All India Aakash Test Series for NEET - 2026

TEST - 5 (Code-E)

Click here for Code-F Sol.

Test Date : 08/02/2026

ANSWERS

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

HINTS & SOLUTIONS

[PHYSICS]

1. Answer (4)

Hint: When switch S_1 is closed potential of conductor 1 becomes zero.

Sol.: Let charge on outer surface of inner shell is q'

Potential of inner shell

$$\frac{q'}{4\pi \in_0 R_1}+\frac{q_2}{4\pi \in_0 R_2}=0$$

$$q'=\frac{-q_2R_1}{R_2}$$

Hence, charge on outer surface of inner shell is non-zero

2. Answer (2)

Hint: When n electrons move out of a body then it acquired positive charge, $q = ne$.

Sol.: Let time required be t

$\therefore\ 10^{12}\, et = 0.2$

$$t=\frac{0.2}{10^{12}\times 1.6\times 10^{-19}}$$

$$=\frac{0.2}{1.6}\times 10^7$$

$= 125 \times 10^4$ s

$= 1.25 \times 10^6$ s

3. Answer (3)

Hint: Energy acquired by a charged particle when accelerated through potential difference V, $E = qV$.

Sol.: $E=\frac{1}{2}mv^2=qV$

$$\Rightarrow \frac{1}{2}\times 1\times 25=2\times 10^{-2}\times V$$

$$\Rightarrow \frac{25\times 10^2}{4}=V$$

$\Rightarrow V = 625$ volt

4. Answer (3)

Hint: Energy stored in capacitor.

$$U=\frac{Q^2}{2C}$$

Sol.: $1.69\frac{Q^2}{2C}=\frac{(Q+x)^2}{2C}$

$$1.69=\left(\frac{Q+x}{Q}\right)^2$$

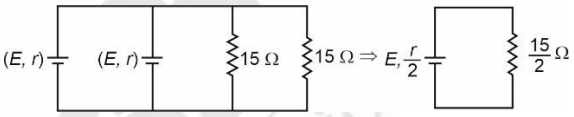
$$1.3=1+\frac{x}{Q}$$

$x = 0.3Q$

5. Answer (3)

Hint: Use $V = IR$, $I=\frac{E_{eq.}}{r_{eq}+R_{eq}}$

Sol.:



$$I=\frac{E}{\frac{r}{2}+\frac{15}{2}}$$

$$1.8=\frac{E}{\frac{r+15}{2}}\times\frac{15}{2}\Rightarrow r+15=\frac{4}{1.8}\times\frac{15}{2}$$

$r = 1.67\ \Omega$

6. Answer (2)

Hint: Use $I = neAv_d$ and $I = I_{P-} + I_{Q+}$

Sol.: $I = I_{P-} + I_{Q+}$

$$=neAv+n2eA\frac{v}{3}$$

$$=\frac{5neAv}{3}$$

7. Answer (4)

Hint: Use $I = neAv_d$

Sol.: $I_1 = I_2$

Current density $J=\frac{I}{A}$

$\because\ A_1 > A_2$

$\therefore\ J_1 < J_2$

Also $A_1v_1 = A_2v_2$

$\therefore\ v_1 < v_2$

8. Answer (1)

Hint: In charging state $V = E + Ir$

Sol.: $E_{equivalent}$ = (20 – 10 + 30 – 15) V

= 25 V

$r_{eq} = 5\ \Omega$

$$I = \frac{25}{5} = 5\ \text{A}$$

V_{AB} = 10 + 5(2) = 20 V

9. Answer (1)

Hint: Terminal potential difference, $V = E - Ir$

Sol.: $V = E - Ir$

If $I = 0$, $V = E = 10$ V

Also using $y = mx + c$

$V = -5I + 10$

$0 = -5I + 10$

$I_{max} = 2$ A

$0 = 10 - 2r \Rightarrow r = 5\ \Omega$

For maximum current through battery, load resistance is zero, effectively creating a short circuit.

$$I_{max} = \frac{E}{r} = \frac{10}{5} = 2\ \text{A}$$

10. Answer (2)

Hint: Heat produced

$$= \frac{1}{2}C_1V_1^2 + \frac{1}{2}C_2V_2^2 - \frac{1}{2}(C_1 + C_2)V^2$$

Where V is common potential

Sol.: Common potential $V = \dfrac{C_1V_1 + C_2V_2}{C_1 + C_2}$

$$= \frac{2(20) + 3(10)}{2 + 3} = 14\ \text{V}$$

Energy loss as heat

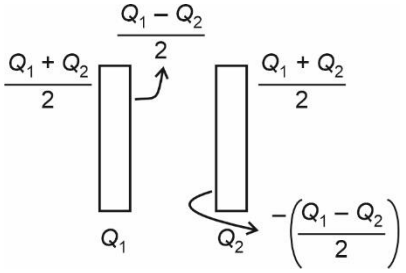
$$= \frac{1}{2} \times 2 \times (20)^2 + \frac{1}{2} \times 3 \times (10)^2 - \frac{1}{2} \times 5 \times (14)^2$$

= (400 + 150 – 490) μJ = 60 μJ

11. Answer (4)

Hint: Arrange charges appearing on faces of plates.

Sol.:



Charge of the capacitor $\dfrac{Q_1 - Q_2}{2}$ is responsible for electric field between the plates of the capacitor.

12. Answer (3)

Hint: Properties of electrostatics of conductors.

Sol.: Electrostatic potential is constant throughout the volume of the conductor and has the same value (as inside) on its surface.

13. Answer (3)

Hint: Use $E = \dfrac{-dV}{dr}$

Sol.: $-\int_{x=5}^{x=0} E_x dx = \int_{v=0}^{v} dV$

$$V - 0 = -10\int_{x=5}^{0} x\,dx$$

$$V = -10\left[\frac{x^2}{2}\right]_5^0 = -\frac{10}{2}[0 - 25]$$

V = 125 V

14. Answer (2)

Hint: Common potential $V = \dfrac{C_1V_1 + C_2V_2}{C_1 + C_2}$

Sol.: $V = \dfrac{C_1V_1 + C_2V_2}{C_1 + C_2}$

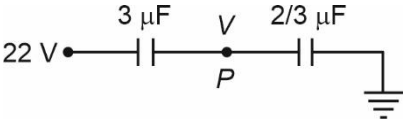
$$= \frac{(10\,\mu\text{F})(200) + (20\,\mu\text{F})(100)}{30\,\mu\text{F}}$$

$$= \frac{2000 + 2000}{30} = \frac{400}{3}\ \text{V}$$

15. Answer (2)

Hint: Charge on each capacitor remains same in series combination.

Sol.:



$Q_1 = Q_2$

$$3(22-V)=\frac{2}{3}(V=0)$$

$$V=\frac{(3\mu F)(22)+\left(\frac{2}{3}\mu F\right)(0)}{3+\frac{2}{3}\mu F}$$

$$=\frac{3\times 22}{11}\times 3=18\,V$$

16. Answer (3)

Hint: Use $U=\frac{1}{4\pi\in_0}\times\frac{q_1q_2}{r}$

Sol.: $U=\frac{1}{4\pi\in_0}\times\frac{q_1q_2}{r}$

$$U=\frac{9\times10^9\times5\times10^{-6}\times(-2)\times10^{-6}}{20\times10^{-2}}$$

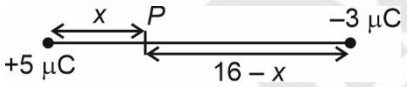
$= -45 \times 10^{-2}$ J $= -0.45$ J

17. Answer (4)

Hint: Electric potential due to point charge $V=\frac{kq}{r}$

Sol.:

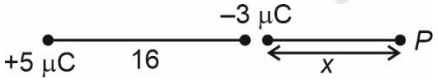
Case-i



$$V_P=\frac{K5\,\mu C}{x}+\frac{K(-3\,\mu C)}{16-x}=0$$

$$\frac{5}{x}=\frac{3}{16-x}\Rightarrow 80-5x=3x\Rightarrow x=10\,cm$$

Case-ii



$$V_P=\frac{K(-3)}{x}+\frac{K5}{16-x}=0$$

$$\frac{3}{x}=\frac{5}{16+x}\Rightarrow 48+3x=5x$$

$$\frac{48}{2}=x=24\,cm$$

18. Answer (4)

Hint: Use $q = CV$ and $V = V_1 + V_2 + V_3$

Sol.: $q_1 = 30\,\mu F\times 50\,V = 1500\,\mu C$

$q_2 = 40\,\mu F\times 50\,V = 2000\,\mu C$

$q_3 = 50\,\mu F\times 50\,V = 2500\,\mu C$

$q_{max} = 1500\,\mu C$ allowed in C_1, C_2, C_3

$$V=\frac{q}{C_1}+\frac{q}{C_2}+\frac{q}{C_3}$$

= 50 V + 37.5 V + 30 V = 117.5 V

19. Answer (4)

Hint: Use $q = CV$

Sol.:

$q_{total} = C_{eq}V = 4\ \mu F \times 6\ V$

$= 24\ \mu C$

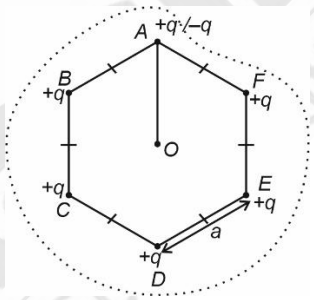
$q_1 = C_1V = 2\ \mu F \times 6V = 12\ \mu C$

$q_2 = q_3 = 2\ \mu F \times 6 = 12\ \mu C\ \therefore\ \frac{q_1}{q_2}=1$

20. Answer (3)

Hint: Apply superposition principle of electric field

Sol.:



Place $+q$ and $-q$ at A. Net electric field is due to $-q$ at A

$\vec{E}=\frac{kq}{q^2}$ along OA

21. Answer (3)

Hint: Electric field due to point charge, $\vec{E}=\frac{kq(\vec{r}-\vec{r}_0)}{|\vec{r}-\vec{r}_0|^3}$

Sol.: $\vec{E}=\frac{9\times10^9\times3\times10^{-9}\left[\sqrt{2}\hat{i}+\hat{j}\right]}{\left(\sqrt{(\sqrt{2})^2+(1)^2}\right)^3}$

$$=\frac{27\left(\sqrt{2}\hat{i}+\hat{j}\right)}{3^{3/2}}=\sqrt{27}\left(\sqrt{2}\hat{i}+\hat{j}\right)$$

$$=3\sqrt{3}\left(\sqrt{2}\hat{i}+\hat{j}\right)$$

$$=\left(3\sqrt{6}\hat{i}+3\sqrt{3}\hat{j}\right)N/C$$

22. Answer (2)

Hint: Use Gauss's law $\oint \vec{E} \cdot \vec{dA} = 0 = \frac{q_{enc}}{\epsilon_0}$

Sol.: $\oint \vec{E} \cdot \vec{dA} = 0$ for the closed surface means $q_{enc} = 0$, irrespective of the presence of other point charges present outside the closed gaussian surface.

23. Answer (2)

Hint: Potential energy of an electric dipole in uniform external electric field.

$(U) = -\vec{P} \cdot \vec{E}$

Sol.: $U = -PE\cos\theta$ (for $\cos 0^\circ = 1$)

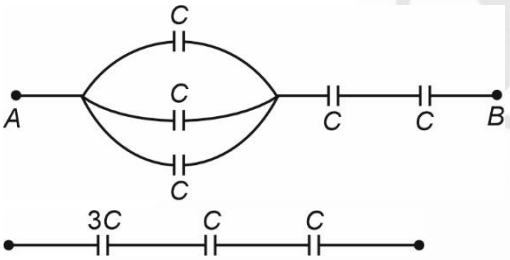
$U_{min} = -PE$ means stable equilibrium state.

24. Answer (3)

Hint: $C_{series} = \frac{C_1 C_2}{C_1 + C_2}$

$C_{parallel} = C_1 + C_2$

Sol.: Given circuit can be rearranged as



$$\frac{1}{C_{AB}} = \frac{1}{3C} + \frac{1}{C} + \frac{1}{C}$$

$$\frac{1}{C_{AB}} = \frac{1+3+3}{3C}$$

$$C_{AB} = \frac{3C}{7}$$

25. Answer (2)

Hint: $C_{medium} = KC_{air}$

Sol.: 110 μF = 5.5 C_{air}

20 μF = C_{air}

26. Answer (1)

Hint: Total flux through closed surface = $\frac{q_{enclosed}}{\varepsilon_0}$

Sol.: Dipole has a combination of equal and opposite charge placed at a separation.

$\therefore$ (q_T)enclose = 0

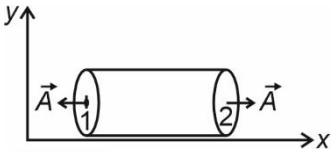
$\therefore$ $\phi = 0$

27. Answer (3)

Hint: Flux $\phi = \int \vec{E} \cdot \vec{dA}$

Sol.: Electric flux through curved surface is zero ($\vec{E} \perp$ curved surface area)

Hence flux will be through circular cross sections only



$\phi_{net} = \phi_2 - \phi_1 = \pi r^2[3x - x]$

$= 2x\pi r^2$

28. Answer (2)

Hint: Use balanced Wheatstone bridge condition

Sol.: $\frac{P}{Q} = \frac{S}{289}$ ...(1)

After interchanging P and Q, $\frac{Q}{P} = \frac{S}{289+35}$

$$\frac{Q}{P} = \frac{S}{324} \quad ...(2)$$

Multiplying (1) and (2)

$$\frac{P}{Q} \times \frac{Q}{P} = \frac{S}{289} \times \frac{S}{324} \Rightarrow S = 17 \times 18 = 306\ \Omega$$

29. Answer (4)

Hint: $E_{net} = (n - 2m)E$,

$r_{eq} = nr$

Where n are total cells and m are wrongly connected.

Sol.: $E_{net} = (10 - 4)E = 6 \times 2 = 12$ V

$r_{eq} = 10(0.2) = 2\ \Omega$

$R_{total} = 2 + 4 = 6\ \Omega$

$$I = \frac{E_{eq}}{R_T} = \frac{12}{6} = 2\ \text{A}$$

30. Answer (1)

Hint: Use balanced Wheatstone bridge principle.

Sol.: $\frac{R_1}{R_2} = \frac{30}{70} = \frac{3}{7}$

and

$$\frac{\frac{R_1}{R_2 10}}{R_2 + 10} = \frac{40}{60} = \frac{2}{3}$$

$$\frac{R_1}{R_2}\left(\frac{R_2+10}{10}\right)=\frac{2}{3}$$

$$\frac{R_2+10}{10}=\frac{2}{3}\times\frac{7}{3}=\frac{14}{9}\Rightarrow R_2=\frac{50}{9}\,\Omega$$

$$R_1=\frac{50}{21}\,\Omega$$

31. Answer (3)

Hint: Use $E_{\text{equivalent}}=\frac{E_1r_2+E_2r_1}{r_1+r_2}$, $r_{\text{eq}}=\frac{r_1r_2}{r_1+r_2}$

Sol.: $E_{\text{equivalent}}=\frac{E_1r_2+E_2r_1}{r_1+r_2}=\frac{8(0.5)+6(0.5)}{1}$

$= 7$ V

$R_{\text{eq}}=\frac{r_1r_2}{r_1+r_2}=\frac{0.5(0.5)}{1}=0.25\,\Omega$

Current I through $10\,\Omega=\frac{7}{R_{\text{eq}}+10}$

$=\frac{7}{10.25}$ A

Potential difference across $10\,\Omega$

$V = IR$

$V=\frac{7}{10.25}\times10=6.8$ V

32. Answer (3)

Hint: $P_{\text{output}}=\frac{V^2_{\text{applied}}}{R}$

Sol.: $P_0=\frac{V^2}{R}$

$R=\frac{220\times220}{100}=22\times22$

New power $=\frac{V^2_{\text{applied}}}{R}=\frac{110\times110}{22\times22}=25$ W

33. Answer (2)

Hint: Use $I = neAV_d$

Sol.: $V_d=\frac{I}{neA}=\frac{100}{10^{30}\times1.6\times10^{-19}\times10^{-6}}$

$= 6.25\times10^{-4}$ m/s

34. Answer (3)

Hint: Use $I=\frac{E_1-E_2}{r_1+r_2+R}$

Sol.: $I=\frac{10-5}{1+2+7}=\frac{5}{10}=0.5$ A

$V_{PQ} = 0.5(7) = 3.5$ V

35. Answer (3)

Hint: Use $\frac{1}{R_P}=\frac{1}{R_1}+\frac{1}{R_2}$, $R=\frac{\rho l}{A}$

Sol.: $\frac{1}{R_P}=\frac{1}{R_1}+\frac{1}{R_2}$

$\frac{2A}{\rho_{\text{eq}}L}=\frac{A}{\rho_1L}+\frac{A}{\rho_2L}$

$\rho_{\text{eq}}=\frac{2\rho_1\rho_2}{\rho_1+\rho_2}$

36. Answer (1)

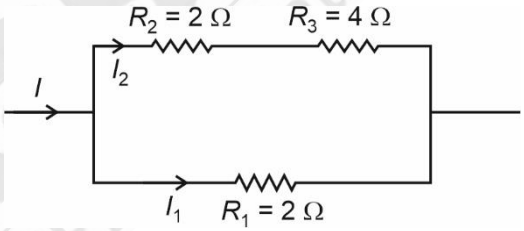
Hint: Resistivity at temperature T $\rho_T=\rho_0(1+\alpha\Delta T)$

Sol.: Metals or conductor have positive temperature coefficient of resistivity or resistance, hence resistivity increases with increase in temperature.

37. Answer (2)

Hint: Heat produced $H = I^2Rt$

Sol.:



Heat produced per unit time

$H = I^2R$

$72=I_1^2(2)$

Also, $I_1 = 6$ A

$I_2 6 = I_1(2)$

$I_2 = 2$ A

Heat produced in $R_3=I_2^2R_3t$

$= (2)^2(4) = 16$ J

38. Answer (2)

Hint: In uniform electric field, acceleration of charge is also uniform.

Sol.: $a_y=\frac{q_E}{M}=\frac{1\times1}{0.4}=\frac{10}{4}\text{m s}^{-2}$

$\Rightarrow v_y=a_yt=\frac{10}{4}\times4=10\text{ m s}^{-1}$

$\therefore$ Speed of particle after 4 s = $\sqrt{v_x^2 + v_y^2}$

$= \sqrt{10^2 + 10^2}$

$= 10\sqrt{2}$ m s^{-1}

39. Answer (4)

Hint: Use $R_T = R_0(1 + \alpha\Delta T)$

Sol.: $R_T = R_0(1 + \alpha\Delta T)$

$1 = R_0(1 + 30\alpha)$ …(i)

$2 = R_0(1 + 100\alpha)$ …(ii)

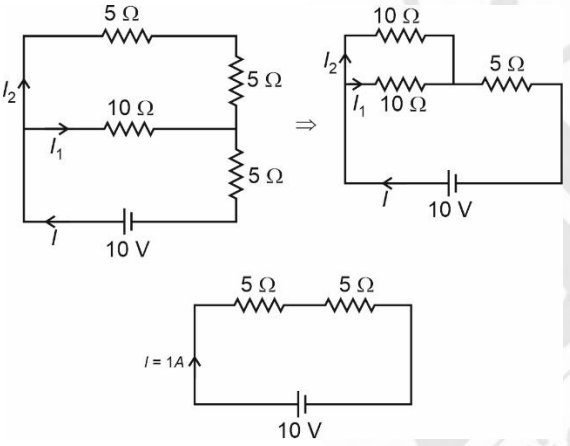
$2 + 60\alpha = 1 + 100\alpha$

$\frac{1}{40} = \alpha = 0.025°C^{-1}$

40. Answer (1)

Hint: Use Kirchhoff's Junction rule $I = I_1 + I_2$

Sol.:



$I = I_1 + I_2$

Also, $I_1 = I_2$

$\therefore$ $I = 2I_1$

$I_1 = \frac{I}{2} = \frac{1}{2} = 0.5$ A

41. Answer (1)

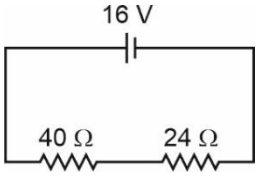
Hint & Sol.: Since both bulbs are connected in parallel and P.D. is 220 V.

$\therefore$ Bulb having more rated power glows brighter

42. Answer (3)

Hint: Use $V = IR$

Sol.: Current I through the circuit is



$I = \frac{16}{64} = \frac{1}{4}$ A

$V_{(40\Omega)} = \frac{1}{4} \times 40 = 10$ V

$\therefore$ Reading of voltmeter = 16 – 10 = 6 V

43. Answer (1)

Hint: Torque experienced by dipole $\vec{\tau} = \vec{P} \times \vec{E}$

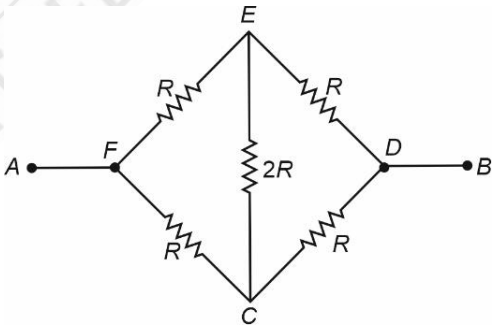
Sol.: Electric field due to dipole $\vec{P}_1$ is along the direction of dipole moment $\vec{P}_2$.

$\therefore$ $\tau_{\vec{P}_2} = 0$

44. Answer (4)

Hint: Balanced Wheatstone bridge

Sol.:



It is a balanced Wheatstone bridge

$\therefore$ Current through part CE is zero

45. Answer (4)

Hint: $v_d = \frac{e\tau}{m}\frac{V}{l}$

Sol.: As drift speed v_d is independent of diameter d, it will not change on doubling the diameter.

[CHEMISTRY]

46. Answer (2)

Hint: Given reaction is Hell-Volhard-Zelinsky reaction

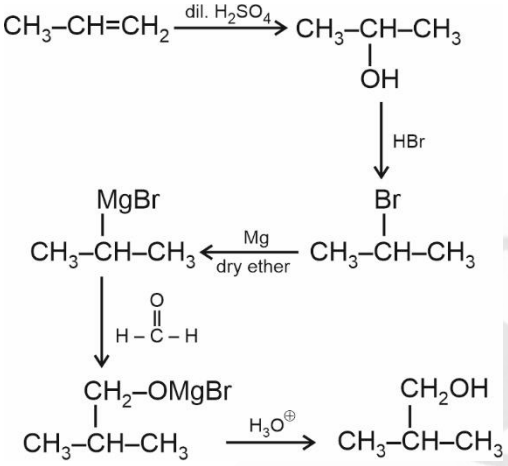
Sol.:

$$CH_3COOH \xrightarrow[(ii)\ H_2O]{(i)\ Br_2/\text{Red phosphorus}} CH_2BrCOOH$$

47. Answer (1)

Hint: Hydration of alkene in acidic medium proceeds with carbocation formation.

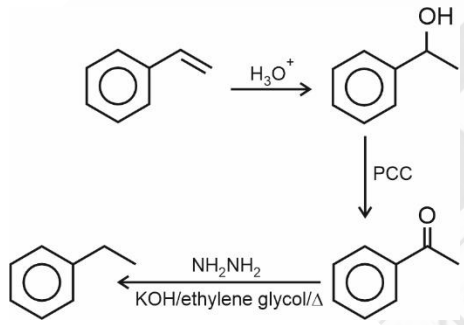
Sol.:



48. Answer (2)

Hint: Alkenes react with water in presence of acid to give alcohols by following Markovnikov's rule.

Sol.



49. Answer (1)

Hint: Electrolysis reaction occurs by free radical mechanism

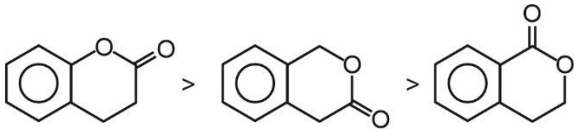
Sol.:

$$CH_3COONa + C_2H_5COONa \xrightarrow{\text{Electrolysis}} CH_3 - CH_3 + CH_3 - CH_2 - CH_2 - CH_3 + CH_3 - CH_2 - CH_3$$

50. Answer (2)

Hint: Electron donating group increases the rate of EAS reaction.

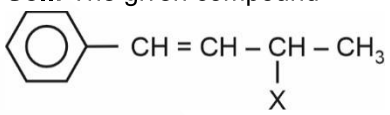
Sol.: Therefore, correct order of rate of EAS reaction will be



51. Answer (1)

Hint : $CH_2 = CH - CH_2 -$, is allyl group.

Sol.: The given compound

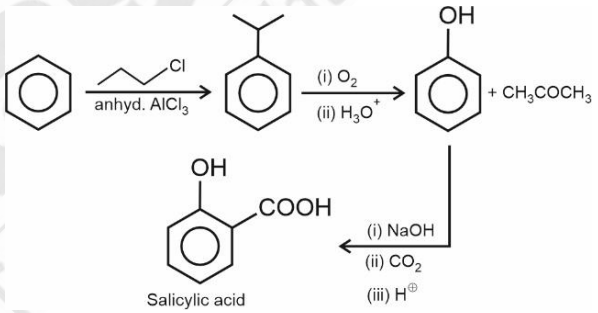


is an example of allylic halides. As in this halogen is bonded to the sp^3 hybridised carbon atom next to the carbon-carbon double bond, which is called as allylic halides.

52. Answer (1)

Hint : Reaction of alkyl halide with benzene in presence of Lewis acid ($AlCl_3$) is Friedel-Crafts alkylation that proceeds with generation of carbocation.

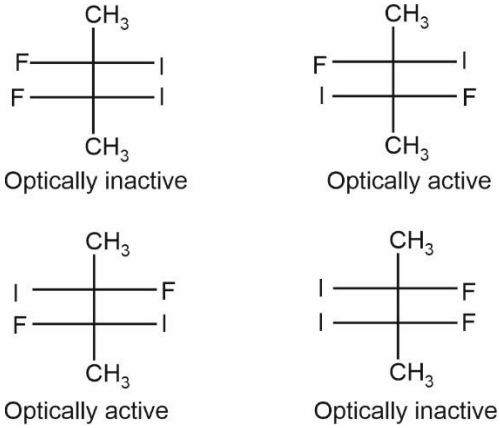
Sol.:



53. Answer (2)

Hint: Molecules with no POS and COS will be optically active.

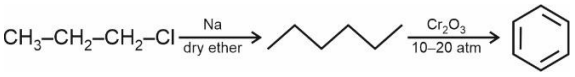
Sol.:



54. Answer (3)

Hint: Cr_2O_3/Al_2O_3 is used for aromatization of alkane.

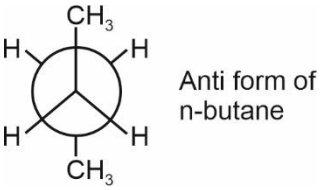
Sol.:



55. Answer (3)

Hint: Some of the confirmations of butane, which arise from rotation around $C_2 - C_3$ rotation bond, are anti, gauche, fully eclipsed and partially eclipsed.

Sol.: Anti conformation of butane is the most stable, due to minimum steric hindrance.

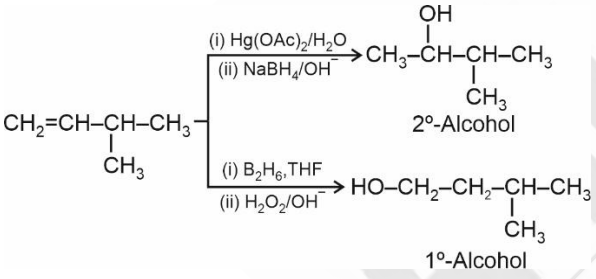


Anti form of n-butane

56. Answer (4)

Hint: Hydroboration oxidation reaction of alkene proceeds with anti-Markovnikov addition.

Sol.:



57. Answer (1)

Hint: Reactivity of alkyl halides towards S_N1 reaction depends on the stability of carbocation.

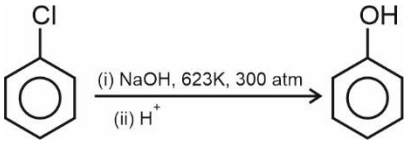
Sol.: Therefore, correct order of reactivity will be

2-Bromo-2-methylbutane > 2-bromopentane > 1-bromopentane

58. Answer (4)

Hint: $CH_3 - Br \xrightarrow[\text{ethanol}]{AgCN} CH_3NC$

Sol.:



59. Answer (2)

Hint: For alkyl halides, rate of S_N2 reactions follow the order 1° > 2° > 3°

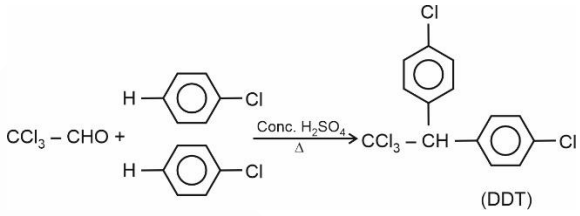
Sol.: $Br^{\ominus}$ is better leaving group than $Cl^{\ominus}$. The correct order of rate of S_N2 reaction will be

d > b > a > c

60. Answer (1)

Hint: Chloral is $CCl_3 - CHO$.

Sol.:

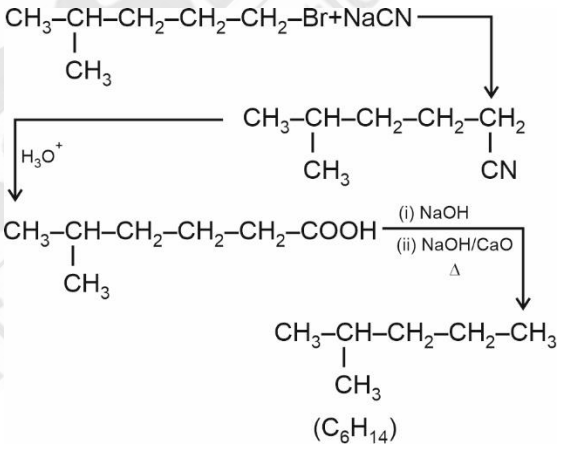


- Freon 12(CCl_2F_2) is manufactured from CCl_4 by Swart reaction.

61. Answer (2)

Hint: Soda lime (NaOH – CaO) is used for decarboxylation of sodium salt of carboxylic acid.

Sol.:

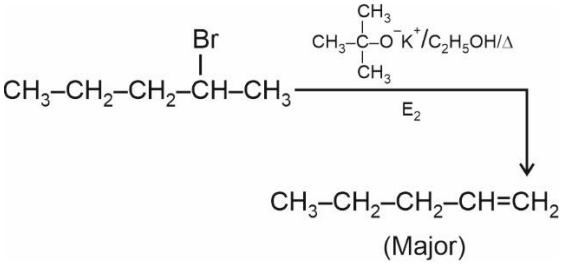


2-methylpentane gives 5 structural isomers on monochlorination.

62. Answer (3)

Hint: Bulky bases gives Hoffmann as the major produced in E_2 elimination reaction.

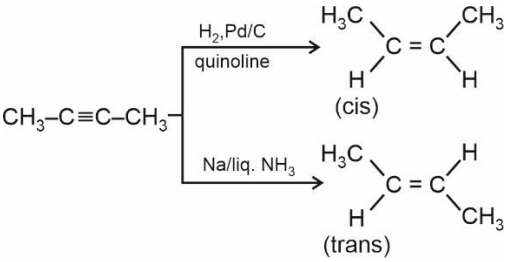
Sol.:



63. Answer (3)

Hint: Alkynes on reduction with sodium in liq. NH_3 give trans-Alkene as major product.

Sol.:



(cis and trans isomers are geometrical isomers)

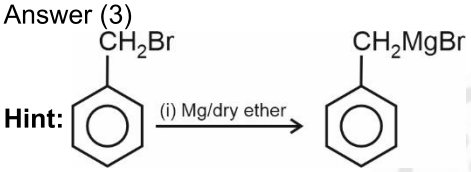
64. Answer (1)

Hint: $CHCl_3 + HNO_3 \rightarrow CCl_3NO_2 + H_2O$

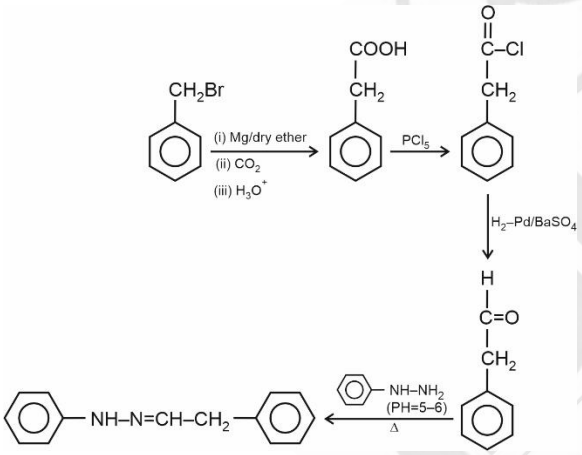
Sol.: Meso compounds are optically inactive and have plane of symmetry but contains chiral centres.

65. Answer (3)

Hint:

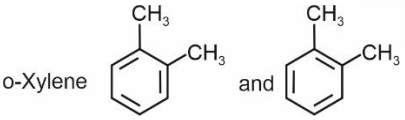


Sol.:



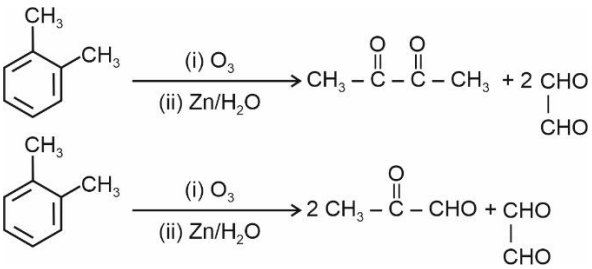
66. Answer (4)

Hint:



Will give different ozonolysis products.

Sol.:



67. Answer (3)

Hint & Sol.:

$$H-CCl_3 + 6Ag + Cl_3C-H \xrightarrow{\Delta} HC \equiv CH + 6AgCl$$

68. Answer (3)

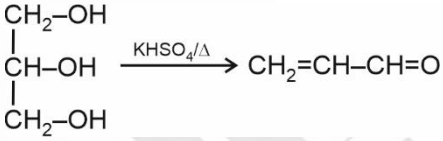
Hint: Due to electron donating effect of methyl group, acidic strength of cresol will be lower than phenol.

Sol.:

Acid	**pKa**
Phenol	10.0
o-cresol	10.2
m-cresol	10.1
p-cresol	10.2

69. Answer (2)

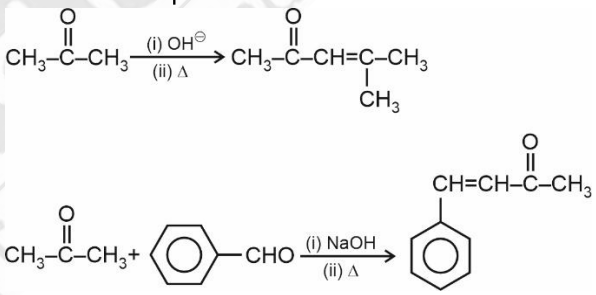
Hint & Sol.:



70. Answer (1)

Hint: Carbonyl compounds with α–H can undergo aldol reaction in presence of strong base and heat.

Sol.: Given mixture will be giving cross aldol condensation products.



71. Answer (2)

Hint: Boiling point depends on the intermolecular force of attraction. More the force of attraction higher will be boiling point.

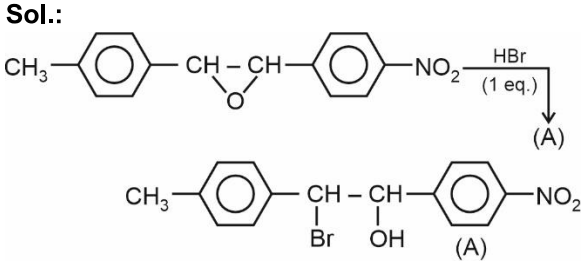
Sol.: Therefore, the correct order will be

$CH_3CH_2CH_2COOH > CH_3CH_2CH_2CH_2OH > CH_3CH_2CH_2CHO$

72. Answer (3)

Hint: Given reaction will follow S_N1 mechanism.

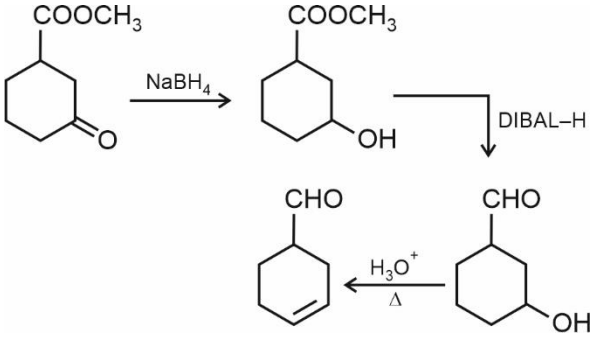
Sol.:



73. Answer (3)

Hint: DIBAL – H converts ester into aldehyde.

Sol.:



74. Answer (3)

Hint: Aldehydes are more reactive than ketones towards nucleophilic addition reaction.

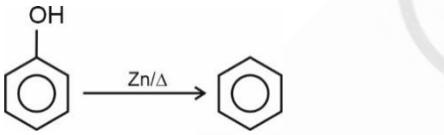
Sol.: Electron donating group decreases the rate of nucleophilic addition reaction.

Therefore, correct order will be

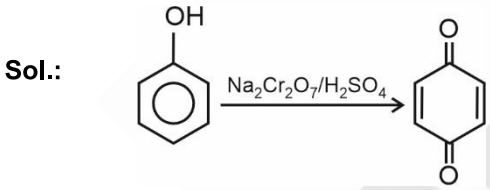
c > a > b

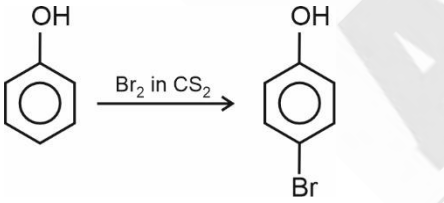
75. Answer (1)

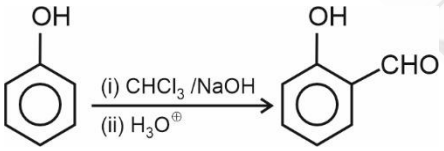
Hint:



Sol.:







76. Answer (3)

Hint: The compounds/species having $(4n + 2)\pi$ electrons will obey Huckel's rule

Sol.: (a), (b), (e) and (*f*) obey the Huckel's rule.

77. Answer (3)

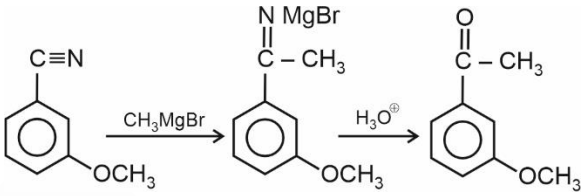
Hint: Alcohols which form stable carbocation will react with Lucas reagent instantaneously.

Sol.: Tert-butyl alcohol will form most stable carbocation, therefore it will react instantaneously with Lucas reagent.

78. Answer (1)

Hint: Reaction with RMgX is nucleophilic addition reaction.

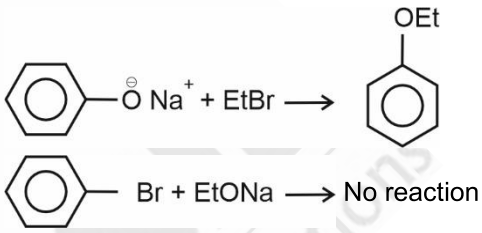
Sol.:



79. Answer (3)

Hint: Williamson's synthesis is used to prepare mixed ethers as well as simple ethers.

Sol.:



80. Answer (1)

Hint:

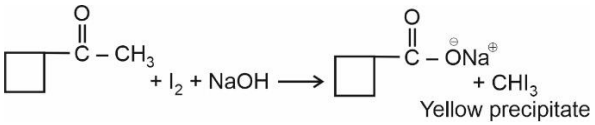
$$CO + 2H_2 \xrightarrow[200-300\,atm,\ 573-673K]{ZnO-Cr_2O_3} CH_3OH$$

Sol.: The hydrogensulphite addition compounds of carbonyl group are water soluble.

81. Answer (4)

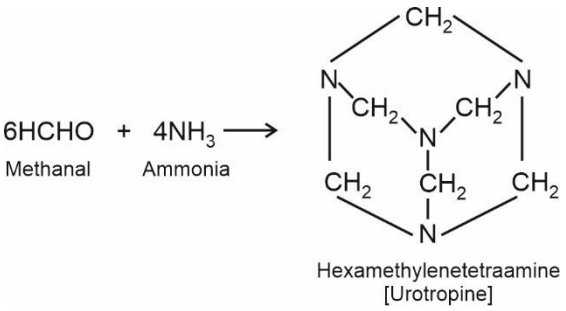
Hint: Carbonyl compounds give positive 2, 4-DNP test. Ketone will not give Tollens and Fehling solution test.

Sol.:



82. Answer (3)

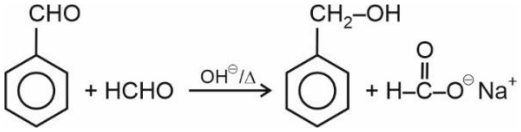
Hint & Sol.:



83. Answer (2)

Hint: Carbonyl compound without α-hydrogen undergoes Cannizzaro reaction.

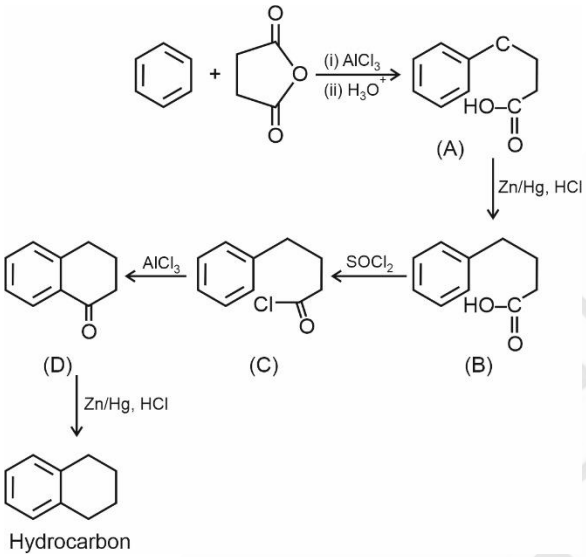
Sol.:



84. Answer (1)

Hint: Reaction of aldehyde or ketones with Zn/Hg, HCl is Clemmensen reduction.

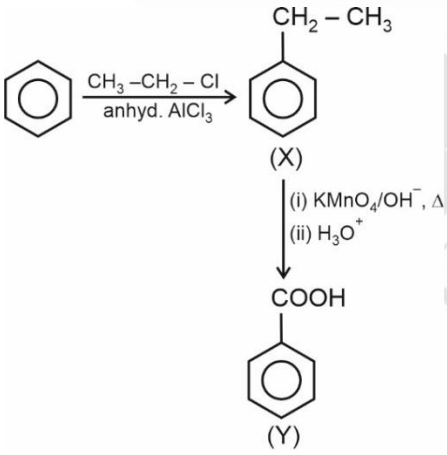
Sol.:



85. Answer (3)

Hint: Reaction of alkyl substituted benzene with $H^+/KMnO_4$ is side chain oxidation.

Sol.:



86. Answer (2)

Hint & Sol.:

$$CH_4 + O_2 \xrightarrow[250°C,\ 100\ atm]{Cu}$$

$$\underset{(A)}{CH_3OH} \xrightarrow[300°C]{Cu} \underset{(B)}{HCHO}$$

87. Answer (1)

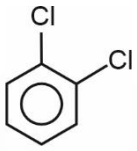
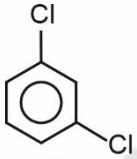
Hint: Ketones and aromatic aldehyde do not give Fehling's test.

Sol.: All the aldehydes give Tollens test but Ketones do not give Tollen's test.

88. Answer (2)

Hint: Dipole moment of chloromethane is more than fluoromethane

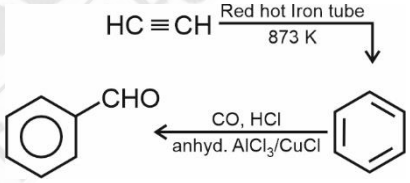
Sol.:

	m.p/K
	256
	249
	323

89. Answer (3)

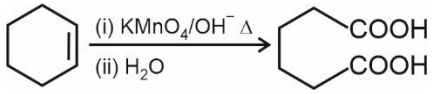
Hint: Acetylene undergoes aromatisation reaction.

Sol.:



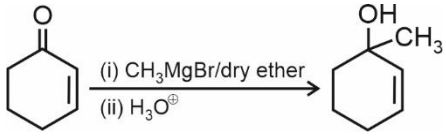
90. Answer (1)

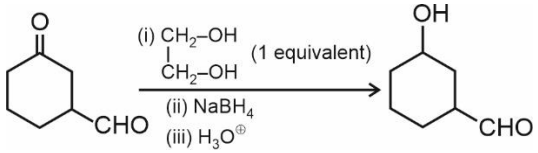
Hint:

(a) 

Sol.:

(b) 

(c) 

(d) 

[BOTANY]

91. Answer (3)

Hint: In cleistogamous flowers, anthers and stigma lie close to each other and these flowers do not open at all.

Sol.: Papaya is a dioecious plant in which there is no chance of autogamy. So, it does not produce cleistogamous flowers.

92. Answer (2)

Hint: Sugarcane is a wind-pollinated plant.

Sol.: *Michelia* has multicarpellary, apocarpous gynoecium. Groundnut seeds are ex-albuminous, so they do not have persistent endosperm at maturity.

93. Answer (3)

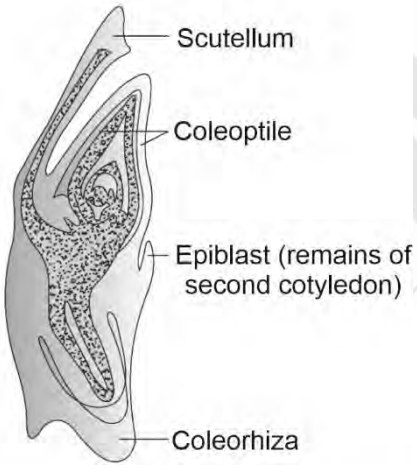
Hint: In ovule, the cells of nucellus undergo megasporogenesis.

Sol.: Synergids have special cellular thickenings at micropylar tip called filiform apparatus, which guides the entry of pollen tube into one of the synergids, where male gametes are released.

94. Answer (2)

Hint: 'A' represents the cotyledon in grasses.

Sol.:



95. Answer (2)

Hint: Not all aquatic plants use water for pollination.

Sol.: Water lily and water hyacinth are insect-pollinated plants.

96. Answer (4)

Hint: Multiple allelism can be detected only in a population.

Sol.: Completely linked genes in a dihybrid cross show F_2 phenotypic ratio of 3 : 1.

97. Answer (4)

Hint: Tapetum is the innermost layer of anther wall which surrounds the sporogenous tissue.

Sol.: Sporogenous tissue is a group of compactly arranged homogenous cells and occupies the centre of each microsporangium.

98. Answer (3)

Hint: Water-pollinated plants produce pollen grains with mucilaginous covering to prevent them from wetting.

Sol.: Wheat has feathery stigma, single ovule in each ovary and pollen grains are light and non-sticky and flowers are packed into inflorescence.

99. Answer (2)

Hint: Seeds of pea are not perispermic.

Sol.: Seeds of beet and black pepper have persistent nucellus called perisperm.

100. Answer (3)

Hint: Seeds are formed as a result of sexual reproduction. Sexual reproduction involves segregation of alleles.

Sol.: If seeds collected from hybrids are sown, the characters in the plant progeny will segregate and not maintain hybrid plant characters.

101. Answer (2)

Hint: Development of ovary into a fruit is a post fertilisation event.

Sol.: The correct sequence is as follows:

- Formation of MMC.
- Monosporic development.
- Characteristic distribution of cells within embryo sac.
- Fusion of a male gamete with two polar nuclei.
- Development of ovary into a fruit.

102. Answer (2)

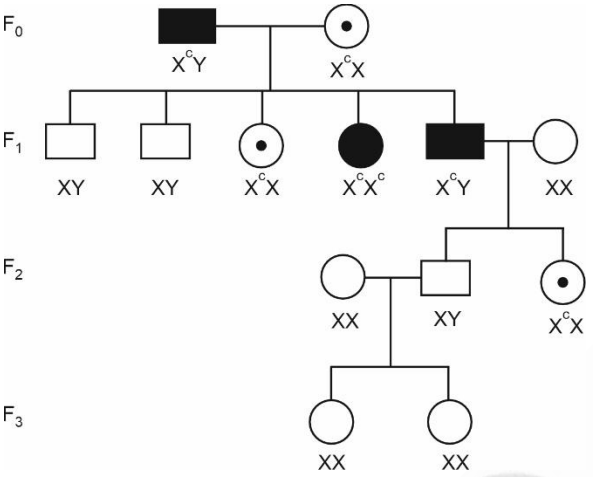
Hint: Sporopollenin is absent at the germ pores in pollen grains.

Sol.: Pollen grains are well-preserved as fossils due to the presence of sporopollenin.

103. Answer (3)

Hint: Colour blindness shows criss-cross inheritance pattern, while phenylketonuria and thalassemia are autosomal recessive disorders.

Sol.:



This pedigree is true for sex-linked recessive disorders, not for autosomal recessive disorders. In F_3, all female progenies are normal (not carriers).

104. Answer (4)

Hint: Embryo sac is formed by the process of meiosis in diploid tissue of ovule.

Sol.: Synergids, antipodals, polar nuclei and egg apparatus are haploid structures.

105. Answer (2)

Hint: Alfred Sturtevant used the frequency of recombination between gene pairs on the same chromosome as a measure of distance between genes and mapped their position on chromosome.

Sol.:

- Gregor Mendel – His work suggested that factors were discrete units. He could not provide any physical proof for the existence of factors or tell what they were made of.
- Walter Sutton – United the knowledge of chromosomal segregation with Mendelian principles and called it the chromosomal theory of inheritance.
- T.H. Morgan – Coined the term recombination.

106. Answer (3)

Hint: Sex determining mechanism in case of humans is of XY type.

Sol.: In each pregnancy, there is always 50% probability of either a male or a female child.

107. Answer (4)

Hint: Endosperm is a product of triple fusion and develops from central cell of embryo sac.

Sol.: Endosperm can be starchy or proteinaceous in cereals. It is triploid and its development precedes embryo development.

108. Answer (2)

Hint: Phenylketonuria is an autosomal recessive disorder.

Sol.: The affected individual lacks a liver enzyme called phenylalanine hydroxylase that converts phenylalanine into tyrosine.

109. Answer (2)

Hint: *Drosophila* shows XX – XY type of sex determination.

Sol.: Birds show ZZ – ZW type of sex determination.

110. Answer (4)

Hint: Mutation is a phenomenon which results in alteration of DNA sequences and consequently results in changes in genotype and phenotype of organism.

Sol.: UV radiation are mutagens that can cause/induce mutations. Analysis of traits in several of generations of a family is called pedigree analysis.

111. Answer (2)

Hint: Haemophilia and colour blindness are sex linked recessive disorders.

Sol.:

A.	Haemophilia	–	A single protein, that is a part of the cascade of proteins involved in clotting of blood is affected.
B.	Colour blindness	–	It occurs in about 8 percent of males and only about 0.4 percent of females
C.	Cystic fibrosis	–	Autosomal recessive disorder
D.	Turner's syndrome	–	Short stature and underdeveloped feminine character

112. Answer (3)

Hint: Two synergids and one egg are grouped together to form egg apparatus at the micropylar end.

Sol.: Castor and maize are monoecious plants, *i.e.,* they can prevent autogamy but not geitonogamy.

113. Answer (4)

Hint: In a typical test cross, an organism showing a dominant phenotype is crossed with the recessive parent, instead of self-crossing.

Sol.: [RrYy × rryy] represents the test cross.

114. Answer (4)

Hint: Recessive traits are expressed in homozygous condition only.

Sol.: Constricted pod shape, white flower colour, green seed colour are the recessive traits.

115. Answer (2)

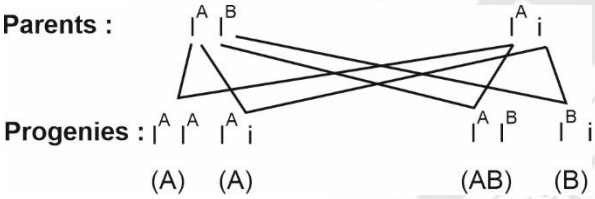
Hint: *Drosophila* shows many types of hereditary variations that can be seen under a low power microscope.

Sol.: Fruit flies (*Drosophila*) have 4 pairs of morphologically distinct chromosomes and a short life cycle of 2 weeks.

116. Answer (3)

Hint: When I^A and I^B are present together, they both express their own types of sugars.

Sol.:



In other options,

- **Parents :** $I^B I^B \times ii$

↓

Progenies: B, B, B, B

- **Parents :** $I^A I^A \times I^B I^B$

↓

Progenies : AB, AB, AB, AB

- **Parents:** $I^B i \times I^A I^A$

↓

Progenies : $I^A I^B$, $I^A I^B$, $I^A i$, $I^A i$

(AB) (AB) (A) (A)

117. Answer (2)

Hint: Pericarp is a fruit wall that develops from the ovary wall.

Sol.:

•	Micropyle	–	Allows the entry of oxygen and water into a seed
•	Hilum	–	Represents the junction between ovule and funicle
•	Filiform apparatus	–	Guides the entry of pollen tube into synergids

118. Answer (2)

Hint: Flowers of snapdragon show incomplete dominance.

Sol.:

Parents : RR × Rr

↓

F_1 generation : RR (Red) Rr (Pink) RR (Red) Rr (Pink)

So, 50% → Pink

50% → Red

Hence, the ratio of 1(red) : 1(pink) is obtained.

119. Answer (2)

Hint: Sickle cell anaemia occurs due to point mutation.

Sol.: It is caused by the substitution of Glutamic acid (Glu) by Valine (Val) at the sixth position of beta globin chain of haemoglobin.

mRNA [GAG → GUG]

120. Answer (4)

Hint: Honey bees show haplodiploid sex-determination system.

Sol.: Male honey bee produces sperms by mitosis, where, drones are haploid and queens are diploid. Egg develops as a male (drone) by means of parthenogenesis.

121. Answer (2)

Hint: Polyploidy is often seen in plants.

Sol.: A polygenic trait shows non-Mendelian inheritance pattern. Polydactyly is a dominant trait.

122. Answer (3)

Hint: Type of gametes can be calculated as 2^n, where 'n' is the number of heterozygous loci.

Sol.: In TtYYzzCcOO, the type of gametes will be 2^n, i.e., $2^2 \Rightarrow 4$

123. Answer (3)

Hint: Human skin colour is a polygenic trait.

Sol.: The effect of each allele is additive. The number of each type of alleles in the genotype would determine darkness or lightness of skin in an individual.

124. Answer (3)

Hint: Only Hb^sHb^s (homozygous) individuals show the phenotype of sickle cell anaemia.

Sol.: Thalassemia differs from sickle-cell anaemia in that the former is a quantitative problem of synthesising too few globin molecules while the latter is a qualitative problem of synthesising an incorrectly functioning globin.

125. Answer (2)

Hint: Due to the presence of an extra copy of X-chromosome, the affected individuals will have feminine development like gynaecomastia.

Sol.: Individuals inflicted with Klinefelter's syndrome, have an overall masculine development but are sterile.

126. Answer (3)

Hint: The law of dominance explains the ratio of 3 : 1, obtained in the F_2 generation.

Sol.: Law of dominance is not universally applicable.

127. Answer (4)

Hint: Mendel selected 14 true-breeding pea plant varieties.

Sol.: Seven pairs of contrasting characters of pea plants were studied by Mendel.

128. Answer (2)

Hint: Single gene product may produce more than one effect in pleiotropy.

Sol.: Phenylketonuria is a classic example of pleiotropy.

129. Answer (2)

Hint: Parthenocarpy is the mechanism of production of seedless fruits without fertilisation.

Sol.: Apomixis is a special mechanism for seed production without fertilisation.

130. Answer (3)

Hint: In a dihybrid cross, six recombinants are obtained in F_2 generation.

Sol.: The phenotypic ratio in F_2 generation in the given dihybrid cross will be 9 : 3 : 3 : 1.

131. Answer (2)

Hint: Inversion is the change in the linear order of genes by rotating a section of chromosome by 180º.

Sol.: Translocation is shifting of a part of one chromosome to another.

132. Answer (2)

Sol.: In rice and wheat, pollen grains lose viability within 30 minutes of their release.

133. Answer (2)

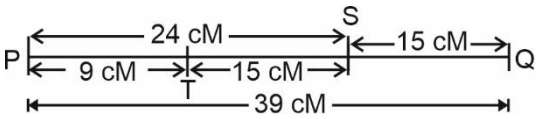
Hint: Endosperm is surrounded by aleurone layer (3n) in the seeds of monocots.

Sol.: Moth and *Yucca* plant cannot complete their life cycles without each other. The fruits are fleshy in guava, orange and mango and dry in groundnut and mustard.

134. Answer (3)

Hint: The frequency of recombination between gene pairs is directly proportional to the distance between genes.

Sol.: The correct sequence of genes can be as follows:



135. Answer (3)

Hint: Vegetative cell is bigger with abundant food reserves.

Sol.: Generative cell is small and floats in the cytoplasm of vegetative cell. Vegetative cell has a large, irregularly shaped nucleus.

[ZOOLOGY]

136. Answer (3)

Hint: Also known as embryoblast

Sol.: Immediately after implantation, the inner cell mass (embryo-blast) differentiates into an outer layer called ectoderm and an inner layer called endoderm. A mesoderm soon appears between the ectoderm and the endoderm.

Trophoblast (outer cell mass) forms extra-embryonic membranes which become the foetal part of placenta.

Inner cell mass contains stem cells.

137. Answer (1)

Hint: Associated with the anterior pituitary gland interstitial cell stimulating hormone (ICSH).

Sol.: LH is secreted by the anterior pituitary gland. This hormone acts on the Leydig cells (Interstitial cells). Under the influence of this hormone, interstitial cells synthesise and secrete testicular hormones called androgens.

138. Answer (4)

Hint: Equal to the number of ear ossicles present in one ear of a man.

Sol.: The male external genitalia (Penis) contains the urethra which is a passage for ejaculation of semen.

The distal end of the male external genitalia is called glans penis which is covered by a loose fold of skin called foreskin.

The male sex accessory glands include paired seminal vesicles, a prostate and paired Cowper's gland (Bulbourethral glands).

Erection of penis is achieved by blood flow across the special tissues present in it.

Secretion of bulbourethral glands does not help in erection of penis; it helps in lubrication of penis.

139. Answer (3)

Hint: 4 spermatozoa are formed by one meiotic division.

Sol.: 4 spermatozoa are formed by one meiotic division, so $63 \times 4 = 252$.

Thus, 63 meiotic divisions will be required to form 252 spermatozoa from one primary spermatocyte.

One ootid and two polar bodies are formed by one complete meiotic division, so, 252 meiotic divisions will form 252 ootids from one primary oocyte.

140. Answer (2)

Hint: Luteal phase has fixed number of days.

Sol.: The duration of luteal phase is of 14 days irrespective of the duration of menstrual cycle. Thus, in 38 days cycle $\Rightarrow 38 - 14 = 24$

24 days is the total duration of menstruation + proliferative phase.

141. Answer (3)

Hint: Primary follicles consist of primary oocyte.

Sol.: Ovarian stroma, which is covered by a thin epithelium, is divided into two zones-a peripheral cortex and an inner medulla.

Ovarian follicles are found in the cortex and consist of either primary or secondary oocyte in various stages of development. Primary oocyte is a diploid (2n) and secondary oocyte is a haploid (n) structure.

142. Answer (2)

Hint: Primary oocyte is formed during foetal life.

Sol.: The first polar body is formed along with the secondary oocyte in the ovary and the 2nd polar body is formed in the oviduct.

The reductional division during gametogenesis in females starts earlier than that of gametogenesis in males.

LH surge leads to the disintegration of Graafian follicle, but not endometrium.

In males, differentiation of gametes occurs after the completion of meiosis.

143. Answer (4)

Hint: Extra-testicular duct system starts with vasa efferentia.

Sol.: Rete testis are present inside the testis.

The seminiferous tubules of testis open into the vasa efferentia through rete testis. The vasa efferentia leave the testis and open into epididymis which leads to vas deferens.

144. Answer (2)

Hint: They are dizygotic twins.

Sol.: Fraternal twins, also called dizygotic twins, are twins that develop from two separate fertilized eggs and each egg is fertilised by a different sperm. They can be the twins with the same sex or different sexes and they do not necessarily look alike.

145. Answer (2)

Hint: Finger-like structure is called clitoris.

Sol.: Mons pubis is a cushion of fatty tissue covered by skin and pubic hair. The clitoris is a tiny finger-like structure which lies at the upper junction of two labia minora above the urethral opening.

146. Answer (4)

Hint: Secretory layer of uterus

Sol.: The wall of uterus has three layers of tissues. The external thin membranous layer called perimetrium, middle thick layer of smooth muscles called myometrium and inner glandular layer called endometrium that lines the uterine cavity. The endometrium undergoes cyclical changes during menstrual cycle while the myometrium exhibits strong contraction during delivery of the baby.

147. Answer (2)

Hint: Part next to the ampulla

Sol.: Each fallopian tube is about 10 – 12 cm long and extends from the periphery of each ovary to the uterus. The part closer to the ovary is the funnel-shaped infundibulum. The edges of the infundibulum possess finger-like projections called fimbriae, which help in ovum collection after ovulation. Infundibulum leads to ampulla. The last part of the oviduct, isthmus, has a narrow lumen and it joins the uterus.

148. Answer (3)

Hint: Corpus luteum is a temporary endocrine body.

Sol.: The edges of the fallopian tubes possess finger-like projections called fimbriae, which help in collection of secondary oocyte after ovulation. Sweeping movement of fimbriae is crucial for normal fertility in human females. If this will not occur, it can severely impact fertility of females by hindering the journey of secondary oocyte into fallopian tube.

Meiosis-II gets completed during fertilization.

If fertilization does not occur, the corpus luteum persists only upto 4 days before date of menstruation to be start.

149. Answer (3)

Hint: More than the number of external nostrils we have

Sol.: A large number of primary follicles degenerate during the phase from birth to puberty.

At puberty, only 60,000-80,000 primary follicles are left in each ovary. Tertiary follicle is characterised by a fluid-filled cavity called antrum.

Primary oocyte within the tertiary follicle grows in size and completes its first meiotic division.

150. Answer (2)

Hint: Menopause is cessation of menstruation.

Sol.: Menstruation begins at puberty and is called menarche. Menopause is cessation of menstruation.

During ovulation, the Graafian follicle ruptures and secondary oocyte is released.

151. Answer (3)

Hint: Include the hormone that is used to check pregnancy.

Sol.:

- Placenta secretes hCG, hPL, estrogen, progesterone and relaxin.
- Estrogen, progesterone and relaxin are also secreted by the ovary.

152. Answer (3)

Hint: Equal to the number of lumbar vertebrae in human.

Sol.: hCG, hPL and relaxin are produced in women only during pregnancy. In addition, during pregnancy, the level of other hormones like estrogen, progestogens, cortisol, prolactin, thyroxine, *etc.,* increases several-folds in the maternal blood.

153. Answer (4)

Hint: At the end of first trimester

Sol.: By the end of second month of pregnancy, the foetus develops limbs and digits. By the end of 12 weeks (first trimester), most of the major organ systems are formed, for example, the limbs and external genital organs are well-developed.

154. Answer (4)

Hint: Equal to the total number of ribs present in a human skeleton.

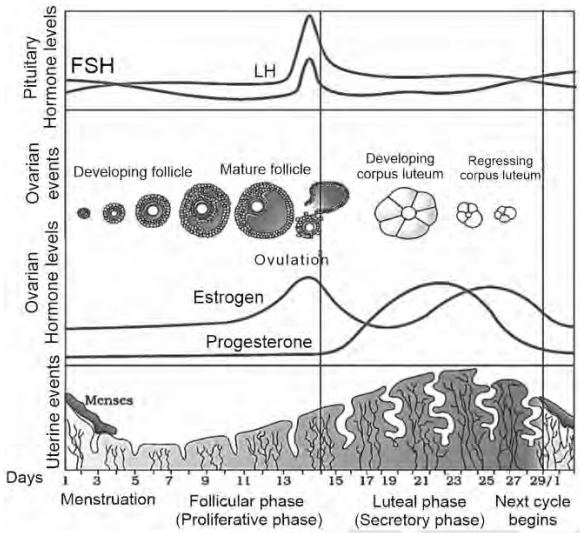
Sol.: For normal fertility, at least 60% sperms in an ejaculate must have normal shape and size and at least 40% of them must show vigorous motility. So, the percentage is

$$= \frac{60}{100} \times \frac{40}{100} = \frac{24}{100} \times 100 = 24\%$$

155. Answer (4)

Hint: A – LH
B – FSH
C – Estrogen
D – Progesterone

Sol.: Throughout the childhood, the ovaries remain inactive due to absence of both LH and FSH.



LH and FSH are water-soluble hormones, hence, both LH and FSH bind to the receptors present on the membrane of target cells (present in ovary) and stimulate the synthesis of estrogen.

During the follicular phase of the ovarian cycle, certain cells of follicles secrete estrogen which is an important female sex hormone.

FSH is responsible for follicular growth.

156. Answer (4)

Hint: Zona pellucida

Sol.: The zona pellucida (a glycoprotein layer) surrounding the ova, blocks the entry of additional sperms and prevents polyspermy. It helps in preventing ectopic pregnancy as it forms a protective layer around the early embryo.

157. Answer (3)

Hint: hCG rescues corpus luteum.

Sol.: Regression of the corpus luteum leads to the onset of the next ovarian cycle in a non-pregnant human female.

Chorionic gonadotropin which has similar function as LH, can act on the corpus luteum to prolong its life in a gravid (pregnant) human female.

The corpus luteum typically persists for the first 10-12 weeks of pregnancy.

158. Answer (3)

Hint: Mitochondria is arranged spirally in the middle piece.

Sol.:

Head	Possesses 23 highly condensed chromosomes
Middle piece	A spiral arrangement of mitochondria in this part provides ATP (Nebenkern)
Neck	Constricted region that contains centriole
Tail	Facilitates sperm motility

159. Answer (3)

Hint: Umbilical cord contains foetal blood vessels only.

Sol.: The actual connection between the placenta and embryo and later the foetus, is through the umbilical cord. It consists of two umbilical arteries and one umbilical vein. Only the blood of foetus flows through it.

160. Answer (3)

Hint: Lactational amenorrhea

Sol.: Prolactin promotes milk synthesis and it is secreted by the mother's anterior pituitary gland.

The milk produced during the initial few days of lactation is called colostrum. It contains large amounts of IgA.

Oxytocin is the milk-ejecting hormone.

161. Answer (3)

Hint: Transferred in uterus during IVF

Sol.: The embryo with 8 to 16 blastomeres is called a morula.

During embryonic development, the nuclear cytoplasmic ratio increases because the number of cells increases while the total cytoplasmic mass remains relatively constant. Cleavage increases the number of blastomeres, hence the DNA content increases but there is no increase in the overall size of embryo.

162. Answer (2)

Hint: After spermiogenesis, sperm head becomes embedded in the Sertoli cells.

Sol.: After spermiogenesis, sperm head becomes embedded in the Sertoli cells and are finally released from the seminiferous tubules by the process called spermiation.

163. Answer (2)

Hint: Include the methods in which fertilization occurs in the mother's body.

Sol.: *In vitro* fertilisation followed by the transfer of embryo into the female genital tract is commonly known as the test tube baby programme. Ova from the female donor and sperms from the male donor are collected and are induced to form zygote under simulated conditions in the laboratory. The zygote or early embryo (with upto 8 blastomeres) could then be transferred into the fallopian tube (ZIFT) and embryo with more than 8 blastomeres, into the uterus (IUT) to complete the further development.

AI is artificial insemination. ICSI is intra-cytoplasmic sperm injection.

164. Answer (3)

Hint: Sex education is important in our country.

Sol.:

The people of age group 15 to 24 years are more prone to STIs.

Hepatitis-B, genital herpes and genital warts are not completely curable, even if detected early and treated properly.

Absence or less significant symptoms in the early stages of infection and the social stigma attached to STIs, deter the patient from going for timely detection and proper treatment.

Gonorrhoea and syphilis are bacterial STIs.

165. Answer (2)

Hint: More than 12 months

Sol.: Inability to conceive or produce children even after 2 years of unprotected sexual co-habitation is called infertility.

166. Answer (4)

Hint: Reversibility is very poor.

Sol.: Surgical intervention blocks gamete transport and thereby prevents conception. Sterilisation procedure in the male is called 'vasectomy' and that in the female, is called 'tubectomy'. In vasectomy, a small part of the vas deferens is removed or tied up through a small incision on the scrotum whereas in tubectomy, a small part of fallopian tube is removed or tied up through a small incision in the abdomen or through vagina. These techniques are highly effective but their reversibility is poor.

167. Answer (4)

Hint: Reduces female foeticide

Sol.: The Medical Termination of Pregnancy (Amendment) Act, 2017, was enacted by the Government of India with the intention of reducing the incidence of illegal abortion and consequent maternal mortality and morbidity. It provides a legal framework for safe abortions in India.

168. Answer (4)

Hint: It is GnRH inhibitor

Sol.: During lactation, release of GnRH is disrupted, leading to decreased levels of LH and FSH that prevents ovulation.

Periodic abstinence is also known as the rhythm method. It is a natural contraceptive method in which the couples abstain from sexual intercourse during the fertile window.

169. Answer (3)

Hint: True for minipills

Sol.: Steroidal combined oral contraceptive pills inhibit ovulation and implantation as well as alter the quality of cervical mucus to prevent/retard entry of sperms. Pills are very effective with lesser side effects and are well accepted by the females.

- Spermicidal creams, jellies and foams are usually used along with condoms to increase their contraceptive efficiency.
- Multiload –375 is a copper releasing IUD. Cu ions suppress sperm motility and fertilising capacity of sperms.
- IUDs can be used as emergency contraceptives.
- Implant is not categorized as barrier method.

170. Answer (3)

Hint: Reproduction rate increases with increase in number of adults.

Sol.: Increased health facilities along with better living conditions had an explosive impact on population growth.

A rapid decline in death rate, MMR, IMR and increase in number of people in reproductive age group are propable reasons for the population growth in India.

171. Answer (4)

Hint: Eliminate the genetic disorders.

Sol.: Cleft palate is not a genetic disorder.

Amniocentesis can detect chromosomal abnormalities.

172. Answer (2)

Hint: Less than a year

Sol.: Lactational amenorrhea (absence of menstruation) method is based on the fact that ovulation and therefore the cycle do not occur during the period of intense lactation following parturition. Therefore, as long as the mother breastfeeds the child fully, chances of conception are almost nil. However, this method has been reported to be effective only upto a maximum period of six months following parturition.

173. Answer (1)

Hint: Calculate the day of ovulation

Sol.: For a human female having 28 days of menstrual cycle, fertile period ranges from day 10^{th} to 17^{th}. So, for a woman who has 38 days long menstrual cycle, ovulation will occur on the 24^{th} day (38 – 14 days), and fertile period will range from day 20^{th} to 27^{th}.

174. Answer (1)

Hint: LH and FSH are gonadotrophins.

Sol.: The primary action of steroidal oral contraceptive pills is to inhibit ovulation by suppressing the secretion of gonadotrophins from anterior pituitary.

Barrier contraceptives like cervical cap is a rubber nipple which is fitted over the cervix and is designed to remain there by suction. This device prevents the entry of sperms into the uterus.

175. Answer (4)

Hint: RCH programmes focus on improving maternal and child health.

Sol.: Improved programmes covering wider reproduction related areas are operated under the popular name RCH (Reproductive and Child Health Care) programmes. Providing support for building a reproductively healthy society, creating awareness among people about various reproduction related aspects are some of the major goals. Providing facilities for maintaining a good reproductive health is also one of the aims.

The primary role of providing education in India is played by the Ministry of Education.

176. Answer (2)

Hint: Nirodh is a popular brand.

Sol.:

Vault	Barrier method
Nirodh	Male condom
Implant	Placed under the skin
Lippes loop	Non-medicated IUD

177. Answer (2)

Hint: Prevents conception

Sol.: Contraceptive methods are not regular requirements for the maintenance of reproductive health.

Widespread usage of contraceptive methods have a significant role in checking uncontrolled growth of population.

An ideal contraceptive should not interfere with the libido of a person.

178. Answer (1)

Hint: Prevents implantation but not ovulation.

Sol.: Saheli, the new oral contraceptive for the females, contains a non-steroidal preparation. The contraceptive action of active ingredient in Saheli (called centchroman), causes asynchrony in preparing uterine lining necessary for implantation of blastocyst.

179. Answer (4)

Hint: 'X' is menarche.

Sol.: 'X' is menarche and 'Y' is menopause.

Most women experience a decline in bone mineral density after menopause due to reduced estrogen in blood.

The production of estrogen declines despite copious secretion of FSH and LH by anterior pituitary as the pool of remaining ovarian follicles becomes exhausted in both ovaries.

During menopause, when ovarian secretion of estrogen ceases, all female estrogens come from conversion of adrenal sex corticoids. FSH is in urine during menopause.

180. Answer (2)

Hint: Aim is to equip students with all the skills so that he/she can make informed choices about their sexual health.

Sol.: The goals of introducing sex education in schools are to:

1. Provide accurate and age-appropriate information.
2. Discourage children in believing myths about sex-related aspects.
3. Provide information to children about adolescence and related changes
4. Provide information about STIs.

❑ ❑ ❑

All India Aakash Test Series for NEET - 2026

TEST - 5 (Code-F)

Click here for Code-E Sol.

Test Date : 08/02/2026

ANSWERS

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

HINTS & SOLUTIONS

[PHYSICS]

1. Answer (4)

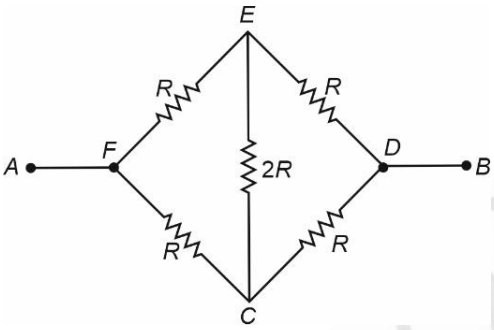
Hint: $v_d = \frac{e\tau}{m}\frac{V}{l}$

Sol.: As drift speed v_d is independent of diameter d, it will not change on doubling the diameter.

2. Answer (4)

Hint: Balanced Wheatstone bridge

Sol.:



It is a balanced Wheatstone bridge

$\therefore$ Current through part CE is zero

3. Answer (1)

Hint: Torque experienced by dipole $\vec{\tau} = \vec{P} \times \vec{E}$

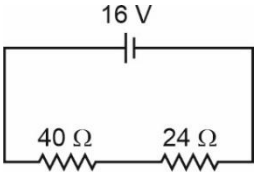
Sol.: Electric field due to dipole $\vec{P}_1$ is along the direction of dipole moment $\vec{P}_2$.

$\therefore \quad \tau_{\vec{P}_2} = 0$

4. Answer (3)

Hint: Use $V = IR$

Sol.: Current I through the circuit is



$$I = \frac{16}{64} = \frac{1}{4}\text{A}$$

$$V_{(40\Omega)} = \frac{1}{4} \times 40 = 10\,\text{V}$$

$\therefore$ Reading of voltmeter = 16 – 10 = 6 V

5. Answer (1)

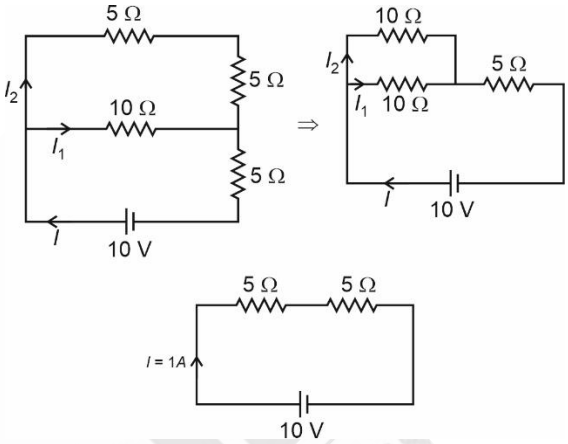
Hint & Sol.: Since both bulbs are connected in parallel and P.D. is 220 V.

$\therefore$ Bulb having more rated power glows brighter

6. Answer (1)

Hint: Use Kirchhoff's Junction rule $I = I_1 + I_2$

Sol.:



$I = I_1 + I_2$

Also, $I_1 = I_2$

$\therefore \quad I = 2I_1$

$$I_1 = \frac{I}{2} = \frac{1}{2} = 0.5\,\text{A}$$

7. Answer (4)

Hint: Use $R_T = R_0(1 + \alpha\Delta T)$

Sol.: $R_T = R_0(1 + \alpha\Delta T)$

$1 = R_0(1 + 30\alpha)$ …(i)

$2 = R_0(1 + 100\alpha)$ …(ii)

$2 + 60\alpha = 1 + 100\alpha$

$$\frac{1}{40} = \alpha = 0.025^\circ\text{C}^{-1}$$

8. Answer (2)

Hint: In uniform electric field, acceleration of charge is also uniform.

Sol.: $a_y = \frac{q_E}{M} = \frac{1 \times 1}{0.4} = \frac{10}{4}\text{m s}^{-2}$

$$\Rightarrow v_y = a_y t = \frac{10}{4} \times 4 = 10\ \text{m s}^{-1}$$

$\therefore$ Speed of particle after 4 s = $\sqrt{v_x^2 + v_y^2}$

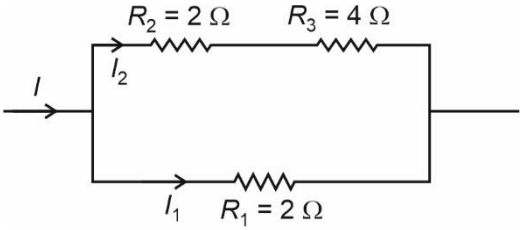
$= \sqrt{10^2 + 10^2}$

$= 10\sqrt{2}\ \text{m s}^{-1}$

9. Answer (2)

Hint: Heat produced $H = I^2Rt$

Sol.:



Heat produced per unit time

$H = I^2R$

$72 = I_1^2(2)$

Also, $I_1 = 6$ A

$I_2 6 = I_1(2)$

$I_2 = 2$ A

Heat produced in $R_3 = I_2^2R_3t$

$= (2)^2(4) = 16$ J

10. Answer (1)

Hint: Resistivity at temperature T $\rho_T = \rho_0(1+\alpha\Delta T)$

Sol.: Metals or conductor have positive temperature coefficient of resistivity or resistance, hence resistivity increases with increase in temperature.

11. Answer (3)

Hint: Use $\frac{1}{R_P} = \frac{1}{R_1} + \frac{1}{R_2}$, $R = \frac{\rho l}{A}$

Sol.: $\frac{1}{R_P} = \frac{1}{R_1} + \frac{1}{R_2}$

$\frac{2A}{\rho_{eq}L} = \frac{A}{\rho_1 L} + \frac{A}{\rho_2 L}$

$\rho_{eq} = \frac{2\rho_1\rho_2}{\rho_1 + \rho_2}$

12. Answer (3)

Hint: Use $I = \frac{E_1 - E_2}{r_1 + r_2 + R}$

Sol.: $I = \frac{10-5}{1+2+7} = \frac{5}{10} = 0.5$ A

$V_{PQ} = 0.5(7) = 3.5$ V

13. Answer (2)

Hint: Use $I = neAV_d$

Sol.: $V_d = \frac{I}{neA} = \frac{100}{10^{30} \times 1.6 \times 10^{-19} \times 10^{-6}}$

$= 6.25 \times 10^{-4}$ m/s

14. Answer (3)

Hint: $P_{output} = \frac{V_{applied}^2}{R}$

Sol.: $P_0 = \frac{V^2}{R}$

$R = \frac{220 \times 220}{100} = 22 \times 22$

New power = $\frac{V_{applied}^2}{R} = \frac{110 \times 110}{22 \times 22} = 25$ W

15. Answer (3)

Hint: Use $E_{equivalent} = \frac{E_1 r_2 + E_2 r_1}{r_1 + r_2}$, $r_{eq} = \frac{r_1 r_2}{r_1 + r_2}$

Sol.: $E_{equivalent} = \frac{E_1 r_2 + E_2 r_1}{r_1 + r_2} = \frac{8(0.5) + 6(0.5)}{1}$

$= 7$ V

$R_{eq} = \frac{r_1 r_2}{r_1 + r_2} = \frac{0.5(0.5)}{1} = 0.25\,\Omega$

Current I through $10\ \Omega = \frac{7}{R_{eq} + 10}$

$= \frac{7}{10.25}$ A

Potential difference across $10\ \Omega$

$V = IR$

$V = \frac{7}{10.25} \times 10 = 6.8$ V

16. Answer (1)

Hint: Use balanced Wheatstone bridge principle.

Sol.: $\frac{R_1}{R_2} = \frac{30}{70} = \frac{3}{7}$

and

$\frac{R_1}{\frac{R_2 10}{R_2 + 10}} = \frac{40}{60} = \frac{2}{3}$

$\frac{R_1}{R_2}\left(\frac{R_2 + 10}{10}\right) = \frac{2}{3}$

$\frac{R_2 + 10}{10} = \frac{2}{3} \times \frac{7}{3} = \frac{14}{9} \Rightarrow R_2 = \frac{50}{9}\ \Omega$

$R_1 = \frac{50}{21}\ \Omega$

17. Answer (4)

Hint: $E_{net} = (n - 2m)E$,

$r_{eq} = nr$

Where n are total cells and m are wrongly connected.

Sol.: $E_{net} = (10 - 4)E = 6 \times 2 = 12$ V

$r_{eq} = 10(0.2) = 2\ \Omega$

$R_{total} = 2 + 4 = 6\ \Omega$

$$I = \frac{E_{eq}}{R_T} = \frac{12}{6} = 2 \text{ A}$$

18. Answer (2)

Hint: Use balanced Wheatstone bridge condition

Sol.: $\frac{P}{Q} = \frac{S}{289}$ …(1)

After interchanging P and Q, $\frac{Q}{P} = \frac{S}{289 + 35}$

$$\frac{Q}{P} = \frac{S}{324} \quad \text{…(2)}$$

Multiplying (1) and (2)

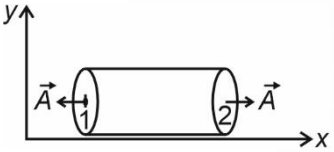
$$\frac{P}{Q} \times \frac{Q}{P} = \frac{S}{289} \times \frac{S}{324} \Rightarrow S = 17 \times 18 = 306\ \Omega$$

19. Answer (3)

Hint: Flux $\phi = \int \vec{E} \cdot d\vec{A}$

Sol.: Electric flux through curved surface is zero ($\vec{E} \perp$ curved surface area)

Hence flux will be through circular cross sections only



$\phi_{net} = \phi_2 - \phi_1 = \pi r^2[3x - x]$

$= 2x\pi r^2$

20. Answer (1)

Hint: Total flux through closed surface = $\frac{q_{enclosed}}{\varepsilon_0}$

Sol.: Dipole has a combination of equal and opposite charge placed at a separation.

$\therefore$ (q_T)enclose = 0

$\therefore$ $\phi = 0$

21. Answer (2)

Hint: $C_{medium} = KC_{air}$

Sol.: 110 μF = 5.5 C_{air}

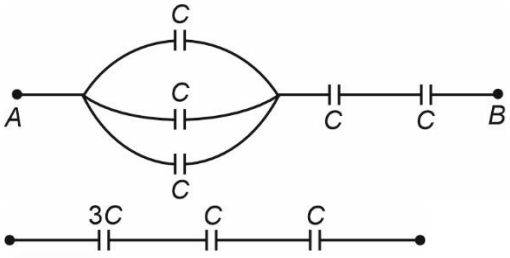
20 μF = C_{air}

22. Answer (3)

Hint: $C_{series} = \frac{C_1 C_2}{C_1 + C_2}$

$C_{parallel} = C_1 + C_2$

Sol.: Given circuit can be rearranged as



$$\frac{1}{C_{AB}} = \frac{1}{3C} + \frac{1}{C} + \frac{1}{C}$$

$$\frac{1}{C_{AB}} = \frac{1 + 3 + 3}{3C}$$

$$C_{AB} = \frac{3C}{7}$$

23. Answer (2)

Hint: Potential energy of an electric dipole in uniform external electric field.

$(U) = -\vec{P} \cdot \vec{E}$

Sol.: $U = -PE\cos\theta$ (for $\cos 0^\circ = 1$)

$U_{min} = -PE$ means stable equilibrium state.

24. Answer (2)

Hint: Use Gauss's law $\oint \vec{E} \cdot \vec{dA} = 0 = \frac{q_{enc}}{\in_0}$

Sol.: $\oint \vec{E} \cdot \vec{dA} = 0$ for the closed surface means $q_{enc} = 0$, irrespective of the presence of other point charges present outside the closed gaussian surface.

25. Answer (3)

Hint: Electric field due to point charge, $\vec{E} = \frac{kq(\vec{r} - \vec{r}_0)}{|\vec{r} - \vec{r}_0|^3}$

Sol.: $\vec{E} = \frac{9 \times 10^9 \times 3 \times 10^{-9}\left[\sqrt{2}\hat{i} + \hat{j}\right]}{\left(\sqrt{\left(\sqrt{2}\right)^2 + (1)^2}\right)^3}$

$$= \frac{27\left(\sqrt{2}\hat{i} + \hat{j}\right)}{3^{3/2}} = \sqrt{27}\left(\sqrt{2}\hat{i} + \hat{j}\right)$$

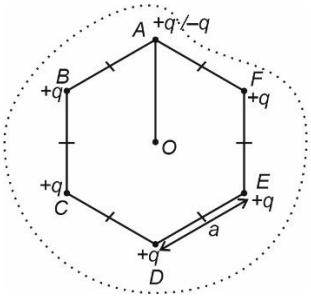
$$= 3\sqrt{3}\left(\sqrt{2}\hat{i} + \hat{j}\right)$$

$$= \left(3\sqrt{6}\hat{i} + 3\sqrt{3}\hat{j}\right) \text{N/C}$$

26. Answer (3)

Hint: Apply superposition principle of electric field

Sol.:



Place $+q$ and $-q$ at A. Net electric field is due to $-q$ at A

$\vec{E} = \frac{kq}{q^2}$ along OA

27. Answer (4)

Hint: Use $q = CV$

Sol.:

$q_{total} = C_{eq}V = 4\ \mu F \times 6\ V$

$= 24\ \mu C$

$q_1 = C_1V = 2\ \mu F \times 6V = 12\ \mu C$

$q_2 = q_3 = 2\ \mu F \times 6 = 12\ \mu C \ \therefore \frac{q_1}{q_2} = 1$

28. Answer (4)

Hint: Use $q = CV$ and $V = V_1 + V_2 + V_3$

Sol.: $q_1 = 30\,\mu F \times 50\,V = 1500\,\mu C$

$q_2 = 40\,\mu F \times 50\,V = 2000\,\mu C$

$q_3 = 50\,\mu F \times 50\,V = 2500\,\mu C$

$q_{max} = 1500\,\mu C$ allowed in C_1, C_2, C_3

$V = \frac{q}{C_1} + \frac{q}{C_2} + \frac{q}{C_3}$

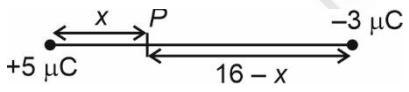
$= 50\ V + 37.5\ V + 30\ V = 117.5\ V$

29. Answer (4)

Hint: Electric potential due to point charge $V = \frac{kq}{r}$

Sol.:

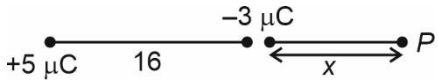
Case-i



$V_P = \frac{K5\,\mu C}{x} + \frac{K(-3\,\mu C)}{16-x} = 0$

$\frac{5}{x} = \frac{3}{16-x} \Rightarrow 80 - 5x = 3x \Rightarrow x = 10\,cm$

Case-ii



$V_P = \frac{K(-3)}{x} + \frac{K5}{16-x} = 0$

$\frac{3}{x} = \frac{5}{16+x} \Rightarrow 48 + 3x = 5x$

$\frac{48}{2} = x = 24\,cm$

30. Answer (3)

Hint: Use $U = \frac{1}{4\pi \in_0} \times \frac{q_1q_2}{r}$

Sol.: $U = \frac{1}{4\pi \in_0} \times \frac{q_1q_2}{r}$

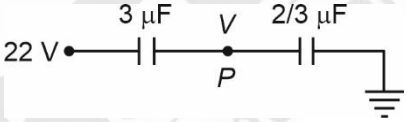
$U = \frac{9\times10^9 \times 5\times10^{-6} \times (-2)\times10^{-6}}{20\times10^{-2}}$

$= -45 \times 10^{-2}\ J = -0.45\ J$

31. Answer (2)

Hint: Charge on each capacitor remains same in series combination.

Sol.:



$Q_1 = Q_2$

$3(22 - V) = \frac{2}{3}(V = 0)$

$V = \frac{(3\,\mu F)(22) + \left(\frac{2}{3}\mu F\right)(0)}{3 + \frac{2}{3}\mu F}$

$= \frac{3\times22}{11} \times 3 = 18\,V$

32. Answer (2)

Hint: Common potential $V = \frac{C_1V_1 + C_2V_2}{C_1 + C_2}$

Sol.: $V = \frac{C_1V_1 + C_2V_2}{C_1 + C_2}$

$= \frac{(10\,\mu F)(200) + (20\,\mu F)(100)}{30\,\mu F}$

$= \frac{2000 + 2000}{30} = \frac{400}{3}\,V$

33. Answer (3)

Hint: Use $E = \frac{-dV}{dr}$

Sol.: $-\int_{x=5}^{x=0} E_x dx = \int_{v=0}^{v} dV$

$V - 0 = -10\int_{x=5}^{0} x\,dx$

$V = -10\left[\frac{x^2}{2}\right]_5^0 = -\frac{10}{2}[0-25]$

V = 125 V

34. Answer (3)

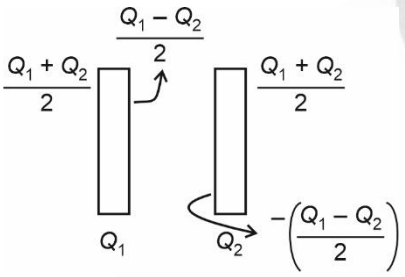
Hint: Properties of electrostatics of conductors.

Sol.: Electrostatic potential is constant throughout the volume of the conductor and has the same value (as inside) on its surface.

35. Answer (4)

Hint: Arrange charges appearing on faces of plates.

Sol.:



Charge of the capacitor $\frac{Q_1 - Q_2}{2}$ is responsible for electric field between the plates of the capacitor.

36. Answer (2)

Hint: Heat produced

$= \frac{1}{2}C_1V_1^2 + \frac{1}{2}C_2V_2^2 - \frac{1}{2}(C_1 + C_2)V^2$

Where V is common potential

Sol.: Common potential $V = \frac{C_1V_1 + C_2V_2}{C_1 + C_2}$

$= \frac{2(20) + 3(10)}{2 + 3} = 14$ V

Energy loss as heat

$= \frac{1}{2}\times 2\times(20)^2 + \frac{1}{2}\times 3\times(10)^2 - \frac{1}{2}\times 5\times(14)^2$

= (400 + 150 – 490) μJ = 60 μJ

37. Answer (1)

Hint: Terminal potential difference, $V = E - Ir$

Sol.: $V = E - Ir$

If I = 0, $V = E$ = 10 V

Also using $y = mx + c$

$V = -5I + 10$

$0 = -5I + 10$

I_{max} = 2 A

$0 = 10 - 2r \Rightarrow r = 5\ \Omega$

For maximum current through battery, load resistance is zero, effectively creating a short circuit.

$I_{max} = \frac{E}{r} = \frac{10}{5} = 2$ A

38. Answer (1)

Hint: In charging state $V = E + Ir$

Sol.: $E_{equivalent}$ = (20 – 10 + 30 – 15) V

= 25 V

$r_{eq} = 5\ \Omega$

$I = \frac{25}{5} = 5$ A

V_{AB} = 10 + 5(2) = 20 V

39. Answer (4)

Hint: Use $I = neAv_d$

Sol.: $I_1 = I_2$

Current density $J = \frac{I}{A}$

$\because\ A_1 > A_2$

$\therefore\ J_1 < J_2$

Also $A_1v_1 = A_2v_2$

$\therefore\ v_1 < v_2$

40. Answer (2)

Hint: Use $I = neAv_d$ and $I = I_{P-} + I_{Q+}$

Sol.: $I = I_{P-} + I_{Q+}$

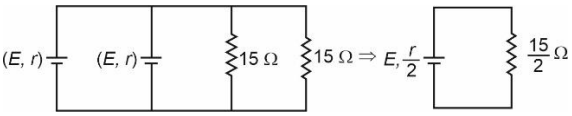
$= neAv + n2eA\frac{v}{3}$

$= \frac{5neAv}{3}$

41. Answer (3)

Hint: Use $V = IR$, $I = \dfrac{E_{eq.}}{r_{eq} + R_{eq}}$

Sol.:



$$I = \frac{E}{\frac{r}{2} + \frac{15}{2}}$$

$$1.8 = \frac{E}{\frac{r+15}{2}} \times \frac{15}{2} \Rightarrow r + 15 = \frac{4}{1.8} \times \frac{15}{2}$$

$r = 1.67\ \Omega$

42. Answer (3)

Hint: Energy stored in capacitor.

$$U = \frac{Q^2}{2C}$$

Sol.: $1.69\dfrac{Q^2}{2C} = \dfrac{(Q+x)^2}{2C}$

$$1.69 = \left(\frac{Q+x}{Q}\right)^2$$

$$1.3 = 1 + \frac{x}{Q}$$

$x = 0.3Q$

43. Answer (3)

Hint: Energy acquired by a charged particle when accelerated through potential difference V, $E = qV$.

Sol.: $E = \dfrac{1}{2}mv^2 = qV$

$$\Rightarrow \frac{1}{2} \times 1 \times 25 = 2 \times 10^{-2} \times V$$

$$\Rightarrow \frac{25 \times 10^2}{4} = V$$

$\Rightarrow V = 625$ volt

44. Answer (2)

Hint: When n electrons move out of a body then it acquired positive charge, $q = ne$.

Sol.: Let time required be t

$\therefore\ 10^{12}\, et = 0.2$

$$t = \frac{0.2}{10^{12} \times 1.6 \times 10^{-19}}$$

$$= \frac{0.2}{1.6} \times 10^7$$

$= 125 \times 10^4$ s

$= 1.25 \times 10^6$ s

45. Answer (4)

Hint: When switch S_1 is closed potential of conductor 1 becomes zero.

Sol.: Let charge on outer surface of inner shell is q'

Potential of inner shell

$$\frac{q'}{4\pi \in_0 R_1} + \frac{q_2}{4\pi \in_0 R_2} = 0$$

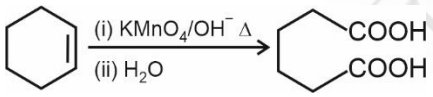
$$q' = \frac{-q_2 R_1}{R_2}$$

Hence, charge on outer surface of inner shell is non-zero

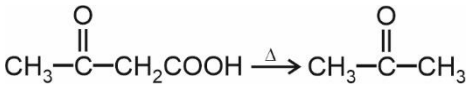
[CHEMISTRY]

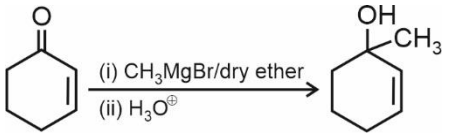
46. Answer (1)

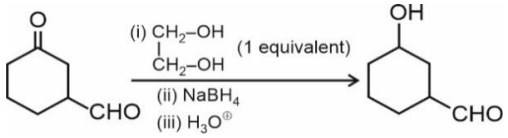
Hint:

(a) 

Sol.:

(b) 

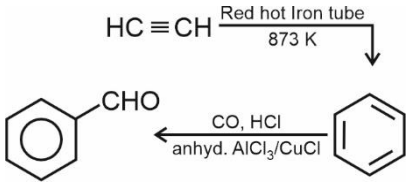
(c) 

(d) 

47. Answer (3)

Hint: Acetylene undergoes aromatisation reaction.

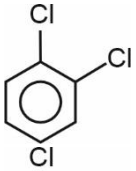
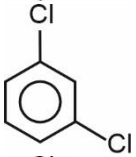
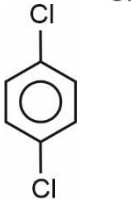
Sol.:



48. Answer (2)

Hint: Dipole moment of chloromethane is more than fluoromethane

Sol.:

	m.p/K
	256
	249
	323

49. Answer (1)

Hint: Ketones and aromatic aldehyde do not give Fehling's test.

Sol.: All the aldehydes give Tollens test but Ketones do not give Tollen's test.

50. Answer (2)

Hint & Sol.:

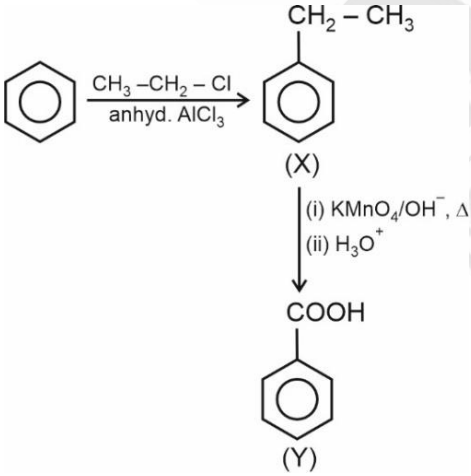
$$CH_4 + O_2 \xrightarrow[250°C,\ 100\ atm]{Cu}$$

$$\underset{(A)}{CH_3OH} \xrightarrow[300°C]{Cu} \underset{(B)}{HCHO}$$

51. Answer (3)

Hint: Reaction of alkyl substituted benzene with $H^+/KMnO_4$ is side chain oxidation.

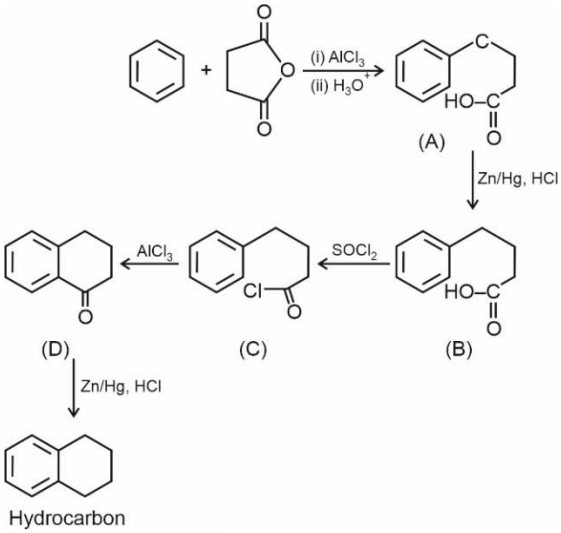
Sol.:



52. Answer (1)

Hint: Reaction of aldehyde or ketones with Zn/Hg, HCl is Clemmensen reduction.

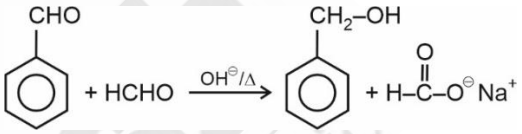
Sol.:



53. Answer (2)

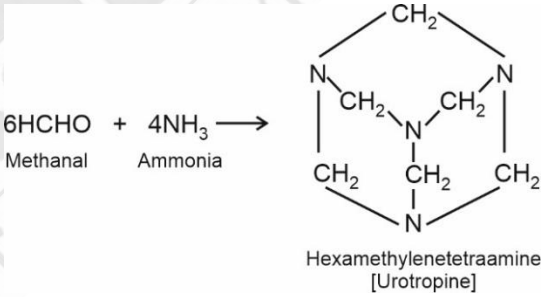
Hint: Carbonyl compound without α-hydrogen undergoes Cannizzaro reaction.

Sol.:



54. Answer (3)

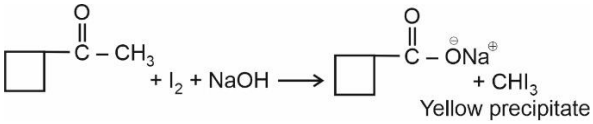
Hint & Sol.:



55. Answer (4)

Hint: Carbonyl compounds give positive 2, 4-DNP test. Ketone will not give Tollens and Fehling solution test.

Sol.:



56. Answer (1)

Hint:

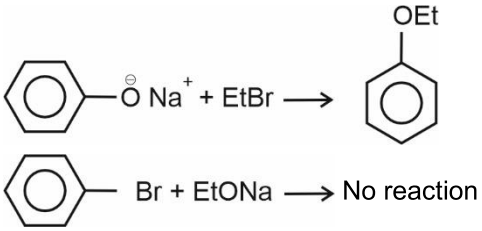
$$CO + 2H_2 \xrightarrow[\substack{200-300\,atm\\573-673K}]{ZnO-Cr_2O_3} CH_3OH$$

Sol.: The hydrogensulphite addition compounds of carbonyl group are water soluble.

57. Answer (3)

Hint: Williamson's synthesis is used to prepare mixed ethers as well as simple ethers.

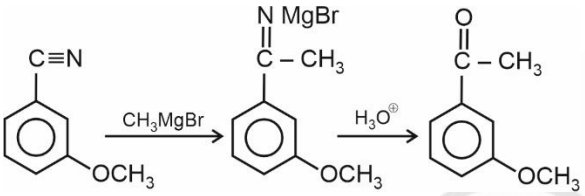
Sol.:



58. Answer (1)

Hint: Reaction with RMgX is nucleophilic addition reaction.

Sol.:



59. Answer (3)

Hint: Alcohols which form stable carbocation will react with Lucas reagent instantaneously.

Sol.: Tert-butyl alcohol will form most stable carbocation, therefore it will react instantaneously with Lucas reagent.

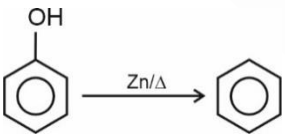
60. Answer (3)

Hint: The compounds/species having $(4n + 2)\pi$ electrons will obey Huckel's rule

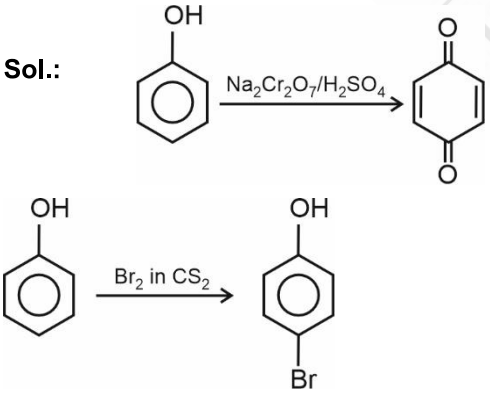
Sol.: (a), (b), (e) and (*f*) obey the Huckel's rule.

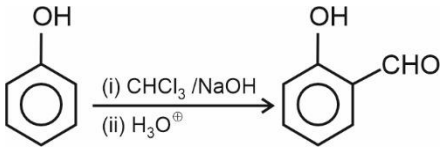
61. Answer (1)

Hint:



Sol.:





62. Answer (3)

Hint: Aldehydes are more reactive than ketones towards nucleophilic addition reaction.

Sol.: Electron donating group decreases the rate of nucleophilic addition reaction.

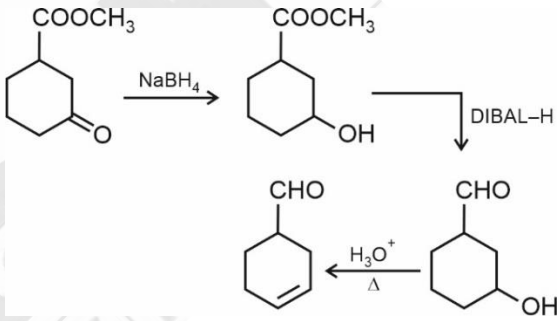
Therefore, correct order will be

c > a > b

63. Answer (3)

Hint: DIBAL – H converts ester into aldehyde.

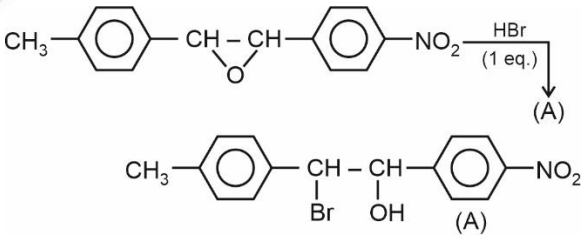
Sol.:



64. Answer (3)

Hint: Given reaction will follow S_N1 mechanism.

Sol.:



65. Answer (2)

Hint: Boiling point depends on the intermolecular force of attraction. More the force of attraction higher will be boiling point.

Sol.: Therefore, the correct order will be

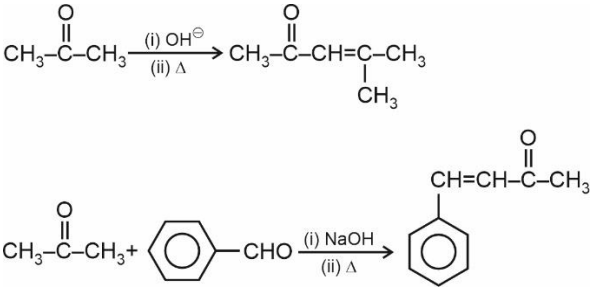
$CH_3CH_2CH_2COOH > CH_3CH_2CH_2CH_2OH >$

$CH_3CH_2CH_2CHO$

66. Answer (1)

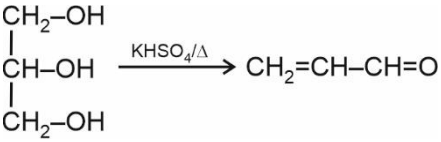
Hint: Carbonyl compounds with α–H can undergo aldol reaction in presence of strong base and heat.

Sol.: Given mixture will be giving cross aldol condensation products.



67. Answer (2)

Hint & Sol.:



68. Answer (3)

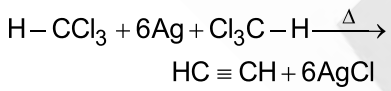
Hint: Due to electron donating effect of methyl group, acidic strength of cresol will be lower than phenol.

Sol.:

Acid	pKa
Phenol	10.0
o-cresol	10.2
m-cresol	10.1
p-cresol	10.2

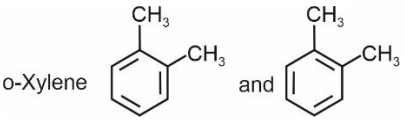
69. Answer (3)

Hint & Sol.:



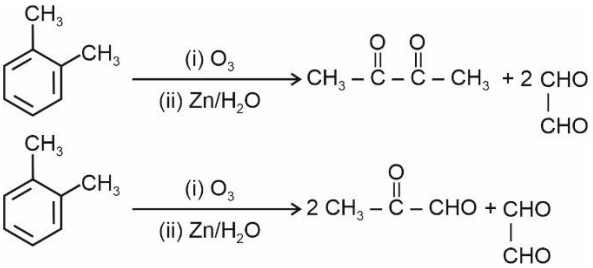
70. Answer (4)

Hint:



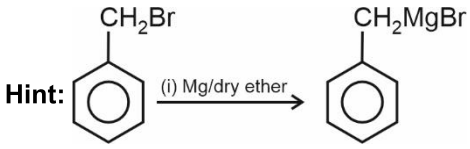
Will give different ozonolysis products.

Sol.:

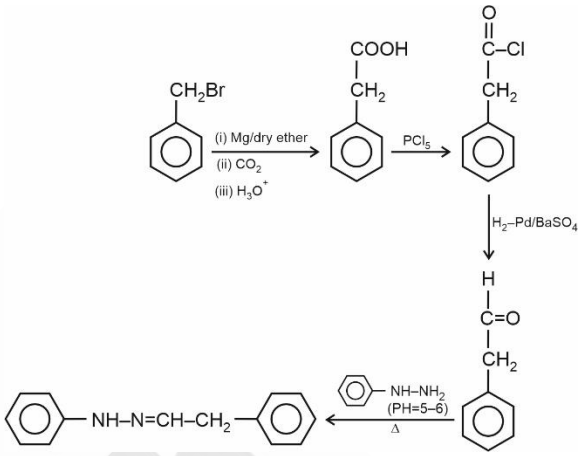


71. Answer (3)

Hint:



Sol.:



72. Answer (1)

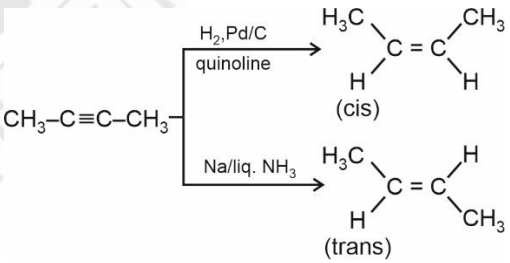
Hint: $CHCl_3 + HNO_3 \rightarrow CCl_3NO_2 + H_2O$

Sol.: Meso compounds are optically inactive and have plane of symmetry but contains chiral centres.

73. Answer (3)

Hint: Alkynes on reduction with sodium in liq. NH_3 give trans-Alkene as major product.

Sol.:

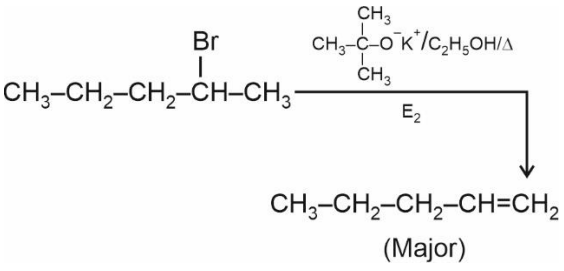


(cis and trans isomers are geometrical isomers)

74. Answer (3)

Hint: Bulky bases gives Hoffmann as the major produced in E_2 elimination reaction.

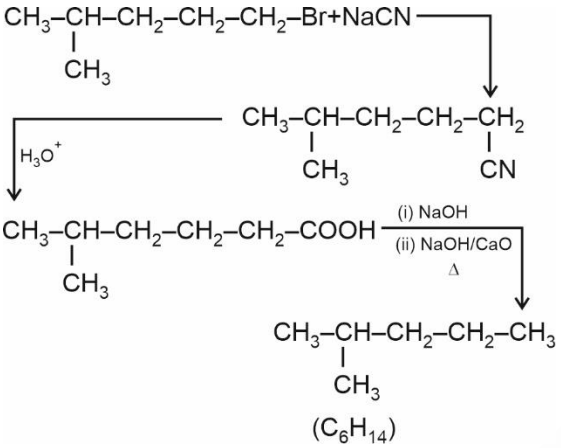
Sol.:



75. Answer (2)

Hint: Soda lime (NaOH – CaO) is used for decarboxylation of sodium salt of carboxylic acid.

Sol.:

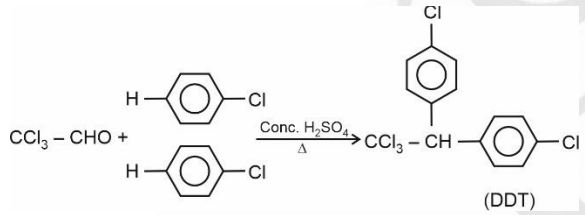


2-methylpentane gives 5 structural isomers on monochlorination.

76. Answer (1)

Hint: Chloral is $CCl_3 - CHO$.

Sol.:



- Freon 12(CCl_2F_2) is manufactured from CCl_4 by Swart reaction.

77. Answer (2)

Hint: For alkyl halides, rate of S_N2 reactions follow the order 1° > 2° > 3°

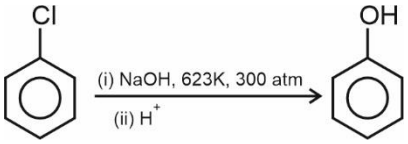
Sol.: $Br^{\ominus}$ is better leaving group than $Cl^{\ominus}$. The correct order of rate of S_N2 reaction will be

d > b > a > c

78. Answer (4)

Hint: $CH_3 - Br \xrightarrow[\text{ethanol}]{AgCN} CH_3NC$

Sol.:



79. Answer (1)

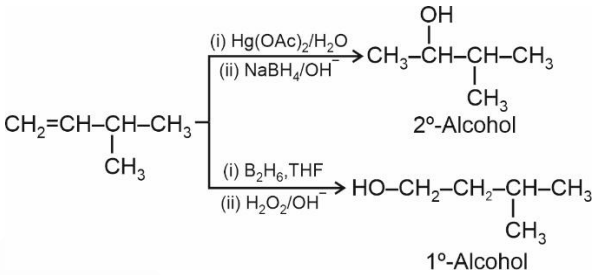
Hint: Reactivity of alkyl halides towards S_N1 reaction depends on the stability of carbocation.

Sol.: Therefore, correct order of reactivity will be 2-Bromo-2-methylbutane > 2-bromopentane > 1-bromopentane

80. Answer (4)

Hint: Hydroboration oxidation reaction of alkene proceeds with anti-Markovnikov addition.

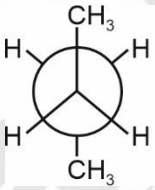
Sol.:



81. Answer (3)

Hint: Some of the confirmations of butane, which arise from rotation around $C_2 - C_3$ rotation bond, are anti, gauche, fully eclipsed and partially eclipsed.

Sol.: Anti conformation of butane is the most stable, due to minimum steric hindrance.

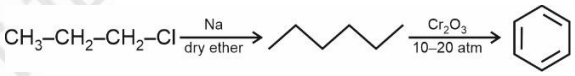


Anti form of n-butane

82. Answer (3)

Hint: Cr_2O_3/Al_2O_3 is used for aromatization of alkane.

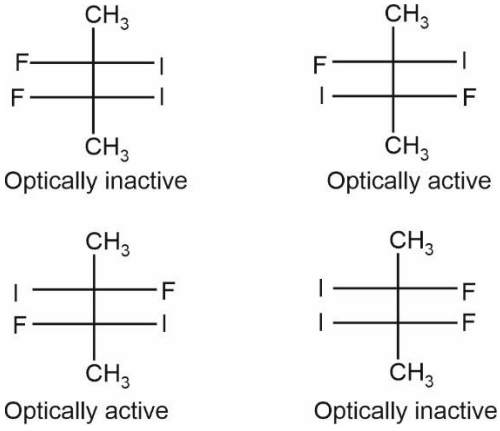
Sol.:



83. Answer (2)

Hint: Molecules with no POS and COS will be optically active.

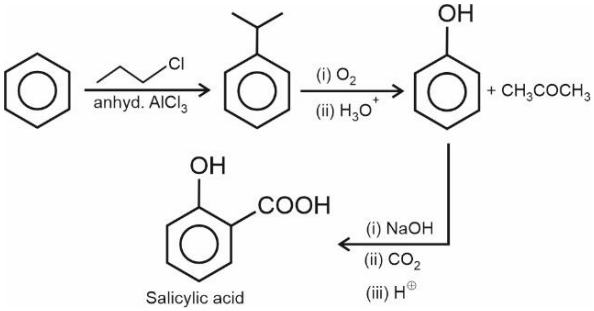
Sol.:



84. Answer (1)

Hint : Reaction of alkyl halide with benzene in presence of Lewis acid ($AlCl_3$) is Friedel-Crafts alkylation that proceeds with generation of carbocation.

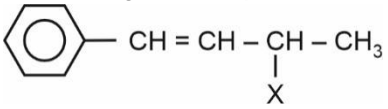
Sol.:



85. Answer (1)

Hint : $CH_2 = CH - CH_2 -$, is allyl group.

Sol.: The given compound

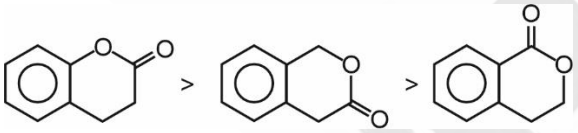


Is an example of allylic halides. As in this halogen is bonded to the sp^3 hybridised carbon atom next to the carbon - carbon double bond, which is called as allylic halides.

86. Answer (2)

Hint: Electron donating group increases the rate of EAS reaction.

Sol.: Therefore, correct order of rate of EAS reaction will be



87. Answer (1)

Hint: Electrolysis reaction occurs by free radical mechanism

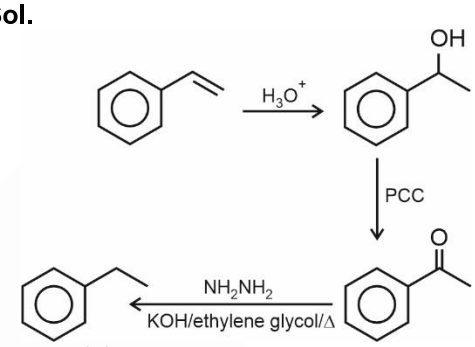
Sol.:

$$CH_3COONa + C_2H_5COONa \xrightarrow{\text{Electrolysis}} CH_3 - CH_3 + CH_3 - CH_2 - CH_2 - CH_3 + CH_3 - CH_2 - CH_3$$

88. Answer (2)

Hint: Alkenes react with water in presence of acid to give alcohols by following Markovnikov's rule.

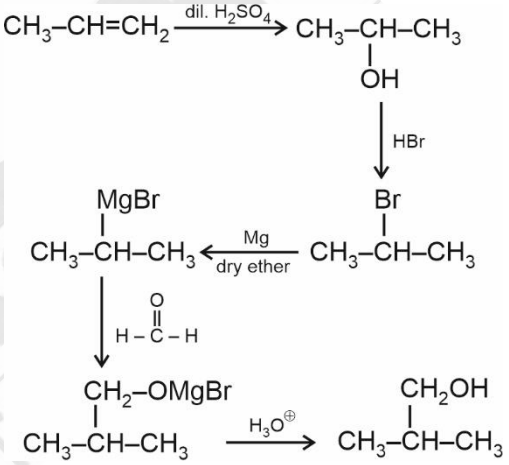
Sol.



89. Answer (1)

Hint: Hydration of alkene in acidic medium proceeds with carbocation formation.

Sol.:



90. Answer (2)

Hint: Given reaction is Hell-Volhard-Zelinsky reaction

Sol.:

$$CH_3COOH \xrightarrow[(ii)\ H_2O]{(i)\ Br_2/\text{Red phosphrus}} CH_2BrCOOH$$

[BOTANY]

91. Answer (3)

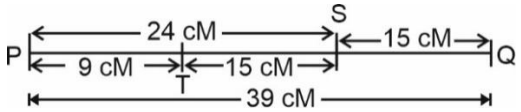
Hint: Vegetative cell is bigger with abundant food reserves.

Sol.: Generative cell is small and floats in the cytoplasm of vegetative cell. Vegetative cell has a large, irregularly shaped nucleus.

92. Answer (3)

Hint: The frequency of recombination between gene pairs is directly proportional to the distance between genes.

Sol.: The correct sequence of genes can be as follows:



93. Answer (2)

Hint: Endosperm is surrounded by aleurone layer (3n) in the seeds of monocots.

Sol.: Moth and *Yucca* plant cannot complete their life cycles without each other. The fruits are fleshy in guava, orange and mango and dry in groundnut and mustard.

94. Answer (2)

Sol.: In rice and wheat, pollen grains lose viability within 30 minutes of their release.

95. Answer (2)

Hint: Inversion is the change in the linear order of genes by rotating a section of chromosome by 180º.

Sol.: Translocation is shifting of a part of one chromosome to another.

96. Answer (3)

Hint: In a dihybrid cross, six recombinants are obtained in F_2 generation.

Sol.: The phenotypic ratio in F_2 generation in the given dihybrid cross will be 9 : 3 : 3 : 1.

97. Answer (2)

Hint: Parthenocarpy is the mechanism of production of seedless fruits without fertilisation.

Sol.: Apomixis is a special mechanism for seed production without fertilisation.

98. Answer (2)

Hint: Single gene product may produce more than one effect in pleiotropy.

Sol.: Phenylketonuria is a classic example of pleiotropy.

99. Answer (4)

Hint: Mendel selected 14 true-breeding pea plant varieties.

Sol.: Seven pairs of contrasting characters of pea plants were studied by Mendel.

100. Answer (3)

Hint: The law of dominance explains the ratio of 3 : 1, obtained in the F_2 generation.

Sol.: Law of dominance is not universally applicable.

101. Answer (2)

Hint: Due to the presence of an extra copy of X-chromosome, the affected individuals will have feminine development like gynaecomastia.

Sol.: Individuals inflicted with Klinefelter's syndrome, have an overall masculine development but are sterile.

102. Answer (3)

Hint: Only Hb^sHb^s (homozygous) individuals show the phenotype of sickle cell anaemia.

Sol.: Thalassemia differs from sickle-cell anaemia in that the former is a quantitative problem of synthesising too few globin molecules while the latter is a qualitative problem of synthesising an incorrectly functioning globin.

103. Answer (3)

Hint: Human skin colour is a polygenic trait.

Sol.: The effect of each allele is additive. The number of each type of alleles in the genotype would determine darkness or lightness of skin in an individual.

104. Answer (3)

Hint: Type of gametes can be calculated as 2^n, where 'n' is the number of heterozygous loci.

Sol.: In TtYYzzCcOO, the type of gametes will be 2^n, i.e., $2^2 \Rightarrow 4$

105. Answer (2)

Hint: Polyploidy is often seen in plants.

Sol.: A polygenic trait shows non-Mendelian inheritance pattern. Polydactyly is a dominant trait.

106. Answer (4)

Hint: Honey bees show haplodiploid sex-determination system.

Sol.: Male honey bee produces sperms by mitosis, where, drones are haploid and queens are diploid. Egg develops as a male (drone) by means of parthenogenesis.

107. Answer (2)

Hint: Sickle cell anaemia occurs due to point mutation.

Sol.: It is caused by the substitution of Glutamic acid (Glu) by Valine (Val) at the sixth position of beta globin chain of haemoglobin.

$$\text{mRNA} \left[\text{GAG} \rightarrow \text{GUG} \right]$$

108. Answer (2)

Hint: Flowers of snapdragon show incomplete dominance.

Sol.:

Parents : RR × Rr

↓

F_1 generation : $\underset{\text{Red}}{RR}$ $\underset{\text{Pink}}{Rr}$ $\underset{\text{Red}}{RR}$ $\underset{\text{Pink}}{Rr}$

So, 50% → Pink

50% → Red

Hence, the ratio of 1(red) : 1(pink) is obtained.

109. Answer (2)

Hint: Pericarp is a fruit wall that develops from the ovary wall.

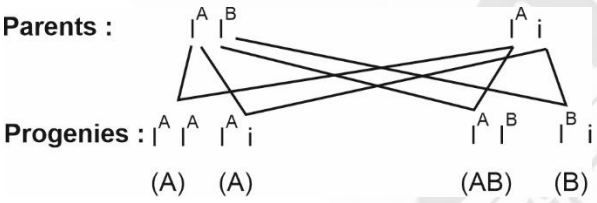
Sol.:

•	Micropyle	–	Allows the entry of oxygen and water into a seed
•	Hilum	–	Represents the junction between ovule and funicle
•	Filiform apparatus	–	Guides the entry of pollen tube into synergids

110. Answer (3)

Hint: When I^A and I^B are present together, they both express their own types of sugars.

Sol.:



In other options,

- **Parents :** $I^BI^B \times ii$

↓

Progenies: B, B, B, B

- **Parents :** $I^AI^A \times I^BI^B$

↓

Progenies : AB, AB, AB, AB

- **Parents:** $I^Bi \times I^AI^A$

↓

Progenies : I^AI^B, I^AI^B, I^Ai, I^Ai

(AB) (AB) (A) (A)

111. Answer (2)

Hint: *Drosophila* shows many types of hereditary variations that can be seen under a low power microscope.

Sol.: Fruit flies (*Drosophila*) have 4 pairs of morphologically distinct chromosomes and a short life cycle of 2 weeks.

112. Answer (4)

Hint: Recessive traits are expressed in homozygous condition only.

Sol.: Constricted pod shape, white flower colour, green seed colour are the recessive traits.

113. Answer (4)

Hint: In a typical test cross, an organism showing a dominant phenotype is crossed with the recessive parent, instead of self-crossing.

Sol.: [RrYy × rryy] represents the test cross.

114. Answer (3)

Hint: Two synergids and one egg are grouped together to form egg apparatus at the micropylar end.

Sol.: Castor and maize are monoecious plants, *i.e.,* they can prevent autogamy but not geitonogamy.

115. Answer (2)

Hint: Haemophilia and colour blindness are sex linked recessive disorders.

Sol.:

A.	Haemophilia	–	A single protein, that is a part of the cascade of proteins involved in clotting of blood is affected.
B.	Colour blindness	–	It occurs in about 8 percent of males and only about 0.4 percent of females
C.	Cystic fibrosis	–	Autosomal recessive disorder
D.	Turner's syndrome	–	Short stature and underdeveloped feminine character

116. Answer (4)

Hint: Mutation is a phenomenon which results in alteration of DNA sequences and consequently results in changes in genotype and phenotype of organism.

Sol.: UV radiation are mutagens that can cause/induce mutations. Analysis of traits in several of generations of a family is called pedigree analysis.

117. Answer (2)

Hint: *Drosophila* shows XX – XY type of sex determination.

Sol.: Birds show ZZ – ZW type of sex determination.

118. Answer (2)

Hint: Phenylketonuria is an autosomal recessive disorder.

Sol.: The affected individual lacks a liver enzyme called phenylalanine hydroxylase that converts phenylalanine into tyrosine.

119. Answer (4)

Hint: Endosperm is a product of triple fusion and develops from central cell of embryo sac.

Sol.: Endosperm can be starchy or proteinaceous in cereals. It is triploid and its development precedes embryo development.

120. Answer (3)

Hint: Sex determining mechanism in case of humans is of XY type.

Sol.: In each pregnancy, there is always 50% probability of either a male or a female child.

121. Answer (2)

Hint: Alfred Sturtevant used the frequency of recombination between gene pairs on the same chromosome as a measure of distance between genes and mapped their position on chromosome.

Sol.:

- Gregor Mendel – His work suggested that factors were discrete units. He could not provide any physical proof for the existence of factors or tell what they were made of.
- Walter Sutton – United the knowledge of chromosomal segregation with Mendelian principles and called it the chromosomal theory of inheritance.
- T.H. Morgan – Coined the term recombination.

122. Answer (4)

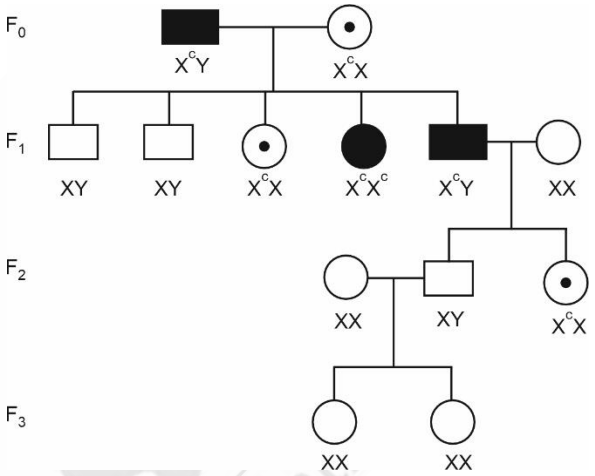
Hint: Embryo sac is formed by the process of meiosis in diploid tissue of ovule.

Sol.: Synergids, antipodals, polar nuclei and egg apparatus are haploid structures.

123. Answer (3)

Hint: Colour blindness shows criss-cross inheritance pattern, while phenylketonuria and thalassemia are autosomal recessive disorders.

Sol.:



This pedigree is true for sex-linked recessive disorders, not for autosomal recessive disorders. In F_3, all female progenies are normal (not carriers).

124. Answer (2)

Hint: Sporopollenin is absent at the germ pores in pollen grains.

Sol.: Pollen grains are well-preserved as fossils due to the presence of sporopollenin.

125. Answer (2)

Hint: Development of ovary into a fruit is a post fertilisation event.

Sol.: The correct sequence is as follows:

- Formation of MMC.
- Monosporic development.
- Characteristic distribution of cells within embryo sac.
- Fusion of a male gamete with two polar nuclei.
- Development of ovary into a fruit.

126. Answer (3)

Hint: Seeds are formed as a result of sexual reproduction. Sexual reproduction involves segregation of alleles.

Sol.: If seeds collected from hybrids are sown, the characters in the plant progeny will segregate and not maintain hybrid plant characters.

127. Answer (2)

Hint: Seeds of pea are not perispermic.

Sol.: Seeds of beet and black pepper have persistent nucellus called perisperm.

128. Answer (3)

Hint: Water-pollinated plants produce pollen grains with mucilaginous covering to prevent them from wetting.

Sol.: Wheat has feathery stigma, single ovule in each ovary and pollen grains are light and non-sticky and flowers are packed into inflorescence.

129. Answer (4)

Hint: Tapetum is the innermost layer of anther wall which surrounds the sporogenous tissue.

Sol.: Sporogenous tissue is a group of compactly arranged homogenous cells and occupies the centre of each microsporangium.

130. Answer (4)

Hint: Multiple allelism can be detected only in a population.

Sol.: Completely linked genes in a dihybrid cross show F_2 phenotypic ratio of 3 : 1.

131. Answer (2)

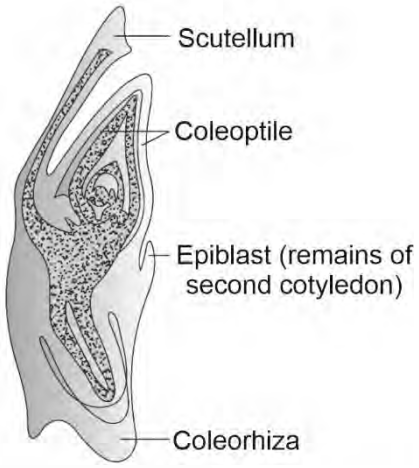
Hint: Not all aquatic plants use water for pollination.

Sol.: Water lily and water hyacinth are insect-pollinated plants.

132. Answer (2)

Hint: 'A' represents the cotyledon in grasses.

Sol.:



133. Answer (3)

Hint: In ovule, the cells of nucellus undergo megasporogenesis.

Sol.: Synergids have special cellular thickenings at micropylar tip called filiform apparatus, which guides the entry of pollen tube into one of the synergids, where male gametes are released.

134. Answer (2)

Hint: Sugarcane is a wind-pollinated plant.

Sol.: *Michelia* has multicarpellary, apocarpous gynoecium. Groundnut seeds are ex-albuminous, so they do not have persistent endosperm at maturity.

135. Answer (3)

Hint: In cleistogamous flowers, anthers and stigma lie close to each other and these flowers do not open at all.

Sol.: Papaya is a dioecious plant in which there is no chance of autogamy. So, it does not produce cleistogamous flowers.

[ZOOLOGY]

136. Answer (3)

Hint: Also known as embryoblast

Sol.: Immediately after implantation, the inner cell mass (embryo-blast) differentiates into an outer layer called ectoderm and an inner layer called endoderm. A mesoderm soon appears between the ectoderm and the endoderm.

Trophoblast (outer cell mass) forms extra-embryonic membranes which become the foetal part of placenta.

Inner cell mass contains stem cells.

137. Answer (1)

Hint: Associated with the anterior pituitary gland interstitial cell stimulating hormone (ICSH).

Sol.: LH is secreted by the anterior pituitary gland. This hormone acts on the Leydig cells (Interstitial cells). Under the influence of this hormone, interstitial cells synthesise and secrete testicular hormones called androgens.

138. Answer (4)

Hint: Equal to the number of ear ossicles present in one ear of a man.

Sol.: The male external genitalia (Penis) contains the urethra which is a passage for ejaculation of semen.

The distal end of the male external genitalia is called glans penis which is covered by a loose fold of skin called foreskin.

The male sex accessory glands include paired seminal vesicles, a prostate and paired Cowper's gland (Bulbourethral glands).

Erection of penis is achieved by blood flow across the special tissues present in it.

Secretion of bulbourethral glands does not help in erection of penis; it helps in lubrication of penis.

139. Answer (3)

Hint: 4 spermatozoa are formed by one meiotic division.

Sol.: 4 spermatozoa are formed by one meiotic division, so $63 \times 4 = 252$.

Thus, 63 meiotic divisions will be required to form 252 spermatozoa from one primary spermatocyte.

One ootid and two polar bodies are formed by one complete meiotic division, so, 252 meiotic divisions will form 252 ootids from one primary oocyte.

140. Answer (2)

Hint: Luteal phase has fixed number of days.

Sol.: The duration of luteal phase is of 14 days irrespective of the duration of menstrual cycle. Thus, in 38 days cycle $\Rightarrow 38 - 14 = 24$

24 days is the total duration of menstruation + proliferative phase.

141. Answer (3)

Hint: Primary follicles consist of primary oocyte.

Sol.: Ovarian stroma, which is covered by a thin epithelium, is divided into two zones-a peripheral cortex and an inner medulla.

Ovarian follicles are found in the cortex and consist of either primary or secondary oocyte in various stages of development. Primary oocyte is a diploid (2n) and secondary oocyte is a haploid (n) structure.

142. Answer (2)

Hint: Primary oocyte is formed during foetal life.

Sol.: The first polar body is formed along with the secondary oocyte in the ovary and the 2nd polar body is formed in the oviduct.

The reductional division during gametogenesis in females starts earlier than that of gametogenesis in males.

LH surge leads to the disintegration of Graafian follicle, but not endometrium.

In males, differentiation of gametes occurs after the completion of meiosis.

143. Answer (4)

Hint: Extra-testicular duct system starts with vasa efferentia.

Sol.: Rete testis are present inside the testis.

The seminiferous tubules of testis open into the vasa efferentia through rete testis. The vasa efferentia leave the testis and open into epididymis which leads to vas deferens.

144. Answer (2)

Hint: They are dizygotic twins.

Sol.: Fraternal twins, also called dizygotic twins, are twins that develop from two separate fertilized eggs and each egg is fertilised by a different sperm. They can be the twins with the same sex or different sexes and they do not necessarily look alike.

145. Answer (2)

Hint: Finger-like structure is called clitoris.

Sol.: Mons pubis is a cushion of fatty tissue covered by skin and pubic hair. The clitoris is a tiny finger-like structure which lies at the upper junction of two labia minora above the urethral opening.

146. Answer (4)

Hint: Secretory layer of uterus

Sol.: The wall of uterus has three layers of tissues. The external thin membranous layer called perimetrium, middle thick layer of smooth muscles called myometrium and inner glandular layer called endometrium that lines the uterine cavity. The endometrium undergoes cyclical changes during menstrual cycle while the myometrium exhibits strong contraction during delivery of the baby.

147. Answer (2)

Hint: Part next to the ampulla

Sol.: Each fallopian tube is about 10 – 12 cm long and extends from the periphery of each ovary to the uterus. The part closer to the ovary is the funnel-shaped infundibulum. The edges of the infundibulum possess finger-like projections called fimbriae, which help in ovum collection after ovulation. Infundibulum leads to ampulla. The last part of the oviduct, isthmus, has a narrow lumen and it joins the uterus.

148. Answer (3)

Hint: Corpus luteum is a temporary endocrine body.

Sol.: The edges of the fallopian tubes possess finger-like projections called fimbriae, which help in collection of secondary oocyte after ovulation. Sweeping movement of fimbriae is crucial for normal fertility in human females. If this will not occur, it can severely impact fertility of females by hindering the journey of secondary oocyte into fallopian tube.

Meiosis-II gets completed during fertilization.

If fertilization does not occur, the corpus luteum persists only upto 4 days before date of menstruation to be start.

149. Answer (3)

Hint: More than the number of external nostrils we have

Sol.: A large number of primary follicles degenerate during the phase from birth to puberty.

At puberty, only 60,000-80,000 primary follicles are left in each ovary. Tertiary follicle is characterised by a fluid-filled cavity called antrum.

Primary oocyte within the tertiary follicle grows in size and completes its first meiotic division.

150. Answer (2)

Hint: Menopause is cessation of menstruation.

Sol.: Menstruation begins at puberty and is called menarche. Menopause is cessation of menstruation.

During ovulation, the Graafian follicle ruptures and secondary oocyte is released.

151. Answer (3)

Hint: Include the hormone that is used to check pregnancy.

Sol.:

- Placenta secretes hCG, hPL, estrogen, progesterone and relaxin.
- Estrogen, progesterone and relaxin are also secreted by the ovary.

152. Answer (3)

Hint: Equal to the number of lumbar vertebrae in human.

Sol.: hCG, hPL and relaxin are produced in women only during pregnancy. In addition, during pregnancy, the level of other hormones like estrogen, progestogens, cortisol, prolactin, thyroxine, *etc.,* increases several-folds in the maternal blood.

153. Answer (4)

Hint: At the end of first trimester

Sol.: By the end of second month of pregnancy, the foetus develops limbs and digits. By the end of 12 weeks (first trimester), most of the major organ systems are formed, for example, the limbs and external genital organs are well-developed.

154. Answer (4)

Hint: Equal to the total number of ribs present in a human skeleton.

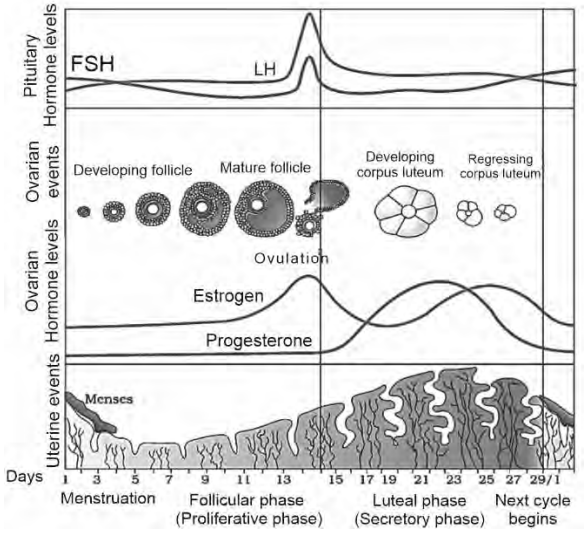
Sol.: For normal fertility, at least 60% sperms in an ejaculate must have normal shape and size and at least 40% of them must show vigorous motility. So, the percentage is

$$= \frac{60}{100} \times \frac{40}{100} = \frac{24}{100} \times 100 = 24\%$$

155. Answer (4)

Hint: A – LH
B – FSH
C – Estrogen
D – Progesterone

Sol.: Throughout the childhood, the ovaries remain inactive due to absence of both LH and FSH.



LH and FSH are water-soluble hormones, hence, both LH and FSH bind to the receptors present on the membrane of target cells (present in ovary) and stimulate the synthesis of estrogen.

During the follicular phase of the ovarian cycle, certain cells of follicles secrete estrogen which is an important female sex hormone.

FSH is responsible for follicular growth.

156. Answer (2)

Hint: Aim is to equip students with all the skills so that he/she can make informed choices about their sexual health.

Sol.: The goals of introducing sex education in schools are to:

1. Provide accurate and age-appropriate information.
2. Discourage children in believing myths about sex-related aspects.
3. Provide information to children about adolescence and related changes
4. Provide information about STIs.

157. Answer (4)

Hint: 'X' is menarche.

Sol.: 'X' is menarche and 'Y' is menopause.

Most women experience a decline in bone mineral density after menopause due to reduced estrogen in blood.

The production of estrogen declines despite copious secretion of FSH and LH by anterior pituitary as the pool of remaining ovarian follicles becomes exhausted in both ovaries.

During menopause, when ovarian secretion of estrogen ceases, all female estrogens come from conversion of adrenal sex corticoids. FSH is in urine during menopause.

158. Answer (1)

Hint: Prevents implantation but not ovulation.

Sol.: Saheli, the new oral contraceptive for the females, contains a non-steroidal preparation. The contraceptive action of active ingredient in Saheli (called centchroman), causes asynchrony in preparing uterine lining necessary for implantation of blastocyst.

159. Answer (2)

Hint: Prevents conception

Sol.: Contraceptive methods are not regular requirements for the maintenance of reproductive health.

Widespread usage of contraceptive methods have a significant role in checking uncontrolled growth of population.

An ideal contraceptive should not interfere with the libido of a person.

160. Answer (2)

Hint: Nirodh is a popular brand.

Sol.:

Vault	Barrier method
Nirodh	Male condom
Implant	Placed under the skin
Lippes loop	Non-medicated IUD

161. Answer (4)

Hint: RCH programmes focus on improving maternal and child health.

Sol.: Improved programmes covering wider reproduction related areas are operated under the popular name RCH (Reproductive and Child Health Care) programmes. Providing support for building a reproductively healthy society, creating awareness among people about various reproduction related aspects are some of the major goals. Providing facilities for maintaining a good reproductive health is also one of the aims.

The primary role of providing education in India is played by the Ministry of Education.

162. Answer (1)

Hint: LH and FSH are gonadotrophins.

Sol.: The primary action of steroidal oral contraceptive pills is to inhibit ovulation by suppressing the secretion of gonadotrophins from anterior pituitary.

Barrier contraceptives like cervical cap is a rubber nipple which is fitted over the cervix and is designed to remain there by suction. This device prevents the entry of sperms into the uterus.

163. Answer (1)

Hint: Calculate the day of ovulation

Sol.: For a human female having 28 days of menstrual cycle, fertile period ranges from day 10^{th} to 17^{th}. So, for a woman who has 38 days long menstrual cycle, ovulation will occur on the 24^{th} day (38 – 14 days), and fertile period will range from day 20^{th} to 27^{th}.

164. Answer (2)

Hint: Less than a year

Sol.: Lactational amenorrhea (absence of menstruation) method is based on the fact that ovulation and therefore the cycle do not occur during the period of intense lactation following parturition. Therefore, as long as the mother breastfeeds the child fully, chances of conception are almost nil. However, this method has been reported to be effective only upto a maximum period of six months following parturition.

165. Answer (4)

Hint: Eliminate the genetic disorders.

Sol.: Cleft palate is not a genetic disorder.

Amniocentesis can detect chromosomal abnormalities.

166. Answer (3)

Hint: Reproduction rate increases with increase in number of adults.

Sol.: Increased health facilities along with better living conditions had an explosive impact on population growth.

A rapid decline in death rate, MMR, IMR and increase in number of people in reproductive age group are propable reasons for the population growth in India.

167. Answer (3)

Hint: True for minipills

Sol.: Steroidal combined oral contraceptive pills inhibit ovulation and implantation as well as alter the quality of cervical mucus to prevent/retard entry of sperms. Pills are very effective with lesser side effects and are well accepted by the females.

- Spermicidal creams, jellies and foams are usually used along with condoms to increase their contraceptive efficiency.
- Multiload –375 is a copper releasing IUD. Cu ions suppress sperm motility and fertilising capacity of sperms.
- IUDs can be used as emergency contraceptives.
- Implant is not categorized as barrier method.

168. Answer (4)

Hint: It is GnRH inhibitor

Sol.: During lactation, release of GnRH is disrupted, leading to decreased levels of LH and FSH that prevents ovulation.

Periodic abstinence is also known as the rhythm method. It is a natural contraceptive method in which the couples abstain from sexual intercourse during the fertile window.

169. Answer (4)

Hint: Reduces female foeticide

Sol.: The Medical Termination of Pregnancy (Amendment) Act, 2017, was enacted by the Government of India with the intention of reducing the incidence of illegal abortion and consequent maternal mortality and morbidity. It provides a legal framework for safe abortions in India.

170. Answer (4)

Hint: Reversibility is very poor.

Sol.: Surgical intervention blocks gamete transport and thereby prevents conception. Sterilisation procedure in the male is called 'vasectomy' and that in the female, is called 'tubectomy'. In vasectomy, a small part of the vas deferens is removed or tied up through a small incision on the scrotum whereas in tubectomy, a small part of fallopian tube is removed or tied up through a small incision in the abdomen or through vagina. These techniques are highly effective but their reversibility is poor.

171. Answer (2)

Hint: More than 12 months

Sol.: Inability to conceive or produce children even after 2 years of unprotected sexual co-habitation is called infertility.

172. Answer (3)

Hint: Sex education is important in our country.

Sol.:

The people of age group 15 to 24 years are more prone to STIs.

Hepatitis-B, genital herpes and genital warts are not completely curable, even if detected early and treated properly.

Absence or less significant symptoms in the early stages of infection and the social stigma attached to STIs, deter the patient from going for timely detection and proper treatment.

Gonorrhoea and syphilis are bacterial STIs.

173. Answer (2)

Hint: Include the methods in which fertilization occurs in the mother's body.

Sol.: *In vitro* fertilisation followed by the transfer of embryo into the female genital tract is commonly known as the test tube baby programme. Ova from the female donor and sperms from the male donor are collected and are induced to form zygote under simulated conditions in the laboratory. The zygote or early embryo (with upto 8 blastomeres) could then be transferred into the fallopian tube (ZIFT) and embryo with more than 8 blastomeres, into the uterus (IUT) to complete the further development.

AI is artificial insemination. ICSI is intra-cytoplasmic sperm injection.

174. Answer (2)

Hint: After spermiogenesis, sperm head becomes embedded in the Sertoli cells.

Sol.: After spermiogenesis, sperm head becomes embedded in the Sertoli cells and are finally released from the seminiferous tubules by the process called spermiation.

175. Answer (3)

Hint: Transferred in uterus during IVF

Sol.: The embryo with 8 to 16 blastomeres is called a morula.

During embryonic development, the nuclear cytoplasmic ratio increases because the number of cells increases while the total cytoplasmic mass remains relatively constant. Cleavage increases the number of blastomeres, hence the DNA content increases but there is no increase in the overall size of embryo.

176. Answer (3)

Hint: Lactational amenorrhea

Sol.: Prolactin promotes milk synthesis and it is secreted by the mother's anterior pituitary gland.

The milk produced during the initial few days of lactation is called colostrum. It contains large amounts of IgA.

Oxytocin is the milk-ejecting hormone.

177. Answer (3)

Hint: Umbilical cord contains foetal blood vessels only.

Sol.: The actual connection between the placenta and embryo and later the foetus, is through the umbilical cord. It consists of two umbilical arteries and one umbilical vein. Only the blood of foetus flows through it.

178. Answer (3)

Hint: Mitochondria is arranged spirally in the middle piece.

Sol.:

Head	Possesses 23 highly condensed chromosomes
Middle piece	A spiral arrangement of mitochondria in this part provides ATP (Nebenkern)
Neck	Constricted region that contains centriole
Tail	Facilitates sperm motility

179. Answer (3)

Hint: hCG rescues corpus luteum.

Sol.: Regression of the corpus luteum leads to the onset of the next ovarian cycle in a non-pregnant human female.

Chorionic gonadotropin which has similar function as LH, can act on the corpus luteum to prolong its life in a gravid (pregnant) human female.

The corpus luteum typically persists for the first 10-12 weeks of pregnancy.

180. Answer (4)

Hint: Zona pellucida

Sol.: The zona pellucida (a glycoprotein layer) surrounding the ova, blocks the entry of additional sperms and prevents polyspermy. It helps in preventing ectopic pregnancy as it forms a protective layer around the early embryo.

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