

All India Aakash Test Series for NEET - 2025

TEST - 6 (Code-E)[Click here for Code-F Sol](#)

Test Date : 09/03/2025

ANSWERS

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

HINTS & SOLUTIONS**[PHYSICS]**

1. Answer (1)

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

$$\begin{aligned} \text{Sol.: } \frac{M_1}{M_2} &= \left(\frac{l_1}{l_2}\right)\left(\frac{r_1}{r_2}\right)^2 = \left(\frac{2}{1}\right)\left(\frac{1}{2}\right)^2 \\ &= 2 \times \frac{1}{4} = \frac{1}{2} \end{aligned}$$

2. Answer (2)

Hint: $\vec{F}_{\text{net}} = \vec{F}_m + \vec{F}_e = q[\vec{v} \times \vec{B} + \vec{E}]$ **Sol.:** $\vec{F}_m = q(\vec{v} \times \vec{B}) = 0$ as $\vec{B} \parallel \vec{v}$

$$a = \frac{qE}{m}$$

So the proton will move in straight line with uniform acceleration.

3. Answer (4)

Hint & Sol.: The Biot-Savart's law for current carrying element is $\frac{\mu_0}{4\pi} \frac{i(d\vec{l} \times \vec{r})}{r^3}$

4. Answer (2)

Hint: Pole strength depends upon cross-sectional area of bar magnet.**Sol.:** The pole strength does not change when a bar magnet is cut perpendicular to its length.

$$\vec{M}_1 = \frac{mL}{3} \Rightarrow \vec{M}_1 = \frac{\vec{M}}{3}$$

5. Answer (2)

Hint & Sol.: $\vec{B}_1 = \frac{\mu_0}{4\pi} \frac{2\vec{M}}{r^3}$

$$\vec{B}_2 = \frac{-\mu_0}{4\pi} \frac{\vec{M}}{r^3}$$

$$|\vec{B}_1| = 2|\vec{B}_2|$$

6. Answer (3)

Hint & Sol.: Any change in magnetic flux whether increase or decrease causes induced current in a loop. The direction of induced current is such that it opposes its cause.

7. Answer (3)

Hint: $|\langle \varepsilon \rangle| = \left| \frac{\Delta\phi}{\Delta t} \right|$ **Sol.:** $\phi_B = t^2 + 2t - 2$

$$\phi(4) = 16 + 8 - 2 = 22 \text{ Wb}$$

$$\phi(1) = 1 \text{ Wb}$$

$$\varepsilon = \left| \frac{22-1}{4-1} \right| \text{ V}$$

$$= \left| \frac{21}{3} \right| = 7 \text{ V}$$

8. Answer (1)

Hint: Average value of function $f(t) = \frac{1}{T} \int_0^T f(t) dt$

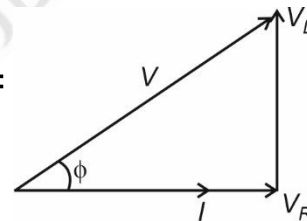
$$= \frac{1}{T} [\text{area under graph}]$$

Sol.: $I_{\text{avg}} = \frac{1}{T} [\text{area of graph}]$

$$= \frac{1}{2} \left[\frac{1}{2} \times 4 \times 2 \right]$$

$$= 2 \text{ A}$$

9. Answer (3)

Hint: Use phasor diagram**Sol.:**

$$\tan\phi = \frac{V_L}{V_R} = \frac{\omega L}{R}$$

For finite value of R and L , the phase difference is always greater than zero and less than $\frac{\pi}{2}$.

10. Answer (4)

Hint: Capacitive reactance is given by $X_C = \frac{1}{\omega C}$

$$\text{Sol.: } X_C = \frac{1}{100 \times 100 \times 10^{-6}}$$

$$X_C = 100 \Omega$$

11. Answer (1)

Hint: At resonance both current and source voltage are in same phase

$$\text{Sol.: } |Z| = \sqrt{R^2 + (X_L - X_C)^2} \text{ and } I = \frac{V}{|Z|}$$

At resonance

$$X_L = X_C$$

$$|Z| = R \text{ (Minimum)}$$

$$I = \frac{V_0}{R} \text{ (Maximum)}$$

12. Answer (3)

Hint & Sol.: Transformer works under AC voltage only. For DC input voltage there will not be any output voltage.

13. Answer (2)

Hint: Total energy is equally distributed between electric and magnetic field.

$$\text{Sol.: } \langle TE \rangle = \frac{1}{2\mu_0} B_0^2 = \frac{1}{2} \epsilon_0 E_0^2$$

$$\langle TE \rangle = \frac{1}{4\mu_0} B_0^2 + \frac{1}{4} \epsilon_0 E_0^2$$

14. Answer (1)

Hint & Sol.: In EM waves, the electric field and magnetic field oscillate in same phase in two perpendicular directions.

15. Answer (1)

Hint: The direction of propagation of electromagnetic wave is along $(\vec{E} \times \vec{B})$

$$\text{Sol.: } \hat{j} \times \hat{k} = \hat{i}$$

So, magnetic field is oscillating along z-axis

$$E_0 = cB_0$$

$$B_0 = \frac{E_0}{c} = \frac{45 \times 10^{-2}}{3 \times 10^8} = 15 \times 10^{-10}$$

$$= 1.5 \text{ nT}$$

16. Answer (1)

Hint & Sol.:

$$\oint \vec{E} \cdot d\vec{l} = \frac{-d\phi_B}{dt}$$

Time varying magnetic field can produce constant electric field as well as variable electric field.

and

An accelerating charge produces EM waves of same frequency.

17. Answer (3)

Hint & Sol.:

(1) Due to short wavelength microwaves are used for radar system for aircraft navigation.

(2) Radio waves are mostly used in radio communication such as AM and FM broadcasting.

(3) Infrared rays are used in household remote switches.

(4) Ultraviolet rays are used in water purifiers.

18. Answer (2)

Hint: Charge passing through a coil due to change in magnetic flux is given by $Q = \frac{\Delta\phi}{R}$

$$\text{Sol.: } Q = \frac{\Delta\phi}{R}$$

$$Q = \frac{12 - 4}{200} \text{ C}$$

$$= \frac{4}{100} \text{ C} = 40 \text{ mC}$$

19. Answer (1)

Hint: Use $\vec{F} = I(d\vec{l} \times \vec{B})$

Sol.: The force on every current element is radially outwards so it will increase its radius.

20. Answer (2)

Hint & Sol.: Magnetic susceptibility of diamagnetic material is less than zero.

21. Answer (1)

Hint: Quality factor, $Q = \frac{\text{Resonant frequency}}{\text{Band width}}$

$$\text{Sol.: } Q = \frac{500}{525 - 475} = \frac{500}{50} = 10$$

22. Answer (3)

Hint: In one cycle current become zero twice.

$$\text{Sol.: } f = \frac{100\pi}{2\pi} = 50 \text{ Hz}$$

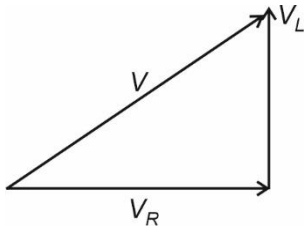
In 1 cycle the current becomes zero 2 times. In 2 seconds there will be 100 cycles, so current will become zero 200 times in 2 seconds.

23. Answer (2)

Hint: The phase difference between voltage across inductor and voltage across resistance is

$$\frac{\pi}{2}$$

Sol.:



$$V = \sqrt{V_R^2 + V_L^2}$$

$$(200)^2 = (160)^2 + V_L^2$$

$$40000 - 25600 = V_L^2$$

$$14400 = V_L^2$$

$$120 V = V_L$$

24. Answer (1)

Hint: Magnetic field inside a solenoid is, $B = \mu ni$

$$\text{Sol.: } B_{\text{net}} = \mu_0 \mu_r ni$$

$$= 4\pi \times 10^{-7} \times 200 \times 2000$$

$$= 4\pi \times 4 \times 10^{-2}$$

$$= 16\pi \times 10^{-2}$$

$$= 0.16\pi \text{ T}$$

25. Answer (3)

Hint & Sol.: The material for permanent magnets should have high retentivity and high coercivity.

26. Answer (2)

Hint & Sol.: At resonance, the value of power factor is one.

27. Answer (1)

Hint: The direction of induced current is such that it opposes the cause that produces it.**Sol.:** The decreasing current will produce decreasing magnetic field going into the plane.

To increase the magnetic flux in downward direction, induced current should be clockwise.

28. Answer (4)

Hint: In case of rotating conductor, induced emf between fixed and free end of separation l is equal

$$\text{to } \frac{B\omega L^2}{2}$$

$$\text{Sol.: } |V_Q - V_R| = \frac{1}{2} B\omega \left[L^2 - \frac{L^2}{4} \right]$$

$$= \frac{3}{8} B\omega L^2$$

29. Answer (4)

$$\text{Hint: } F = I(\vec{l}_{\text{eff}} \times \vec{B})$$

$$\text{Sol.: } F = I(2R)(B)\sin 0^\circ$$

$$F = 0$$

30. Answer (2)

$$\text{Hint: Wave velocity} = \frac{\omega}{k}$$

$$\text{Sol.: } vB_0 = E_0$$

$$\frac{\omega}{k} = \frac{E_0}{B_0}$$

Same sign of ωt and kx implies that wave is moving in $-x$ direction.

31. Answer (4)

Hint: Radiation pressure on a perfectly reflecting

$$\text{surface} = \frac{2I}{c}$$

Sol.: Force = Pressure \times Area

$$F = \left(\frac{2I}{c} \right) (A)$$

32. Answer (4)

$$\text{Hint: Energy, } E = \frac{1}{2} \times L \times i^2$$

$$\text{Sol.: } E = \frac{1}{2} \times 2 \times 10^{-6} \times 4 \times 4 = 16 \times 10^{-6} = 16 \mu\text{J}$$

33. Answer (1)

Hint & Sol.: At high voltage the current is very small and transmission loss (I^2R) are minimised.

34. Answer (1)

Hint: A galvanometer is converted into voltmeter by connecting a resistance in series with it.

$$\text{Sol.: } V = I_g (G + R)$$

$$5 = 10 \times 10^{-3} (50 + R)$$

$$500 - 50 = R$$

$$R = 450 \Omega$$

35. Answer (2)

Hint: Magnetic field of wire passing through centre is zero.

$$\text{Sol.: } \vec{B} = \vec{B}_1 + \vec{B}_2$$

Magnetic field due to circular arc :

$$\vec{B}_1 = \frac{3}{4} \left(\frac{\mu_0 I}{2R} \right) \otimes$$

Magnetic field due to straight wire :

$$\vec{B}_2 = \frac{\mu_0 I}{4\pi R} \otimes$$

$$\vec{B} = \frac{\mu_0 I}{4R} \left[\frac{3}{2} + \frac{1}{\pi} \right] \otimes$$

36. Answer (1)

Hint: Current due to point charge moving in a circular orbit, $I = \frac{q}{t} = \frac{q\omega}{2\pi}$

Sol.: $M = I\pi r^2 = \frac{q\omega}{2\pi} \pi r^2$

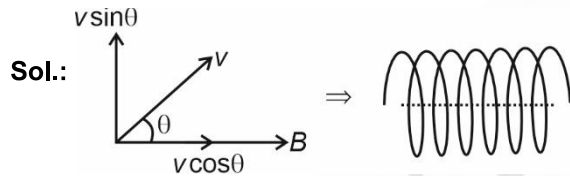
$$M = \frac{q\omega r^2}{2}$$

$$L = I\omega = mr^2\omega$$

$$\frac{M}{L} = \frac{q\omega r^2}{2mr^2\omega} = \frac{q}{2m}$$

37. Answer (3)

Hint: The velocity has both perpendicular and parallel component with magnetic field.



$$r = \frac{mv \sin \theta}{Bq} \Rightarrow \text{constant}$$

$$\text{Pitch} = v \cos \theta \times \frac{2\pi m}{Bq} \Rightarrow \text{constant}$$

38. Answer (3)

Hint: Voltage sensitivity (V_S)

$$= \frac{\text{Current sensitivity } (I_S)}{R}$$

Sol.: $V_S = \frac{I_S}{R}$

$$5 = \frac{10}{10^{-3} \times R}$$

$$R = \frac{10^4}{5} = \frac{10000}{5} = 2000 \Omega$$

39. Answer (3)

Hint: The magnetic force on a charged particle is always perpendicular to velocity.

Sol.: The charged particle will move in a circle with uniform speed. So its kinetic energy is constant and its acceleration is variable.

40. Answer (2)

Hint: The electric force must balance magnetic force

Sol.: $qE = qvB$

$$v = \frac{E}{B} = \frac{50}{10^4} = 5 \times 10^5 \text{ m s}^{-1}$$

41. Answer (2)

Hint & Sol.: According to Lenz's law, the induced current will oppose the increasing magnetic flux. So the direction of induced current is anticlockwise.

42. Answer (2)

Hint: The dimensions of mutual inductance and self-inductance are same.

Sol.: $E = \frac{1}{2} L I_0^2$

$$[ML^2 T^{-2}] = [L][A^2]$$

$$[ML^2 T^{-2} A^{-2}] = [L]$$

43. Answer (4)

Hint & Sol.: The voltage across the inductor leads the current by $\frac{\pi}{2}$ and voltage across capacitor lag behind current by $\frac{\pi}{2}$. So the phase difference of π radian is there.

44. Answer (3)

Hint & Sol.:

- (1) Static charge produces electrostatic field.
- (2) A charge moving with constant velocity produces magnetostatic field.
- (3) An accelerating charge produces electromagnetic wave.

45. Answer (2)

Hint: $i_d = \frac{dq}{dt}$

Sol.: $q = CV = CV_0 \cos \omega t$

$$\frac{dq}{dt} = CV_0 \frac{d}{dt}(\cos \omega t)$$

$$= -CV_0 \omega \sin \omega t$$

$$i_d = \frac{dq}{dt} = -C\omega V_0 \sin \omega t$$

$$i_d = -\omega C V_0 \sin \omega t$$

55. Answer (3)

Hint: Ligands are arranged in their increasing order of field strength. The series which is obtained is known as spectrochemical series

Sol.: Correct order of field strength is $S^{2-} < OH^- < edta^{4-} < en$

56. Answer (2)

Hint: Δ_0 represents crystal field splitting energy for octahedral complexes.

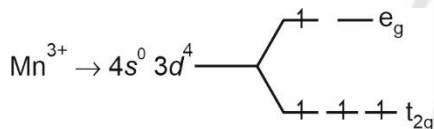
Sol.:

- Ligands for which $\Delta_0 < P$ are known as weak field ligands and form high spin complexes.
- Ligands for which $\Delta_0 > P$ are known as strong field ligands and form low spin complexes.

57. Answer (2)

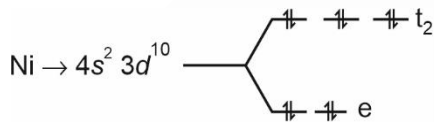
Hint & Sol.:

- In $[MnCl_6]^{3-}$



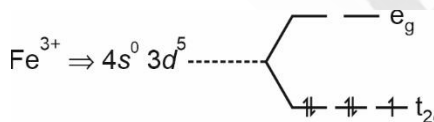
Number of unpaired $e^- = 4$

- In $[Ni(CO)_4]$



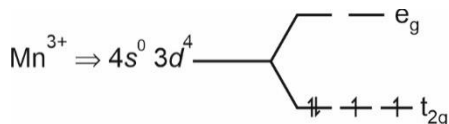
Number of unpaired $e^- = 0$

- In $[Fe(CN)_6]^{3-}$



Number of unpaired $e^- = 1$

- In $[Mn(CN)_6]^{3-}$

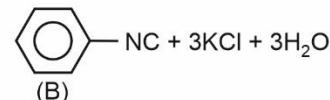
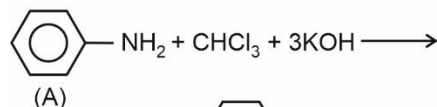
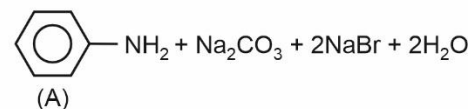
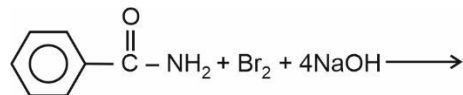


Number of unpaired $e^- = 2$

58. Answer (1)

Hint: Aliphatic and aromatic primary amines on heating with chloroform and ethanolic KOH form isocyanides or carbylamines.

Sol.:



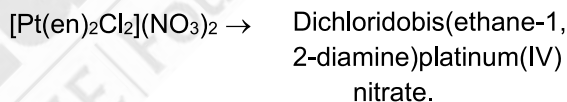
59. Answer (1)

Hint & Sol.: Tetrahedral complexes do not show geometrical isomerism because the relative positions of the unidentate ligands attached to the central metal atom are the same with respect to each other.

60. Answer (3)

Hint: The cation is named first in both positively and negatively charged coordination entities

Sol.:



61. Answer (4)

Hint & Sol: The UV-visible absorption bands in the spectra of lanthanoid ions are narrow, probably because of the excitation of electrons involving f orbitals

62. Answer (4)

Hint: $Ln(\text{lanthanoids}) + \text{dilute acid} \rightarrow H_2\uparrow$

Sol.:

- $2Cu^+ \rightarrow Cu^{2+} + Cu$
- Bronze is an alloy of copper and tin.
- Due to lanthanoid contraction, ionic radii from lanthanum to lutetium decreases

63. Answer (1)

Hint: For octahedral complex CFSE

$$= -0.4\Delta_0 \times t_{2g}e^- + 0.6\Delta_0 \times e_g e^-$$

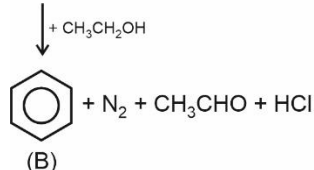
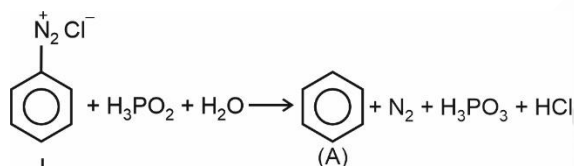
72. Answer (4)

Hint: Ce⁴⁺ and Yb²⁺ have no unpaired electrons**Sol.:** La³⁺ – [Xe]Lu³⁺ – [Xe] 4f¹⁴Ce⁴⁺ – [Xe]Yb²⁺ – [Xe] 4f¹⁴

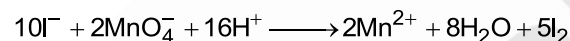
73. Answer (1)

Hint: Gadolinium and Lutetium are lanthanoid metals.**Sol.:** ⁶⁴Gd → [Xe] 4f⁷ 5d¹ 6s²⁷¹Lu → [Xe] 4f¹⁴ 5d¹ 6s²

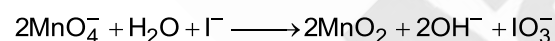
74. Answer (1)

Hint & Sol.:

75. Answer (2)

Hint & Sol.: In acidic medium

In neutral or faintly alkaline solution



76. Answer (1)

Hint & Sol.: Gold combines with cyanide in the presence of oxygen and water to form the coordination entity [Au(CN)₂]⁻ in aqueous solution. Gold can be separated from this solution by the addition of zinc in metallic form.

- Hardness of water is estimated by simple titration with Na₂EDTA

77. Answer (2)

Hint: V₂O₅ catalyses the oxidation of SO₂ in the manufacture of sulphuric acid.**Sol.:** Wacker's process – PdCl₂Manufacture of polythene – TiCl₄ + Al(CH₃)₃

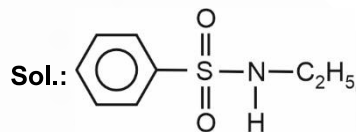
Haber process – Fe

78. Answer (4)

Hint: Structural Isomers are two or more compounds that have the same chemical formula but a different arrangement of atoms.**Sol.:**

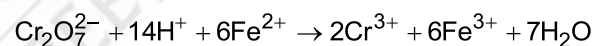
- [Cr(H₂O)₆]Cl₃ and [Cr(H₂O)₅Cl]Cl₂·H₂O are solvate isomers
- [Co(NH₃)₆] [Cr(CN)₆] and [Cr(NH₃)₆] [Co(CN)₆] are coordination isomers.
- [Co(NH₃)₅(NO₂)]Cl₂ and [Co(NH₃)₅(ONO)]Cl₂ are linkage isomers.

79. Answer (1)

Hint: N-Ethylbenzenesulphonamide is acidic in nature

N-Ethylbenzenesulphonamide (Soluble in alkali)

80. Answer (3)

Hint: In acidic medium, Cr₂O₇²⁻ converts into Cr³⁺ ion**Sol.:**6 mole Fe²⁺ are oxidised by 1 mole K₂Cr₂O₇2 mole Fe²⁺ are oxidised by $\frac{1}{3}$ mole K₂Cr₂O₇

81. Answer (3)

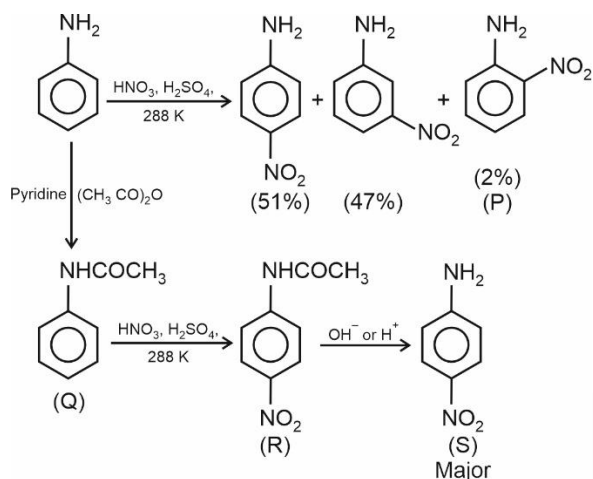
Hint: Wilkinson catalyst [(PPh₃)₃RhCl] is used for the hydrogenation of alkenes.**Sol.:**

- Chlorophyll is a coordination compound of magnesium
- Vitamin B₁₂, cyanocobalamin is a coordination compound of cobalt.
- Haemoglobin, the red pigment of blood which acts as oxygen carrier is a coordination compound of iron.

82. Answer (3)

Hint: $-\text{NH}_2$ group is ortho and para directing and a powerful activating group

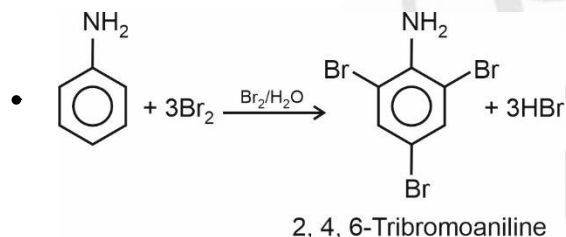
Sol.:



83. Answer (1)

Hint: Aniline reacts with bromine water at room temperature to give a white precipitate.

Sol.:

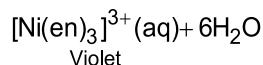
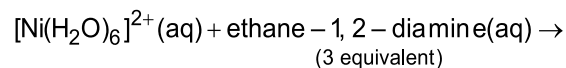
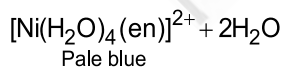
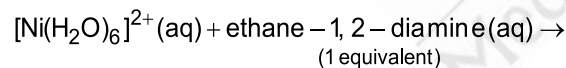


- Aniline does not undergo Friedel-Crafts reaction due to salt formation with AlCl_3 .

84. Answer (4)

Hint: Crystal field theory attributes the colour of the coordination compounds to $d-d$ transition of the electron.

Sol.:



85. Answer (2)

Hint: Actinoids show greater range of oxidation states

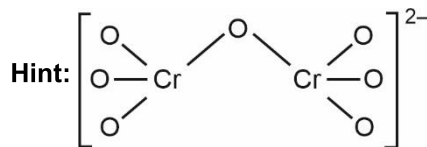
Sol.: Th \rightarrow +4 only

Np \rightarrow +3, +4, +5, +6 and +7

Cf \rightarrow +3 only

No \rightarrow +3 only

86. Answer (3)



(Dichromate ion)

Sol.: The colour of both sodium dichromate and potassium dichromate is orange.

87. Answer (2)

Hint & Sol.:

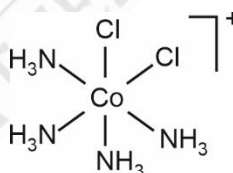
- The primary valences are normally ionisable and are satisfied by negative ions
- The secondary valences are non-ionisable. These are satisfied by neutral molecules or negative ions.

The secondary valence is equal to the coordination number and is fixed for a metal.

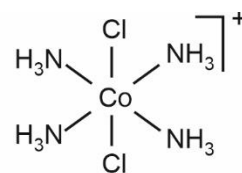
88. Answer (2)

Hint: Geometrical isomerism arises in heteroleptic complexes due to different possible arrangements of the ligands.

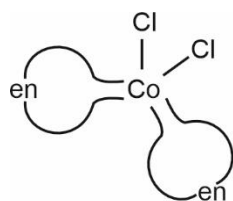
Sol.:



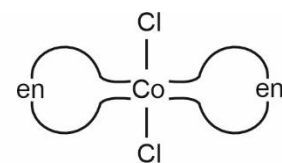
(Cis)



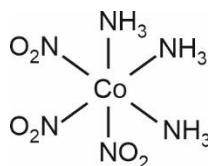
(Trans)



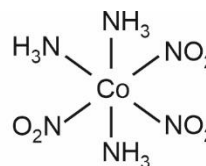
(Cis)



(Trans)



Fac-



Mer-

89. Answer (1)

Hint: The magnetic moment increases with the increasing number of unpaired electrons.

Sol.:

Species	Number of unpaired electron(s)
Cr ²⁺	4
Co ²⁺	3
Ni ²⁺	2

Cu ²⁺	1
Zn ²⁺	0
Fe ²⁺	4
V ²⁺	3

90. Answer (3)

Hint: MnO₄²⁻ is manganate ion

Sol.: MnO₄²⁻ contains one unpaired electron hence it is paramagnetic in nature.

[BOTANY]

91. Answer (1)

Hint: In actual structure, tRNA looks like inverted L.

Sol.: Severo Ochoa enzyme (Polynucleotide phosphorylase) is helpful in polymerising RNA with defined sequences in a template independent manner.

92. Answer (2)

Hint: SnRNA and tRNA are transcribed by RNA polymerase III.

Sol.: 5.8S rRNA is transcribed by RNA polymerase I.

93. Answer (1)

Hint: Charging of tRNA is the attachment of amino acid to tRNA.

Sol.: In the first phase of translation amino acids are activated in the presence of ATP and linked to their cognate tRNA by a process, commonly called as charging of tRNA or aminoacylation of tRNA.

94. Answer (3)

Hint: Griffith gave the transforming principle.

Sol.:

Avery MacLeod and McCarty	–	Biochemical characterisation of transforming principle
Har Gobind Khorana	–	Using synthetic DNA, he prepared polynucleotide with known repeating sequence.
Meselson and Stahl	–	Semiconservative DNA replication

95. Answer (2)

Hint: Nuclein was named by Friedrich Meischer which is acidic substance present in nucleus.

Sol.: Heterochromatin is densely packed chromatin.

96. Answer (4)

Hint: 5-methyl uracil is another chemical name of thymine.

Sol.: In RNA, uracil is found in place of thymine.

97. Answer (2)

Hint: The promoter and terminator flank the structural gene in a transcription unit.

Sol.: The promoter is said to be located towards 5'-end (upstream) of coding strand. The terminator is located towards 3'-end (downstream) of the coding strand and it usually defines the end of the process of transcription.

The UTRs are present at both 5'-end (before start codon) and at 3'-end (after stop codon). They are required for efficient translation process.

98. Answer (1)

Hint: SNPs is single nucleotide polymorphism.

Sol.: BAC – Bacterial artificial chromosomes.

99. Answer (3)

Hint: 99.9% nucleotide bases are exactly the same in all people.

Sol.: Repetitive DNA sequences are stretches of nucleic acids, that occur in multiple copies throughout the genome. They are thought to have no direct coding functions, but they shed light on chromosome structure, dynamics and evolution.

100. Answer (1)

Hint: DNA is dependent on RNA for the synthesis of proteins.

Sol.: Both DNA and RNA can function as genetic material, but DNA being more stable is preferred for storage of genetic information. For the transmission of genetic information, RNA is better as it can directly code for the synthesis of proteins, hence can easily express the characters.

101. Answer (3)

Hint: The genetic material should be stable enough not to change with different stages of life cycle, age or with change in physiology of organism.

Sol.: Genetic material should provide the scope for slow changes (mutation) that are required for evolution.

102. Answer (1)

Hint: tRNA anticodon read mRNA sequence from 5' → 3'

Sol.: tRNA anticodon have the same sequence as of template DNA strand but in place of thymine they have uracil.

∴ 1st tRNA–3'UAC5', 2nd tRNA–3'GUA5',
3rd tRNA–3'GCU5', 4th tRNA–3'AGG5',

103. Answer (4)

Hint: When one codon codes for only one amino acid it is non-degenerate.

Sol.: Some amino acids are coded by more than one codon, hence the code is degenerate.

104. Answer (2)

Hint: A nitrogenous base is linked to the OH of 1'C pentose sugar through a N-glycosidic linkage to form a nucleoside.

Sol.: When a phosphate group is linked to OH of 5'C of a nucleoside through phosphoester linkage a corresponding nucleotide is formed. Two nucleotides are linked through 3' – 5' phosphodiester linkage to form a dinucleotide.

105. Answer (4)

Hint: Lambda phage has linear dsDNA.

Sol.: DNA of bacteriophage lambda has 48502 bp. Human genome has an estimated 3.3×10^9 base pairs. $\phi \times 174$ bacteriophage has 5386 nucleotides.

106. Answer (1)

Hint: A prokaryote was used in proving that DNA replicates semiconservatively.

Sol.: The experimental proof that DNA replicates semiconservatively was shown first in a prokaryote named *E. coli* and subsequently in higher organism, such as plants and human cells.

107. Answer (2)

Hint: The segment of DNA that takes part in transcription is called transcription unit.

Sol.: Inducer is not a component of transcription unit as it can be a molecule. For example, lactose can function as inducer for the transcription of *lac* operon DNA into mRNA.

108. Answer (3)

Hint: Bacteria has 70S ribosome.

Sol.: The 30S subunit of ribosomes in prokaryotes has 16S rRNA and 50S subunit has 23S and 5S rRNA. 23S rRNA has peptidyl transferase activity and catalyse the synthesis of peptide bonds between amino acids in bacteria. This rRNA also serve as structural component of large subunit in bacterial ribosome.

109. Answer (4)

Hint: Unwinding of DNA helix is carried out by the helicase enzyme.

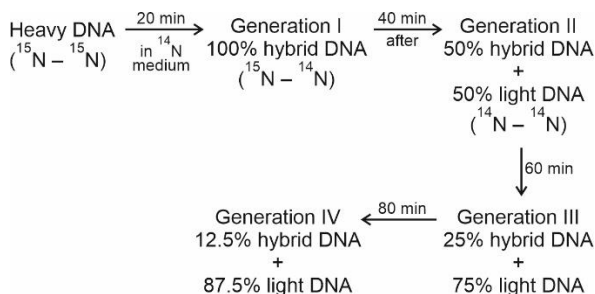
Sol.: In eukaryotes the tension that develops in the replicating fork due to unwinding of DNA, is released the by the enzyme, topoisomerase.

In prokaryotes, DNA gyrase has topoisomerase activity.

110. Answer (4)

Hint: In 1st generation there is 100% of hybrid DNA

Sol.:



111. Answer (3)

Hint: *Lac i* is a regulatory gene.

Sol.: The *lac i* mutation results the active repressor to lose its ability to identify operator sequence. In this condition, the cell would continuously produce β -galactosidase and the two other enzymes.

112. Answer (3)

Hint: DNA has deoxyribose sugar.

Sol.: 2'-OH group present at every nucleotide in RNA is a reactive group and make RNA labile and easily degradable. RNA is also known to be catalytic, hence reactive. Therefore, DNA chemically is less reactive and structurally more stable than RNA.

113. Answer (2)

Hint: Bread is prepared from dough, which is fermented by using Baker's yeast.

Sol.: Dough of Dosa and idli is prepared by fermenting activity of bacteria.

114. Answer (3)

Hint: Bt cotton is a transgenic plant, resistant to attack by insect pests.

Sol.: Ladybird beetle is useful in controlling aphids and butterfly caterpillars are controlled by using *Bacillus thuringiensis*.

115. Answer (4)

Hint: The core objective of Ganga Action Plan (1985) was to save these major rivers and improve water quality.

Sol.: The Ministry of Environment and Forests has initiated Ganga Action Plan and Yamuna Action Plan.

116. Answer (1)

Hint: Primary treatment involves removal of large and small particles from sewage.

Sol.: Tertiary treatment is a physico-chemical process.

117. Answer (4)

Hint: Clot buster is produced by the bacterium *Streptococcus*.

Sol.: Streptokinase, modified by genetic engineering is used for removing clots from blood vessels of patients.

118. Answer (3)

Hint: Toddy is made by fermenting sap from palm.

Sol.: Swiss cheese is ripened with the help of bacterium called *Propionibacterium shermanii*.

Toddy undergoes fermentation due to presence of naturally occurring yeast. Cyclosporin A is produced by *Trichoderma polysporum*. Statins are produced by *Monascus purpureus*.

119. Answer (4)

Hint: Nucleopolyhedrovirus are excellent candidates for species-specific; narrow spectrum insecticidal application

Sol.: *Aulosira* is non-symbiotic nitrogen fixer in rice field. *Trichoderma* species are very common in root ecosystems.

Baculoviruses have no negative impacts on birds, fishes and non-target insects.

120. Answer (2)

Hint: Product obtained from *Acetobacter aceti* can be used in preparation of vinegar.

Sol.: Butyric acid is obtained from *Clostridium butylicum*.

121. Answer (1)

Hint: The floating cover in biogas plant functions as gas holder.

Sol.: A floating cover is placed over the slurry, which keeps on rising as the gas is produced in the tank due to the microbial activity.

122. Answer (2)

Hint: BOD test measure the rate of uptake of oxygen by microbes in a sample of water.

Sol.: The greater BOD of waste water more is its polluting potential.

123. Answer (3)

Hint: Cyanobacteria are photosynthetic N_2 fixing prokaryotes.

Sol.: In paddy fields, cyanobacteria serves as an important biofertilizer.

124. Answer (2)

Hint: Sustainable pest management is known as Integrated pest management, *i.e.*, integration of control of single pest on one or more crops.

Sol.: IPM, as applied in agriculture is ideally the use of most effective, economical, safest, ecologically sustainable and sociologically acceptable combination of physical, chemical and biological methods to limit the harmful effects of crop pests.

125. Answer (3)

Hint: A biocontrol agent can or cannot be a free living N_2 -fixing organism.

Sol.: A biocontrol agent to be a part of an Integrated Pest Management should be species-specific and have no negative impacts on non-target organism.

126. Answer (1)

Hint: Swelling of dough during bread making is called leavening.

Sol.: Puffed-up appearance of dough is due to production of CO_2 during fermentation.

127. Answer (2)

Hint: Excreta of cattle is rich in methanogens.

Sol.: *Methanobacterium* grows anaerobically on cellulosic material, produce large amount of methane along with CO_2 and H_2 .

128. Answer (2)

Hint: Lactic acid bacteria grow in milk and convert it into curd.

Sol.: Lactic acid bacteria as probiotics inhibit the development of pathogenic bacteria in our stomach.

129. Answer (2)

Hint: Splicing of hnRNA involves removal of introns.

Sol.: Splicing is the process of removal of introns and joining of exons in a defined order. Introns are removed by small nuclear RNA (SnRNA) and protein complex called small nuclear ribonucleoproteins or SnRNPs (Snurps).

130. Answer (3)

Hint: Synthesis of DNA over RNA template is called reverse transcription.

Sol.: H. Temin and D. Baltimore, independently discovered reverse transcription in some viruses. These viruses produce an enzyme reverse transcriptase which can synthesise DNA over RNA template.

131. Answer (3)

Hint: The plane of one base pair stack over the other in double helix of DNA. This, in addition to H-bonds, confers stability to the helical structure.

Sol.: dsDNA is made of two polynucleotide chains, where the backbone is constituted by sugar-phosphate, and the bases project inside.

DNA polymer has free phosphate moiety at 5'-end of sugar.

132. Answer (3)

Hint: Insertion of one or two base changes the reading frame from the point of insertion or deletion.

Sol.: Insertion or deletion of three or its multiple bases insert or delete one or multiple codon hence one or multiple amino acids, and reading frame remains unaltered from that point onwards. Such mutations are referred to as frame shift mutations.

133. Answer (3)

Hint: Eukaryotes have different compartments for transcription and translation.

Sol.: The RNA polymerase (core enzyme) is only capable of catalysing the process of elongation in prokaryotes.

Transcription and translation take place in the same compartment in bacteria.

134. Answer (2)

Hint: Polymorphism is the variation at genetic level that arises due to mutation.

Sol.: Polymorphism in DNA sequence is the basis of DNA fingerprinting as it is unique to every individual. It is also the basis for genetic mapping of human genome.

135. Answer (4)

Hint: If both the strands of a DNA transcribe mRNA, they will have different base sequences.

Sol.: If both RNA molecule code for proteins, the sequence of amino acids in the proteins would be different. Hence, one segment of the DNA would be coding for two different proteins, and this would complicate the genetic information transfer machinery.

[ZOOLOGY]

136. Answer (4)

Hint: Opioids are sedatives**Sol.:** Excessive dosage of cocaine (obtained from *Erythroxylum coca*) causes hallucinations. Other plants such as *Atropa belladonna* and *Datura* produce substances that have hallucinogenic properties. *Papaver somniferum* produces substances that have analgesic and depressive properties.

137. Answer (3)

Hint: A type of agranulocyte**Sol.:** Two types of acquired immune response in humans are-

(a) Humoral (mediated by antibodies)

(b) Cell-mediated (mediated by T-lymphocytes)

The T-lymphocytes themselves do not produce antibodies but help B-cells to produce them.

138. Answer (4)

Hint: Preformed antibodies provide quick immune response**Sol.:** If a person is infected with some deadly microbes to which quick immune response is required as in tetanus, one should be directly administered with preformed antibodies, or antitoxin. This type of immunisation is called passive immunisation.

In active immunity, antibodies are produced in the host body, when host is exposed to antigens in the form of living or dead microbes or other proteins. Active immunity is slow and takes time to give its full effective response.

139. Answer (3)

Hint: Ancestors of dinosaurs.**Sol.:** The chronological order for the evolution of mammals is:-

Early reptiles → Synapsids → Pelycosaur → Therapsids → Mammals.

Thecodonts gave rise to crocodiles, dinosaurs and birds.

140. Answer (4)

Hint: Cysteine residues are involved**Sol.:** Each monomeric antibody molecule has four peptide chains (two heavy and two light). Hence, a monomeric molecule of antibody is represented as H_2L_2 . Because the antibodies are found in the blood, the response is called humoral immune response. In a monomeric antibody molecule, overall, there are 16 disulfide bonds.

141. Answer (2)

Hint: Chemicals released by both basophils and mast cells**Sol.:** The exaggerated response of the immune system to certain antigens present in the environment is called allergy.

Allergy is due to the release of chemicals like histamine and serotonin from the mast cells. The use of drugs like anti-histamine, adrenaline and steroids quickly reduce the symptoms of allergy.

142. Answer (1)

Hint: Monomers of proteins**Sol.:** S.L. Miller, an American scientist created electric discharge in a closed flask containing CH_4 , H_2 , NH_3 and water vapour at $800^\circ C$. He observed the formation of amino acids. In similar experiments, others observed formation of sugars, nitrogen bases, pigment and fats.

143. Answer (3)

Hint: Exclude secondary lymphoid organs.**Sol.:** The primary lymphoid organs are bone marrow and thymus where immature lymphocytes differentiate into antigen-sensitive lymphocytes.

After maturation, the lymphocytes migrate to secondary lymphoid organs like spleen, lymph nodes, tonsils, etc.

144. Answer (3)

Hint: Macrophages**Sol.:** The spleen is a large bean-shaped, secondary lymphoid organ. It mainly contains lymphocytes and phagocytes. It acts as a filter of the blood by trapping blood-borne microorganisms. It also has a large reservoir of RBCs.

Thrombocytes are cell fragments produced from megakaryocytes. Megakaryocytes are special cells in the bone marrow.

145. Answer (4)

Hint: Mere physical touch

Sol.: Transmission of HIV infection generally occurs by-

- (a) Sexual contact with the infected person
 - (b) Transfusion of contaminated blood
 - (c) Sharing infected needles as in case of intravenous drug abusers
 - (d) Infected mother to her child through placenta.
- Mere handshake or hugging does not spread HIV.

146. Answer (4)

Hint: Chemically proteinaceous in nature

Sol.: Interferons are included in cytokine barriers of innate immunity.

Skin and mucus coating of the epithelium lining the major tracts of human body belong to physical barrier; while acid in stomach, saliva and tears belong to physiological barrier of innate immunity.

147. Answer (2)

Hint: Euphoria is a feeling of highness.

Sol.: Addiction is a psychological attachment to euphoria and temporary feeling of well-being-associated with drugs and alcohol. With repeated use of drugs, the tolerance level of the receptor present in our body increases. Dependence is the tendency of the body to manifest a characteristic and unpleasant withdrawal syndrome, if regular dose of drug /alcohol is abruptly discontinued.

148. Answer (3)

Hint: Smack is a depressant

Sol.:

Heroin (Smack)	–	A depressant obtained by acetylation of morphine
Cocaine (Coke or crack)	–	A stimulant that acts on CNS

149. Answer (1)

Hint: Derived from monocytes

Sol.: Upon HIV infection, macrophages continue to produce virus and thus, act as HIV factory. Infected macrophages can survive while HIV is being replicated and released from them. A widely used diagnostic test for AIDS is ELISA. Treatment of AIDS with anti-retroviral drugs is only partially effective. Widal test is used to confirm typhoid.

150. Answer (3)

Hint: Helper T-lymphocytes provide immunity to the body.

Sol.: In AIDS, due to decrease in the number of helper T-lymphocytes below a certain level (> 200 cells/mm³), the person starts suffering from infections that could have been otherwise overcome such as those due to bacteria especially *Mycobacterium*, viruses, fungi and even parasites like *Toxoplasma*. The patient becomes so immunodeficient that he/she is unable to protect himself/herself against these infections.

151. Answer (3)

Hint: Neck of giraffes

Sol.: A French naturalist, Lamarck said that evolution of life forms had occurred but driven by use and disuse of organs. He gave the examples of giraffes who in an attempt to forage leaves on tall trees had to adapt by elongation of their necks.

Branching descent and natural selection are the two key concepts of Darwinian theory of evolution. Hugo de Vries believed that mutation causes speciation and he called it saltation.

152. Answer (3)

Hint: Participate in acquired immunity

Sol.: Certain types of leucocytes of human body like neutrophils and monocytes in the blood as well as macrophages in the tissues can phagocytose and destroy microbes.

Primary immune response is of low intensity whereas secondary immune response is anamnestic response.

153. Answer (3)

Hint: Contact inhibition is a property of normal cells

Sol.: Normal cells show a property called contact inhibition by virtue of which contact with other cells inhibit their uncontrolled growth. Cancer cells appears to have lost this property. Benign tumors normally remain confined to their original location and do not spread.

Malignant tumors grow rapidly, are invading and cause damage to the normal surrounding tissue.

154. Answer (3)

Hint: It talks of a singular huge explosion

Sol.: The Big Bang theory attempts to explain to us the origin of universe. It talks of a singular huge explosion unimaginable in physical terms.

Early Greek thinkers thought units of life called spores were transferred to different planets including Earth. This theory is known as 'Panspermia'. The theory of spontaneous generation was dismissed by Louis Pasteur who experimentally demonstrated that life comes only from pre-existing life.

Oparin and Haldane proposed that formation of life was preceded by chemical evolution.

155. Answer (2)

Hint: Atmosphere on early Earth was reducing.

Sol.: Earlier the conditions on Earth were - high temperature, volcanic storms, reducing atmosphere containing CH₄, NH₃, etc. In 1953, S.L. Miller, an American scientist created similar conditions in a laboratory scale. He created electric discharge in a closed flask containing CH₄, H₂, NH₃ and water vapour at 800°C.

156. Answer (1)

Hint: Analogous organs are the result of convergent evolution.

Sol.: Homology indicates common ancestry. Examples of homologous organs are:-

- (1) Forelimbs of man, cheetah, whale and bat, i.e, all mammals.
- (2) Vertebrate hearts or brains.
- (3) The thorn of *Bougainvillea* and tendrils of *Cucurbita*.

Wings of butterfly and of birds look alike but they are not anatomically similar structures though they perform similar functions. These are analogous structures.

157. Answer (3)

Hint: Exclude the small solid structures at various points of lymphatic system

Sol.: There is lymphoid tissue located within the lining of the major tracts called mucosa associated lymphoid tissue. It constitutes about 50% of the lymphoid tissue in human body.

Lymph node, Peyer's patches, MALT, tonsils are secondary lymphoid organs.

158. Answer (3)

Hint: Mutation causes speciation

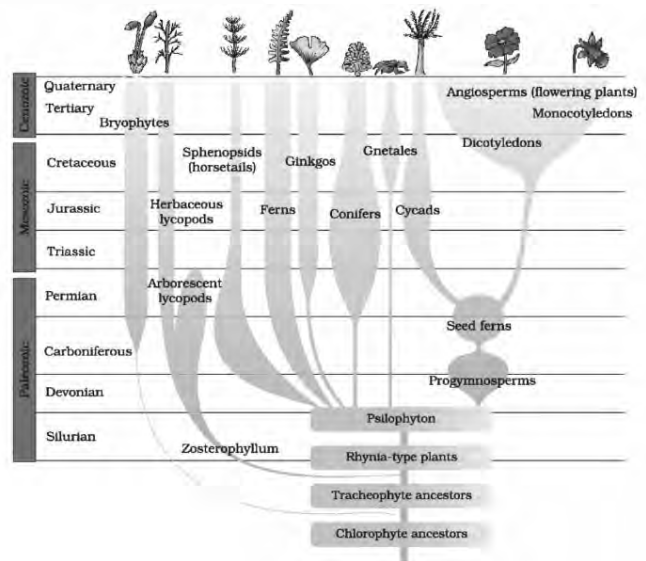
Sol.: Hugo de Vries based on his work on evening primrose brought forth the idea of mutations-large difference arising suddenly in a population. He believed that, it is mutation which causes evolution and not the minor variations (heritable) that Darwin talked about.

Mutations according to Hugo de Vries are random and directionless while Darwinian variations are small and directional.

159. Answer (3)

Hint: Monocots are more advanced than dicots.

Sol.:



160. Answer (2)

Hint: If gene migration occurs by chance, it is called genetic drift.

Sol.: When migration of a section of population to another place and population occurs, gene frequencies change in the original as well as in the new population. New genes/alleles are added to the new population and these are lost from the old population. There would be a gene flow if this gene migration, happens multiple times. If the same change occurs by chance, it is called genetic drift.

161. Answer (2)

Hint: Primary lymphoid organ

Sol.: Thymus is a lobed organ, located near the heart and beneath the breastbone. The thymus is quite large at the time of birth but keeps reducing in size with age. Bone marrow is located in long bones of the body. Appendix is a secondary lymphoid organ. Spleen is the graveyard of RBCs.

162. Answer (2)

Hint: Came before *Homo habilis*

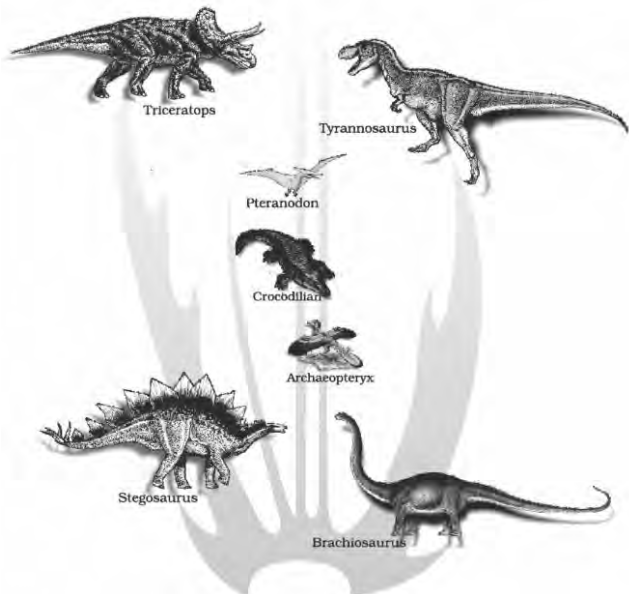
Sol.: Two mya, *Australopithecines* probably lived in East African grasslands. Evidence shows they hunted with stone weapons but essentially ate fruits.

Dryopithecus was more ape-like. First human-like being, the hominid was *Homo habilis*. They probably did not eat meat. Fossils discovered in Java revealed next stage, i.e., *Homo erectus*. *Homo sapiens* arose in Africa.

163. Answer (2)

Hint: Biggest of all dinosaur

Sol.: The biggest of the dinosaur i.e., *Tyrannosaurus rex* was about 20 feet in height and had huge fearsome dagger-like teeth



164. Answer (3)

Hint: Chimpanzees exhibit menstrual cycle

Sol.: A comparison of the skull of adult human being, baby chimpanzee and adult chimpanzee had been made, and it was found that the skull of baby chimpanzee is more like adult human skull than adult chimpanzee skull.

165. Answer (2)

Hint: Evolved probably 200 mya

Sol.: In 1938, a fish caught in South Africa happened to be a Coelacanth which was thought to be extinct. These animals called lobe-fins evolved into the first amphibians that lived on both land and water.

Some of the land reptiles went back into water to evolve into fish-like reptiles probably 200 mya (e.g. *Ichthyosaurs*).

166. Answer (3)

Hint: Placental mammals and Australian marsupials show convergent evolution.

Sol.: When more than one adaptive radiation appeared to have occurred in an isolated geographical area (representing different habitats), one can call this convergent evolution. e.g., Lemur and spotted cuscus.

Rest animals mentioned in the options are all Australian marsupials showing adaptive radiation.

167. Answer (4)

Hint: Population is not following Hardy-Weinberg equilibrium.

Sol.: Hardy-Weinberg principle says that allelic frequencies in a population are stable and is constant from generation to generation. The gene pool (total genes and their alleles in a population) remains a constant. This is called genetic equilibrium. Change in frequency of alleles i.e., disturbance in Hardy-Weinberg equilibrium in a population would then be interpreted as resulting in evolution.

168. Answer (1)

Hint: Evolution is a random process.

Sol.: Evolution is not a directed process in the sense of determinism. It is a stochastic process based on the chance events in nature and chance mutation in the organisms.

169. Answer (4)

Hint: Lichens can be used as an industrial pollution indicators.

Sol.: After industrialisation, there were more of melanised moths as compared to white winged moths. Presence of lichens indirectly promoted the increase in population of white-winged moths. No variants of moths were completely wiped out.

170. Answer (3)

Hint: Result of intensive breeding programme

Sol.: Varieties of dogs have been created by man under breeding programmes where breeds that differ from other breeds but still are of same group have been created.

Darwin's finches are result of adaptive radiation.

Australian marsupials and placental mammals are result of convergent evolution.

171. Answer (2)

Hint: Exclude scientists who contributed in chemical evolution theory.

Sol.: Embryological support for evolution was proposed by Ernst Heckel based upon the observation of certain features during embryonic stage common to all vertebrates that are absent in adult.

However, this proposal was disapproved on careful study performed by Karl Ernst von Baer. He noted that embryos never pass through the adult stages of other animals.

Hardy and Weinberg gave Hardy-Weinberg principle. Oparin and Haldane proposed the chemical evolution theory.

172. Answer (3)

Hint: Female mosquito is the vector of malarial pathogen.

Sol.: Malaria → *Anopheles*

Dengue → *Aedes*

Amoebiasis → Housefly (Mechanical carrier)

Filariasis → *Culex*

173. Answer (2)

Hint: A separate lineage of chlorophytes

Sol. : Bryophytes arose from chlorophyte ancestors. Plants called Psilophyton are descendants of chlorophyte ancestors. The first mammals were like shrews. Their fossils are small-sized.

174. Answer (1)

Hint: Elephantiasis

Sol.:

Filariasis	–	Helminth (<i>Wuchereria bancrofti</i>)
Typhoid	–	Bacterium (<i>Salmonella typhi</i>)
Malaria	–	Protozoan (<i>Plasmodium</i>)
Amoebic dysentery	–	Protozoan (<i>Entamoeba histolytica</i>)

175. Answer (4)

Hint: Result of convergent evolution

Sol.: Eye of the *Octopus* and of mammals; or the flippers of penguins and dolphins are examples of analogy. They are the result of convergent evolution.

176. Answer (3)

Hint: Produce cannabinoids

Sol.: Natural cannabinoids are obtained from the inflorescences of the plant *Cannabis sativa*. The flower tops, leaves and the resin of *Cannabis* plant are used in various combinations to produce marijuana, hashish, charas and ganja.

Erythroxylum coca produces cocaine, *Papaver somniferum* produces morphine.

177. Answer (4)

Hint: Damages gastric mucosa

Sol.: Smoking increases CO content in blood and reduces the concentration of haem bound oxygen. This causes oxygen deficiency in the body. Smoking can also cause gastric ulcer

178. Answer (2)

Hint: Normal cells of humans have inactivated proto-oncogenes.

Sol.: Several genes called cellular oncogenes (*c-onc*) or proto-oncogenes have been identified in normal cells which, when activated under certain conditions, could lead to oncogenic transformation of the cells.

Also, cancer causing viruses called oncogenic viruses have genes called viral oncogenes. When oncogenic viruses infect human cells, they possibly lead to cancer. Sporozoites are infective stage for humans in case of malaria.

179. Answer (3)

Hint: Human males naturally have deeper voice

Sol.: The side effects of the use of anabolic steroids in females include masculinisation, increased aggressiveness, abnormal menstrual cycles, deepening of voice, etc.

180. Answer (3)

Hint: Presence of two peaks

Sol.: Natural selection can lead to stabilisation (in which more individuals acquire mean character value), directional change (more individuals acquire value other than the mean character value) or disruption (more individuals acquire peripheral character value at both ends of the distribution curve).



All India Aakash Test Series for NEET - 2025

TEST - 6 (Code-F)[Click here for Code-E Sol.](#)

Test Date : 09/03/2025

ANSWERS

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

HINTS & SOLUTIONS

[PHYSICS]

1. Answer (2)

Hint: $i_d = \frac{dq}{dt}$

Sol.: $q = CV = CV_0 \cos \omega t$

$$\frac{dq}{dt} = CV_0 \frac{d}{dt}(\cos \omega t)$$

$$= -CV_0 \omega \sin \omega t$$

$$i_d = \frac{dq}{dt} = -C\omega V_0 \sin \omega t$$

$$i_d = -\omega C V_0 \sin \omega t$$

2. Answer (3)

Hint & Sol.:

- (1) Static charge produces electrostatic field.
- (2) A charge moving with constant velocity produces magnetostatic field.
- (3) An accelerating charge produces electromagnetic wave.

3. Answer (4)

Hint & Sol.: The voltage across the inductor leads the current by $\frac{\pi}{2}$ and voltage across capacitor lag behind current by $\frac{\pi}{2}$. So the phase difference of π radian is there.

4. Answer (2)

Hint: The dimensions of mutual inductance and self-inductance are same.

Sol.: $E = \frac{1}{2} L I_0^2$

$$[ML^2 T^{-2}] = [L][A^2]$$

$$[ML^2 T^{-2} A^{-2}] = [L]$$

5. Answer (2)

Hint & Sol.: According to Lenz's law, the induced current will oppose the increasing magnetic flux. So the direction of induced current is anticlockwise.

6. Answer (2)

Hint: The electric force must balance magnetic force

Sol.: $qE = qvB$

$$v = \frac{E}{B} = \frac{50}{10^4} = 5 \times 10^5 \text{ m s}^{-1}$$

7. Answer (3)

Hint: The magnetic force on a charged particle is always perpendicular to velocity.

Sol.: The charged particle will move in a circle with uniform speed. So its kinetic energy is constant and its acceleration is variable.

8. Answer (3)

Hint: Voltage sensitivity (V_S)

$$= \frac{\text{Current sensitivity}(I_S)}{R}$$

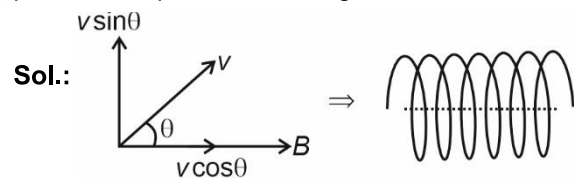
Sol.: $V_S = \frac{I_S}{R}$

$$5 = \frac{10}{10^{-3} \times R}$$

$$R = \frac{10^4}{5} = \frac{10000}{5} = 2000 \Omega$$

9. Answer (3)

Hint: The velocity has both perpendicular and parallel component with magnetic field.



Sol.:

$$r = \frac{mv \sin \theta}{Bq} \Rightarrow \text{constant}$$

$$\text{Pitch} = v \cos \theta \times \frac{2\pi m}{Bq} \Rightarrow \text{constant}$$

10. Answer (1)

Hint: Current due to point charge moving in a circular orbit, $I = \frac{q}{t} = \frac{q\omega}{2\pi}$

Sol.: $M = I\pi r^2 = \frac{q\omega}{2\pi}\pi r^2$

$$M = \frac{q\omega r^2}{2}$$

$$L = I\omega = mr^2\omega$$

$$\frac{M}{L} = \frac{q\omega r^2}{2mr^2\omega} = \frac{q}{2m}$$

11. Answer (2)

Hint: Magnetic field of wire passing through centre is zero.

Sol.: $\vec{B} = \vec{B}_1 + \vec{B}_2$

Magnetic field due to circular arc :

$$\vec{B}_1 = \frac{3}{4} \left(\frac{\mu_0 I}{2R} \right) \otimes$$

Magnetic field due to straight wire :

$$\vec{B}_2 = \frac{\mu_0 I}{4\pi R} \otimes$$

$$\vec{B} = \frac{\mu_0 I}{4R} \left[\frac{3}{2} + \frac{1}{\pi} \right] \otimes$$

12. Answer (1)

Hint: A galvanometer is converted into voltmeter by connecting a resistance in series with it.

Sol.: $V = I_g (G + R)$

$$5 = 10 \times 10^{-3} (50 + R)$$

$$500 - 50 = R$$

$$R = 450 \Omega$$

13. Answer (1)

Hint & Sol.: At high voltage the current is very small and transmission loss (I^2R) are minimised.

14. Answer (4)

Hint: Energy, $E = \frac{1}{2} \times L \times i^2$

Sol.: $E = \frac{1}{2} \times 2 \times 10^{-6} \times 4 \times 4 = 16 \times 10^{-6} = 16 \mu J$

15. Answer (4)

Hint: Radiation pressure on a perfectly reflecting surface = $\frac{2I}{c}$

Sol.: Force = Pressure \times Area

$$F = \left(\frac{2I}{c} \right) (A)$$

16. Answer (2)

Hint: Wave velocity = $\frac{\omega}{k}$

Sol.: $vB_0 = E_0$

$$\frac{\omega}{k} = \frac{E_0}{B_0}$$

Same sign of ωt and kx implies that wave is moving in $-x$ direction.

17. Answer (4)

Hint: $F = I(\vec{I}_{\text{eff}} \times \vec{B})$

Sol.: $F = I(2R)(B)\sin 0^\circ$

$$F = 0$$

18. Answer (4)

Hint: In case of rotating conductor, induced emf between fixed and free end of separation l is equal to $\frac{B\omega L^2}{2}$

Sol.: $|V_Q - V_R| = \frac{1}{2} B\omega \left[L^2 - \frac{L^2}{4} \right]$

$$= \frac{3}{8} B\omega L^2$$

19. Answer (1)

Hint: The direction of induced current is such that it opposes the cause that produces it.

Sol.: The decreasing current will produce decreasing magnetic field going into the plane.

To increase the magnetic flux in downward direction, induced current should be clockwise.

20. Answer (2)

Hint & Sol.: At resonance, the value of power factor is one.

21. Answer (3)

Hint & Sol.: The material for permanent magnets should have high retentivity and high coercivity.

22. Answer (1)

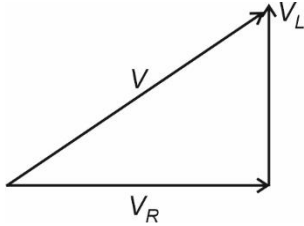
Hint: Magnetic field inside a solenoid is, $B = \mu ni$

Sol.: $B_{\text{net}} = \mu_0 \mu_r ni$
 $= 4\pi \times 10^{-7} \times 200 \times 2000$
 $= 4\pi \times 4 \times 10^{-2}$
 $= 16\pi \times 10^{-2}$
 $= 0.16\pi \text{ T}$

23. Answer (2)

Hint: The phase difference between voltage across inductor and voltage across resistance is $\frac{\pi}{2}$.

Sol.:



$$V = V_R^2 + V_L^2$$

$$(200)^2 = (160)^2 + V_L^2$$

$$40000 - 25600 = V_L^2$$

$$14400 = V_L^2$$

$$120\text{V} = V_L$$

24. Answer (3)

Hint: In one cycle current become zero twice.

$$\text{Sol.: } f = \frac{100\pi}{2\pi} = 50 \text{ Hz}$$

In 1 cycle the current becomes zero 2 times. In 2 seconds there will be 100 cycles, so current will become zero 200 times in 2 seconds.

25. Answer (1)

Hint: Quality factor, $Q = \frac{\text{Resonant frequency}}{\text{Band width}}$

$$\text{Sol.: } Q = \frac{500}{525 - 475} = \frac{500}{50} = 10$$

26. Answer (2)

Hint & Sol.: Magnetic susceptibility of diamagnetic material is less than zero.

27. Answer (1)

Hint: Use $\vec{F} = I(d\vec{l} \times \vec{B})$

Sol.: The force on every current element is radially outwards so it will increase its radius.

28. Answer (2)

Hint: Charge passing through a coil due to change in magnetic flux is given by $Q = \frac{\Delta\phi}{R}$

$$\text{Sol.: } Q = \frac{\Delta\phi}{R}$$

$$Q = \frac{12 - 4}{200} C$$

$$= \frac{4}{100} C = 40 \text{ mC}$$

29. Answer (3)

Hint & Sol.:

(1) Due to short wavelength microwaves are used for radar system for aircraft navigation.

(2) Radio waves are mostly used in radio communication such as AM and FM broadcasting.

(3) Infrared rays are used in household remote switches.

(4) Ultraviolet rays are used in water purifiers.

30. Answer (1)

Hint & Sol.:

$$\oint \vec{E} \cdot d\vec{l} = \frac{-d\phi_B}{dt}$$

Time varying magnetic field can produce constant electric field as well as variable electric field. and

An accelerating charge produces EM waves of same frequency.

31. Answer (1)

Hint: The direction of propagation of electromagnetic wave is along $(\vec{E} \times \vec{B})$

$$\text{Sol.: } \hat{j} \times \hat{k} = \hat{i}$$

So, magnetic field is oscillating along z-axis

$$E_0 = cB_0$$

$$B_0 = \frac{E_0}{c} = \frac{45 \times 10^{-2}}{3 \times 10^8} = 15 \times 10^{-10}$$

$$= 1.5 \text{ nT}$$

32. Answer (1)

Hint & Sol.: In EM waves, the electric field and magnetic field oscillate in same phase in two perpendicular directions.

33. Answer (2)

Hint: Total energy is equally distributed between electric and magnetic field.

$$\text{Sol.: } \langle TE \rangle = \frac{1}{2\mu_0} B_0^2 = \frac{1}{2} \epsilon_0 E_0^2$$

$$\langle TE \rangle = \frac{1}{4\mu_0} B_0^2 + \frac{1}{4} \epsilon_0 E_0^2$$

34. Answer (3)

Hint & Sol.: Transformer works under AC voltage only. For DC input voltage there will not be any output voltage.

35. Answer (1)

Hint: At resonance both current and source voltage are in same phase

Sol.: $|Z| = \sqrt{R^2 + (X_L - X_C)^2}$ and $I = \frac{V}{|Z|}$

At resonance

$X_L = X_C$

$|Z| = R$ (Minimum)

$I = \frac{V_0}{R}$ (Maximum)

36. Answer (4)

Hint: Capacitive reactance is given by $X_C = \frac{1}{\omega C}$

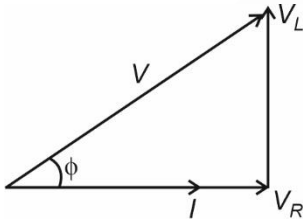
Sol.: $X_C = \frac{1}{100 \times 100 \times 10^{-6}}$

$X_C = 100 \Omega$

37. Answer (3)

Hint: Use phasor diagram

Sol.:



$\tan \phi = \frac{V_L}{V_R} = \frac{\omega L}{R}$

For finite value of R and L , the phase difference is always greater than zero and less than $\frac{\pi}{2}$.

38. Answer (1)

Hint: Average value of function $f(t) = \frac{1}{T} \int_0^T f(t) dt$

$= \frac{1}{T}$ [area under graph]

Sol.: $I_{avg} = \frac{1}{T}$ [area of graph]

$= \frac{1}{2} \left[\frac{1}{2} \times 4 \times 2 \right]$

$= 2 \text{ A}$

39. Answer (3)

Hint: $|\langle \epsilon \rangle| = \left| \frac{\Delta \phi}{\Delta t} \right|$

Sol.: $\phi_B = t^2 + 2t - 2$

$\phi(4) = 16 + 8 - 2 = 22 \text{ Wb}$

$\phi(1) = 1 \text{ Wb}$

$\epsilon = \left| \frac{22 - 1}{4 - 1} \right| \text{ V}$

$= \left| \frac{21}{3} \right| = 7 \text{ V}$

40. Answer (3)

Hint & Sol.: Any change in magnetic flux whether increase or decrease causes induced current in a loop. The direction of induced current is such that it opposes its cause.

41. Answer (2)

Hint & Sol.: $\vec{B}_1 = \frac{\mu_0 2\vec{M}}{4\pi r^3}$

$\vec{B}_2 = \frac{-\mu_0 \vec{M}}{4\pi r^3}$

$|\vec{B}_1| = 2|\vec{B}_2|$

42. Answer (2)

Hint: Pole strength depends upon cross-sectional area of bar magnet.

Sol.: The pole strength does not change when a bar magnet is cut perpendicular to its length.

$\vec{M}_1 = \frac{m\vec{L}}{3} \Rightarrow \vec{M}_1 = \frac{\vec{M}}{3}$

43. Answer (4)

Hint & Sol.: The Biot-Savart's law for current

carrying element is $\frac{\mu_0}{4\pi} \frac{i(d\vec{l} \times \vec{r})}{r^3}$

44. Answer (2)

Hint: $\vec{F}_{net} = \vec{F}_m + \vec{F}_e = q[\vec{v} \times \vec{B} + \vec{E}]$

Sol.: $\vec{F}_m = q(\vec{v} \times \vec{B}) = 0$ as $\vec{B} \parallel \vec{v}$

$a = \frac{qE}{m}$

So the proton will move in straight line with uniform acceleration.

45. Answer (1)

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

Sol.: $\frac{M_1}{M_2} = \left(\frac{I_1}{I_2} \right) \left(\frac{r_1}{r_2} \right)^2 = \left(\frac{2}{1} \right) \left(\frac{1}{2} \right)^2$

$= 2 \times \frac{1}{4} = \frac{1}{2}$

[CHEMISTRY]

46. Answer (3)

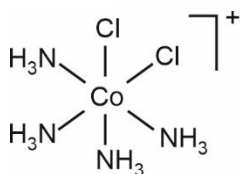
Hint: MnO_4^{2-} is manganate ion**Sol.:** MnO_4^{2-} contains one unpaired electron hence it is paramagnetic in nature.

47. Answer (1)

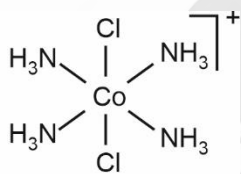
Hint: The magnetic moment increases with the increasing number of unpaired electrons.**Sol.:**

Species	Number of unpaired electron(s)
Cr^{2+}	4
Co^{2+}	3
Ni^{2+}	2
Cu^{2+}	1
Zn^{2+}	0
Fe^{2+}	4
V^{2+}	3

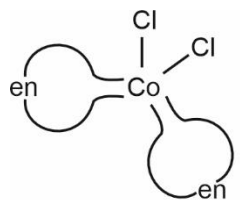
48. Answer (2)

Hint: Geometrical isomerism arises in heteroleptic complexes due to different possible arrangements of the ligands.**Sol.:**

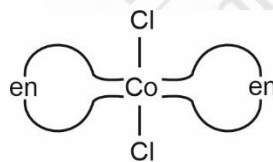
(Cis)



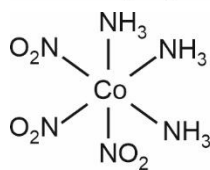
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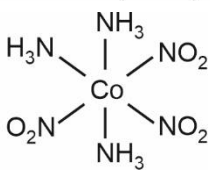
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(Trans)



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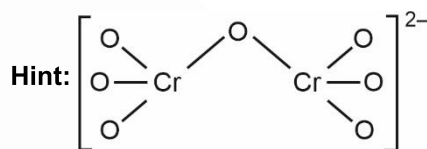
49. Answer (2)

Hint & Sol.:

- The primary valences are normally ionisable and are satisfied by negative ions
- The secondary valences are non-ionisable. These are satisfied by neutral molecules or negative ions.

The secondary valence is equal to the coordination number and is fixed for a metal.

50. Answer (3)



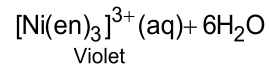
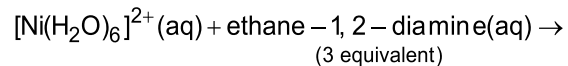
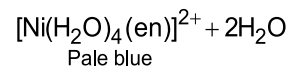
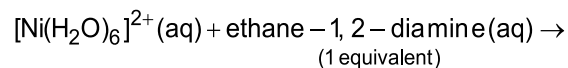
(Dichromate ion)

Sol.: The colour of both sodium dichromate and potassium dichromate is orange.

51. Answer (2)

Hint: Actinoids show greater range of oxidation states**Sol.:** Th \rightarrow +4 onlyNp \rightarrow +3, +4, +5, +6 and +7Cf \rightarrow +3 onlyNo \rightarrow +3 only

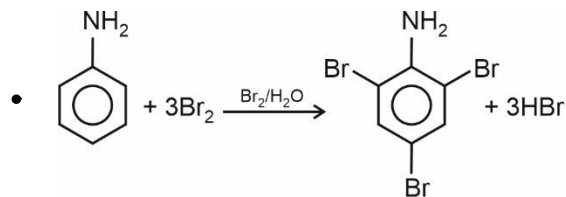
52. Answer (4)

Hint: Crystal field theory attributes the colour of the coordination compounds to $d-d$ transition of the electron.**Sol.:**

53. Answer (1)

Hint: Aniline reacts with bromine water at room temperature to give a white precipitate.

Sol.:



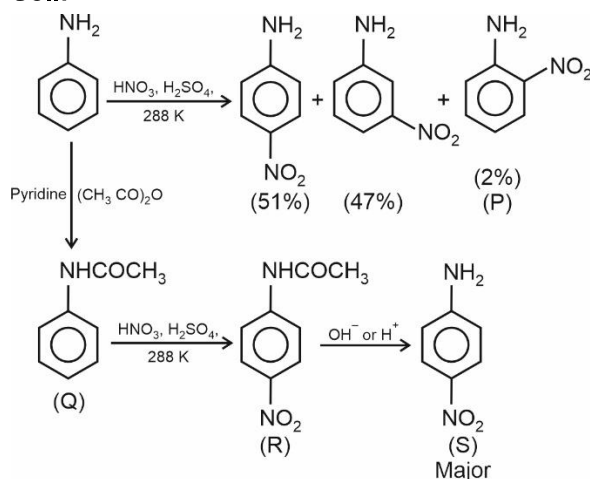
2, 4, 6-Tribromoaniline

- Aniline does not undergo Friedel-Crafts reaction due to salt formation with AlCl_3 .

54. Answer (3)

Hint: $-\text{NH}_2$ group is ortho and para directing and a powerful activating group

Sol.:



55. Answer (3)

Hint: Wilkinson catalyst $[(\text{PPh}_3)_3\text{RhCl}]$ is used for the hydrogenation of alkenes.

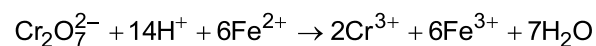
Sol.:

- Chlorophyll is a coordination compound of magnesium
- Vitamin B₁₂, cyanocobalamin is a coordination compound of cobalt.
- Haemoglobin, the red pigment of blood which acts as oxygen carrier is a coordination compound of iron.

56. Answer (3)

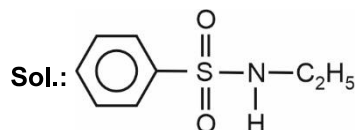
Hint: In acidic medium, $\text{Cr}_2\text{O}_7^{2-}$ converts into Cr^{3+} ion

Sol.:

6 mole Fe^{2+} are oxidised by 1 mole $\text{K}_2\text{Cr}_2\text{O}_7$ 2 mole Fe^{2+} are oxidised by $\frac{1}{3}$ mole $\text{K}_2\text{Cr}_2\text{O}_7$

57. Answer (1)

Hint: N-Ethylbenzenesulphonamide is acidic in nature



N-Ethylbenzenesulphonamide (Soluble in alkali)

58. Answer (4)

Hint: Structural Isomers are two or more compounds that have the same chemical formula but a different arrangement of atoms.

Sol.:

- $[\text{Cr}(\text{H}_2\text{O})_6]\text{Cl}_3$ and $[\text{Cr}(\text{H}_2\text{O})_5\text{Cl}]\text{Cl}_2 \cdot \text{H}_2\text{O}$ are solvate isomers
- $[\text{Co}(\text{NH}_3)_6]$ $[\text{Cr}(\text{CN})_6]$ and $[\text{Cr}(\text{NH}_3)_6]$ $[\text{Co}(\text{CN})_6]$ are coordination isomers.
- $[\text{Co}(\text{NH}_3)_5(\text{NO}_2)]\text{Cl}_2$ and $[\text{Co}(\text{NH}_3)_5(\text{ONO})]\text{Cl}_2$ are linkage isomers.

59. Answer (2)

Hint: V_2O_5 catalyses the oxidation of SO_2 in the manufacture of sulphuric acid.

Sol.: Wacker's process – PdCl_2 Manufacture of polythene – $\text{TiCl}_4 + \text{Al}(\text{CH}_3)_3$

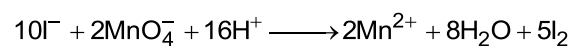
Haber process – Fe

60. Answer (1)

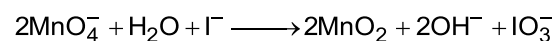
Hint & Sol.: Gold combines with cyanide in the presence of oxygen and water to form the coordination entity $[\text{Au}(\text{CN})_2]^-$ in aqueous solution. Gold can be separated from this solution by the addition of zinc in metallic form.

- Hardness of water is estimated by simple titration with Na_2EDTA

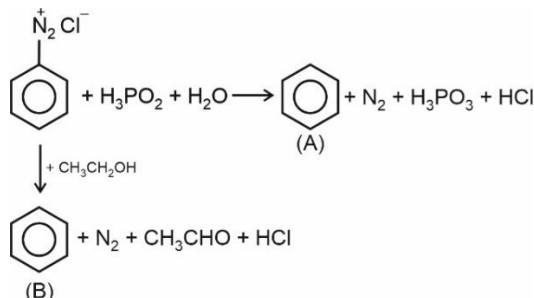
61. Answer (2)

Hint & Sol.: In acidic medium

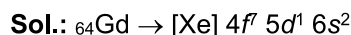
In neutral or faintly alkaline solution



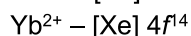
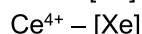
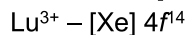
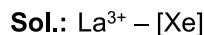
62. Answer (1)

Hint & Sol.:

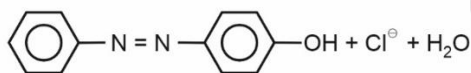
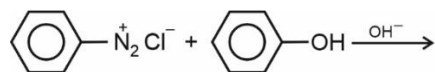
63. Answer (1)

Hint: Gadolinium and Lutetium are lanthanoid metals.

64. Answer (4)

Hint: Ce^{4+} and Yb^{2+} have no unpaired electrons

65. Answer (2)

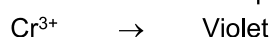
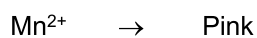
Hint: The reaction of benzenediazonium salt with phenol is an example of electrophilic substitution reaction.**Sol.:**

(Orange)

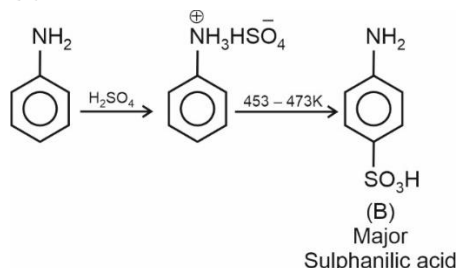
66. Answer (4)

Hint: Interstitial compounds are those which are formed when small atoms like H, C or N are trapped inside the crystal lattices of metals.**Sol.:** They have high melting points, higher than those of pure metals.

67. Answer (3)

Hint: When an electron from a lower energy d orbital is excited to a higher energy d orbital, the energy of excitation corresponds to the frequency of light absorbed.**Sol.:** Colour of given ions in aqueous medium

68. Answer (1)

Hint: p -aminobenzene sulphonic acid, commonly known as sulphanilic acid**Sol.:**

69. Answer (1)

Hint: If the back donation from metal to ligand is weak then C – O bond strength is more.**Sol.:** More is the positive charge on the metal, lesser is the back donation of electron from metal to ligand and stronger is C – O bond.

70. Answer (4)

Hint: Aromatic amines are weaker bases than Aliphatic amines.**Sol.:**

	pK_b value
	9.38
	4.70
	9.30
	8.92

71. Answer (1)

Hint: The stability of the half-filled d subshell in Mn^{2+} is related to its E° value.**Sol.:**

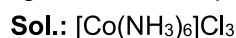
$$E^\circ_{\text{Ti}^{2+}/\text{Ti}} = -1.63 \text{ V}$$

$$E^\circ_{\text{Cr}^{2+}/\text{Cr}} = -0.90 \text{ V}$$

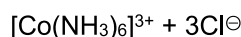
$$E^\circ_{\text{Mn}^{2+}/\text{Mn}} = -1.18 \text{ V}$$

$$E^\circ_{\text{Co}^{2+}/\text{Co}} = -0.28 \text{ V}$$

72. Answer (1)

Hint: Octahedral complex of cobalt will contain six ligands in its complex

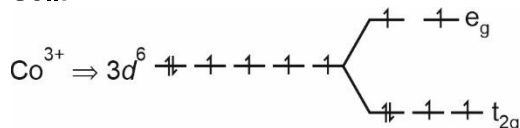
↓



73. Answer (1)

Hint: For octahedral complex CFSE

$$= -0.4\Delta_0 \times t_{2g}e^- + 0.6\Delta_0 \times e_g e^-$$

Sol.:

$$\begin{aligned} \text{CFSE} &= -0.4 \times 4 + 0.6 \times 2 \\ &= -1.6 + 1.2\Delta_0 \\ &= -0.4\Delta_0 \end{aligned}$$

74. Answer (4)

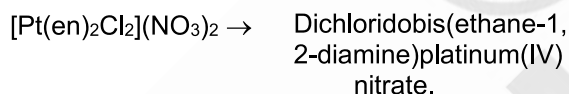
Hint: Ln(lanthanoids) + dilute acid \rightarrow $\text{H}_2\uparrow$ **Sol.:**

- $2\text{Cu}^+ \rightarrow \text{Cu}^{2+} + \text{Cu}$
- Bronze is an alloy of copper and tin.
- Due to lanthanoid contraction, ionic radii from lanthanum to lutetium decreases

75. Answer (4)

Hint & Sol: The UV-visible absorption bands in the spectra of lanthanoid ions are narrow, probably because of the excitation of electrons involving *f* orbitals

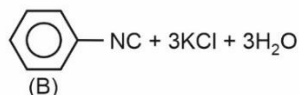
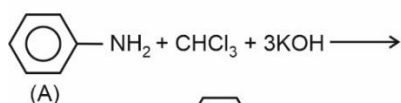
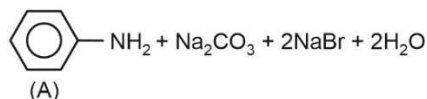
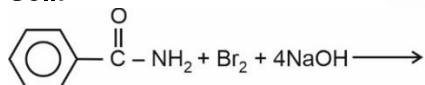
76. Answer (3)

Hint: The cation is named first in both positively and negatively charged coordination entities**Sol.:**

77. Answer (1)

Hint & Sol.: Tetrahedral complexes do not show geometrical isomerism because the relative positions of the unidentate ligands attached to the central metal atom are the same with respect to each other.

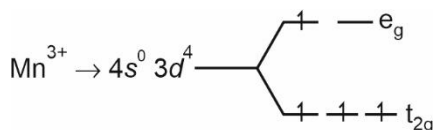
78. Answer (1)

Hint: Aliphatic and aromatic primary amines on heating with chloroform and ethanolic KOH form isocyanides or carbylamines.**Sol.:**

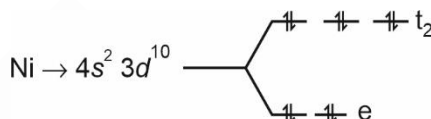
79. Answer (2)

Hint & Sol.:

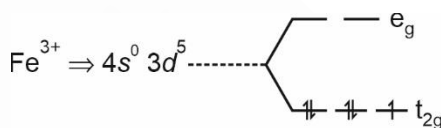
- In $[\text{MnCl}_6]^{3-}$

Number of unpaired $e^- = 4$

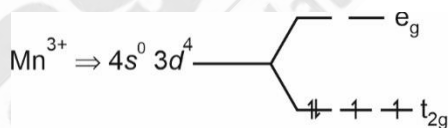
- In $[\text{Ni}(\text{CO})_4]$

Number of unpaired $e^- = 0$

- In $[\text{Fe}(\text{CN})_6]^{3-}$

Number of unpaired $e^- = 1$

- In $[\text{Mn}(\text{CN})_6]^{3-}$

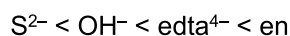
Number of unpaired $e^- = 2$

80. Answer (2)

Hint: Δ_0 represents crystal field splitting energy for octahedral complexes.**Sol.:**

- Ligands for which $\Delta_0 < P$ are known as weak field ligands and form high spin complexes.
- Ligands for which $\Delta_0 > P$ are known as strong field ligands and form low spin complexes.

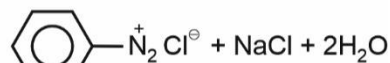
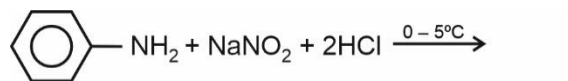
81. Answer (3)

Hint: Ligands are arranged in their increasing order of field strength. The series which is obtained is known as spectrochemical series**Sol.:** Correct order of field strength is

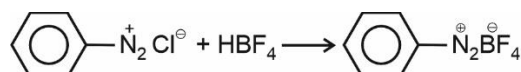
82. Answer (2)

Hint: The conversion of primary aromatic amines into diazonium salts is known as diazotisation

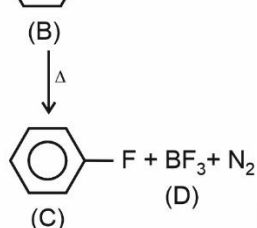
Sol.:



(A)



(A)



(C)

(D)

83. Answer (2)

Hint: The crystal field splitting Δ_0 , depends upon the field produced by the ligand and charge on the metal ion.

Sol.:

Coordination entity	Wavelength of light
$[\text{Co}(\text{Cl})(\text{NH}_3)_5]^{2+}$	535
$[\text{Co}(\text{NH}_3)_5(\text{H}_2\text{O})]^{3+}$	500
$[\text{Co}(\text{NH}_3)_6]^{3+}$	475
$[\text{Co}(\text{CN})_6]^{3-}$	310

84. Answer (2)

Hint & Sol.:

	Complex		Hybridisation
a.	$[\text{NiCl}_4]^{2-}$	(i)	sp^3
b.	$[\text{Co}(\text{C}_2\text{O}_4)_3]^{3-}$	(ii)	d^2sp^3
c.	$[\text{Ni}(\text{CN})_4]^{2-}$	(iii)	dsp^2
d.	$[\text{CoF}_6]^{3-}$	(iv)	sp^3d^2

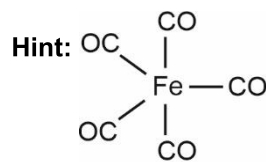
85. Answer (2)

Hint: NH_3 is a strong field ligand. Water with Co^{3+} acts as strong field ligand.

Sol.: Both $[\text{Co}(\text{NH}_3)_6]^{3+}$ and $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$ are inner orbital complexes.

Both are diamagnetic in nature.

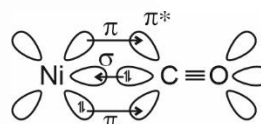
86. Answer (4)

 $[\text{Fe}(\text{CO})_5]$

Sol.: The structure of $[\text{Fe}(\text{CO})_5]$ is Trigonal bipyramidal. The oxidation state of Fe in the compound is zero.

87. Answer (1)

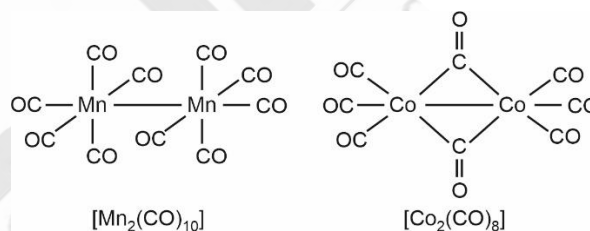
Hint & Sol.:



Synergic bonding

88. Answer (1)

Hint:

 $[\text{Mn}_2(\text{CO})_{10}]$ $[\text{Co}_2(\text{CO})_8]$

Sol.: $[\text{Mn}_2(\text{CO})_{10}]$ does not contain bridged CO groups. While $[\text{Co}_2(\text{CO})_8]$ contains two bridged CO groups.

89. Answer (3)

Hint: Primary and secondary amines are engaged in intermolecular association due to hydrogen bonding. Tertiary amines do not have intermolecular association by hydrogen bonding.

Sol.:

	b.p/K
$n\text{-C}_4\text{H}_9\text{NH}_2$	350.8
$(\text{C}_2\text{H}_5)_2\text{NH}$	329.3
$\text{C}_2\text{H}_5\text{N}(\text{CH}_3)_2$	310.5

90. Answer (4)

Hint & Sol.: Gabriel phthalimide synthesis is used for the preparation of primary aliphatic amines. Aromatic primary amines cannot be prepared by this method because aryl halides do not undergo nucleophilic substitution with the anion formed by phthalimide.

[BOTANY]

91. Answer (4)
Hint: If both the strands of a DNA transcribe mRNA, they will have different base sequences.
Sol.: If both RNA molecule code for proteins, the sequence of amino acids in the proteins would be different. Hence, one segment of the DNA would be coding for two different proteins, and this would complicate the genetic information transfer machinery.
92. Answer (2)
Hint: Polymorphism is the variation at genetic level that arises due to mutation.
Sol.: Polymorphism in DNA sequence is the basis of DNA fingerprinting as it is unique to every individual. It is also the basis for genetic mapping of human genome.
93. Answer (3)
Hint: Eukaryotes have different compartments for transcription and translation.
Sol.: The RNA polymerase (core enzyme) is only capable of catalysing the process of elongation in prokaryotes.
 Transcription and translation take place in the same compartment in bacteria.
94. Answer (3)
Hint: Insertion of one or two base changes the reading frame from the point of insertion or deletion.
Sol.: Insertion or deletion of three or its multiple bases insert or delete one or multiple codon hence one or multiple amino acids, and reading frame remains unaltered from that point onwards. Such mutations are referred to as frame shift mutations.
95. Answer (3)
Hint: The plane of one base pair stack over the other in double helix of DNA. This, in addition to H-bonds, confers stability to the helical structure.
Sol.: dsDNA is made of two polynucleotide chains, where the backbone is constituted by sugar-phosphate, and the bases project inside.
 DNA polymer has free phosphate moiety at 5'-end of sugar.
96. Answer (3)
Hint: Synthesis of DNA over RNA template is called reverse transcription.
- Sol.:** H. Temin and D. Baltimore, independently discovered reverse transcription in some viruses. These viruses produce an enzyme reverse transcriptase which can synthesise DNA over RNA template.
97. Answer (2)
Hint: Splicing of hnRNA involves removal of introns.
Sol.: Splicing is the process of removal of introns and joining of exons in a defined order. Introns are removed by small nuclear RNA (SnRNA) and protein complex called small nuclear ribonucleoproteins or SnRNPs (Snurps).
98. Answer (2)
Hint: Lactic acid bacteria grow in milk and convert it into curd.
Sol.: Lactic acid bacteria as probiotics inhibit the development of pathogenic bacteria in our stomach.
99. Answer (2)
Hint: Excreta of cattle is rich in methanogens.
Sol.: *Methanobacterium* grows anaerobically on cellulosic material, produce large amount of methane along with CO₂ and H₂.
100. Answer (1)
Hint: Swelling of dough during bread making is called leavening.
Sol.: Puffed-up appearance of dough is due to production of CO₂ during fermentation.
101. Answer (3)
Hint: A biocontrol agent can or cannot be a free living N₂-fixing organism.
Sol.: A biocontrol agent to be a part of an Integrated Pest Management should be species-specific and have no negative impacts on non-target organism.
102. Answer (2)
Hint: Sustainable pest management is known as Integrated pest management, *i.e.*, integration of control of single pest on one or more crops.
Sol.: IPM, as applied in agriculture is ideally the use of most effective, economical, safest, ecologically sustainable and sociologically acceptable combination of physical, chemical and biological methods to limit the harmful effects of crop pests.

103. Answer (3)

Hint: Cyanobacteria are photosynthetic N_2 fixing prokaryotes.

Sol.: In paddy fields, cyanobacteria serves as an important biofertilizer.

104. Answer (2)

Hint: BOD test measure the rate of uptake of oxygen by microbes in a sample of water.

Sol.: The greater BOD of waste water more is its polluting potential.

105. Answer (1)

Hint: The floating cover in biogas plant functions as gas holder.

Sol.: A floating cover is placed over the slurry, which keeps on rising as the gas is produced in the tank due to the microbial activity.

106. Answer (2)

Hint: Product obtained from *Acetobacter aceti* can be used in preparation of vinegar.

Sol.: Butyric acid is obtained from *Clostridium butylicum*.

107. Answer (4)

Hint: Nucleopolyhedrovirus are excellent candidates for species-specific; narrow spectrum insecticidal application

Sol.: *Aulosira* is non-symbiotic nitrogen fixer in rice field. *Trichoderma* species are very common in root ecosystems.

Baculoviruses have no negative impacts on birds, fishes and non-target insects.

108. Answer (3)

Hint: Toddy is made by fermenting sap from palm.

Sol.: Swiss cheese is ripened with the help of bacterium called *Propionibacterium shermanii*.

Toddy undergoes fermentation due to presence of naturally occurring yeast. Cyclosporin A is produced by *Trichoderma polysporum*. Statins are produced by *Monascus purpureus*.

109. Answer (4)

Hint: Clot buster is produced by the bacterium *Streptococcus*.

Sol.: Streptokinase, modified by genetic engineering is used for removing clots from blood vessels of patients.

110. Answer (1)

Hint: Primary treatment involves removal of large and small particles from sewage.

Sol.: Tertiary treatment is a physico-chemical process.

111. Answer (4)

Hint: The core objective of Ganga Action Plan (1985) was to save these major rivers and improve water quality.

Sol.: The Ministry of Environment and Forests has initiated Ganga Action Plan and Yamuna Action Plan.

112. Answer (3)

Hint: Bt cotton is a transgenic plant, resistant to attack by insect pests.

Sol.: Ladybird beetle is useful in controlling aphids and butterfly caterpillars are controlled by using *Bacillus thuringiensis*.

113. Answer (2)

Hint: Bread is prepared from dough, which is fermented by using Baker's yeast.

Sol.: Dough of Dosa and idli is prepared by fermenting activity of bacteria.

114. Answer (3)

Hint: DNA has deoxyribose sugar.

Sol.: 2'-OH group present at every nucleotide in RNA is a reactive group and make RNA labile and easily degradable. RNA is also known to be catalytic, hence reactive. Therefore, DNA chemically is less reactive and structurally more stable than RNA.

115. Answer (3)

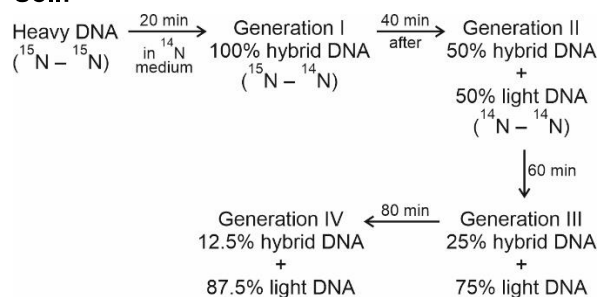
Hint: *Lac i* is a regulatory gene.

Sol.: The *lac i* mutation results the active repressor to lose its ability to identify operator sequence. In this condition, the cell would continuously produce β -galactosidase and the two other enzymes.

116. Answer (4)

Hint: In 1st generation there is 100% of hybrid DNA

Sol.:



117. Answer (4)

Hint: Unwinding of DNA helix is carried out by the helicase enzyme.

Sol.: In eukaryotes the tension that develops in the replicating fork due to unwinding of DNA, is released by the enzyme, topoisomerase.

In prokaryotes, DNA gyrase has topoisomerase activity.

118. Answer (3)

Hint: Bacteria has 70S ribosome.

Sol.: The 30S subunit of ribosomes in prokaryotes has 16S rRNA and 50S subunit has 23S and 5S rRNA. 23S rRNA has peptidyl transferase activity and catalyse the synthesis of peptide bonds between amino acids in bacteria. This rRNA also serve as structural component of large subunit in bacterial ribosome.

119. Answer (2)

Hint: The segment of DNA that takes part in transcription is called transcription unit.

Sol.: Inducer is not a component of transcription unit as it can be a molecule. For example, lactose can function as inducer for the transcription of *lac* operon DNA into mRNA.

120. Answer (1)

Hint: A prokaryote was used in proving that DNA replicates semiconservatively.

Sol.: The experimental proof that DNA replicates semiconservatively was shown first in a prokaryote named *E. coli* and subsequently in higher organism, such as plants and human cells.

121. Answer (4)

Hint: Lambda phage has linear dsDNA.

Sol.: DNA of bacteriophage lambda has 48502 bp. Human genome has an estimated 3.3×10^9 base pairs. $\phi \times 174$ bacteriophage has 5386 nucleotides.

122. Answer (2)

Hint: A nitrogenous base is linked to the OH of 1'C pentose sugar through a N-glycosidic linkage to form a nucleoside.

Sol.: When a phosphate group is linked to OH of 5'C of a nucleoside through phosphoester linkage a corresponding nucleotide is formed. Two nucleotides are linked through 3' – 5' phosphodiester linkage to form a dinucleotide.

123. Answer (4)

Hint: When one codon codes for only one amino acid it is non-degenerate.

Sol.: Some amino acids are coded by more than one codon, hence the code is degenerate.

124. Answer (1)

Hint: tRNA anticodon read mRNA sequence from 5' → 3'

Sol.: tRNA anticodon have the same sequence as of template DNA strand but in place of thymine they have uracil.

∴ 1st tRNA–3'UAC5', 2nd tRNA–3'GUA5',
3rd tRNA–3'GCU5', 4th tRNA–3'AGG5',

125. Answer (3)

Hint: The genetic material should be stable enough not to change with different stages of life cycle, age or with change in physiology of organism.

Sol.: Genetic material should provide the scope for slow changes (mutation) that are required for evolution.

126. Answer (1)

Hint: DNA is dependent on RNA for the synthesis of proteins.

Sol.: Both DNA and RNA can function as genetic material, but DNA being more stable is preferred for storage of genetic information. For the transmission of genetic information, RNA is better as it can directly code for the synthesis of proteins, hence can easily express the characters.

127. Answer (3)

Hint: 99.9% nucleotide bases are exactly the same in all people.

Sol.: Repetitive DNA sequences are stretches of nucleic acids, that occur in multiple copies throughout the genome. They are thought to have no direct coding functions, but they shed light on chromosome structure, dynamics and evolution.

128. Answer (1)

Hint: SNPs is single nucleotide polymorphism.

Sol.: BAC – Bacterial artificial chromosomes.

129. Answer (2)

Hint: The promoter and terminator flank the structural gene in a transcription unit.

Sol.: The promoter is said to be located towards 5'-end (upstream) of coding strand. The terminator is located towards 3'-end (downstream) of the coding strand and it usually defines the end of the process of transcription.

The UTRs are present at both 5'-end (before start codon) and at 3'-end (after stop codon). They are required for efficient translation process.

130. Answer (4)

Hint: 5-methyl uracil is another chemical name of thymine.

Sol.: In RNA, uracil is found in place of thymine.

131. Answer (2)

Hint: Nuclein was named by Friedrich Meischer which is acidic substance present in nucleus.

Sol.: Heterochromatin is densely packed chromatin.

132. Answer (3)

Hint: Griffith gave the transforming principle.

Sol.:

Avery MacLeod and McCarty	–	Biochemical characterisation of transforming principle
Har Gobind Khorana	–	Using synthetic DNA, he prepared polynucleotide with known repeating sequence.

Meselson and Stahl	–	Semiconservative DNA replication
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133. Answer (1)

Hint: Charging of tRNA is the attachment of amino acid to tRNA.

Sol.: In the first phase of translation amino acids are activated in the presence of ATP and linked to their cognate tRNA by a process, commonly called as charging of tRNA or aminoacylation of tRNA.

134. Answer (2)

Hint: SnRNA and tRNA are transcribed by RNA polymerase III.

Sol.: 5.8S rRNA is transcribed by RNA polymerase I.

135. Answer (1)

Hint: In actual structure, tRNA looks like inverted L.

Sol.: Severo Ochoa enzyme (Polynucleotide phosphorylase) is helpful in polymerising RNA with defined sequences in a template independent manner.

[ZOOLOGY]

136. Answer (4)

Hint: Opioids are sedatives

Sol.: Excessive dosage of cocaine (obtained from *Erythroxylum coca*) causes hallucinations. Other plants such as *Atropa belladonna* and *Datura* produce substances that have hallucinogenic properties. *Papaver somniferum* produces substances that have analgesic and depressive properties.

137. Answer (3)

Hint: A type of agranulocyte

Sol.: Two types of acquired immune response in humans are-

- (a) Humoral (mediated by antibodies)
- (b) Cell-mediated (mediated by T-lymphocytes)

The T-lymphocytes themselves do not produce antibodies but help B-cells to produce them.

138. Answer (4)

Hint: Preformed antibodies provide quick immune response

Sol.: If a person is infected with some deadly microbes to which quick immune response is required as in tetanus, one should be directly administered with preformed antibodies, or

antitoxin. This type of immunisation is called passive immunisation.

In active immunity, antibodies are produced in the host body, when host is exposed to antigens in the form of living or dead microbes or other proteins. Active immunity is slow and takes time to give its full effective response.

139. Answer (3)

Hint: Ancestors of dinosaurs.

Sol.: The chronological order for the evolution of mammals is:-

Early reptiles → Synapsids → Pelycosaur → Therapsids → Mammals.

Thecodonts gave rise to crocodiles, dinosaurs and birds.

140. Answer (4)

Hint: Cysteine residues are involved

Sol.: Each monomeric antibody molecule has four peptide chains (two heavy and two light). Hence, a monomeric molecule of antibody is represented as H_2L_2 . Because the antibodies are found in the blood, the response is called humoral immune response. In a monomeric antibody molecule, overall, there are 16 disulfide bonds.

141. Answer (2)

Hint: Chemicals released by both basophils and mast cells

Sol.: The exaggerated response of the immune system to certain antigens present in the environment is called allergy.

Allergy is due to the release of chemicals like histamine and serotonin from the mast cells. The use of drugs like anti-histamine, adrenaline and steroids quickly reduce the symptoms of allergy.

142. Answer (1)

Hint: Monomers of proteins

Sol.: S.L. Miller, an American scientist created electric discharge in a closed flask containing CH_4 , H_2 , NH_3 and water vapour at 800°C . He observed the formation of amino acids. In similar experiments, others observed formation of sugars, nitrogen bases, pigment and fats.

143. Answer (3)

Hint: Exclude secondary lymphoid organs.

Sol.: The primary lymphoid organs are bone marrow and thymus where immature lymphocytes differentiate into antigen-sensitive lymphocytes.

After maturation, the lymphocytes migrate to secondary lymphoid organs like spleen, lymph nodes, tonsils, etc.

144. Answer (3)

Hint: Macrophages

Sol.: The spleen is a large bean-shaped, secondary lymphoid organ. It mainly contains lymphocytes and phagocytes. It acts as a filter of the blood by trapping blood-borne microorganisms. It also has a large reservoir of RBCs.

Thrombocytes are cell fragments produced from megakaryocytes. Megakaryocytes are special cells in the bone marrow.

145. Answer (4)

Hint: Mere physical touch

Sol.: Transmission of HIV infection generally occurs by-

- Sexual contact with the infected person
 - Transfusion of contaminated blood
 - Sharing infected needles as in case of intravenous drug abusers
 - Infected mother to her child through placenta.
- Mere handshake or hugging does not spread HIV.

146. Answer (4)

Hint: Chemically proteinaceous in nature

Sol.: Interferons are included in cytokine barriers of innate immunity.

Skin and mucus coating of the epithelium lining the major tracts of human body belong to physical barrier; while acid in stomach, saliva and tears belong to physiological barrier of innate immunity.

147. Answer (2)

Hint: Euphoria is a feeling of highness.

Sol.: Addiction is a psychological attachment to euphoria and temporary feeling of well-being-associated with drugs and alcohol. With repeated use of drugs, the tolerance level of the receptor present in our body increases. Dependence is the tendency of the body to manifest a characteristic and unpleasant withdrawal syndrome, if regular dose of drug /alcohol is abruptly discontinued.

148. Answer (3)

Hint: Smack is a depressant

Sol.:

Heroin (Smack)	–	A depressant obtained by acetylation of morphine
Cocaine (Coke or crack)	–	A stimulant that acts on CNS

149. Answer (1)

Hint: Derived from monocytes

Sol.: Upon HIV infection, macrophages continue to produce virus and thus, act as HIV factory.

Infected macrophages can survive while HIV is being replicated and released from them. A widely used diagnostic test for AIDS is ELISA. Treatment of AIDS with anti-retroviral drugs is only partially effective. Widal test is used to confirm typhoid.

150. Answer (3)

Hint: Helper T-lymphocytes provide immunity to the body.

Sol.: In AIDS, due to decrease in the number of helper T-lymphocytes below a certain level (> 200 cells/ mm^3), the person starts suffering from infections that could have been otherwise overcome such as those due to bacteria especially *Mycobacterium*, viruses, fungi and even parasites like *Toxoplasma*. The patient becomes so immunodeficient that he/she is unable to protect himself/herself against these infections.

151. Answer (3)

Hint: Neck of giraffes

Sol.: A French naturalist, Lamarck said that evolution of life forms had occurred but driven by use and disuse of organs. He gave the examples of giraffes who in an attempt to forage leaves on tall trees had to adapt by elongation of their necks. Branching descent and natural selection are the two key concepts of Darwinian theory of evolution. Hugo deVries believed that mutation causes speciation and he called it saltation.

152. Answer (3)

Hint: Participate in acquired immunity

Sol.: Certain types of leucocytes of human body like neutrophils and monocytes in the blood as well as macrophages in the tissues can phagocytose and destroy microbes.

Primary immune response is of low intensity whereas secondary immune response is anamnestic response.

153. Answer (3)

Hint: Contact inhibition is a property of normal cells

Sol.: Normal cells show a property called contact inhibition by virtue of which contact with other cells inhibit their uncontrolled growth. Cancer cells appears to have lost this property. Benign tumors normally remain confined to their original location and do not spread.

Malignant tumors grow rapidly, are invading and cause damage to the normal surrounding tissue.

154. Answer (3)

Hint: It talks of a singular huge explosion

Sol.: The Big Bang theory attempts to explain to us the origin of universe. It talks of a singular huge explosion unimaginable in physical terms.

Early Greek thinkers thought units of life called spores were transferred to different planets including Earth. This theory is known as 'Panspermia'. The theory of spontaneous generation was dismissed by Louis Pasteur who experimentally demonstrated that life comes only from pre-existing life.

Oparin and Haldane proposed that formation of life was preceded by chemical evolution.

155. Answer (2)

Hint: Atmosphere on early Earth was reducing.

Sol.: Earlier the conditions on Earth were - high temperature, volcanic storms, reducing

atmosphere containing CH_4 , NH_3 , etc. In 1953, S.L. Miller, an American scientist created similar conditions in a laboratory scale. He created electric discharge in a closed flask containing CH_4 , H_2 , NH_3 and water vapour at 800°C .

156. Answer (3)

Hint: Presence of two peaks

Sol.: Natural selection can lead to stabilisation (in which more individuals acquire mean character value), directional change (more individuals acquire value other than the mean character value) or disruption (more individuals acquire peripheral character value at both ends of the distribution curve).

157. Answer (3)

Hint: Human males naturally have deeper voice

Sol.: The side effects of the use of anabolic steroids in females include masculinisation, increased aggressiveness, abnormal menstrual cycles, deepening of voice, etc.

158. Answer (2)

Hint: Normal cells of humans have inactivated proto-oncogenes.

Sol.: Several genes called cellular oncogenes (*c-onc*) or proto-oncogenes have been identified in normal cells which, when activated under certain conditions, could lead to oncogenic transformation of the cells.

Also, cancer causing viruses called oncogenic viruses have genes called viral oncogenes. When oncogenic viruses infect human cells, they possibly lead to cancer. Sporozoites are infective stage for humans in case of malaria.

159. Answer (4)

Hint: Damages gastric mucosa

Sol.: Smoking increases CO content in blood and reduces the concentration of haem bound oxygen. This causes oxygen deficiency in the body. Smoking can also cause gastric ulcer

160. Answer (3)

Hint: Produce cannabinoids

Sol.: Natural cannabinoids are obtained from the inflorescences of the plant *Cannabis sativa*. The flower tops, leaves and the resin of *Cannabis* plant are used in various combinations to produce marijuana, hashish, charas and ganja.

Erythroxylum coca produces cocaine, *Papaver somniferum* produces morphine.

161. Answer (4)

Hint: Result of convergent evolution**Sol.:** Eye of the *Octopus* and of mammals; or the flippers of penguins and dolphins are examples of analogy. They are the result of convergent evolution.

162. Answer (1)

Hint: Elephantiasis**Sol.:**

Filariasis	–	Helminth (<i>Wuchereria bancrofti</i>)
Typhoid	–	Bacterium (<i>Salmonella typhi</i>)
Malaria	–	Protozoan (<i>Plasmodium</i>)
Amoebic dysentery	–	Protozoan (<i>Entamoeba histolytica</i>)

163. Answer (2)

Hint: A separate lineage of chlorophytes**Sol. :** Bryophytes arose from chlorophyte ancestors. Plants called Psilophyton are descendants of chlorophyte ancestors. The first mammals were like shrews. Their fossils are small-sized.

164. Answer (3)

Hint: Female mosquito is the vector of malarial pathogen.**Sol.:** Malaria → *Anopheles*Dengue → *Aedes*

Amoebiasis → Housefly (Mechanical carrier)

Filariasis → *Culex*

165. Answer (2)

Hint: Exclude scientists who contributed in chemical evolution theory.**Sol.:** Embryological support for evolution was proposed by Ernst Haeckel based upon the observation of certain features during embryonic stage common to all vertebrates that are absent in adult.

However, this proposal was disapproved on careful study performed by Karl Ernst von Baer. He noted that embryos never pass through the adult stages of other animals.

Hardy and Weinberg gave Hardy-Weinberg principle. Oparin and Haldane proposed the chemical evolution theory.

166. Answer (3)

Hint: Result of intensive breeding programme**Sol.:** Varieties of dogs have been created by man under breeding programmes where breeds that differ from other breeds but still are of same group have been created.

Darwin's finches are result of adaptive radiation.

Australian marsupials and placental mammals are result of convergent evolution.

167. Answer (4)

Hint: Lichens can be used as an industrial pollution indicators.**Sol.:** After industrialisation, there were more of melanised moths as compared to white winged moths. Presence of lichens indirectly promoted the increase in population of white-winged moths. No variants of moths were completely wiped out.

168. Answer (1)

Hint: Evolution is a random process.**Sol.:** Evolution is not a directed process in the sense of determinism. It is a stochastic process based on the chance events in nature and chance mutation in the organisms.

169. Answer (4)

Hint: Population is not following Hardy-Weinberg equilibrium.**Sol.:** Hardy-Weinberg principle says that allelic frequencies in a population are stable and is constant from generation to generation. The gene pool (total genes and their alleles in a population) remains a constant. This is called genetic equilibrium. Change in frequency of alleles *i.e.*, disturbance in Hardy-Weinberg equilibrium in a population would then be interpreted as resulting in evolution.

170. Answer (3)

Hint: Placental mammals and Australian marsupials show convergent evolution.**Sol.:** When more than one adaptive radiation appeared to have occurred in an isolated geographical area (representing different habitats), one can call this convergent evolution. *e.g.*, Lemur and spotted cuscus.

Rest animals mentioned in the options are all Australian marsupials showing adaptive radiation.

171. Answer (2)

Hint: Evolved probably 200 mya

Sol.: In 1938, a fish caught in South Africa happened to be a Coelacanth which was thought to be extinct. These animals called lobefins evolved into the first amphibians that lived on both land and water.

Some of the land reptiles went back into water to evolve into fish-like reptiles probably 200 mya (e.g. *Ichthyosaurs*).

172. Answer (3)

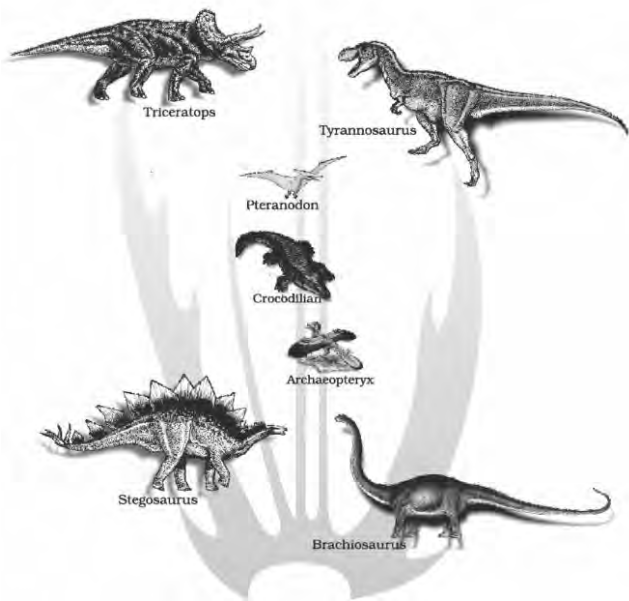
Hint: Chimpanzees exhibit menstrual cycle

Sol.: A comparison of the skull of adult human being, baby chimpanzee and adult chimpanzee had been made, and it was found that the skull of baby chimpanzee is more like adult human skull than adult chimpanzee skull.

173. Answer (2)

Hint: Biggest of all dinosaur

Sol.: The biggest of the dinosaur i.e., *Tyrannosaurus rex* was about 20 feet in height and had huge fearsome dagger-like teeth



174. Answer (2)

Hint: Came before *Homo habilis*

Sol.: Two mya, *Australopithecines* probably lived in East African grasslands. Evidence shows they hunted with stone weapons but essentially ate fruits.

Dryopithecus was more ape-like. First human-like being, the hominid was *Homo habilis*. They probably did not eat meat. Fossils discovered in Java revealed next stage, i.e., *Homo erectus*. *Homo sapiens* arose in Africa.

175. Answer (2)

Hint: Primary lymphoid organ

Sol.: Thymus is a lobed organ, located near the heart and beneath the breastbone. The thymus is quite large at the time of birth but keeps reducing in size with age. Bone marrow is located in long bones of the body. Appendix is a secondary lymphoid organ. Spleen is the graveyard of RBCs.

176. Answer (2)

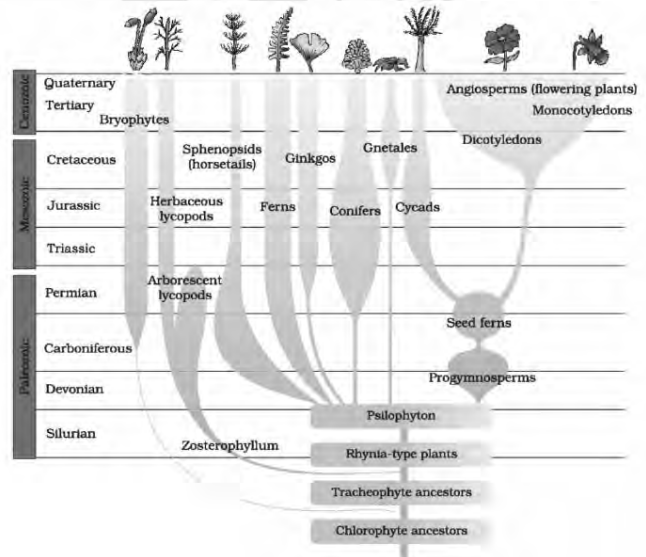
Hint: If gene migration occurs by chance, it is called genetic drift.

Sol.: When migration of a section of population to another place and population occurs, gene frequencies change in the original as well as in the new population. New genes/alleles are added to the new population and these are lost from the old population. There would be a gene flow if this gene migration, happens multiple times. If the same change occurs by chance, it is called genetic drift.

177. Answer (3)

Hint: Monocots are more advanced than dicots.

Sol.:



178. Answer (3)

Hint: Mutation causes speciation

Sol.: Hugo de Vries based on his work on evening primrose brought forth the idea of mutations-large difference arising suddenly in a population. He believed that, it is mutation which causes evolution and not the minor variations (heritable) that Darwin talked about.

Mutations according to Hugo de Vries are random and directionless while Darwinian variations are small and directional.

179. Answer (3)

Hint: Exclude the small solid structures at various points of lymphatic system

Sol.: There is lymphoid tissue located within the lining of the major tracts called mucosa associated lymphoid tissue. It constitutes about 50% of the lymphoid tissue in human body.

Lymph node, Peyer's patches, MALT, tonsils are secondary lymphoid organs.

180. Answer (1)

Hint: Analogous organs are the result of convergent evolution.

Sol.: Homology indicates common ancestry. Examples of homologous organs are:-

- (1) Forelimbs of man, cheetah, whale and bat, *i.e.*, all mammals.
- (2) Vertebrate hearts or brains.
- (3) The thorn of *Bougainvillea* and tendrils of *Cucurbita*.

Wings of butterfly and of birds look alike but they are not anatomically similar structures though they perform similar functions. These are analogous structures.



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