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SOLUTIONS

1. \[ \frac{dN}{dt} = \lambda N = \lambda N \]
   \[ A = \frac{N}{N} \]
   \[ T_{1/2} = \frac{0.693}{\lambda} = \frac{N\lambda}{N} \]

2. \[ A \xrightarrow{\text{A}} \frac{1}{10} \xrightarrow{\text{A}} \frac{1}{10} \xrightarrow{\text{A}} \frac{1}{10} \xrightarrow{\text{A}} \frac{1}{10} \xrightarrow{\text{A}} \frac{1}{10} \]

3. \[ KE_{\text{max}} = h\nu - \delta \]
   \[ E_1 = 2h\nu_0 - h\nu_0 = h\nu_0 = \frac{1}{2} m v_1^2 \]
   \[ E_2 = 5h\nu_0 - h\nu_0 = 4h\nu_0 = \frac{1}{2} m v_2^2 \]
   \[ V_2 = 2V_1 \]

4. \[ \alpha = \frac{I_C}{I_B} = \frac{10\text{mA}}{100} = 100 \]
   \[ I _B = \frac{10 \times 10^{-6}}{100} = 10^{-4} \text{A} = 100 \mu\text{A} \]
5. **Correct option is (2)**

   **Solution:**

   ![Diagram of a transistor circuit]

   Applying Kirchoff Rule
   
   \[ 10 - 245 \times 40 \times 10^{-3} = V_{BE} \]
   
   \[ V_{BE} = 0.2 \text{ V} \]

6. **Correct option is (4)**

   **Solution:**

   \[
   \frac{1}{\lambda_1} = R \left( \frac{1}{2^2} - \frac{1}{3^2} \right) \quad \text{[For 1st members of Balmer series]} \]
   
   \[
   \frac{1}{\lambda_2} = R \left( \frac{1}{1^2} - \frac{1}{2^2} \right) \quad \text{[For 1st members of Lyman series]} \]
   
   \[
   \frac{\lambda_1}{\lambda_2} = \frac{36 \times 3}{5 \times 4} \]
   
   \[
   \lambda_2 = \lambda_1 \times \frac{5}{27} \]

7. \[ R^2 + B^2 = R^2 \]

   \[ R^2 + B^2 + 2AB \cos \theta = R^2 \]

   \[ (\vec{R} + 2\vec{B}) \cdot \vec{R} = 0 \]

   \[ \vec{A} + 2\vec{B} = R^2 \]

   \[ A^2 + 2AB \cos \theta = 0 \]

   \[ B^2 + 0 = R^2 \]

8. \[
   \frac{d\theta}{\theta} = \pm \frac{3\Delta A}{A} \pm \frac{3\Delta B}{B} \pm \frac{\Delta C}{C} \pm \frac{1}{2} \Delta D \quad \text{(Always add up)}
   \]

   \[
   = \pm \left( 3 \times 2 + 3 \times 1 + 3 + \frac{1}{2} \times 4 \right) = \pm 14 \%
   \]
9. Correct option is (2)
Solution:
Answer (2)

\[ PT = \text{Constant} \]

or

\[ \frac{T^2}{V} = \text{Constant} \quad [PV = nRT] \Rightarrow T_2 = KV \quad \ldots (i) \]

Differentiating w.r.t. \( T \), we get

\[ \frac{2T}{V} \cdot \frac{K}{dV} = \frac{2T}{VK} = \frac{dV}{dT} \]

\[ \frac{dV}{dT} = \frac{2TV}{VT^2} = \frac{2}{T} \]

10. \[ \frac{8d}{3} - \frac{d}{2} = \frac{6d - 3d}{6} = \frac{d}{6} \]

12. \[ \frac{\lambda}{\lambda - 3\xi} \sim \frac{2}{2} \]

\[ \theta \theta \sim \frac{3\lambda}{2} \]

\[ \theta \theta \sim \frac{3\lambda}{2d} \sim \frac{3}{4} \]

13. \[ x = \frac{m\omega^2}{k-m\omega^2} \]

\[ l+x = l \left(1 + \frac{m\omega^2}{k-m\omega^2}\right) \sim \frac{k\omega}{k-m\omega^2} \]

14. \[ N \cos \theta = m\omega^2R \]

\[ N \cos \theta = mg \]

\[ R \sin \theta = \frac{g}{R} \]

\[ \omega^2 = \frac{g}{R \sin \theta} \]

\[ v^2 = \frac{g}{\sin \theta} \]

\[ v^2 = \sqrt{gR \sin \theta} \]

\[ v^2 = \sqrt{9h} \]

\[ v^2 = \sqrt{10 \times 2} = \sqrt{20} \]
15. Correct option is (2)
Solution:
\[ P = \frac{V^2}{R} \]
\[ R = \frac{V^2}{P} = \frac{(220)^2}{60} \]
\[ P_{\text{Total}} = \frac{V^2}{R_{\text{eq}}} = \frac{(220)^2}{10(220)^2} \times 60 = 6 \text{ W} \]

16. Correct option is (3)
Solution:
Answer (3)
\[ f_1 = 500 \times 10^3 \text{ Hz} \]
\[ L' \rightarrow 2L, \ C' \rightarrow \frac{1}{8}C \]
\[ f = \frac{1}{2\pi\sqrt{LC}} \Rightarrow \frac{f_1}{f_2} = \frac{\sqrt{L_2C_2}}{\sqrt{L_1C_1}} = \sqrt{\frac{2L}{L}(\frac{1}{8}C)} = \frac{\sqrt{LC}}{L} \]
\[ f_1 = \frac{1}{2} \Rightarrow f_2 = 1000 \text{ kHz} \]

17. Correct option is (1)
Answer (1)
Using \( \phi = Mi \)
\[ M = \frac{\phi}{i} = \left( \frac{\mu_0}{2\pi} \right) \frac{l_2^2}{i} \propto \frac{l_2^2}{r} \]

\[ -T_1 \vec{a}_1 - T_2 \vec{a}_2 - T_3 \vec{a}_3 = 0 \]
\[ 2T_2 = T_2, \quad 2T_2 = T_3 = 4T_1 \]
\[ \phi \vec{a}_1^2 + 2 \vec{a}_2^2 + 4 \vec{a}_3^2 = 0 \]
19. **Correct option is (2)**
**Solution:**
Answer (2)

\[ \frac{mv}{m+M} = \frac{m}{m+M} \]

\[ \frac{1}{2}(m+M)\left(\frac{mv}{m+M}\right)^2 = (m+M)gh \]

\[ \frac{1}{2} \cdot \frac{m^2v^2}{m+M} = (m+M)gh \]

\[ v^2 = \frac{2(m+M)^2gh}{m^2} \]

\[ v = \frac{m+M}{m} \sqrt{2gh} \]

20. **Correct option is (2)**
**Solution:**
Answer (2)

Common acceleration of the system is \( a = \frac{mg}{m+11} \) m/s²

\[ f_r = 6 \times a \Rightarrow a = \frac{\mu \cdot N_r}{6} = \frac{\mu \cdot 5 \times 10}{6} = \frac{40}{6} \]

\[ a = \frac{20}{3} m/s^2 \Rightarrow \frac{mg}{m+11} = \frac{20}{3} \Rightarrow m = 22 \text{ kg} \]

\[ \Rightarrow \quad 7 \times 7 \times 8 \times 2 \times 4 = 16 \]

22. **Correct option is (1)**
**Solution:**
Answer (1)

For \( x > 2 \), \( F \) is -ve
For \( x < 2 \), \( F \) is again -ve
This is translatory motion
Putting \( x - 2 = X \)
\[ F = -5X^2 \]
This is not SHM.
25. **Correct option is (4)**  
**Solution:**
Answer (4)
If \( l \gg R \), effective length \( l' \) can be given by

\[
\frac{l}{l'} = \frac{1 + \frac{1}{R}}{1 + \frac{R}{l}}
\]

\[
l' = \frac{R}{1 + \frac{R}{l}}
\]

\[
T = 2\pi \sqrt{\frac{R}{g \left(1 + \frac{R}{l} \right)}}
\]

Put \( l = R \)

\[
T = 2\pi \sqrt{\frac{R}{2g}}
\]

26. **Correct option is (1)**  
**Solution:**
Answer (1)
Time taken by sound in air = \( \frac{5000 \text{ m}}{330 \text{ m/s}} = 15.15 \text{ s} \)

\[
\therefore \text{ Time taken by sound to travel through iron } = 15.15 - 14 = 1.15 \text{ s}
\]

\[
\therefore \text{ Speed of sound in iron } = \frac{5000}{1.15} = 4347.8 \text{ m/s}
\]
27. Correct option is (1)
Solution:
Answer (1)
\[ mC_A (15 - 10) = mC_B (25 - 15) \]
\[ \frac{C_A}{C_B} = 2 \]
\[ \Rightarrow m \cdot C_B \cdot (30 - 25) = mC_C \cdot (40 - 30) \]
\[ \Rightarrow \frac{C_B}{C_C} = 2 \Rightarrow \frac{C_A}{C_C} = 4 \]
\[ C_A(t - 10) = C_C(40 - t) \]
\[ \Rightarrow 5t = 80 \Rightarrow t = 16^\circ C \]

28. Correct option is (4)
Solution:
Answer (4)
\[ (v_x)_m = 0 \]
\[ -MV_r + m(v_0 \cos \theta - v_r) = 0 \]
\[ v_r = \frac{mv_0 \cos \theta}{M+m} \]

29. Correct option is (3)
Solution:
Answer (3)
Applying \( \tau = I \alpha \) about bottom most point
\[ \alpha = \frac{F \cdot 2R}{I} = \frac{F}{MR} \Rightarrow a = \frac{F}{M} \]
i.e., Force of friction is zero.
31. Correct option is (2)
   Solution:
   Answer (2)

\[ V_P - 10 + 3 \times 1 - 3 \times 1 - 3 \times 3 = V_Q \]
\[ \Rightarrow V_P - V_Q = 19 \text{ V} \]

32. Correct option is (2)
   Solution:
   Answer (2)

\[ TE(2R) = \frac{Gmm}{4R} \]
\[ TE(3R) = \frac{Gmm}{6R} \]

\[ \Delta E = TE(3R) - TE(2R) = \frac{Gmm}{6R} + \frac{Gmm}{4R} = \frac{Gmm}{R} \left[ \frac{1}{4} - \frac{1}{6} \right] = \frac{Gmm}{R} \left[ \frac{6 - 4}{24} \right] = \frac{Gmm}{12R} \]

34. Correct option is (1)
   Solution:
   Answer (1)

\[ T = 2\pi \sqrt{\frac{I}{MB}} \]
\[ T' = 2\pi \sqrt{\frac{I}{n^3 \frac{M}{n} B}} = \frac{2\pi}{n} \sqrt{\frac{I}{MB}} \]
\[ T' = \frac{T}{n} \]
Correct option is (2)

Solution:

Since two equal vectors $\mathbf{M}$ are inclined at 120°, their resultant will also be $\mathbf{M}$ and along its angular bisector. So point $P$ is on axial line of resultant moment $M$.

\[
B_{\text{net}} = \frac{2\mu_0 M}{4\pi d^3}
\]

36. \[mg = F_x + F_y\]

\[
\frac{\sqrt[3]{2}}{3} \times \frac{\pi \times 3^2}{3} = \frac{\sqrt[3]{2}}{3} \times \frac{\pi \times 3^3}{3} + 6 \pi \eta \delta \nu
\]

\[
V = \frac{2(8-8\delta)}{\eta}
\]

\[
\frac{m_1}{m_2} = \frac{1}{64} = \frac{8\delta_1^2}{8\delta_2^2} \Rightarrow \delta_1 = \frac{1}{\delta_2}
\]

\[
\frac{V_1}{V_2} = \frac{\delta_1}{\delta_2^2} = \frac{1}{6}
\]

When the stone was floating (in water in the ice), the buoyancy force > the buoyancy force when it sinks.
38. **Correct option is (4)**  
   **Solution:**  
   Answer (4)  
   It is the case of a physical pendulum.  
   \[ T = 2\pi \sqrt{\frac{I_{c.o.m.}}{mg L_{c.o.m.}}} \]  
   \[ I_{c.o.m.} = \frac{MR^2}{2} + MR^2 = \frac{3}{2}MR^2 \]  
   \[ L_{c.o.m.} = R \]  
   \[ T = 2\pi \sqrt{\frac{3R}{2g}} \]

39. **Correct option is (2)**  
   **Solution:**  
   Answer (2)  
   \[ 3K(100 - \theta) + 2K(50 - \theta) = K\theta \]  
   \[ 300K - 3K\theta + 100K - 2K\theta = K\theta \]  
   \[ 400 = 6\theta \]  
   \[ \frac{400}{6} = \theta \]  
   \[ \frac{200}{3} = \theta \]

40. **Correct option is (2)**  
   **Solution:**  
   Answer (2)  
   Time intervals to change thickness from 0 to \(x\) from \(x\) to \(2x\) are in ratio of 1 : 3 : 5 : 7 ......  
   \[ . \]  
   \[ t_1 : t_2 = 1 : 3 \]  
   \[ = 24 : 24 \times 3 \]  
   \[ \Rightarrow t_2 = 72 \text{ hours} \]

\[ Q = CV \& \, \frac{\partial Q}{\partial t} = \frac{\partial Q}{\partial \zeta} \]  
\[ v_1 + v_2 = V \]  
\[ \frac{V_1}{V_2} = \frac{C_2}{C_1} \]  
\[ \frac{V_1}{V_2} = \frac{C_2}{C_1} \]  
\[ \frac{V_1}{V_2} = \frac{C_2}{C_1} \]  
\[ 2V_1 = V_2 \]
46. (1) 4th complex cannot show geometrical isomerism due to presence of symmetrical ligand.

47. (2) 
\[ 25 \times N_1 = 40 \times 0.4 \]
\[ N_1 = \frac{16}{25} = 0.64N \]
Volume strength = 0.64\times5.6 = 3.584

48. (3) 
\[ \pi = icRT \]
\[ 4.92 = i \times 0.1 \times 0.0821 \times 300 \]
\[ i = 1.99 \]
\[ \alpha = \frac{i-1}{n-1} = \frac{1.99-1}{3-1} = 0.49 \]
% of \( \alpha = 49\% \)

49. (1) 
\[ \Delta G = -nFE \Rightarrow E = -\frac{\Delta G}{nF} = \frac{965 \times 10^3}{4 \times 96500} = -2.5 \]
The potential difference needed for the reduction = 2.5V

50. (2) 
\[ \text{NaCl} (aq) + \text{AgNO}_3 (aq) \rightarrow \text{AgCl} (s) + \text{NaNO}_3 (aq) \]
143.5 g of AgCl is got from 58.5 g of NaCl
\[ \frac{58.5}{143.5} \times 0.287 = 0.117 \text{g} \]
\[ \therefore \] 0.287 g of AgCl is got from 143.5
\[ \frac{0.117}{2} \times 100 = 5.85\% \]
\[ \therefore \] % purity of sample
51. \[ Z = \frac{\rho \times a^3 \times N_A}{M} = \frac{2.75 \times (660 \times 10^{-10})^3 \times 6.023 \times 10^{23}}{119} = 4 \]

\[ \therefore \text{Number of formula units per unit cell} = 4 \]

No. of unit cells
\[ = \frac{23.8}{119 \times 4} \times 6.023 \times 10^{23} = 0.05 \times 6.023 \times 10^{23} = 3.011 \times 10^{22} \]

52. \[ \text{m eq of NaOH} = 16 \times \frac{1}{5} = 3.2 \]

20ml of acid requires 3.2m eq of NaOH

500ml acid requires \[ \frac{3.2 \times 500}{20} = 80 \text{m eq of NaOH} \]

m.eq. of \( NH_3 = \text{m eq of } H_2SO_4 - \text{m eq of } NaOH \]

= 100 - 80 = 20

\[ \% \text{ N} = \frac{1.4 \text{ m eq of } NH_3}{\text{wt of } O.C} \]

\[ \therefore \text{wt of } O.C = \frac{1.4 \times 20}{14} = 2 \text{ g} \]

53. (3)

54. (4)

55. (1)

\[ \text{PCl}_5 \xrightarrow{\text{reaction}} \text{PCl}_3 + \text{Cl}_2 \]

\[
\begin{array}{ccc}
1 & 0 & 0 \\
(1-x) & x & x \\
\end{array}
\]

Total no. of moles \( = 1 - x + x + x = (1 + x) \)

\[ K_p = \frac{\left( \frac{x}{1+x} \right)^P \times \left( \frac{x}{1+x} \right)^P}{\left( \frac{1-x}{1+x} \right)^P} = \frac{x^2}{1-x^2} \times P \]

\[ x = \sqrt{\frac{K_p}{K_p + P}} \]

56. (2)

57. (4)

58. (4)

59. (1)

60. (3)

61. (2)
62. (3)
63. (4)
\[4\text{LiNO}_3 \xrightarrow{\Delta} 2\text{Li}_2\text{O} + 4\text{NO}_2 + \text{O}_2\]
64. (3)
65. (4)
66. (2)
67. (3)
\[t_{93.75\%} = 4 \times t_{50\%} = 120 \text{ min} \]
\[t_{50\%} = \frac{120}{4} = 30 \text{ min} \]
\[K = \frac{0.693}{30} = 0.0231 \times 10^{-2} \text{ min}^{-1} \]
\[t_{\frac{1}{2}} = \frac{0.693}{2.31} \times 0.125 = 0.88 \times 10^{-3} \text{ M} \text{ min}^{-1} \]
68. (4)
69. (2)
70. (4)
71. (2)
72. (2)
73. (4)
74. (3)
75. (4)
76. (3)
Meq of salt = Meq of \(\text{Na}_2\text{SO}_3\)
\[50 \times 0.1 \times n = 25 \times 0.1 \times 2 \]
\[\therefore \quad n = 1 \quad \left[ \text{change in (O.N.)} \right] \]
\[\therefore \quad \text{M}^{2+} + e^- \longrightarrow \text{M}^{3+} \]
77. (4)
Allotropes of an element have the same chemical properties but have different arrangement of atoms and physical properties.
78. (1)  
It undergoes dehydration easily as the product obtained is conjugated, and is more stable.

79. (3)  
Polarity in a molecule gives rise to an increase in forces of attraction among molecules and thus, the boiling point increases.

80. (4)  
Being amphoteric, $\text{Al(OH)}_3$ is soluble in NaOH solution whereas $\text{Fe(OH)}_3$ is insoluble.

81. (3)  
\[ \text{CaC}_2 \rightarrow \text{C}_2\text{H}_2 \rightarrow \text{CH}_3\text{CHO} \rightarrow \text{CH}_3\text{CH}_2\text{OH} \]

82. (4)  
Let $w$ g of each be taken, then initial mole of \( P = \frac{w}{10} \); mol of \( Q = \frac{w}{20} \)

Final mole of \( P = \frac{w_1}{5 \times 10} \)  
For \( P \)  
\[ \frac{P_{N_e}}{P_N} = e^{-\lambda t} \]  
\[ \therefore \text{For } P \quad \frac{w \times 5 \times 10}{10 \times w_2} = e^{\lambda_2 \times 20} \]

Final mole of \( Q = \frac{4w_1}{20 \times 5} \)  
For \( Q \)  
\[ \frac{Q_{N_e}}{Q_N} = e^{-\lambda t} \]  
\[ \therefore \text{For } Q \quad \frac{w \times 20 \times 5}{20 \times w_1 \times 4} = e^{\lambda_2 \times 20} \]

By Eqs. (i) and (ii) \( 4 = e^{(\lambda_1 - \lambda_2) \times 20} \)  
\[ \therefore 20(\lambda_1 - \lambda_2) = \log_e 4 \]

or \[ 20 \left( \frac{0.693}{10} - \frac{0.693}{t_{1/2}} \right) = \log_e 4 \]

\[ \therefore t = \infty \]

83. (3)  
$\text{FeSO}_4 \cdot 7\text{H}_2\text{O} \xrightarrow{\triangle} \text{FeSO}_4 + 7\text{H}_2\text{O}$;  
$2\text{FeSO}_4 \xrightarrow{\triangle} \text{Fe}_2\text{O}_3 + \text{SO}_2 + \text{SO}_3$

84. (1)  
\[ \text{C}_3\text{H}_6\text{Cl}_2 \xrightarrow{\text{KOH}_{(aq)}} \text{C}_3\text{H}_2\text{O} \]  
or  
\[ \text{KOH}_{(a)} \xrightarrow{\text{C}_3\text{H}_4} \]

$\text{CH}_3\text{C} \equiv \text{CH} \xrightarrow{\text{H}_2\text{O}} \text{CH}_3\text{COCH}_3 \xrightarrow{\text{Br} + \text{NaOH}} \text{CHBr}_3 + \text{CH}_3\text{COONa}$

Since, B and D are different, thus B is $\text{CH}_3\text{CH}_2\text{CHO}$ and so A is $\text{CH}_3\text{CH}_2\text{CHCl}_2$.

85. (4)  
Higher vapour pressure of $\text{H}_2\text{O}$ in atmosphere will drive $\text{H}_2\text{O}$ vapours to the solute particles.
86. (3)
\[ \text{HO–SO}_2\text{OH} + \text{PCl}_5 \rightarrow \text{Cl–SO}_2\text{Cl} + \text{POCl}_3 + 2\text{HCl} \]

87. (1)
must be a tertiary alcohol as it gives alkene on treatment with Cu. Thus, \( \text{C}_4\text{H}_8\text{O} \) is a ketone.

88. (3)
phenomenon of conversion of freshly precipitated mass into colloidal state by the action of solute or solvent is called peptization.

89. (3)
The solubility of noble gases increases with increase in molecular weight due to increase in van der Waals’ forces. However, these are sparingly soluble.

90. (3)
Follow applications of inductive effect. The negative charge on carboxylate ion is dispersed more due to \(-\text{IE}\) of F atom.

\[
\begin{array}{c}
\text{F} \\
\text{C} \\
\text{O} \\
\text{F} \\
\text{F}
\end{array}
\]

The carboxylate ion thus becomes more stable and the acid becomes more reactive.

91. (1) (XI)(NCERT Pg. 11)
P-iv, Q-iii, R-ii, S-i

92. (2) (XI)(NCERT Pg. 229, 232)

93. (4) (XI)(NCERT Pg. 19)
Chlorophyll a, photoautotrophs
A is incorrect as plants do not have phycocyanin.
B is incorrect as plants do not have heterocyst.
C is incorrect as Cyanobacteria have chlorophyll a.

94. (1) (XII)(NCERT Pg.5)

95. (3) (XI)(NCERT Pg. 27)
They do not grow in polluted areas.

96. (2) (XII)
To produce 1 zygote = 1 male gamete + 1 female gamete

To produce 1 male gamete = 1 meiosis and 4 viable pollen grains are formed, but only 1 is used to fertilize 1 female gamete

\[ \text{No. of meiotic divisions are } 1/4 \]

To produce 1 female gamete = 1 meiosis and 1 viable megaspore is formed, thus

\[ \text{No. of meiotic divisions are } 1 \]

Thus,

To produce 1 zygote meiotic divisions required = \(1/4 + 1= 5/4\)

Hence, for 200 zygotes meiotic divisions required = 200 multiplied by 5/4 = 250
97. (1) (XI)(NCERT Pg. 36)
   In bryophytes zygote does not undergo reduction division immediately.
   Incorrect statements:
   (2) Leafy members having leaf like appendages in two rows on the stem like structures are not observed in liverworts. (as they are observed in liverworts)
   (3) Leafy stage of mosses develops from the primary protonema as a lateral bud. (as leafy stage of mosses develop from secondary protonema)
   (4) Sporophyte of mosses is less elaborate then that of liverworts. (as sporophyte is less elaborate in liverworts as compared to mosses)

98. (4) (XII)(NCERT Pg. 85)
99. (1) (XI)(NCERT Pg. 38)
   Selaginella – Lycopsida
   Incorrect pairs-
   (2) Adiantum – Sphenopsida (It belongs to Pteropsida)
   (3) Equisetum - Pteropsida (It belongs to Sphenopsida)
   (4) Salvinia - Homosporous (It is heterosporous)

100. (2) (XII)(NCERT Pg.99)
101. (4) (XI)(NCERT Pg. 39)
   Unlike bryophytes and pteridophytes, in gymnosperms, the female gametophytes do not have independent free living existence.

102. (2) (XII) (NCERT Pg.182)
103. (1) (XI)(NCERT Pg. 201)
   *The Nitrobacter* oxidise nitrite of nitrate

104. (2) (XII) (NCERT Pg.179,181,182,185)
105. (4) (XI)(NCERT Pg. 197)
   Sulphur is present in Cysteine Methionine, Ferredoxin and Coenzyme A

106. (1) (XII)(NCERT Pg. 25)
107. (1) (XI)(NCERT Pg. 249)
   Spraying of juvenile conifers with GA hastens the maturity period and thus leading to early seed production.

108. (1) (XII) (NCERT Pg.112)
109. (1) (XI)(NCERT Pg. 243)
   Exponential growth can be expressed as \( W_i = W_0 e^{rt} \)

110. (1) (XII) (NCERT Pg.271)
111. (3) (XI)(NCERT Pg. 163)
   In the 24 hour average duration of cell cycle of a human cell, cell division proper lasts for about 1 hour.

112. (3) (XII)(NCERT Pg. 83)
113. (4) (XI)(NCERT Pg. 164, 165)
   Initiation of assembly of mitotic spindle – Mitotic metaphase
   This is incorrect pair as initiation of assembly of mitotic spindle occurs in Mitotic prophase

114. (2) (XII) (NCERT Pg.117)
115. (3) (XI)(NCERT Pg. 129)
   As Reserve material in prokaryotic are stored in the form of inclusion bodies.

116. (1) (XII) (NCERT Pg.176)
117. (2) (XI)(NCERT Pg. 131)
   In human beings, the membrane of erythrocyte has 52 % proteins and 40% lipids

118. (1) (XII) (NCERT Pg.265)
119. (4) (XI)(NCERT Pg. 189)
Incorrect statements:
iii and iv, as C_4 plants are twice as efficient as C_3 plants in terms of fixing carbon.

120. (1) (XII) (NCERT Pg.251)
121. (3) (XI)(NCERT Pg. 189)
   Root endodermis because of the layer of suberin has the ability to actively transport ions in one direction only.
122. (4) (XII)(NCERT Pg. 26)
123. (2) (XI)(NCERT Pg. 212)
   PS II
124. (2) (XI)(NCERT Pg.231)
125. (3) (XI)(NCERT Pg. 220)
   In photorespiratory pathway sugar and ATPs are not synthesized
126. (3) (XII) (NCERT Pg.235)
127. (1) (XI)(NCERT Pg. 208)
   T. W. Englemann
128. (4) (XII )(NCERT Pg. 90)
129. (4) (XI)(NCERT Pg. 71)
   Palmately compound
130. (1) (XII) (NCERT Pg.243)
131. (4) (XI) (NCERT Pg. 68)
   Sweet potato is analogous to potato, as sweet potato is a modified root and potato is a modified stem and both store food. Organs with different origin, but which perform similar function are analogous organs.
132. (2) (XII) (NCERT Pg.266)
133. (1) (XI) (NCERT Pg. 68)
   Opuntia is a xerophytic plant in which the stem is modified into the flat green and succulent structure.
134. (4) (XII) (NCERT Pg.231)
135. (4) (XI) (NCERT Pg. 74)
136. (3) (XII )(NCERT Pg. 91)
137. (2) (XI)(NCERT Pg. 96)
   Sap wood
138. (4) (XI)(NCERT Pg. 311, these are bones of hindlimbs)
139. (2) (XII)(NCERT pg 199, first para
140. (3) (XI)(NCERT Pg.271)
141. (4) XI, NCERT Page - 49
142. (1) XII, NCERT Page – 212, 5th para, 4th line
143. (2) XI, NCERT Page – 52, 2nd para
144. (2) XII, NCERT Page – 202, Fig. – 11.6
145. (4) XI, NCERT Page – 54, 2nd para, last lines
146. (2) XII, NCERT Page – 194, 195
147. (3) XI, NCERT, Page - 59
148. (1) XII, NCERT, Page – 169, 5th para, 4th line
149. (3) XI, NCERT, Page – 104, 1st para
150. (1) XII, NCERT, Page – 154, Last para, 2nd line
151. (4) XI, NCERT, Page – 112, 1st para, 15th line
152. (1) XII, NCERT, Page – 153, 2nd para, 1st line
153. (2) XI, NCERT, Page - 144
154. (4) XII, NCERT, Page – 157, 2nd para, 3rd line
155. (1) XI, NCERT, Page – 146, Table 4.3
156. (2) XII, NCERT, Page – 137, 3rd para, last line
157. (2) XI, NCERT, Page – 157, Fig. 9.7C
158. (4) XII, NCERT, Page – 141, 2nd line
159. (1) XI, NCERT, Page – 258, 2nd line
160. (3) XII, NCERT, Page – 136, Fig. 7.8
161. (1) XI, NCERT, Page – 262 & 263
162. (2) XII NCERT Page – 53, 2nd para
163. (1) XI, NCERT, Page – 274, 2nd para, 9th line
164. (3) XI A- grey matter , B-white matter , C-dorsal root with axons of sensory neurons, D-central canal
165. (2) XI, NCERT, Page – 272, Table 17.1
166. (2) XII, NCERT, Page – 53, 2nd para, 1st line
167. (1) XI, NCERT, Papillary muscles are found in ventricles. Ductus arteriosus is found only in foetal heart.
168. (3) XII, NCERT, Gastrulation involves cell differentiation and morphogenetic movements.
169. (3) XI, NCERT, Page – 284, 2nd para
170. (2) XII, NCERT Glans penis is enlarged corpus spongiosum having urethra passing through it.
171. (3) XI, NCERT, Page – 293, 2nd para
172. (4) XI, NCERT, Page – 288
173. (4) XI, NCERT, Page – 296, 1st para
174. (3) XI, NCERT, Page – 332, 2nd para, 1st line
175. (4) XI, NCERT, Page – 306, 3rd line, 1st para
176. (2) XI, NCERT, Page – 335, 1st para
177. (4) XI, NCERT, Page – 321, 1st para
178. (2) XI, NCERT, Page – 337, 335, 2nd para
179. (4) XI, NCERT, Its inborn reflex hence unconditional. As it involves many neurons and effectors hence polysynaptic.
180. (1) XI, NCERT, Page – 324, 4th para