whale is an example of commensalism.

Sol.: Clown fish and sea anemone show commensalism.

108. Answer (1)

Hint and Sol.: Mean annual temperature in a tropical rain forest ranges between 20°-30°C.

109. Answer (4)

Hint: Emigration refers to the number of individuals of the population who left the habitat and went elsewhere during the time period under consideration.

Sol.: Evolutionary changes through natural selection take place at the population level.

110. Answer (1)

Hint: He is known as the father of ecology in India.

Sol.: Government of India established the National Committee for Environmental Planning and Coordination in 1972, due to the efforts of Ramdeo Misra.

111. Answer (2)

Hint: The density of a population in a given habitat during a given period fluctuates due to changes in natality, mortality, immigration and emigration.

Sol.: Size of a population for any species is not a static parameter but it keeps changing with time.

112. Answer (4)

Hint: An individual is either a male or a female but a population has a sex ratio.

Sol.: An individual may have birth and death, but a population has birth rates and death rates.

113. Answer (2)

Hint: In a logistic growth curve, 'K' represents the carrying capacity of nature.

Sol.: Logistic growth curve reaches an asymptote when the population density reaches the carrying capacity (K = N).

114. Answer (4)

Hint: One of the roles of predators is to keep the prey population under control.

Sol.: Predators maintain species diversity in a community.

115. Answer (2)

Hint: Logistic growth curve is an S-shaped curve which shows an asymptote when the population density reaches the carrying capacity.

Sol.: Since resources for growth for most animal populations are finite and become limiting sooner or later, the logistic growth model is considered a more realistic one.

116. Answer (3)

Hint: Herbivores occupy the second trophic level.

Sol.: Sparrow can feed on seeds as well as insects and hence, can occupy more than one trophic level.

117. Answer (3)

Hint: Plants capture 2-10% of PAR.

Sol.: Plants capture 1-5% of the incident solar radiations.

118. Answer (1)

Hint and Sol.: Primary productivity can be expressed in terms of $gm^{-2}\ yr^{-1}$ or $(k\ cal\ m^{-2})\ yr^{-1}$.

119. Answer (3)

Hint: The amount of energy stored and fixed at one trophic level passes to the next trophic level.

Sol.: $\text{Sun} \rightarrow \underset{(100\ J)}{\text{Grass}} \rightarrow \underset{(10\ J)}{\text{Rabbit}} \rightarrow \underset{(1\ J)}{\text{Fox}} \rightarrow \underset{(0.1\ J)}{\text{Lion}}$

Fox stores and fixes 0.1 J of energy in the given food chain, which is passed on to the lion.

120. Answer (4)

Hint: Phosphorylation is an anabolic process.

Sol.: Catabolism is carried out by saprotrophic organisms, which by releasing digestive enzymes, change the complex organic matter into inorganic substances and hence it results into mineralisation.

121. Answer (3)

Hint: Anthropogenic ecosystem is also known as man-made ecosystem.

Sol.: The tidal mouth of a large river, where the tide meets the stream is called as estuary. It is a natural ecosystem.

122. Answer (4)

Hint: Pyramid of energy for any ecosystem is always upright.

Sol.: Pyramid of biomass in a grassland ecosystem is usually upright.

123. Answer (4)

Hint: Phytoplanktons act as producers in an aquatic ecosystem.

Sol.: Wolf can never occupy the second trophic level as; it is a carnivore.

124. Answer (1)

Hint: During the transfer of biomass at any trophic level, 90% of the biomass is either lost in wastage or broken down during cellular respiration for providing energy for various life activities.

Sol.: During transfer of biomass at any trophic level, only 10% of the food present in one trophic level becomes part of the next trophic level. Thus, the number of top carnivores is too small to support the next trophic level and to act as prey to the other organism.

125. Answer (2)

Hint: Ecological pyramids do not take into account insectivorous plants.

Sol.: In terrestrial ecosystems, a much larger fraction of energy flows through DFC than through GFC.

126. Answer (3)

Hint and Sol.: Among the given options, deep sea ecosystem is the least productive one due to the deficiency of sunlight.

127. Answer (1)

Hint: In a food web/chain, energy transfer takes place from one organism to another.

Sol.: Herbivores feed on producers and further become food for the other organisms. Energy never gets trapped in an organism forever, but passes from one organism to another.

128. Answer (3)

Hint: Saprophytes and decomposers are not given any place in ecological pyramids.

Sol.: Energy flow in an ecosystem is always unidirectional.

129. Answer (4)

Hint: Gross primary productivity (GPP) is the total amount of biomass produced by autotrophs.

Sol.: The available biomass for the consumption for heterotrophs is present in stored form in the body of producers.

130. Answer (4)

Hint: Bottom layer of strata in a forest ecosystem is occupied by grasses and herbs.

Sol.: Shrubs occupy the middle strata (second layer) in a forest ecosystem.

131. Answer (2)

Hint: Warm and moist environment favour decomposition.

Sol.: The factors that are not favourable for the decomposition process are lignin rich detritus, low temperature, dry environment and anaerobiosis.

132. Answer (2)

Hint: Oceans occupy 70 per cent of the earth's surface.

Sol.: Despite occupying about 70 per cent of the earth's surface, the productivity of oceans are only 55 billion tons.

133. Answer (4)

Hint: Decomposers convert complex organic matter into simpler ones.

Sol.: Decomposers reduce the organic remains on earth and also replenish the soil naturally with minerals.

134. Answer (3)

Hint: Producers are also called as transducers.

Sol.: Transducers convert solar energy into chemical energy stored in the bonds of sugar.

135. Answer (3)

Hint: First order consumers are also called as key industry animals.

Sol.: Lizard is a second order consumer and feeds on herbivores.

[ZOOLOGY]

136. Answer (1)

Hint: Some ethical standards are required to evaluate morality of all human activities.

Sol.: The laws and rules to prevent unauthorised exploitation of bio-resources are termed as bioethics. Biopiracy is the term used to refer to the use of bio-resources by any organisation without proper authorisation from the countries and people concerned without compensatory payment.

137. Answer (4)

Hint: Probe can have complementarity with any desired sequence.

Sol.: Single stranded DNA or RNA, tagged with a radioactive molecule is called probe that is allowed to hybridise to its complimentary DNA in a clone of cells followed by detection using autoradiography. The clone having mutated gene will hence not appear on the photographic film, because the probe will not have complementarity with mutated gene.

Probes can be designed to target mutated gene sequence.

138. Answer (2)

Hint: This gene is not present in pBR322.

Sol.:

a.	Gene therapy	–	Replacement of faulty gene by a normal healthy gene
b.	Genome	–	Total DNA in the cells of an organism
c.	*Bacillus thuringiensis*	–	'*cry*' gene
d.	Kanamycin^R gene	–	Antibiotic resistance

139. Answer (2)

Hint: Very minute quantity of DNA is required

Sol.: The amount of target DNA can be very small because PCR is extremely sensitive and will work with just a single starting molecule.

The polymerase chain reaction can be used to obtain a pure sample of gene. This is because the region of the starting DNA molecule that is copied during PCR is the segment whose boundaries are marked by the annealing positions of the two oligonucleotide primers.

PCR can also be used with DNA from forensic material such as hair and dried bloodstains or even from the bones of long dead humans.

140. Answer (3)

Hint: Chitinase digests the chitin present in the cell wall of fungi.

Sol.: For isolation of genetic material of plant cells, enzyme cellulase is used. For digestion of cell wall of fungi and bacteria, chitinase and lysozyme are used, respectively.

The causative agent of enteric fever is bacterium *Salmonella typhimurium.*

141. Answer (2)

Hint: Formation of multiple copies of a desired gene.

Sol.: The main steps in the formation of a recombinant DNA are mentioned below:

1. Fragmentation of DNA by using restriction enzymes.
2. Isolation of desired DNA fragment.
3. Ligation of DNA fragment into a vector.
4. Insertion of recombinant DNA into host cell.

142. Answer (4)

Hint: Smaller fragments move faster than the longer DNA fragments.

Sol.: During agarose gel electrophoresis, DNA fragments separate according to their size because charge on each fragment remains the same. The smaller the DNA fragment, farther it moves towards the anode from the cathode.

Bromophenol blue is a tracking dye.

143. Answer (1)

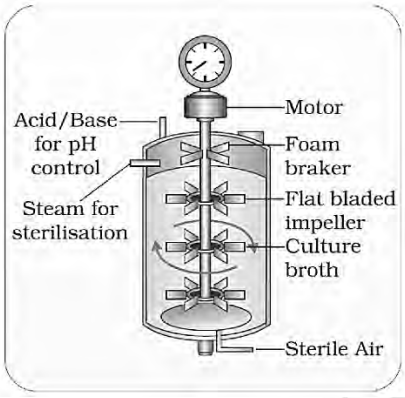
Hint: Restriction enzymes cut DNA at specific points.

Sol.: In biotechnology, restriction endonucleases and DNA ligases act as tools in which former cuts DNA at specific points in recognition site. So, it is considered as a molecular scissor. DNA polymerase joins two nucleotides by forming phosphodiester bonds, so, it is considered as a molecular glue.

144. Answer (2)

Hint: Former is responsible for breaking foam

Sol.:



145. Answer (3)

Hint: Spooling is the removal of precipitated DNA with the help of glass rod.

Sol.: After gel electrophoresis, the separated bands of DNA are cut out from the agarose gel. The site in a DNA molecule which is hydrolysed with the help of a particular restriction endonuclease is called recognition site. Maintenance of sterile ambience in chemical engineering process to enable the growth of only the desirable cells for the manufacture of biotechnological products is called bioprocess engineering.

146. Answer (4)

Hint: Transgenic animals carry alien gene.

Sol.: For chemical safety testing, transgenic animals are made that carry genes which make them more sensitive to toxic substances than non-transgenic animals.

147. Answer (4)

Hint: Desired plants can be produced by genetic modifications.

Sol.: Genetically modified plants have been used to create tailor-made plants to supply alternating resources to industries in the form of starches, fuels and pharmaceuticals.

148. Answer (4)

Hint: Detection of a disease can be done by detecting antibodies.

Sol.: ELISA is based on the principle of antigen-antibody interaction. Infection by a pathogen can be detected by the presence of antigens or by detecting the antibodies synthesized against the pathogen.

149. Answer (2)

Hint: Ti plasmid of *A. tumefaciens*

Sol.: The specific palindromic sequence of *Hind* II consists of 6 base pairs. A piece of DNA called 'T-DNA' is present in Ti-plasmid of *A. tumefaciens* which transforms normal plant cells into tumor cells when it is delivered in plant cell. When gene of interest is introduced into an alien organism, it may get integrated into the genome of the recipient and may multiply and be inherited along with the host DNA.

150. Answer (3)

Hint: Extension is the last step of PCR.

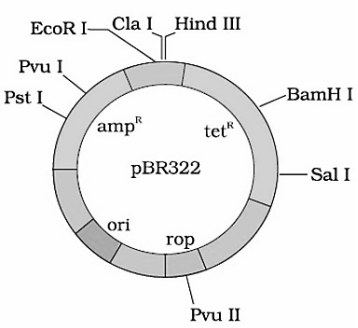
Sol.: PCR stands for polymerase chain reaction which includes three steps. The correct sequence of all these three steps is

(1) Denaturation, (2) Annealing and (3) Extension

151. Answer (2)

Hint: Closer to the part which codes for proteins involved in replication.

Sol.: In a chromosome, there is a specific DNA sequence called the origin of replication, which is responsible for initiating replication. For multiplication of any alien piece of DNA in an organism, it needs to be a part of chromosome which has origin of replication/*ori*. *rop* codes for the proteins involved in replication of plasmids.



152. Answer (4)

Hint: Restriction endonucleases cut after recognising a specific nucleotide sequence.

Sol.: Each restriction endonuclease functions by inspecting the length of a DNA sequence. It cuts each of the two strands of DNA at specific points in their sugar-phosphate backbones. They either cut the DNA strands a little away from the centre or in the centre of palindrome but between the same two bases on the opposite strands.

Restriction endonucleases are produced by prokaryotes.

153. Answer (2)

Hint: Mobile genetic elements are also called transposons.

Sol.: Silencing of mRNA is possible *via* RNAi because of complimentary dsRNA. The source of this complimentary RNA could be from an infection by viruses having RNA genomes or mobile genetic elements (transposons) that replicate *via* an RNA intermediate.

154. Answer (4)

Hint: Bt-toxin is produced by some strains of *Bacillus thuringiensis.*

Sol.: Some strains of *Bacillus thuringiensis* produce proteins that kill certain insects such as lepidopterans, dipterans and coleopterans. Bt toxin is synthesized in *Bacillus* in an inactive form, so, no effect is seen on it. But when insects ingest this toxin, it gets activated in alkaline pH of their midgut and forms pores in epithelium of midgut which leads to lysis and cell death.

155. Answer (3)

Hint: Loss of minerals from the soil decreases fertility of soil.

Sol.: Genetic modification has

1. Made crops more tolerant to abiotic stresses
2. Reduced reliance on chemical pesticides
3. Helped to reduce post-harvest losses
4. Increased efficiency of mineral usage by plants
5. Enhanced nutritional value of food.

156. Answer (3)

Hint: dsRNA initiates RNAi

Sol.: In RNAi, the introduction of DNA is such that it produces both sense and anti-sense RNA in the host cells. These two RNAs being complementary to each other, formes a double stranded RNA that initiates RNAi and thus, silences the specific mRNA.

RNAi is a post-transcriptional gene silencing technique.

157. Answer (3)

Hint: Genetic defects can be cured only at embryonic stage.

Sol.: ADA deficiency can be cured permanently by introducing gene for ADA, isolated from marrow cells into cells at early embryonic stages. Gene therapy at adult stage and bone marrow transplantation are not completely curative. Because lymphocytes are not immortal, the patient requires periodic infusion of such genetically engineered lymphocytes.

158. Answer (4)

Hint: Nutritionally a more balanced product.

Sol.: In 1997, the first transgenic cow, 'Rosie', produced human protein-enriched milk (2.4 gm/L). The milk contained human α-lactalbumin and was nutritionally a more balanced product for human babies than the natural cow milk. In 1997, an American company got patent rights on Basmati rice through the US Patent and Trademark Office.

159. Answer (3)

Hint: Nations have laws to prevent unauthorised exploitation of bio-resources.

Sol.: GEAC makes decisions regarding validity of GM research and the safety of introducing GM-organisms for public services.

The Indian Parliament has recently cleared the 2nd amendment of the Indian Patent Bill, that takes issues into consideration such as emergency provisions, research and development initiative.

160. Answer (4)

Hint: Transgenic models exist for many human diseases.

Sol.: Transgenic animals are designed to increase our understanding of how genes contribute to the development of diseases. Today, transgenic models exist for many human diseases such as cancer, cystic fibrosis, rheumatoid arthritis and Alzheimer's disease.

161. Answer (3)

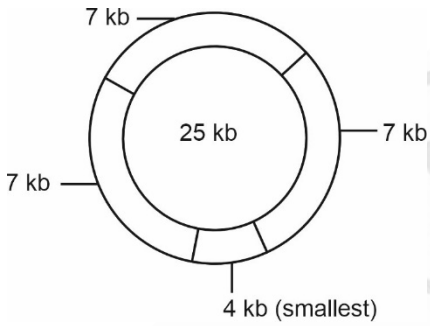
Hint: Plants produced through tissue culture.

Sol.: The method of producing thousands of plants through tissue culture is called micro-propagation. Each of these plants will be genetically identical to the original plant from which they were grown *i.e.,* they are somaclones. Any part of a plant taken out and grown in a test tube under sterile conditions in special nutrient media is called explant. The capacity to generate whole plant from any cell/explant is called totipotency. Hybrid protoplasts are grown to form somatic hybrids.

162. Answer (3)

Hint: For circular DNA, the number of restriction fragments obtained is equal to the number of restriction sites present for the endonuclease.

Sol.:



On complete restriction digestion, 3 fragments of 7 kb will be obtained and one smallest segment of 4 kb will be obtained. In gel electrophoresis, DNA bands move over the gel based on their sizes. So, all the three DNA fragments (each of 7 kb) will form only one band and the smallest one (4 kb) will form another band closer to anode.

163. Answer (2)

Hint: Identical copies of biological entity.

Sol.: Making multiple identical copies of any template DNA is called cloning. DNA is a hydrophilic molecule and restriction site for *Hin*d II is not present in the plasmid pBR322.

In PCR, primers anneal at the 3′ end of a complementary single-stranded DNA template.

164. Answer (4)

Hint: Enzymes that belong to class Hydrolases.

Sol.: Besides *Hin*d II, today, we know more than 900 restriction on enzymes that have been isolated from over 230 strains of bacteria, each of which recognise different recognition sequences.

165. Answer (3)

Hint: Plasmids are usually circular DNA.

Sol.: Plasmids are extra-chromosomal double stranded circular DNA which are used as vectors in biotechnology. Mosquito acts as the insect vector and transfers the parasite in the human body. In the same way, a plasmid can be used as a vector to deliver an alien piece of DNA into the host organism.

Aedes transmits the pathogen causing dengue, chikungunya, *etc*.

166. Answer (4)

Hint: Restriction enzymes which produce sticky ends cut the DNA a little away from the centre of palindrome.

Sol.: Some restriction endonucleases which cut the DNA in the centre of palindrome, produces blunt ends whereas some restriction endonucleases which cut DNA slightly away from the centre of palindrome, produces overhanging or sticky ends.

167. Answer (3)

Hint: Principle of insertional inactivation

Sol.: β-galactosidase produces blue coloured colonies in the presence of the chromogenic substrate. Because site of *Bam* HI in this plasmid is present in coding sequence of tet^R gene and gene for enzyme β-galactosidase is present at the site of *Eco* RI, so there is no insertional inactivation of β-galactosidase. So, for recombinant transformants, blue coloured colonies growing on ampicillin containing medium and showing sensitivity to tetracycline will be selected.

168. Answer (3)

Hint: Includes adenine and guanine.

Sol.: The recognition sequence of *Eco* RI is $\overset{\downarrow}{5'G}AATTC3'$ $3'CTTAA\overset{\uparrow}{G}5'$ and always cuts between adenine (A) and guanine (G). Adenine (A) and guanine (G) are substituted purines. On restriction digestion, *Eco* RI produces sticky ends.

169. Answer (2)

Hint: The process of isolation and purification

Sol.: The basic steps involved in genetically modifying an organism are given in the options. Downstream processing includes separation and purification. It is performed post biosynthetic stage.

170. Answer (3)

Hint: Biotechnology overcomes the disadvantage of traditional methods.

Sol.: The definition of modern biotechnology encompasses both traditional view and modern molecular biotechnology.

Traditional hybridisation procedure used in plant and animal breeding, very often lead to inclusion and multiplication of undesirable genes along with the desired genes.

171. Answer (1)

Hint: Eliminate the methods used for plants

Sol.: In micro-injection, recombinant DNA is directly injected into the nucleus of an animal cell. In gene gun/biolistics, cells are bombarded with high velocity micro-particles of gold or tungsten coated with DNA.

172. Answer (2)

Hint: Cells are maintained in their exponential phase.

Sol.: Bioreactors can process 100-1000 litres of culture.

- They can be thought of as vessels in which raw materials are biologically converted into specific products, individual enzymes, *etc.,* using microbial plant, animal or human cells.
- A bioreactor provides the optimal conditions for achieving the desired product by providing optimum growth conditions, (temperature, pH, substrate, salts, vitamins, oxygen).

  The cells can be multiplied in a continuous culture system wherein the cells are maintained in their physiologically most active log/ exponential phase.

173. Answer (3)

Hint: Most commonly used matrix is gel.

Sol.: DNA fragments or DNA of interest used in cloning, can be separated by gel electrophoresis. Separation of DNA from gel piece is called elution and removal of precipitated DNA strands from a solution with the help of a glass rod is called spooling. Transformation is introduction of foreign DNA into a bacterial cell.

174. Answer (4)

Hint: It is a heat-stable DNA polymerase.

Sol.: Thermostable DNA polymerase used in PCR was isolated from *Thermus aquaticus* and is commonly known as *Taq* polymerase. *Taq* polymerase is a DNA dependent DNA polymerase whereas reverse transcriptase is a RNA dependent DNA polymerase.

175. Answer (2)

Hint: Choose a conventional method of diagnosis.

Sol.: Advanced methods are useful for early detection and diagnosis of diseases. These are RDT, PCR, ELISA and probe followed by autoradiography. Early detection and diagnosis of a disease is not possible by using conventional methods such as serum analysis, urine analysis, *etc.*

176. Answer (4)

Hint: Only 'A' chain has an intrachain disulphide bond.

Sol.: In both proinsulin and insulin, total three disulphide bonds are present in which only one intra-chain disulphide bond is present in 'A' chain and two interchain disulphide bonds are present between 'A' and 'B' chains.

177. Answer (3)

Hint: Acts as an intracellular messenger.

Sol.: RNAi is a cellular defence mechanism in eukaryotes in which silencing of specific messenger RNA is possible *via* RNAi because of complementary dsRNA.

178. Answer (2)

Hint: Equal to the number of cranial bones in a man

Sol.: Total number of DNA fragments obtained after 'n' cycles = 2^n

So, $256 = 2^n$

So n = 8 and $2^8 = 256$ DNA fragments.

179. Answer (2)

Hint: Cohen had been studying extra-chromosomal DNA.

Sol.: Cohen had been studying small ringlets of DNA called plasmids which float about freely in the cytoplasm of certain bacterial cells and replicate independently from the coding strand of the host DNA. They are double-stranded, circular and extra- chromosomal DNA.

180. Answer (1)

Hint: Also used as host in the synthesis of human insulin by Eli Lilly.

Sol.: By 1969, Boyer performed studies on a couple of restriction enzymes of the *E.coli* bacterium with especially useful properties. *Salmonella typhimurium* was used in genetic engineering to form the first recombinant DNA in the year 1972. *Thermus aquaticus* bacterium has the DNA polymerase which can resist comparatively high temperature. The Ti-plasmid in *Agrobacterium tumefaciens* has T-DNA which causes plant tumour.

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