



Student's Solution Copy [CODE - 27685]

NEET PATTERN TEST Brahmastra Semi Major Test-06 (New pattern)

13th NEET - Phase 12

KOTA

Date: 02-Mar-2025

Duration: 3 Hours

Max Marks: 720

Physics - Section A

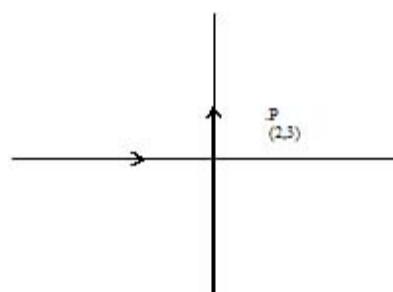
1. Answer: 4

Sol:

A stationary charge produces electric field only.

2. Answer: 3

Sol:



$$B_{\text{net}} = \frac{\mu_0 I}{2\pi(2)} - \frac{\mu_0 I}{2\pi(3)}, B_{\text{net}} = \frac{\mu_0 I}{12\pi} \otimes$$

3. Answer: 2

Sol:

$$\begin{aligned} \text{Power} &= \frac{\text{Energy}}{\text{Time}} = \frac{nh\nu}{t} \\ \Rightarrow \frac{n}{t} &= \frac{\text{Power}}{h\nu} = \frac{P\lambda}{hc} \\ \Rightarrow \frac{n}{t} &= \frac{2.2 \times 10^{-3} \times 5000 \times 10^{-10}}{6.6 \times 10^{-34} \times 3 \times 10^8} \\ &= \frac{5}{9} \times 10^{16} \text{ photons per second} \end{aligned}$$

4. Answer: 3

Sol:

$$\frac{1}{f} = \left[\frac{n_2}{n_1} - 1 \right] \left[\frac{1}{R_1} - \frac{1}{R_2} \right]$$

here; $n_2 = n_1 = 1.4$

$$\frac{1}{f} = 0$$

f = infinite.

5. Answer: 2

6. Answer: 3

Sol:

Sol:

$$\phi = E_0 a^2 (a^2)$$

Magnetic field.

$$\therefore q = \phi \epsilon_0$$

7. Answer: 1

8. Answer: 4

Sol:

Sol:

Both p and E increase

Water should be poured to a height h cm so that apparent shift in position of coin is 30 cm.

$$d_{\text{app}} = \frac{d}{\mu} = \frac{h}{(5/3)}$$

$$\text{Shift} = h - \frac{3h}{5} = 30$$

$$h = 75 \text{ cm}$$

9. Answer: 1

10. Answer: 4

Sol:

$$W = MB (\cos 50^\circ - \cos 360^\circ) = 0$$

Sol:

$$\text{We have P.E between two charges} = \frac{kq_1 q_2}{d_1}$$

applying law of conservation of energy

$$\Rightarrow \frac{kQQ}{d} = \frac{1}{2}mv^2 + \frac{1}{2}mv^2 + \frac{kQQ}{2d}$$

11. Answer: 1

Sol:

$$\text{We know, } eV_0 = hv - W$$

$$\therefore V_0 = \left(\frac{h}{e}\right)\nu = \frac{W}{e}$$

$$\text{Given, Slope} = 4.12 \times 10^{-15} \text{ Vs} = \frac{h}{e}$$

$$\therefore h = 4.12 \times 10^{-15} \text{ e}$$

$$= 4.12 \times 10^{-15} \times 1.6 \times 10^{-19}$$

$$= 6.592 \times 10^{-34} \text{ Js}^{-1}$$

12. Answer: 4

Sol:

$$i = 2r$$

$$\sin i \times n_1 = \sin r \times n_2$$

$$\sin i \times 1 = \sin \frac{i}{2} \times \sqrt{2n}$$

$$\frac{\sin i}{\sin \frac{i}{2}} = \sqrt{2n}$$

$$\frac{2 \sin \frac{i}{2} \cos \frac{i}{2}}{\sin \frac{i}{2}} = \sqrt{2n}$$

$$\cos \frac{i}{2} = \sqrt{\frac{n}{2}}$$

$$\frac{i}{2} = \cos^{-1} \left(\sqrt{\frac{n}{2}} \right)$$

$$i = 2 \cos^{-1} \left(\sqrt{\frac{n}{2}} \right)$$

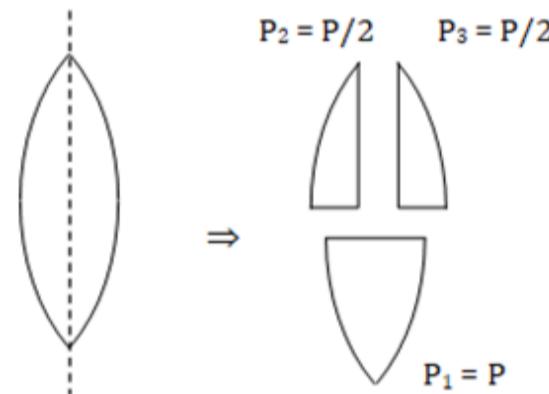
13. Answer: 4

Sol:

Remove 10Ω resistance as wheatstone is balanced.

14. Answer: 1

Sol:



15. Answer: 1

16. Answer: 1

Sol:

(i)

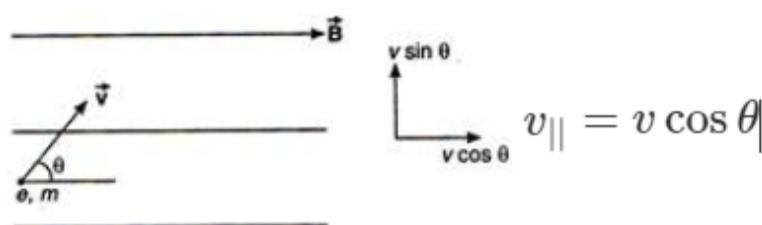
$$Q = \alpha t - \beta t^2 \Rightarrow I = \frac{dQ}{dt} = \alpha - 2\beta t = 0 \Rightarrow t = \frac{\alpha}{2\beta}$$

(ii) Total charge flow through the conductor

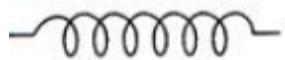
$$I = \frac{dQ}{dt} = \alpha - 2\beta t \Rightarrow \int dQ = \int_0^{\alpha/2\beta} (\alpha - 2\beta t) dt \Rightarrow Q = \frac{\alpha^2}{4\beta}$$

Sol:

If electron moves in a magnetic field at an angle θ (other than 0° , 180° or 90°), its velocity can be resolved in two components one along \vec{B} and another perpendicular to \vec{B} . Let the two components be $v_{||}$ and v_{\perp} . Then



and $v_{\perp} = v \sin \theta$. The component perpendicular to field (v_{\perp}) gives a circular path and the component parallel to field ($v_{||}$) gives a straight line path



The resultant path is, helix as shown in figure. The radius of this helical path is

$$r = \frac{mv_{\perp}}{eB} = \frac{mv \sin \theta}{eB} \text{ or } r = \frac{v \sin \theta}{(e/m)B}$$

$$v = 1 \times 10^3 \text{ m/s}, B = 0.3 \text{ T}, \theta = 30^\circ,$$

$$\frac{e}{m} = 1.76 \times 10^{11} \text{ C/kg}$$

$$\therefore r = \frac{1 \times 10^3 \sin 30^\circ}{1.76 \times 10^{11} \times 0.3} = \frac{1 \times 10^3 \times \frac{1}{2}}{1.76 \times 10^{11} \times 0.3} = 10^{-8} \text{ m}$$

17. Answer: 4**Sol:**

$$e = Bv(2r)$$

$$\text{Resistance} = \frac{\frac{R}{2} \times \frac{R}{2}}{R} = \frac{R}{4}$$

$$i = \frac{Bv(2r)}{R/4} = \frac{8Bvr}{R}$$

18. Answer: 4**Sol:**

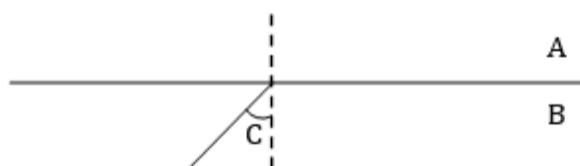
We know that

$$\mu = \frac{c}{v}$$

using this

$$\mu_A = \frac{3 \times 10^8}{2 \times 10^8} = 1.5$$

$$\mu_B = \frac{3 \times 10^8}{1.5 \times 10^8} = 2$$



For light going from B to A, For TIR to occur the angle of incidence must be greater than critical angle.

$$\mu_B \sin C = \mu_A \sin 90^\circ$$

$$2 \sin C = \frac{3}{2} \times 1$$

$$\Rightarrow \sin C = \frac{3}{4} \Rightarrow C = \sin^{-1} \frac{3}{4}$$

For TIR

$$\theta > C \Rightarrow \theta > \sin^{-1} \frac{3}{4}$$

19. Answer: 2**20. Answer: 2**

Sol:

$$P = \frac{V^2}{R} \text{ or } R = \frac{V^2}{P}$$

$$\therefore R_1 = \frac{V^2}{100} \text{ and } R_2 = R_3 = \frac{V^2}{60}$$

$$\text{Now, } W_1 = \frac{(250)^2}{(R_1+R_2)^2} \cdot R_1$$

$$W_2 = \frac{(250)^2}{(R_1+R_2)^2} \cdot R_2 \quad \text{and} \quad W_3 = \frac{(250)^2}{R_3}$$

$$W_1 : W_2 : W_3 = 15 : 25 : 64$$

$$\text{or } W_1 < W_2 < W_3$$

21. Answer: 3

Sol:

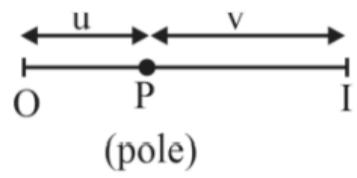


Image is virtual. So $m = -\frac{v}{u}$ is positive.

$$\Rightarrow m = +2$$

$$\Rightarrow -\frac{v}{-u} = 2 \Rightarrow v = 2u$$

Also distance between object and image is 15cm.

$$\text{i.e., } 3u = 15 \text{ cm} \Rightarrow u = 5 \text{ cm}$$

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

$$\Rightarrow \frac{1}{10} + \frac{1}{-5} = \frac{1}{f}$$

$$\Rightarrow \frac{1}{f} = -\frac{1}{10}$$

$$\Rightarrow f = -10 \text{ cm}$$

23. Answer: 2

Sol:

$$e = -M \frac{di}{dt} = -5 \times \frac{(-5)}{10^{-3}} = 25000V$$

25. Answer: 2

Sol:

$$\text{Let } \lambda_1 = 700 \text{ nm}, \beta_1 = 0.7 \text{ mm}$$

$$\lambda_2 = 500 \text{ nm}, \beta = ?$$

$$\therefore \text{fringe width } \beta = \frac{\lambda D}{d}$$

$$\frac{\beta_2}{\beta_1} = \frac{\lambda_2}{\lambda_1}$$

$$\beta_2 = \frac{500}{700} \times 0.7$$

$$\beta_2 = 0.5 \text{ mm}$$

27. Answer: 4

Sol:

about 10 A

Sol:

When rod AB starts its motion, current induces in it from A to B due to which rod experiences a magnetic force towards left which opposed motion of the rod. Hence $v < v_0$

22. Answer: 3

Sol:

$$\text{Charge, } Q = CV = 500 \times 10^{-6} \times 10 \\ = 5 \times 10^{-3} \text{ C}$$

$$\text{Now, } Q = qt \text{ or } t = \frac{Q}{q}$$

$$\text{or } t = \frac{5 \times 10^{-3}}{100 \times 10^{-6}} = \frac{1}{20} \times 100 = 50 \text{ s}$$

24. Answer: 4

Sol:

By theory of radioactivity.

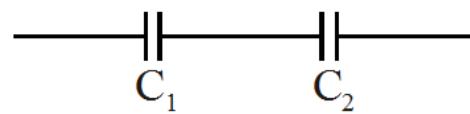
26. Answer: 1

Sol:

Use series n parallel combination.

28. Answer: 3

Sol:



Q_{\max} = maximum of $C_1 V_1$ and $C_2 V_2$

$$Q_{1 \max} = 40 \mu\text{C}$$

$$Q_{2 \max} = 36 \mu\text{C}$$

$$Q_{\max} = 36 \mu\text{C}$$

$$V = \frac{\frac{36}{C_1 C_2}}{\frac{C_1 + C_2}{C_1 + C_2}} = \frac{\frac{36}{4 \times 6}}{\frac{4+6}{4+6}} = \frac{360}{24} = 15 \text{ V}$$

29. Answer: 1

Sol:

$\therefore X_L = X_C$ so circuit is in resonance.

At resonance, $V_L - V_C = 0$

\therefore Reading of voltmeter = 0

At resonance, $Z = R = 30 \Omega$

$$\therefore I = \frac{V}{Z} = \frac{240}{30} = 8 \text{ A}$$

31. Answer: 4

Sol:

Given

$$D = 1 \text{ m}$$

$$\lambda = 600 \times 10^{-9} \text{ m}$$

$$n = 5$$

$$\text{As } y_{\text{nth}} = \frac{n\lambda D}{d}$$

$$\Rightarrow \frac{5 \times 600 \times 10^{-9} \times 1}{d} = 5 \times 10^{-2}$$

$$\Rightarrow d = \frac{5 \times 600 \times 10^{-9} \times 1}{5 \times 10^{-2}} = 60 \times 10^{-6} \text{ m}$$

$$\Rightarrow d = 60 \mu\text{m}$$

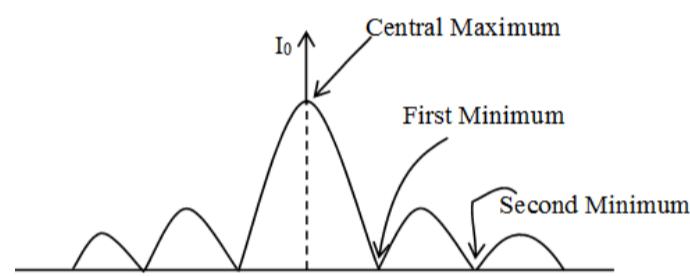
30. Answer: 4

Sol:

By theory

32. Answer: 4

Sol:



Given as : $\lambda = 600 \text{ nm} \Rightarrow 600 \times 10^{-9} \text{ m}$

$$a = 1 \text{ mm} = 10^{-3} \text{ m}$$

$$D = 2 \text{ m}$$

Distance between the first dark fringes on either side of the central bright fringe is also the width of central maxima.

$$\text{Width of central maxima} = \frac{2\lambda D}{a}$$

$$= \frac{2 \times 2 \times 6 \times 10^{-7}}{1 \times 10^{-3}} \Rightarrow 24 \times 10^{-4} \text{ m}$$

$$\Rightarrow 2.4 \text{ mm}$$

33. Answer: 1

34. Answer: 1

Sol:

Electric field in vector form can be written as

$$\mathbf{E} = \left(100 \cos 30^\circ \hat{i} + 100 \sin 30^\circ \hat{j} \right) \text{Vm}^{-1}$$

$$= \left(50\sqrt{3}\hat{i} + 50\hat{j} \right) \text{Vm}^{-1}$$

$$\mathbf{A} = (-2 \text{ m}, 0, 0)$$

$$\text{and } \mathbf{B} = (0, 4 \text{ m}, 0)$$

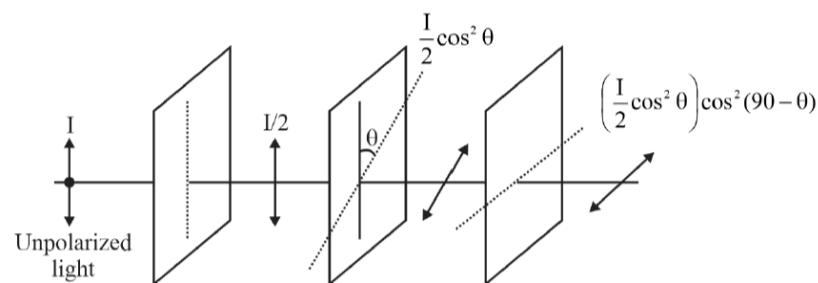
$$V_{BA} = V_B - V_A = - \int_A^B \mathbf{E} \cdot d\mathbf{r}$$

$$- \int_{(-2,0,0)}^{(0,4,0)} \left(50\sqrt{3}\hat{i} + 50\hat{j} \right) \cdot \left(dx\hat{i} + dy\hat{j} + dz\hat{k} \right)$$

$$- \left[50\sqrt{3}x + 50y \right]_{(-2,0,0)}^{(0,4,0)}$$

$$- 100(2 + \sqrt{3}) \text{ V}$$

35. Answer: 4

Sol:

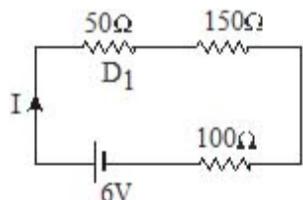
$$\text{Find output} = \frac{I}{2} \cos^2 \theta \sin^2 \theta = \frac{I}{8} (\sin 2\theta)^2$$

Clearly output is maximum for $\theta = 45^\circ$

37. Answer: 4

Sol:

Since D_2 is reverse biased no current flows through it.



The equivalent circuit is as shown in figure, in which the diode D_1 is replaced by its forward resistance 50Ω .

$$I = \frac{\text{emf}}{\text{effective resistance}} = \frac{6}{50+150+100} = 0.02 \text{ A}$$

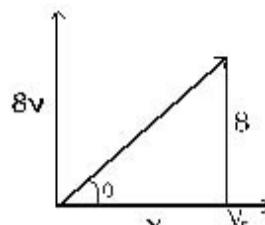
Sol:

From Given data

$$V_{\text{applied}} = 10 \text{ V}$$

$$V_C = 8 \text{ V}$$

$$V_R = ?$$



$$8^2 + x^2 = 10^2$$

$$x = 6 \text{ volt}$$

$$\theta = \tan^{-1} \left(\frac{4}{3} \right)$$

36. Answer: 2

Sol:

No current flows through grounded wire

$$\therefore I = \frac{V}{2R}$$

38. Answer: 3

Sol:

$$I_{\text{rms}} = 3 \text{ A}, V = 120 \text{ V}$$

$$P = 108 \text{ W}, f = 50 \text{ Hz}$$

$$P = I_{\text{rms}}^2 R = (3)^2 \times R = 108$$

$$R = \frac{108}{9} = 12 \Omega$$

39. Answer: 3

40. Answer: 2

Sol:

By KVL

$$V_A - \frac{q}{C} = V_B \dots \dots (i)$$

Here,

$$\begin{aligned} q &= C_{eq} \Delta V \\ &= \left(\frac{5 \times 15}{5+15} \right) \times 2000 \\ &= 7500 \mu\text{C} \end{aligned}$$

\therefore From equation (i)

$$2000 - \frac{7500}{5} = V_B$$

$$2000 - 1500 = V_B$$

$$500 = V_B$$

41. Answer: 3**Sol:**

Based on theory

43. Answer: 1**Sol:**

As we know that the displacement current is obtain by the changing electric field hence to obtain the changing electric field potential difference should be change with the time .

or

When potential difference between the plates of a capacitor changes with time then variable electric field is set up between the plates and this variable electric field gives rise to displacement current.

Sol:

At $t = 1 \text{ s}$, $I = 2 + 3 \times 1 = 5 \text{ A}$ and

$$|e| = L \frac{di}{dt} = 9 \times 10^{-3}$$

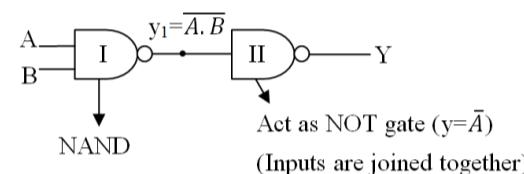
$$\Rightarrow L \times \frac{d}{dt} (2 + 3t) = 9 \times 10^{-3}$$

$$\Rightarrow L = 3 \times 10^{-3} \text{ H and}$$

$$u = \frac{1}{2} LI^2 = \frac{3 \times 10^{-3}}{2} (5)^2 = 37.5 \text{ mJ}$$

42. Answer: 3**Sol:**

Given logic gate represents OR gate

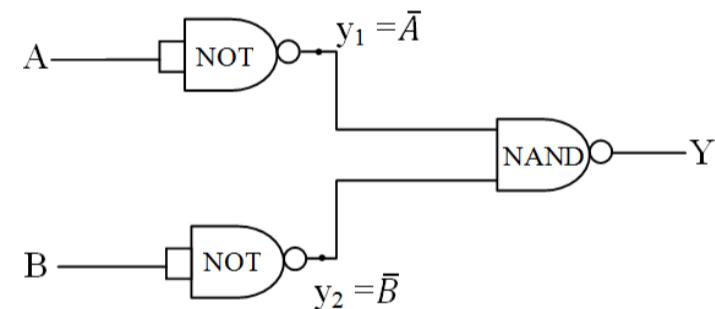
44. Answer: 1**Sol:**

$$Y = \bar{y}_1$$

$$= \overline{\overline{A} \cdot B}$$

$Y = A \cdot B$ Boolean expression for AND gate.

Now,



$$Y = \overline{\overline{y}_1 \cdot \overline{y}_2}$$

$$= \overline{\overline{A} \cdot \overline{B}}$$

$$= \overline{\overline{A}} \cdot \overline{\overline{B}} \quad [\text{According to De Morgan's law}]$$

$$Y = A + B$$

Boolean Expression for OR gate.

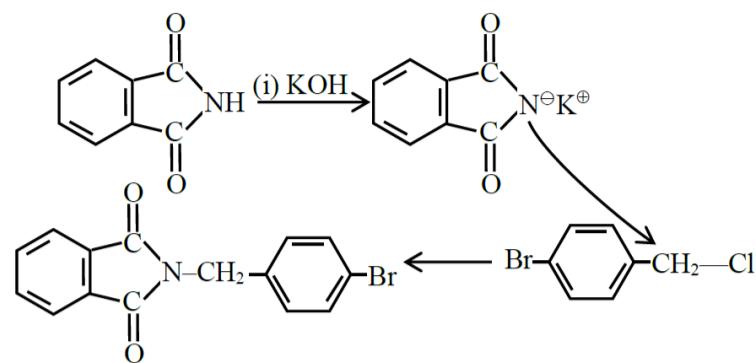
45. Answer: 4**Sol:**

A	B	Y
1	1	0
0	1	1
1	0	1
0	0	1

NAND gate is universal gate.

46. Answer: 1

Sol:



47. Answer: 1

Sol:

Salt which can act as a reducing agent will decolorize the pink solution of KMnO_4 (good oxidizing agent) so the ion should be an oxidizing agent

SO_3^{2-} Reducing agent

CO_3^{2-} NO_3^- HCO_3^- Oxidizing agent

49. Answer: 4

Sol:

Electronic configuration Co^{+3}

$\text{Co}^{+3} = 4\text{S}^0 \ 3\text{d}^6$

NH_3 strong ligand pairing possible

$\text{Co}^{+3} \Rightarrow \boxed{1\downarrow} \boxed{1\downarrow} \boxed{1\downarrow} \quad \boxed{} \quad \boxed{} \quad \boxed{}$

low spin complex and all electrons are paired

48. Answer: 4

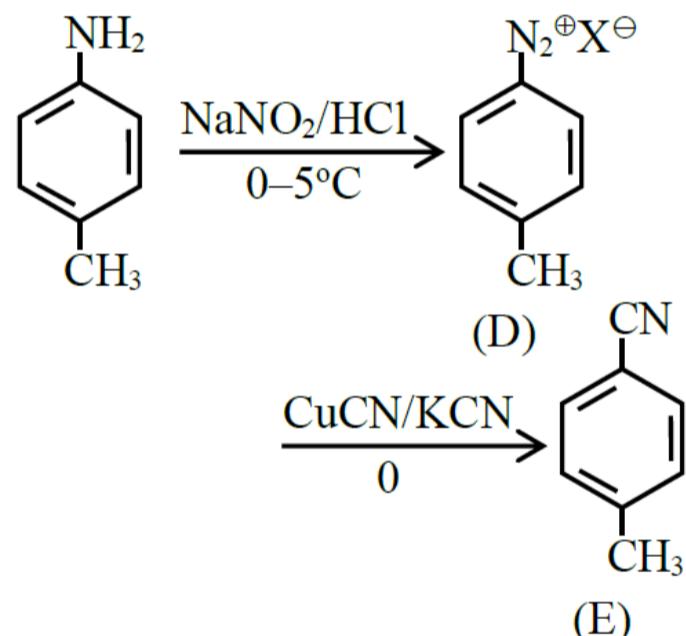
Sol:

$$t = \frac{2.303}{0.082} \log \frac{0.15}{0.03}$$

$$t = 19.6 \text{ min}$$

50. Answer: 1

Sol:



51. Answer: 1

Sol:

Out of Ti^{4+} , Cu^{2+} , Co^{3+} & Fe^{2+} only Ti^{4+} is diamagnetic with 3d^0 . Thus due to absence of d-electrons it is colourless.

52. Answer: 2

Sol:

$$C_t = \frac{C_0}{(2)^n}$$

$$(2)^n = \frac{800}{50} = 16$$

$$(2)^n = (2)^4$$

$$\text{So, } n = 4$$

$$4T_{1/2} = 200 \text{ sec}$$

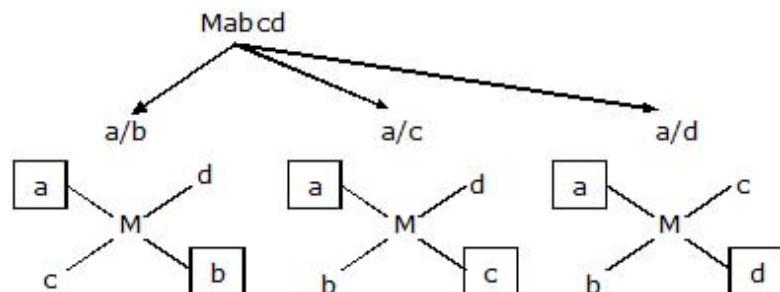
$$T_{1/2} = 50 \text{ sec}$$

$$K = \frac{0.693}{T_{1/2}} = \frac{0.693}{50} = 1.386 \times 10^{-2} \text{ sec}^{-1}$$

53. Answer: 4

54. Answer: 2

Sol:



⇒ 3GI (But cis and trans are not defined)

55. Answer: 3

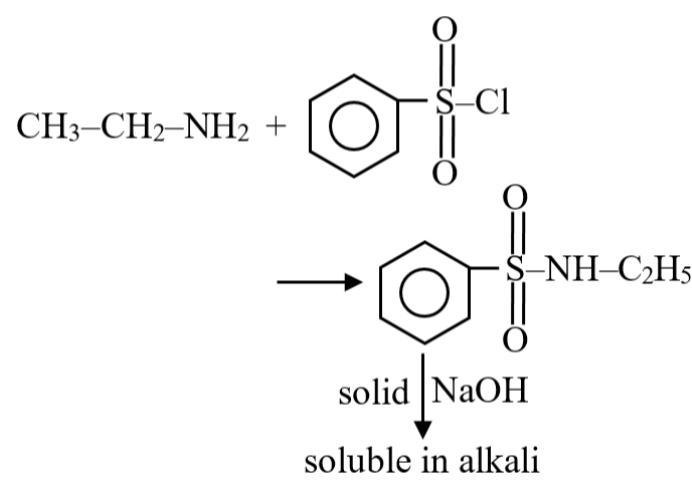
Sol:

- (a) Chromyl chloride test - CrO_2Cl_2
- (b) Rotten egg smell - H_2S
- (c) Suffocating smell - SO_2
- (d) Brown chocolate test of Cu^{2+} - $\text{K}_4[\text{Fe}(\text{CN})_6]$

57. Answer: 3

Sol:

1° amine reaction with Hinsberg's reagent to give a solid which dissolves in alkali.



56. Answer: 2

Sol:

For zero order

$$t = \frac{x}{K}$$

For completion $x = a$

$$t = \frac{a}{K}$$

58. Answer: 4

Sol:

Method-1

Given that

$$W_{\text{solute}} = 1.25 \text{ g}$$

$$W_{\text{solvent}} = 20 \text{ g}$$

$$\Delta T_f = T_f - T'_f = 273 - 271.94 = 1.06 \text{ K}$$

$$K_f = 1.86 \text{ K kg mol}^{-1}$$

We know,

$$MW_{\text{solute}} = \frac{K_f \times W_{\text{solute}} \times 1000}{\Delta T_f \times W_{\text{solvent}}} \dots\dots (1)$$

Put all the values in equation (1)

$$MW_{\text{solute}} = \frac{1.86 \times 1.25 \times 1000}{1.06 \times 20} \\ = 109.66 \text{ g/mole}$$

Method-2

$$\Delta T_f = K_f \times \frac{W_{\text{solute}} \times 1000}{M_{\text{wt solute}} \times W_2}$$

$$1.06 = \frac{1.86 \times 1.25 \times 1000}{W_{\text{wt}} \times 20}$$

$$W_{\text{wt}} = \frac{1.86 \times 1.25 \times 1000}{1.06 \times 20}$$

$$W_{\text{wt}} = 109.66 \text{ gm}$$

59. Answer: 4

Sol:

In Ti^{4+} , Cu^{2+} and Zn^{2+} , all have electrons paired so all are diamagnetic. Cr^{3+} with electron configuration $[\text{Ar}]^{18} 3\text{d}^3$ has three unpaired electrons. So it undergoes d-d transition of electrons in presence of ligands according to CFT and thus it is coloured.

60. Answer: 2

Sol:

$$\Delta T_b \propto$$

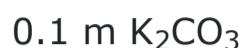


$$i=1+(n-1)\alpha$$

$\alpha=1$ for salt

$$n=2$$

$$i=2$$



$$i=1+(n-1)\alpha$$

$$n=3$$

$$\alpha=1$$

$$i=3$$

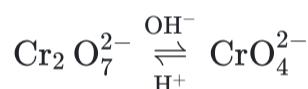
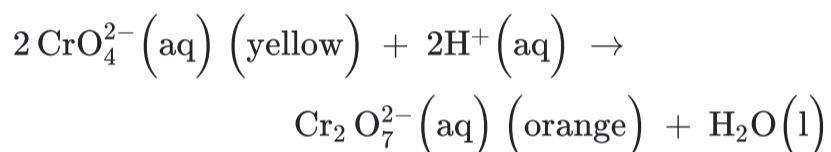
$$\Delta T_b \propto i m$$

So option (C) & (D) has low concentration that's why $\Delta T_b \downarrow$ boiling point is low comparatively from (A) & (B) concentration is same but (B) option (van't Hoff factor) is greater that's why having highest boiling point

61. Answer: 2

62. Answer: 3

Sol:



If we add OH^- in $Cr_2 O_7^{2-}$ this reaction will shift in right side because of Le-Chatelier's principle.

∴ RHS contains CrO_4^{2-} ions which will increase when base is added.

63. Answer: 3

64. Answer: 4

Sol:

Lawrencium (atomic no. = 103)

Electronic configuration $\rightarrow [Rn] 5f^{14} 6d^1 7s^2$

Sol:

We know that

$$\Delta T_b = K_f \times m$$

$$\Delta T_b = K_f \times \frac{W_s \times 1000}{M_s \times W_{\text{Solvent}}}$$

$$\left\{ \therefore m = \frac{W_s \times 1000}{M_s \times W_{\text{Solvent}}} \right\}$$

Given

$$\Delta T_b = 0.3^\circ\text{C}$$

$$W_s = 10 \text{ gm} ; M_s = 100 \text{ gram mol}^{-1}$$

$$W_{\text{Solvent}} = 100 \text{ gm}$$

$$\Delta T_b = \frac{K_f \times W_s \times 1000}{M_s \times W_{\text{Solvent}}}$$

$$K_f = \frac{\Delta T_b \times M_s \times W_{\text{Solvent}}}{K_f \times W_s \times 1000}$$

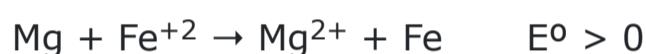
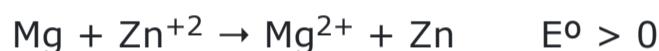
$$K_f = \frac{0.3 \times 100 \times 100}{10 \times 1000}$$

$$K_f = 0.3 \text{ K kg mol}^{-1}$$

65. Answer: 4

66. Answer: 3

Sol:

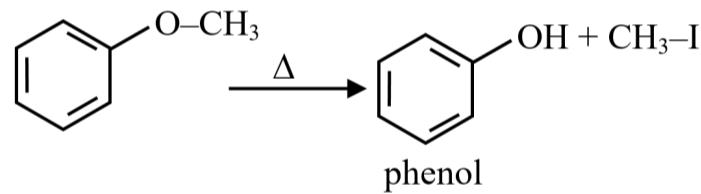


So, Mg can reduce both Zn^{2+} and Fe^{2+} .

67. Answer: 3

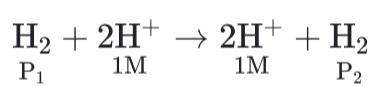
68. Answer: 1

Sol:



Sol:

cell reaction



$$E_{\text{cell}} = 0 - \frac{0.0591}{2} \log \left[\frac{P_2 \times 1}{P_1 \times 1} \right] > 0$$

$$\Rightarrow \log \left(\frac{P_2}{P_1} \right) < 0$$

$$\Rightarrow \frac{P_2}{P_1} < 1 \Rightarrow P_2 < P_1$$

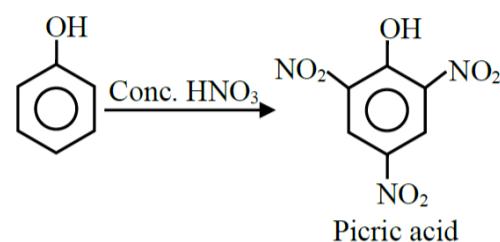
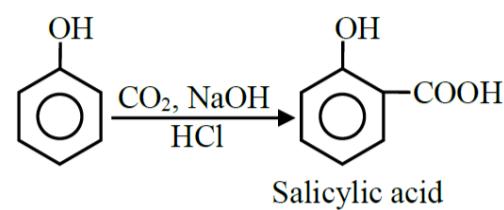
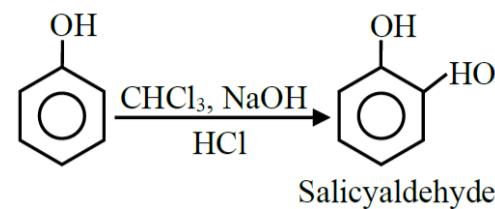
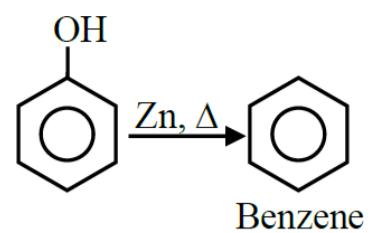
69. Answer: 4

70. Answer: 1

Sol:

Complexes with more chelation are more stable.

Sol:



71. Answer: 3

Sol:

$$pK_w = pH + pOH$$

$$pK_w = 14 \text{ (at } 25^\circ\text{C)}$$

$$14 = pH + 4$$

$$pH = 14 - 4 = 10$$

$$E_{red} = E^o - \frac{0.0591}{1} \log \frac{1}{[H^+]}$$

$$E_{red} = 0 - \frac{0.0591}{1} \log \frac{1}{10^{-10}} = -0.59$$

73. Answer: 2

Sol:

$$(Mol \times v.f) H_2 = 0.01 \times 2 \times 1$$

$$Mol \times 2 = 0.02$$

$$Mol = 0.01$$

$$V_{H_2} = 0.01 \times 22.4$$

$$\Rightarrow 0.224 \text{ L}$$

$$V_{H_2} \Rightarrow 224 \text{ ml}$$

$$(Mol \times 4) O_2 = 0.02$$

$$Mol = \frac{0.02}{4}$$

$$V_{O_2} = \frac{0.02}{4} \times 22400$$

$$\Rightarrow 112 \text{ ml}$$

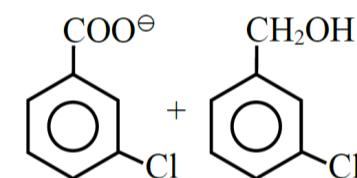
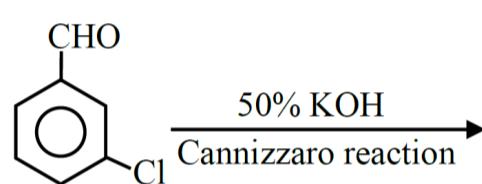
$$V = 224 + 112$$

$$= 336 \text{ ml}$$

75. Answer: 3

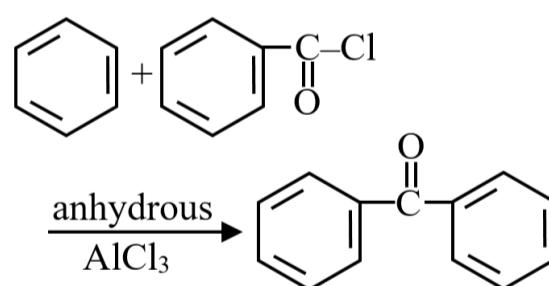
72. Answer: 2

Sol:



74. Answer: 4

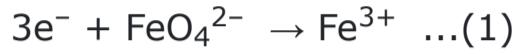
Sol:



76. Answer: 4

Sol:

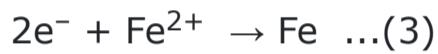
The reduction potential of D (-0.402V) is minimum. So that oxidation potential of D ($+0.402$) is maximum. D can oxidize itself and reduce others. The aqueous solution A will be present in its ionic form and can be reduced by D because A (-0.250) reduction potential is higher than D (-0.402).

77. Answer: 1**Sol:**

$$\Delta G_1^0 = -3F \times 2.20$$



$$\Delta G_2^0 = -1F \times 0.77$$



$$\Delta G_3^0 = -2F (-0.445)$$

Adding equation (1) and (2)



$$\Delta G_1^0 + \Delta G_2^0 = \Delta G_4^0$$

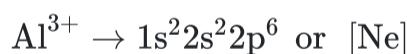
$$\Rightarrow -3F \times 2.2 + (-1 \times F \times 0.77) = -4 \times F \\ \times E_4^0$$

$$\Rightarrow \frac{3 \times 2.2 + 1 \times 0.77}{4} = E_4^0$$

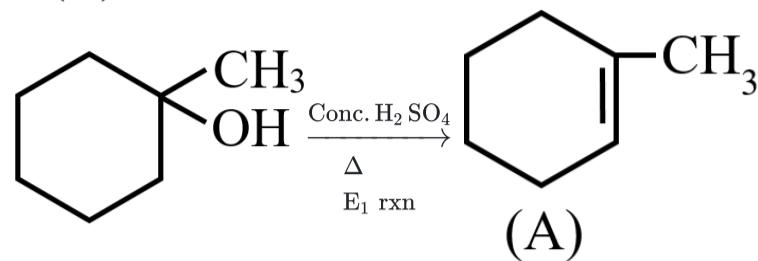
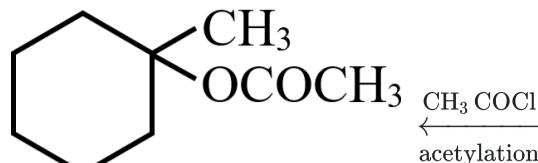
$$\Rightarrow E_4^0 = 1.84 \text{ V}$$

79. Answer: 4**Sol:**

Aluminum has three electrons in its valence shell, and it can easily lose these electrons to acquire the electrical configuration of Neon.

**81. Answer: 1****Sol:**

F_3^- trihalide ion is unknown due to absence of vacant d-orbital.

Sol:**78. Answer: 1****Sol:**

(a)-(q), (b)-(r), (c)-(p), (d)-(s)

80. Answer: 3**Sol:**

B < Al > Ga < In

Top to bottom atomic size increase but due to poor shielding, radius of Gallium is less than Al.

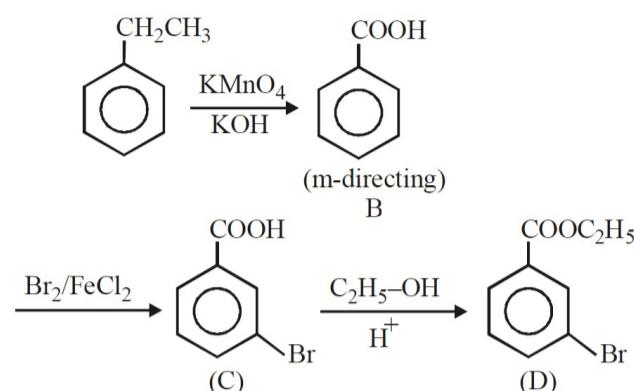
82. Answer: 4

Sol:

Acidic KMnO_4 converts complete carbon chain that is directly attached to benzene nucleus, to $- \text{COOH}$ group.

Br_2 in the presence of halogen carrier causes bromination and

Ethyl alcohol in acidic medium results in esterification.

**83. Answer: 4****Sol:**

In Arrhenius equation, $k = A e^{\frac{E_a}{RT}}$

At very low temperature,

$\frac{1}{T} \rightarrow \infty$ means $T = 0$

$\therefore A \neq k$

85. Answer: 2**Sol:**

$\text{Ag}^+ + e^- \rightarrow \text{Ag}$ 1 mole e^- deposit 1 mole Ag

$\text{Cu}^{+2} + 2e^- \rightarrow \text{Cu}$ 1 mole e^- deposit $\frac{1}{2}$ mole Cu

$\text{Al}^{+3} + 3e^- \rightarrow \text{Al}$ 1 mole e^- deposit $\frac{1}{3}$ mole Al

Molar ratio $1 : \frac{1}{2} : \frac{1}{3}$

$6 : 3 : 2$

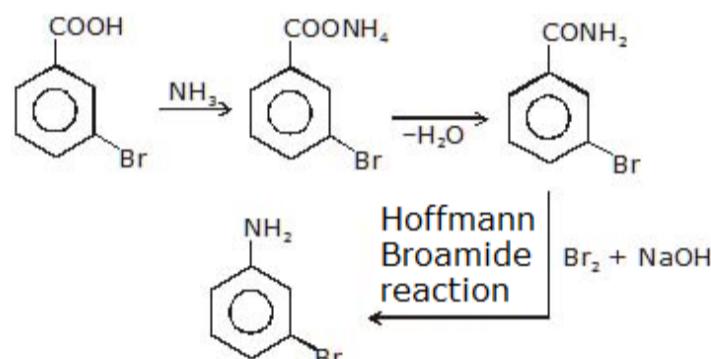
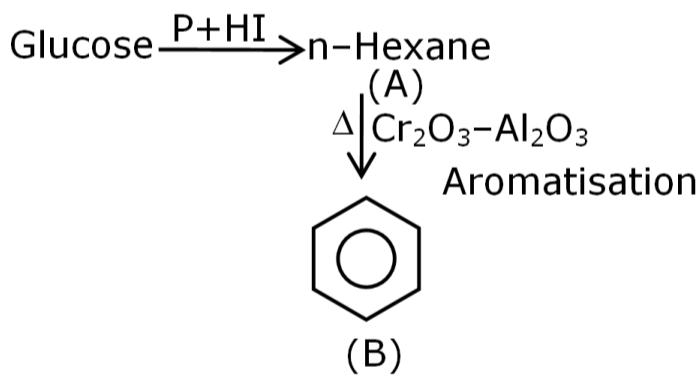
87. Answer: 3**Sol:**

The equivalent conductivity of 0.1 M weak acid is 100 times lesser than that at infinite dilution.

$$\Lambda_v = \frac{\Lambda^0}{100}$$

\therefore Degree of dissociation

$$(\alpha) = \frac{\Lambda_v}{\Lambda^0} = \frac{\Lambda^0}{100 \Lambda^0} = 0.01$$

89. Answer: 2**84. Answer: 4****Sol:****86. Answer: 3****Sol:****88. Answer: 4****Sol:**

All

90. Answer: 3

Sol:

$$\lambda_m^\infty (\text{AgCl}) = 130 \text{ ohm}^{-1} \text{ cm}^2 \text{ mol}^{-1}$$

$$\lambda_m^\infty = \frac{k \times 1000}{m}$$

$$130 = \frac{2.6 \times 10^{-6} \times 1000}{m}$$

$$m = \frac{2.6 \times 10^{-6} \times 1000}{130}$$

$$m = 2 \times 10^{-5}$$

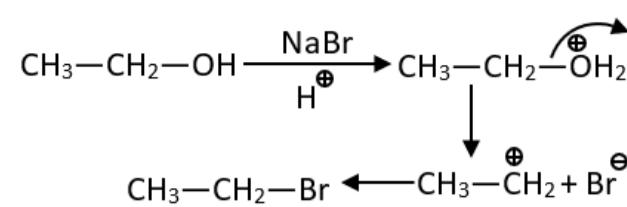
$$k_{sp} = [\text{Ag}^+] [\text{Cl}^-]$$

$$= [2 \times 10^{-5}] [2 \times 10^{-5}]$$

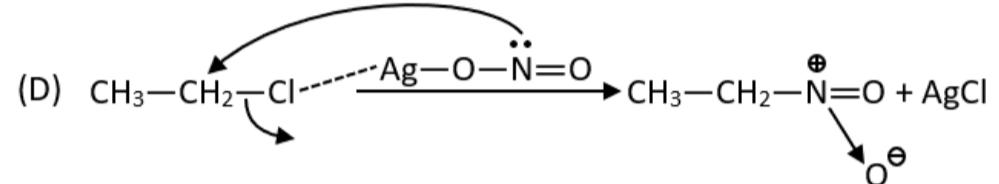
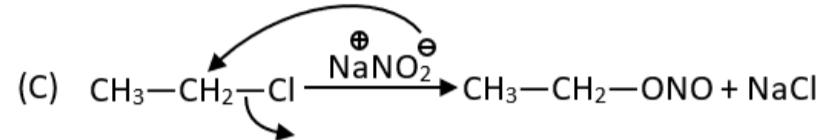
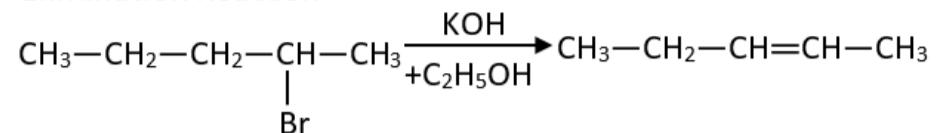
$$k_{sp} = 4 \times 10^{-10}$$

Sol:

(A) Substitution Reaction



(B) Elimination Reaction



91. Answer: 2

Sol:

Pollen grain is the first cell of the male gametophyte that divides mitotically to form a small generative cell and a large tube-like vegetative cell. Pollen with small generative and large vegetative cells or with one vegetative cell and two male gametes is known as a mature **male gametophyte**.

92. Answer: 1

Sol:

If the alleles of a gene are different, one allele will be expressed; it is the dominant gene. The effect of the other allele, called recessive, is masked.

A recessive allele is the allele that is usually overshadowed by the dominant allele. This means that this allele is less likely to be expressed.

A widespread misconception is that traits due to dominant alleles are the most common in the population. While this is sometimes true, it is not always the case.

93. Answer: 3

Sol:

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95. Answer: 2

Sol:

A pollen grain is a microscopic body that contains the male reproductive cell of a plant. In the pollen grains of an insect pollinated plant, the exine is covered by a yellowish, viscous, sticky and oily layer called pollen kitt. It is made up of lipids and carotenoids. Pollen kitt is secreted by tapetum.

94. Answer: 2

Sol:

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96. Answer: 1

Sol:

The yellow seeds are dominant to green, the allele for yellow seeds should be represented with upper case letter while the one for green seeds should be written in lower case letter. Let's suppose that the allele for yellow seed is Y and that for green seeds is y. Hence the genotype of the heterozygous yellow seeded plant will be "Yy" and that for the green seeded plant will be "yy" (as the recessive allele is expressed only in homozygous conditions). The cross between a heterozygous yellow seeded plant and a green seeded plant will produce 50% yellow seeded plants and 50% green seeded plants.

97. Answer: 3

Sol:

The central cell is the largest cell of the embryo sac. It has a highly vacuolated cytoplasm which is rich in reserve food and golgi bodies. In the middle, the cell contains two polar nuclei which often fuse to form a single diploid secondary or fusion nucleus.

98. Answer: 4

Sol:

The number of different types of gametes produced is given by the formula 2^n where $n = \text{heterozygosity}$. In this case, $n=3$ so total types of gametes that will be produced will be 8.

99. Answer: 3

Sol:

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100. Answer: 2

Sol:

The egg apparatus is located at the end of the embryo sac closer to the micropyle (the opening through which pollen nuclei enter the ovule.) The synergids are thought to help direct the pollen nucleus to the egg cell as part of the process of double fertilization characteristic of angiosperm.

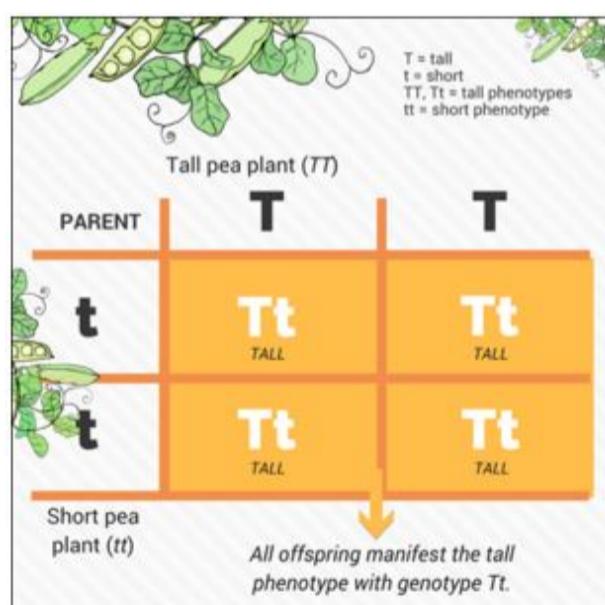
101. Answer: 3**Sol:**

The phenotype of F_1 hybrid resembles either of the two parents in dominance. Law of dominance explains why individuals of F_1 generation express trait of only one parent. In heterozygous individuals, a character is represented by two contrasting factors called alleles. Out of the two contrasting alleles, only one is able to express its itself in the individual. It is called dominant allele and get expressed in the phenotype which is exactly similar to the phenotype of dominant parent.

In incomplete dominance, the expression of the character in a hybrid is intermediate of the expression of both the parents.

Incomplete dominance is also known as intermediate inheritance.

In co dominance, the F_1 hybrid is able to express itself independently. Hence, it does not resemble either of the two parent.

**103. Answer: 3****102. Answer: 1****Sol:**

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104. Answer: 1**Sol:**

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Sol:

When one character or trait is controlled by several genes and these genes are large in number but their effect is very less.

Examples of human **polygenic inheritance** are:-

- 1) Height
- 2) Eye color
- 3) Weight etc.

In the given example, the genotype of parents is AaBbCc and AaBbCc.

As it is a trihybrid cross i.e., no. of zygote formed will be = $4n$. Where, $n = 3$ then $4^3 = 64$.

$$\begin{aligned} \text{So, } 1 + 6 + x + 20 + x + 6 + 1 &= 64 \\ 34 + 2x &= 64 \\ 2x &= 64 - 34 \\ 2x &= 30 \\ x &= 15 \end{aligned}$$

105. Answer: 1**Sol:**

In domesticated fowls, sex of progeny depends on the type of sperm rather than egg.

107. Answer: 3**Sol:**

During gamete formation, both homologous chromosomes as well as genes carried by them segregate in such a way that only one of each pair is transmitted to a gamete. Hence, haploid gametes consist of only one of the chromosome or gene from the pair present before segregation.

So, the correct option is 'Chromosomes and genes occur in pairs in diploid and haploid cells'.

109. Answer: 1**106. Answer: 1****Sol:**

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108. Answer: 3**Sol:**

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110. Answer: 1**Sol:**

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Sol:

If a male with an X-linked condition has a daughter, he will **always** pass on the changed gene to her. This is because males only have one X chromosome, which they always pass on to their daughters. All his daughters will therefore be carriers. The daughters will usually not have the condition, but they are at risk of having affected sons.

If a male who has an X-linked condition has a son, his son will **never** inherit the changed gene on the X chromosome. This is because men always pass on their Y chromosome to their sons (if they passed on their X chromosome, they would have a daughter).

111. Answer: 1

Sol:

DNA is a polymer of deoxyribonucleotides. The deoxyribonucleotides are made up of phosphoric acid and deoxyribonucleosides. The deoxyribonucleosides are made up of deoxyribose sugars and nitrogenous bases. The deoxyribonucleotides are joined to each other with the help of 3', 5' phosphodiester bonds forming the backbone of single DNA chain. In a molecule of DNA, two such chains are present attached with each other with the help of hydrogen bonds between the nitrogenous bases of deoxyribonucleotides.

113. Answer: 3

Sol:

Ligase is defined as an enzyme that can catalyze the joining of two large molecules by forming a new chemical bond.

DNA polymerase I is an enzyme that participates in the process of prokaryotic DNA replication. DNA Pol II is responsible for the association and dissociation of the DNA strand from the catalytic subunit.

Ribonuclease is an enzyme that catalyzes the breakdown of RNA.

115. Answer: 4

Sol:

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112. Answer: 2

Sol:

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114. Answer: 3

Sol:

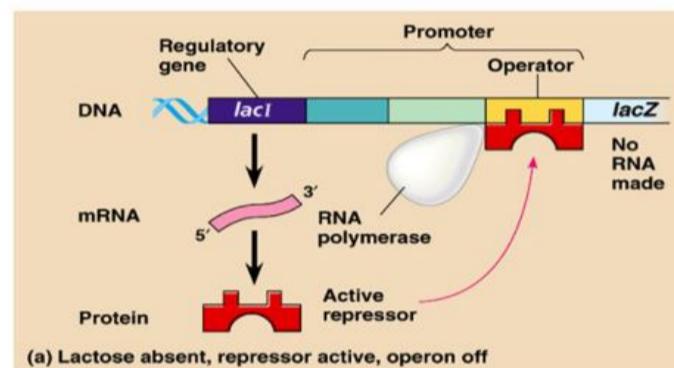
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116. Answer: 1

Sol:

The lac operon is a negatively controlled inducible operon, where the inducer molecule is allolactose. The lac operon is regulated by several factors including the availability of glucose and lactose. It can be activated by allolactose. Lactose (inducer) binds to the repressor (Active repressor) protein and converts it into an inactive repressor and prevents it from repressing gene transcription, and the lac operon gets switched on.

Active repressor + Inducer → Inactive repressor

Inducible transcription: lac operon**117. Answer: 1****Sol:**

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118. Answer: 4**Sol:**

Alec Jeffreys discovered that repetitive patterns of DNA, known as Variable Number of Tandem Repeats (VNTRs), were present in all human beings but they varied in length for each individual. He said that this variation could be used to establish the identity of a person and he named his technique genetic fingerprinting. He demonstrated that a genetic fingerprint is specific to each individual and the pattern does not belong to any other person on earth except for identical twins.

SNP is a single nucleotide polymorphism.

119. Answer: 2**Sol:**

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120. Answer: 2

Sol:

1, 2 & 4 are correct statements.

The base components of nucleic acids are heterocyclic compounds with the rings containing nitrogen and carbon. Adenine and guanine are purines, which contain a pair of fused rings; cytosine, thymine, and uracil are pyrimidines, which contain a single ring.

DNA is the genetic material found in living organisms, all the way from single-celled bacteria to multicellular mammals. In some viruses RNA is genetic material.

Adenosine monophosphate (AMP), also known as 5'-adenylic acid, is a nucleotide.

Cytidine is a nucleoside molecule that is formed when cytosine is attached to a ribose ring (also known as a ribofuranose) via a β -N1-glycosidic bond.

121. Answer: 4**Sol:**

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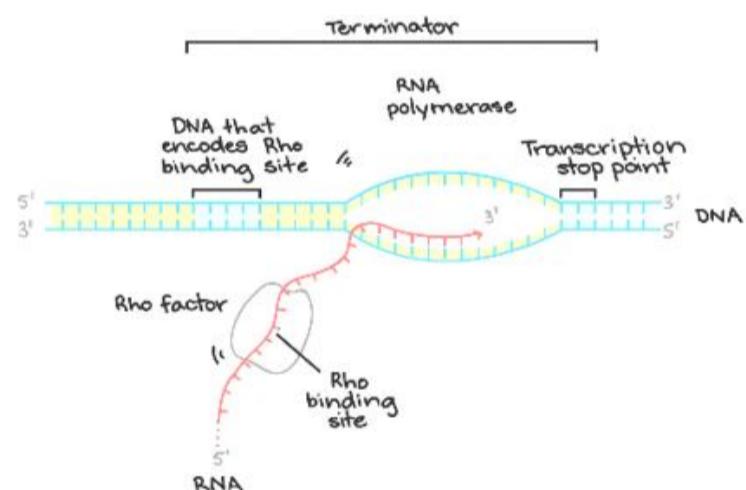
122. Answer: 1**Sol:**

A Rho factor acts on a RNA substrate. RNA polymerase pauses at the termination sequence, because there is a specific site around 100 metre away from the Rho binding site called the Rho-sensitive pause site.

Sigma factor is the initiation factor that starts the translation of mRNA.

AUG is the start codon.

UAG is the stop codon.

**123. Answer: 4****Sol:**

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124. Answer: 4**Sol:**

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The **ribosome consists of structural RNAs and about 80 different proteins**. The ribosome consists of two subunits, each of which is made up of **ribosomal RNA (rRNA) and many ribosomal proteins**. Structurally, the ribosomes of prokaryotes and eukaryotes vary by the types of rRNA and protein molecules found in them.

125. Answer: 1**Sol:**

SYNERGIDS:- They are somewhat elongated in shape and present at the micropylar end, when two synergids are present they lie in contact with each other and partially embrace the egg.

A filiform apparatus is present at the micropylar end, this secretes chemical substances that attract the pollinators and this apparatus also serves as a transporter and absorber of the nutrients from the nucleus and transfers it to the embryo sac.

127. Answer: 2**Sol:**

Although India has only 2.4 per cent of the world's land area, its share of the global species diversity is an impressive 8.1 per cent. That is what makes our country one of the 12 mega diversity countries of the world. Nearly 45,000 species of plants and twice as many of animals have been recorded from India.

129. Answer: 3**Sol:**

Biodiversity indicates the richness of flora and fauna that exist in a particular environment. It includes the minute organisms ie microorganisms, plants, animals, every biotic entity that exist on this particular planet.

The biodiversity term was given by W.G Rosen but this term was popularized at different levels of the organization by Edward Wilson.

Hence, the correct option is "3" - Edward Wilson.

131. Answer: 4**126. Answer: 1****Sol:**

Pollination can be divided into three types depending upon the source of pollen grains. The transfer of pollen grains from anther to the stigma of the same flower is called self-pollination or Autogamy.

128. Answer: 1**Sol:**

Sex-linked diseases are passed down through families through one of the X or Y chromosomes. X and Y are sex chromosomes. X-linked recessive diseases most often occur in males. Males have only one X chromosome. A single recessive gene on that X chromosome will cause the disease.

The Y chromosome is the other half of the XY gene pair in the male. However, the Y chromosome doesn't contain most of the genes of the X chromosome, and because of that, it doesn't protect the male.

130. Answer: 1**Sol:**

Since recombination frequency is directly proportional to the distance between genes, the values are used to locate genes on a chromosome. Here three genes a, b and c can assume any of three linear sequences: a-b-c or a-c-b or b-a-c, which depends on the gene present in the middle. Here, recombination frequency for a and b (X) = 20%, that for a and c (Y) = 8% and for b and c (Z) = 28%. As we can see that Z = X + Y or 28 = 20+8 which means that genes b and c are present at extremes and a is in the middle. Thus, the sequence of genes is b-a-c.

132. Answer: 2**Sol:**

50%

Sol:

Correct statement

A. Haemophilia: Haemophilia is a sex-linked recessive disorder. It is also called a bleeder's disease because in this disease the affected person is unable to form blood clots and bleeds continuously even on a small cut or injury.

B. Down's syndrome: Trisomy of chromosome 21 caused due to the abnormal cell division. Trisomy of chromosome 21 means that the 21th chromosome has an extra copy of chromosome 21. There is no cure for Down's syndrome, the disabilities are lifelong. However, people with Down's syndrome can live healthy lives but their mental and physical development delays. This syndrome is caused due to the aneuploidy or trisomy which is the addition of an extra chromosome.

C. Phenylketonuria: Phenylketonuria is an autosomal recessive gene disorder which is caused by mutations in both alleles of the gene for PAH (Phenylalanine hydroxylase) found in chromosome 12. The enzyme Phenylalanine hydroxylase is used to convert phenylalanine into tyrosine, which the body uses to create neurotransmitters such as epinephrine, norepinephrine and dopamine.. When this enzyme is missing from the body phenylalanine accumulated in the body.

Incorrect statement

D. Sickle cell anemia: Sickle cell anemia is an autosomal recessive disorder. In this disease the shape of RBC changes from biconcave to sickle like shape. Due to the sickle shape of RBCs they cannot easily pass through the veins. They get stuck at the branching points in the vein. This disease is caused by the point gene mutation in the Beta-globin chain at 6th position.

133. Answer: 3

Sol:

DNA fingerprinting involves identifying differences in some specific regions in DNA sequence called as repetitive DNA, because in these sequences, a small stretch of DNA is repeated many times. These repetitive DNA are separated from bulk genomic DNA as different peaks during density gradient centrifugation. The bulk DNA forms a major peak and the other small peaks are referred to as satellite DNA.

134. Answer: 2

Sol:

ECOSYSTEM:- It is defined as the association of living and non-living components existing together.

The natural ecosystem operates itself with the help of natural conditions without any interference from man. They are divided into two types:-

- 1) Terrestrial ecosystem
- 2) Aquatic ecosystem.

But the ultimate source of energy for all ecosystems is the Sun.

135. Answer: 4**Sol:**

In this process, chromatin is rearranged to form a more accessible form that will be available for gene expression, or to carry out the mRNA formation ie Transcription and followed by the binding of DNA proteins.

Regulation of gene expression can be exerted at four levels:-

- (i) Transcriptional level during the formation of the primary transcript,
- (ii) Processing like splicing, terminal additions or modifications.
- (iii) Transport of mRNAs from the nucleus to the cytoplasm and
- (iv) Translational level.

137. Answer: 3**Sol:**

(i), (ii) and (iv)

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136. Answer: 2**Sol:**

The large holes in 'Swiss cheese' are due to production of a large amount of CO₂ by a bacterium named **Propionibacterium sharmanii**.

139. Answer: 3**Sol:**

Only statement I is correct.

141. Answer: 1**Sol:**

Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.

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138. Answer: 2**Sol:**

Saccharomyces cerevisiae-also called **bakers yeast or brewers yeast** used in fermentation of bread,malted cereal and fruit juices.

Monascus purpureus-Its a yeast used in production of statins. Its used for **lowering blood cholesterol level**.

Trichoderm polysporum-a fungi that produced cyclosporine A is used a **immunosuppressive agent**.

Propionibacterium sharmanii-bacterium that produces large amount of carbon dioxide which is responsible for large holes in '**swiss cheese**'.

Hence the **correct** option is **D**

140. Answer: 2**Sol:**

Human male ejaculates about 200 to 300 million sperms during coitus of which, for normal fertility, at least 60 percent of sperms must have normal shape and size and at least 40 percent of them must show vigorous motility.

142. Answer: 2**Sol:**

Statement I - After spermiogenesis the sperm heads become embedded in the Sertoli cells, and are finally released from the seminiferous tubules or sertoli cells by the process called spermatiation.

Statement II - Transformation of spermatid into sperm is termed spermiogenesis.

143. Answer: 4**Sol:**

Parturition is another word that describes childbirth. Both labour and delivery terminologies refer to Parturition. During parturition, the uterus contracts to push the foetus towards the cervix, which continues until the foetus comes down the birth canal.

Gestation is the period of time between pregnancy and birth. During this time, the baby grows and develops inside the mother's womb.

Ovulation is the process by which a mature egg is released from the ovary and happens about every 28 days. The ovum is sucked into a fallopian tube. If the woman has sexual intercourse, the ovum may be fertilised, and the woman is then pregnant.

Implantation is one of the stages of pregnancy. During this stage, the embryo attaches to the wall of the uterus through the uterine endometrium.

Fertilisation is the process of forming a zygote by the fusion of egg and sperm. Fertilisation is a complex, multi-step process that is completed in 24 hours. The sperm from a male meets an ovum from a female and forms a zygote; this is the point at which pregnancy begins.

145. Answer: 2**Sol:**

Both (A) and (R) are true but (R) is not the correct explanation of (A).

144. Answer: 4**Sol:**

Diseases or infections which are transmitted through sexual intercourse are collectively called sexually transmitted diseases (STD). For example – Gonorrhoea, syphilis, genital herpes etc. This could lead to complications later if not properly treated may lead to pelvic inflammatory diseases (PID), abortions, still births, ectopic pregnancies, infertility or even cancer of the reproductive tract.

146. Answer: 2**Sol:**

ZIFT (Zygote Intrafallopian Transfer): A zygote (fertilized egg) is transferred into the fallopian tube.

GIFT (Gamete Intrafallopian Transfer): Gametes (sperm and ovum) are transferred into the fallopian tube for fertilization to occur naturally.

IUT (Intrauterine Transfer): An embryo with more than eight blastomeres is transferred into the uterus.

ICSI (Intracytoplasmic Sperm Injection): A single sperm is directly injected into an ovum to facilitate fertilization.

147. Answer: 4**148. Answer: 3****Sol:**

(a) and (b) only

Class 12th NCERT Page No.147 & 148,
149

Sol:

Innate immunity is non-specific type of defence, that is present at the time of birth. It consists of four types of barriers. These are —

Physiological barriers : Acid in the stomach, saliva in the mouth, tears from eyes—all prevent microbial growth.

Physical barriers : Skin on our body is the main barrier which prevents entry of the micro-organisms. Mucus coating of the epithelium lining the respiratory, gastrointestinal and urogenital tracts also help in trapping microbes entering our body.

Cellular barriers : Certain types of leukocytes (WBC) of our body like polymorpho-nuclear leukocytes (PMNL-neutrophils) and monocytes and natural killer (type of lymphocytes) in the blood as well as macrophages in tissues can phagocytose and destroy microbes.

Cytokine barriers : Virus-infected cells secrete proteins called interferons which protect non-infected cells from further viral infection.

149. Answer: 1**Sol:**

Computed Tomography uses strong magnetic fields and non-ionising radiations to detect physiological changes in living tissue.

150. Answer: 4**Sol:**

12th NCERT Page No. - 156, 157, 158

	Column I		Column II
(a)	AIDS	(iii)	Don't die of ignorance
(b)	Cancer	(iv)	Metastasis
(c)	Biological Response modifier	(i)	α -Interferon
(d)	HIV factory	(ii)	Macrophages

151. Answer: 3**152. Answer: 1****Sol:**

12th NCERT Page No. - 158, 159

Sol:

Assertion (A): Nicotine stimulates the adrenal glands to release adrenaline (epinephrine) into the bloodstream. This statement is true because nicotine activates the sympathetic nervous system, leading to the release of adrenaline, which prepares the body for a "fight or flight" response.

Reason (R): Tobacco raises blood pressure and increases heart rate. This statement is also true because the release of adrenaline leads to an increase in heart rate and blood pressure.

However, the reason given does not directly explain the mechanism described in the assertion. The assertion explains a physiological process (release of adrenaline due to nicotine), while the reason describes a consequence (increased heart rate and blood pressure) of this process, rather than explaining it directly.

153. Answer: 1**Sol:**

12th NCERT Page No. 115

155. Answer: 2**Sol:**

12th NCERT Page No – 120, 121

157. Answer: 2**Sol:**

Agrobacterium tumefaciens naturally transfers some part of Ti-plasmid into host plant DNA without any human effort so it is called natural genetic engineer of plant. The tumour inducing (Ti) plasmid of Agrobacterium tumefaciens has now been modified into a cloning vector which is no more pathogenic to the plants but is still able to use the mechanisms to deliver genes (disarmed) and are now used to deliver desirable genes into animal cells.

154. Answer: 1**Sol:**

12th NCERT Page No – 118

156. Answer: 2**Sol:**

12th NCERT Page No. 124,125

158. Answer: 2**Sol:**

The **construction of recombinant DNA** involves **two basic steps**. The **first step** is **cleaving DNA segments** with the help of **cleaving enzymes**. **Restriction endonuclease cleaves DNA** at a specific **recognition** sequence. The **second step** is the **joining of bits of DNA by ligase or DNA ligase**. **as ligase joins the sticky ends of the DNA fragments** from end to end.

Reverse transcriptase (RT), also known as **RNA-dependent DNA polymerase**, is a DNA polymerase enzyme that **transcribes single-stranded RNA into DNA**.

So the enzymes commonly used in **genetic engineering are restriction endonuclease and ligase**.

159. Answer: 2**160. Answer: 3**

Sol:

Stirred tank bioreactors allow taking small volumes of the sample for testing and the use of a control system that regulates the temperature and pH. These bioreactors ensure oxygen availability during the process.

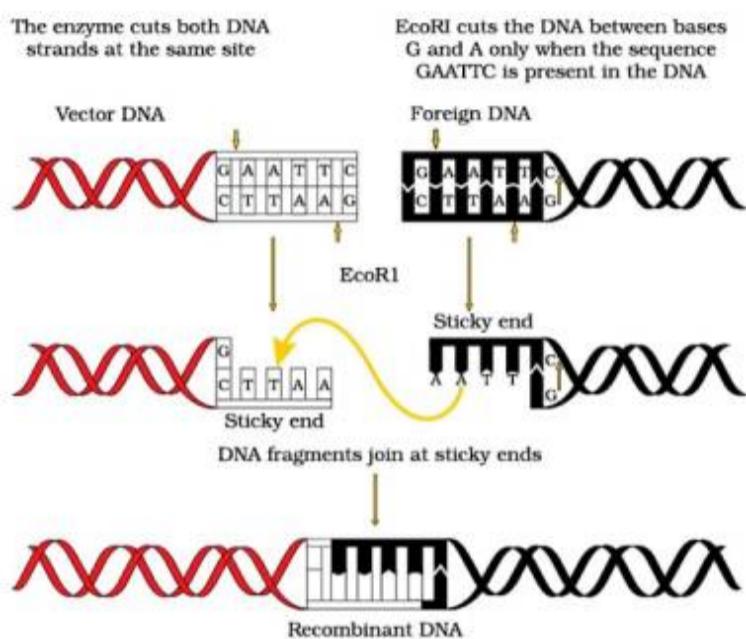
Sol:

If recombinant DNA bearing the **gene** for **ampicillin resistance** is transferred into **E. coli cells** and the host cells are spread on **agar plates** containing **ampicillin**, then only transformants will grow and the **untransformed recipient cells** will die.

Cloning the vector during this process aids in **distinguishing transformants** from **non-transformants** and selectively allowing the transformation by the **vector to grow**.

161. Answer: 3**Sol:**

12th NCERT, PAGE NO.- 196



According to above diagram of steps in formation of recombinant DNA by action of restriction endonuclease enzyme - EcoRI

X - EcoRI

Y - DNA ligase

163. Answer: 2**Sol:**

12th NCERT, PAGE NO.- 200

Alternative selectable markers have been developed which differentiate recombinants from the non-recombinants on the basis of their ability to produce colour in the presence of a chromogenic substrate. In this, a recombinant DNA is inserted within the coding sequence of an enzyme, galactosidase. This results into inactivation of the enzyme, which is referred to as insertional inactivation. The presence of a chromogenic substrate gives blue coloured colonies if the plasmid in the bacteria does not have an insert. Presence of insert results into insertional inactivation of the -galactosidase gene and the colonies do not produce any colour, these are identified as recombinant colonies.

162. Answer: 1**Sol:**

12th NCERT, PAGE NO.- 200

Agrobacterium tumifaciens, a pathogen of several dicot plants is able to deliver a piece of DNA known as 'T-DNA' to transform normal plant cells into a tumor and direct these tumor cells to produce the chemicals required by the pathogen. Similarly, retroviruses in animals have the ability to transform normal cells into cancerous cells.

164. Answer: 1**Sol:**

Golden rice is a **genetically modified crop** plant where the incorporated gene is meant for the **biosynthesis** of **vitamin A**. Golden rice is **vitamin A rich**. So Golden Rice, help in Alleviation of vitamin A deficiency.

165. Answer: 3**Sol:**

In mammals, like humans, insulin is produced as a pro-hormone that contains an extra stretch called the C peptide.

C peptide is not present in the mature insulin as it is removed during maturation into insulin.

166. Answer: 4**Sol:**

The human protein content of the first transgenic cow's milk was not 30-40 gm/litre. The actual amount of human protein content in the milk of the first transgenic cow was not specified in the options. Therefore, we cannot assume or attribute a specific protein content value to the milk of the first transgenic cow based on the given options.

The first transgenic cow produced milk containing a protein called human straight alpha-lactalbumin.

The first transgenic cow, which was genetically modified to produce human protein in its milk, was indeed named Rosie.

The milk produced by the first transgenic cow was engineered to be more nutritionally balanced for human consumption compared to ordinary cow's milk.

167. Answer: 1**Sol:**

12th NCERT Page No. - 211

The first clinical gene therapy was given in 1990 to a 4-year old girl with adenosine deaminase (ADA) deficiency. This enzyme is crucial for the immune system to function. The disorder is caused due to the deletion of the gene for adenosine deaminase.

168. Answer: 4**Sol:**

The given diagram is of adeno virus.

Adenoviruses are a group of viruses that can cause mild to severe infection throughout our body. Adenovirus infections most commonly affect your respiratory system. These infections can cause symptoms similar to the common cold or flu. Most adenovirus infections are mild and require only symptom relief for treatment.

169. Answer: 4**Sol:**

12th NCERT, PAGE NO.- 35, 38

171. Answer: 4**Sol:**

(a) → (ii) → (b) → (iii) → (c) → (i)

170. Answer: 1**Sol:****172. Answer: 2****Sol:**

12th NCERT Page No. 44-45

List - I	List - II
A. Non-Medicated IUD	Lippes loop
B. Copper releasing IUD	Multiload 375
C. Hormone releasing IUD	LNG-20
D. Implants	Progestogens

173. Answer: 1**Sol:**

Both statements I and II are correct.

174. Answer: 3**Sol:**

(d) only

175. Answer: 4**176. Answer: 3**

Sol:

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

12 ncert (page 138 last line)

177. Answer: 3**Sol:**

Annealing: In this process temperature is lowered to approximately 5 °C below the melting temperature (Tm) of the primers (often 45–60 °C) to promote primer binding to the template.

179. Answer: 3**Sol:**

crylAc and crylAb

12th NCERT PAGE NO.- 209

Sol:

In the **heat shock process**, the **bacterial cells** are subjected to **incubation** on **ice** with the **recombinant DNA**. Following that, they are placed at **42 °C** and then over the **ice**.

This process helps the bacterial cell take up the recombinant DNA through **transient pores** that are **present** in its **cell wall**.

178. Answer: 2**Sol:**

12th NCERT, PAGE NO.- 199

180. Answer: 3**Sol:**

Biopiracy is the **illegal use of bioresources** by commercial sectors without the proper or authorised consent of the people or country to which they belong.

Biopatents refer to the **rights granted to biological entities** by the government or the original owner.

Gene therapy is the technique widely used for **gene correction** and is mainly used to treat one's genes **to cure disease**.

RNAi is RNA interference that **selects the target gene for gene silencing**, as this process is involved in **suppressing gene expression**.