## ANSWER KEY

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Hints & Solutions

1. (d)
   \[ s = \frac{u^2}{2\mu g} = \frac{10 \times 10}{2 \times 0.5 \times 10} = 10 \text{m} \]

2. (d)
   \[ S = \frac{t^3}{3} \quad \therefore dS = t^2 dt \]
   \[ a = \frac{d^2S}{dt^2} = \frac{d^2}{dt^2} \left[ \frac{t^3}{3} \right] = 2t \text{ m/s}^2 \]
   Now work done by the force \( W = \int_0^2 F \cdot dS = \int_0^2 ma \cdot dS = 24 \text{J} \)

3. (a)
   Apply Newton’s law for system along the string
   \[ m_B g = \mu (m_A + m_C) \times g \]
   \[ \Rightarrow m_C = \frac{m_B}{\mu} - m_A = \frac{5}{0.2} - 10 = 15 \text{ kg} \]

4. (c)
   \[ K_f = 2k_i \]
   or \[ \frac{1}{2} m (v + 2)^2 = \left( \frac{1}{2} \right) m v^2 (2) \]
   or \[ v = \frac{2}{\sqrt{2} - 1} = 2 \left( \sqrt{2} + 1 \right) \text{ m/s} \]

5. (d)
   \[ U = \frac{1}{2} k x^2 \text{ or } U \propto x^2 \]
   Stretch is increased to 5 times. Therefore stored potential energy will be increased by 25 times.

6. (c)
   Max. frictional force
   \[ f_{\text{max}} = \mu N \]
   \[ = \mu (mg + F \sin 53^\circ) \]
   \[ = 0.2 (20 \times 10 + 30 \times \frac{4}{5}) \]
   \[ = 44.8 \text{ N} \]
   As applied horizontal force is \( F \cos 53^\circ \)
   \[ = 18N < f_{\text{max}}, \text{ friction force will also be } 18 \text{ N}. \]

7. (a)
   Power is equal to the scalar product of force with velocity.
   Power of the engine,
   \[ P = \bar{F} \cdot \bar{v} \quad ... (i) \]
   Given
\[ \mathbf{F} = (20\hat{i} - 3\hat{j} + 5\hat{k}) \text{N} \]
\[ \mathbf{v} = (6\hat{i} + 20\hat{j} + 3\hat{k}) \text{m/s} \]

Thus, after substituting for \( \mathbf{F} \) and \( \mathbf{v} \) in equation (i), it becomes,

\[ P = (20\hat{i} - 3\hat{j} + 5\hat{k}) \cdot (6\hat{i} + 20\hat{j} - 3\hat{k}) \]
\[ = (20 \times 6)(\hat{i}\cdot\hat{i}) + (-3 \times 20)(\hat{j}\cdot\hat{j}) + (5 \times -3)(\hat{k}\cdot\hat{k}) \]
\[ = 120 - 60 - 15 \]
\[ = 45 \]

8. (b)

For equilibrium slope of U vs r graph must be zero.
For stable equilibrium U must be minimum.

9. (b)

Gravitational force is a conservative force and work done against it is a point function \( i.e. \) does not depend on the path.

10. (a)

\[ \mu = \tan 30^\circ = \frac{1}{\sqrt{3}} \]

11. (c)

No non conservative force exists.

12. (d)

\[ W_N + W_F + W_i = \Delta K \]
\[ 0 + 2 \times 10 \times 20 + W_i = 300 \]
\[ W_i = -100 \text{J} \]

13. (b)

\[ f = mg = 2 \times 10 = 20 \text{N.} \]

14. (a)

\[ a = 2 \text{ m/sec}^2 \]
\[ a = 2 \text{m/sec} \]
\[ F = 20 \text{N.} \]

15. (d)

Increase in KE = work done
\[ \frac{1}{2} m v_2^2 - \frac{1}{2} m x \left( \frac{2F x_0}{m} \right) = \frac{1}{2} (2F_0 + F_0) 3x_0 \]
\[ v_2 = \sqrt{\frac{11F x_0}{m}}. \]

16. (c)

\[ \omega_{arg} = \langle \omega \rangle = \frac{\text{total}}{\text{total}} \frac{0}{\text{time}} \]
\[ = \frac{2\pi / 3 + 2\pi / 3}{2 + 1} = \frac{4\pi}{9} \text{ rad/sec.} \]

17. (c)
\[ W_{\text{pseudo}} + W_g + W_T = \Delta K = 0 \]
\[ ma(\ell \sin \theta) + (-mg(\ell - \ell \cos \theta)) + 0 = 0 \]
\[ \theta = 2\tan^{-1} \left( \frac{a}{g} \right) = 60^\circ \]

18. (b)
At point A
\[ mgR = \frac{1}{2}mv_A^2 \implies v_A = \sqrt{2gR} \]

\[ a_r \quad \square \quad m \quad \downarrow \quad mg \]

\[ N_1 - mg = ma_r = \frac{mV_A^2}{R} \]
\[ = 2mg \]

19. (b)
\[ \cos \theta = \frac{7}{2} - \frac{2}{3} = \frac{1}{2} \]
\[ \theta = 60^\circ \]
Angle from lower vertical = 120°

20. (b)
If the both mass are revolving about the axis yy' and tension in both the threads are equal then
\[ M \quad m \]
\[ M\omega^2 x = m\omega^2(l - x) \]
\[ \Rightarrow Mx = m(l - x) \]
\[ \Rightarrow x = \frac{ml}{M + m} \]

21. (c)
Both changes in direction although their magnitudes remains constant.

22. (a)
\[ F = -\frac{dU}{dx} = -\frac{d}{dx} (20 + 2x + 4x^2) \]
\[ F = -2 - 8x \]
\[ W_F = -\int_0^4 (2 + 8x) \, dx \]
\[ = -\int_0^4 2 \, dx - \int_0^4 8x \, dx \]
\[ = -2 [4 - 0] - \frac{8}{2} [16 - 0] \]
\[ = -8 - 64 = -72 \, J \]
\[ W_{ext} + W_F = \Delta K = 0 \]
\[ W_{ext} = -W_F = -(-72) = 72 \, J \]

23. (d)
The bob of the pendulum moves in a circle of radius
\[ (R + R\sin 30^\circ) = \frac{3R}{2} \]

Force equations
\[ T\sin 30^\circ = m\left(\frac{3R}{2}\right) \omega^2 \]
\[ T\cos 30^\circ = mg \]
\[ \Rightarrow \tan 30^\circ = \frac{\frac{3}{2} \omega^2 R}{g} = \frac{1}{\sqrt{3}} \]
\[ \Rightarrow \omega = \sqrt{\frac{2g}{3\sqrt{3}R}} \quad \text{Ans} \]

24. (a)
\[ R_{CM} = \frac{m_1 \hat{r}_1 + m_2 \hat{r}_2}{m_1 + m_2} \]
\[ R_{CM} = -\frac{(\hat{i} + \hat{j} + \hat{k})}{2} \]

25. (a)
\[ F = -\frac{dU}{dx} \]
\[ \therefore U(x) = kx^2 \]
\[ F = -2kx \]

26. (d)
Mechanical Energy conservation between A and C
27. (c) 
Thrust force, 
\[ F = \left| \mathbf{v} \cdot \left( -\frac{dm}{dt} \right) \right| \]
\[ \therefore \quad 500 = (2000) \frac{dm}{dt} \]
or \[ \frac{dm}{dt} = 0.25 \text{ kg/sec.} \]

28. (a) 
\[ C_1 \rightarrow \text{Position of centre of mass of rods AB and CD (nearer to CD, as it is heavy)} \]

29. (b) 
\[ a_{CM} = \frac{(m)(0) + (m)(a)}{m + m} = \frac{1}{2} a \]

30. (a) 
From conservation of linear momentum we can see that velocity of 2m will become \( \frac{v}{2} \) after collision (as mass is doubled) 

\[ \text{Now, } e = \frac{\text{Relative velocity of separation}}{\text{Relative velocity of approach}} = \frac{\frac{v}{2}}{v} = \frac{1}{2} \]

31. (c) 
Initial momentum of 3m mass = 0 
Due to explosion this mass splits into three fragments of equal masses. 
Final momentum of system = ......(iii) 
By the law of conservation of linear momentum 
\[ m\vec{v} + m\vec{i} + m\vec{j} = 0 \quad \Rightarrow \quad \vec{v} = -\vec{u}(\vec{i} + \vec{j}) \]
34. (c)
External torque about axis on system is zero so angular momentum is conserved.
As man walks towards axis of rotation. Moment of inertia of system decreases so that angular velocity increases.

35. (c)

\[ I = \frac{mR^2}{2} \]

36. (a)
\[ I_1 \omega_1 = I_2 \omega_2 \]
Since, men move towards middle of turn table I decreases hence \( \omega_2 \) increases.

\[ \therefore KE = \frac{L^2}{21} \]
L = constant and I decreases so KE increases

37. (c)
using angular momentum conservation

\[ \frac{ML^2}{12} \omega_0 = \left( \frac{ML^2}{12} + 2m \left( \frac{L}{4} \right)^2 \right) \omega \]
\[ \omega = \frac{M\omega_0}{M + 6m} \]

38. (d)
\[ I_x = I_{cm} + mx^2 \]

39. (b)

\[ f = \text{Friction force} = \frac{MV^2}{R} \]
By Newton’s third law, friction force on the disc acts in radially outwards direction.
\[ f = \frac{MV^2}{R} \]
No work done by non-conservative forces exists. Loss of gravitational potential energy goes to increase in kinetic energy of both the spheres i.e. reached at bottom with same kinetic energy.
MI of hollow sphere is higher than MI of solid sphere so rotational KE of hollow sphere is high.
And translational KE of solid sphere is higher.

41. (a)

For conical pendulum of length $\ell$, mass $m$ moving along horizontal circle as shown

$T \cos \theta = mg \quad \ldots \ (1)$

$T \sin \theta = m\omega^2 \ell \sin \theta \quad \ldots \ (2)$

From equation 1 and equation 2, $\ell \cos \theta = \frac{g}{\omega^2}$

$\ell \cos \theta$ is the vertical distance of sphere below O point of suspension. Hence if $\omega$ of both pendulums are same, they shall move in same horizontal plane.

Hence statement-2 is correct explanation of statement-1.

42. (a)

43. (c)

44. (a)

45. (a)
Given: \( y_B = 2y_B \),

\[ M_B = 2N_A \]

For ideal gas:

\[ 0 \quad \frac{p}{\rho} = \frac{PM}{RT} \]

\[ \frac{p_B}{p_A} = \frac{P_A \cdot M_A}{T_A} \times \frac{T_B}{P_B \cdot M_B} \]

\[ x = 2x \]

\[ 2 = \frac{P_A}{p_B} \times \frac{1}{3} \]

\[ \frac{P_A}{p_B} = 6 \]

\( \text{Option b is correct} \)
47. For ideal gas:

\[ \rho = \frac{PM}{RT} \]

\[ z \approx 0.82 \]

By comparing:

The density of nitrogen is maximum at 546 K and 5 atm.

48. Applying ideal gas law:

\[ PV = \frac{m}{M} RT \]

\[ M = \frac{MRT}{PV} = \frac{1.76 \times 0.82 \times 273}{\frac{1120}{1000} \times 1} = 35.178 \]

Let 'x' be the fraction of O₂ in a given sample

\[ x \times 82 + (1 - x) \times 48 = 35.178 \]
\( n = 0.8 \)

**Volume of O\(_2\) in a given sample:** 
\[ 1120 \times 0.8 = 896 \, \text{ml} \]

49. At constant temperature:

\[ P_1 V_1 = P_2 V_2 \]

\[ \Rightarrow P_2 = \frac{1 \times 2.5}{0.5} = 5 \, \text{bar} \]

\[ \therefore \text{Increase in pressure} = \frac{P_2 - P_1}{P_1} \times 100 \]

\[ = 400\% \]

52. Van der Wall equation is given by:

\[ \left( P + \frac{a}{V^2} \right) (V-b) = RT \]

At high pressure; \( P \gg \frac{a}{V^2} \)

\[ \Rightarrow P (V-b) = RT \]
\[ \rho V = RT + bP \]

\[ \frac{\rho V}{RT} = z = 1 + \frac{bP}{RT} \]
53. For weak acids:

\[ [\text{H}^+] = \sqrt{K_a x_c} \]

\[ \Rightarrow \quad \text{pH} = \frac{1}{2} \left( \text{p}K_a - \log c \right) \]

\[ \Rightarrow \quad (\text{pH})_1 - (\text{pH})_2 = \frac{1}{2} \left( \log c_1 - \log c_2 \right) \]

\[ = \frac{1}{2} \left( \log \frac{c_1}{c_2} \right) \]

\[ = 0.5 \]

57. \( \text{pH} = 18 \)

\[ \Rightarrow \quad [\text{H}^+] = 10^{-18} \text{ M} \]

\[ \text{No. of moles of } \text{H}^+ \text{ in } 1 \text{ ml solution} \]

\[ = 10^{-18} \times 10^{-3} \text{ moles} \]

\[ = 10^{-16} \text{ moles} \]

\[ \Rightarrow \quad \text{No. of hydrogen ions} = 10^{-16} \times 6.022 \times 10^{23} \]

\[ = 6.022 \times 10^7 \]
58. In water;

\[ S_0 = \sqrt{K_{sp}} \]

In 0.02 M \( CaCl_2 \)

\[ S_1 = \frac{K_{sp}}{0.02} \]

In 0.01 M \( NaCl \)

\[ S_2 = \frac{K_{sp}}{0.01} \]

In 0.05 M \( AgNO_3 \)

\[ S_3 = \frac{K_{sp}}{0.05} \]

\[ S_0 > S_2 > S_1 > S_3 \]

59. Degree of hydrolysis:

\[ h = \sqrt{\frac{K_a}{C}} = \sqrt{\frac{K_{eq}}{K_a x C}} = \sqrt{\frac{10^{-14}}{4 \times 10^{-3} \times 0.4}} = 2.5 \times 10^{-6} \]
\[(\text{NH}_4)_2 \text{SO}_4 \rightarrow 2\text{NH}_4^+ + \text{SO}_4^{2-}\]

Also:
\[\text{NH}_3 + \text{H}_2\text{O} \rightarrow \text{NH}_4^+ + \text{OH}^-\]

Let moles of salt added be \(x\)

\[\text{[NH}_4^+] \text{ from salt} = \frac{2x}{0.2} \text{ M}\]

\[pOH = pK_b + \log \left( \frac{\text{[salt]}}{\text{[Base]}} \right)\]

\[0.5 = 4.7 + \log \left( \frac{2x/0.5}{0.2} \right)\]

\[0.3 = 2\log x + \log 20\]

\[x = 0.1\]

Mass of \((\text{NH}_4)_2 \text{SO}_4 = 0.1 \times 132 = 13.2 \text{ g}\]
Relative acidic strength = \( \frac{a_1}{a_2} \)
\[ = \sqrt{\frac{K_{a_1}}{K_{a_2}}} \]
\[ = \sqrt{10} \]

62.
Conc. of \( Ca(OH)_2 \) = \( \frac{20}{100 \times 10} = 0.02 \) M

For:
\[ CaCO_3 \rightleftharpoons CaO + CO_2 \]
\[ 0.02 - n \]

\[ K_p = P_{CO_2} = 1.16 \text{ atm} \]

\[ \Rightarrow \text{For CO}_2: \]
\[ P \cdot V = nRT \]
\[ P_{CO_2} = nRT \]
\[ 1.16 = n \times 0.082 \times 1073 \]
\[ n = 0.013 \]

\( \Rightarrow \% \text{ of } CaCO_3 \text{ remaining} = \frac{0.007}{0.02} \times 100 \)}
\( \% \) of \( \text{CaCO}_3 \) remained = \( \frac{0.007}{0.02} \times 100 \) = 3.4 \%

63.

\[ \Delta G = -RT \ln K \]

\[ \ln K = -\frac{\Delta G}{RT} \]

For positive slope; \( \Delta G \) must be negative

\[ \Rightarrow \text{reaction must be exothermic.} \]

64.

\[ \text{XY}_2 \rightleftharpoons \text{XY} + \text{Y} \]

\[ (P_0 - \rho) \quad (P) \quad (P) \]

\( (P_T)_{eq} = 600 = 400 - \rho + \rho + \rho = 400 + \rho \)

\[ \Rightarrow \rho = 200 \text{ mm Hg} \]

\[ \Rightarrow k_p = \frac{P_{XY} \times P_Y}{P_{XY}_2} = 200 \text{ mm Hg} \]
For \( B \rightarrow C \):

\[
p_0 \times 2V_0 = p_C \times 4V_0
\]

\[\Rightarrow p_C = \frac{p_0}{2}\]

\[\Rightarrow T_A = \frac{p_0 V_0}{R}\]

\[\Rightarrow T_B = \frac{p_0}{2} \times \frac{2V_0}{R} = \frac{p_0 V_0}{R}\]

\[\Rightarrow T_A = T_B\]

For process \( ABCD\):

\( DE = DU = 0\)

Also:

\[\omega = -p_0 V_0 + \frac{p_0}{2} \times 2V_0 - 2p_0 V_0 \ln 2\]

\[\Rightarrow \omega = -2p_0 V_0 \ln 2\]

And:

\[Q = C_p \left( \frac{p_0 V_0}{R} \right) - C_p \left( \frac{p_0 \times 2V_0}{R} \right) + 2p_0 V_0 \ln 2\]

\[\Rightarrow Q = 2p_0 V_0 \ln 2\]
67. For adiabatic process:

\[ Q = 0 \]

and for expansion against vacuum:

\[ W = 0 \]

\[ \Rightarrow \Delta U = 0 \]

\[ \Rightarrow T_1 = T_2 \]

68. Entropy change is given by:

\[ \Delta S = C_v \ln \frac{T_2}{T_1} + R \ln \frac{V_2}{V_1} \]

\[ \Rightarrow \Delta S = 5 \ln \frac{373}{298} + 2 \ln 10 \]

69. \[ N_n^2 = \frac{N_2}{2} + \left( \frac{3 \sqrt{N_2}}{2} \right) \left( \ln \frac{373}{298} \right) \]
\[ K_p = \frac{P_{H_2}^{1/2} \times P_{N_2}^{1/2}}{P_{N_2}} \]

\[ K_p = \left( \frac{3}{2(1+\alpha)} \right)^{1/2} \left( \frac{\alpha P}{2(1+\alpha)} \right)^{1/2} \]

\[ \frac{(1-\alpha)P}{(1+\alpha)P} \]

\[ K_p = 3^{3/2} \times \frac{\alpha^2 P}{2^2 \cdot (1+\alpha)(1-\alpha)} \]

\[ K_p = 2^{3/2} \alpha^2 P \]

\[ \frac{1}{4(1-\alpha^2)} \]

Solving for \( \alpha \) given:

\[ \alpha = \left( 1 + \frac{2.5 \times P}{K_p} \right)^{-1/2} \]

7b.

\[ ^{+n} \text{A} \; ^{+n} \text{A}^+ \rightarrow ^{+5} \text{A} \; ^{-2} \text{O}_2^- + (5-n) e^- \]

\[ 2.63 \times 10^{-3} \text{ mol} \]

\[ 2.63 \times 10^{-3} (5-n) \text{ mol} \]
Also,

\[ \text{MnO}_4^- + 5e^- \rightarrow \text{Mn}^{2+} \]

\[ 1.61 \times 10^3 \text{ mol} \quad 1.61 \times 5 \times 10^{-2} \text{ mol} \]

\[ \Rightarrow \quad 1.61 \times 5 \times 10^{-2} = 2.60 \times 10^{-2} \ (5 - n) \]

\[ \Rightarrow \quad 5 - n = 3 \]

\[ \Rightarrow \quad n = 2 \]

74.

\[ \text{Sn}^{2+} \rightarrow \text{Sn}^{4+} + 2e^- \]

\[ \text{Ca}_2 \text{O}_7^{2-} + 6e^- \rightarrow 2 \text{Ca}^{2+} \]

or

\[ \frac{1}{3} \text{Ca}_2 \text{O}_7^{2-} + 2e^- \rightarrow \frac{2}{3} \text{Ca}^{2+} \]

\[ \Rightarrow \quad \frac{1}{3} \text{ mol of } \text{K}_2\text{Ca}_2\text{O}_7 \text{ will oxidise } 1 \text{ mol} \]

of \( \text{Sn}^{2+} \).
75. \[ \text{MnO}_4^- + 5e^- \rightarrow \text{Mn}^{2+} \]

\[ \text{H}_2\text{O}_2 \rightarrow \text{O}_2 + 2e^- \]

or \[ \frac{5}{2}\text{H}_2\text{O}_2 \rightarrow \frac{5}{2} \text{O}_2 + 5e^- \]

\( \Rightarrow \) 2.5 mol of \( \text{H}_2\text{O}_2 \) decolorizes 1 mol \( \text{KMnO}_4 \)

76.

\[ 8\text{H}^+ + 2\text{I}^+ + 7e^- \rightarrow \frac{1}{2} \text{I}_2 + 4\text{H}_2\text{O} \]

\( \Rightarrow \) Eq. wt. = \( \frac{M}{7} \)

77.

No. of moles of gas: \( n = \frac{P_1 V_1}{R T_1} \)

\[ = \frac{10}{0.0821 \times 300} \]

\( \Rightarrow \) \( n = 0.406 \) mol

Also:

\[ T_2 = \frac{P_2 V_2}{R n} = \frac{20}{0.0821 \times 0.406} \]

\( = 600 \) K
\[ 
\Delta U = C_p \Delta T \\
= 50 \times 300 = 150 \text{ kJ} 
\]

78. Density of ideal gas is given by:

\[ d = \frac{PM}{RT} \]

\[ \Rightarrow \frac{d_A}{d_B} = \frac{P_A M_A}{P_B M_B} \hspace{1cm} \because T_A = T_B \]

\[ \Rightarrow \frac{P_A}{P_B} \times 2 \times 2 = 4 \]

79. 

\[ \therefore \text{rate of efflux/diffusion } \propto \frac{1}{\sqrt{M}} \]

\[ \Rightarrow \text{lightest gas will be filled first} \]

81. 

Given:

\[ \text{H}_2 + \frac{1}{2} \text{O}_2 \rightarrow \text{H}_2\text{O} \hspace{1cm} \text{I} \]

\[ \text{K} + \text{H}_2\text{O} + \text{water} \rightarrow \text{KOH(aq)} + \text{H}_2 \hspace{1cm} \text{II} \]

\[ \text{KOH} + \text{water} \rightarrow \text{KOH(aq)} \hspace{1cm} \text{III} \]
\( \text{①} + \text{②} \rightarrow \text{③} \) give

\[
k + \frac{1}{2} \text{H}_2 + \frac{1}{2} \text{O}_2 \rightarrow \text{KON}
\]

\( \Delta H = -68.29 - 48 + 14 \)

is the heat of formation of KON.

82.

\( \Delta H = \Delta H_{\text{f}} \rightarrow \text{TOS} \)

Reaction is spontaneous if:

\( \Delta H < 0 \)

This will happen when temperature is increased.
Entropy change for isothermal process:

\[ \Delta S = nR \ln \frac{V_2}{V_1} \]

\[ = 2 \times 8.314 \times 2.302 \log 10 \]

\[ = 38.2 \, \text{J/mol K} \]

84.

\[ \text{N}_2 \text{O}_4 \rightleftharpoons 2 \text{HNO}_2 \]

\[ (1-x) \quad 2x \]

Given: \( x = 0.2 \)

\[ \Rightarrow \text{Total moles} = 1 + x = 1.2 \]

\[ \Rightarrow P_2 V_2 = 1.2 \, RT_2 \]

Also, \( V_1 = V_2 = \frac{1 \, RT_1}{P_1} \)

\[ \Rightarrow P_2 \times \frac{RT_1}{P_1} = 1.2 \, RT_2 \]

\[ \Rightarrow P_2 \times \frac{300}{1} = 1.2 \times 600 \]

\[ \Rightarrow P_2 = 2.4 \, \text{atm} \]
91. Ans: C, Page 30
Volvox and Fucus: Oogamy, Spirogyra: Isogamy, non-flagellated gametes, Chlamydomonas: Isogamy, flagellated gametes

92. Ans: D
Page 32

93: Ans: B
Page 33

94. Ans: B
Page 32, 33
These are the characters of Phaeophyceae

95: Ans: C
Page 38, 39
Both pteridophytes and gymnosperms have archegonia

96. Ans: B
Page: 66
Primary roots are formed by direct elongation of radical.

97. Ans: B
Page: 39
In Cycas, male cones and megasporophylls are borne on different trees.

98. Ans: D
Page: 41
In angiosperms fusion of diploid secondary nucleus and haploid male gamete results in the formation of triploid primary endosperm nucleus.

99. Ans: C
Page: 33
Red algae show presence of chl-a, d and phycoerythrin

100. Ans: B
Page: 38

101. Ans: A
Page: 36

102. Ans: C
Page: 35
Sphagnum has capacity to hold water.

103: Ans: A
Page: 38

104. Ans: A
Page: 38

105. Ans: A
Formation of gametophyte directly from any cell of sporophyte other than spore is called apospory.

106: Ans: B
Stamens in angiosperms and microsporophylls in pteridophytes and gymnosperms produce microspores

107. Ans: B
Winged pollen grains are found in Pinus.

108: Ans: B
Page: 68
Analogous organs are those which have similar function and different origin. Sweet potato and potato are modified root and stem respectively. Both store food and are modified for vegetative reproduction.

109. Ans: D
Page: 69

110. Ans: A
Page: 71

111. Ans: C

112. Ans: B
Page: 73

113. Ans: D
Page: 79

114. Ans: A
Page: 80
Only Belladonna belongs to family Solanaceae whereas other plants belong to family Liliaceae.

115. Ans: B
Page: 78

116. Ans: A
Page: 77
In seeds of cereals seed coat is membranous and fused with fruit wall.

117. Ans: C  
Page: 76

118. Ans: D  
Page: 75

119. Ans: C  
Page: 68
Stem (and not root) bears nodes and internodes.

120 Ans: B  
Page: 68

121. Ans: D  
Page: 68
In *Euphorbia*, modified stem is cylindrical whereas in *Opuntia* it is flattened.

122. Ans: D  
Page: 75

123. Ans: A  
Page: 68
In *Rhizophora*, pneumatophores grow vertically upwards and help to get oxygen for respiration.

124. Ans: A  
Page: 77

125. Ans: C  
Page: 73

126. Ans: C  
Page: 70
In some leguminous plants leaf bases may become swollen and are called pulvinous leaf bases.

127. Ans: B  
Page: 71
In Australian acacia, the leaves are small and short lived. The petioles expand, become green and synthesise food.

128. Ans: C  
In apple, thalamus becomes fleshy and becomes a part of fruit. Such fruits are called false fruits.

129. Ans: A
Fertilization results in formation of diploid zygospore.

130. Ans: D
In Asteraceae family inflorescence is capitulum or head type.

131. Ans: C
In *Monstera* roots develop from parts of the plant other than the radical
Page: 66

132. Ans: B
Page: 78

133 Ans: B
Page: 75

134. Ans: C
Page: 66

135. Ans: C
Page: 29

*(NOTE : To get the answer refer above page numbers from NCERT XI Biology Text Book.)*
136. (d) DNA: heteropolymer of Deoxyribonucleotides (Deoxy Ribose sugar + Nitrogen base + Phosphate group).

137. (a) Ornithorhyncus (Duck billed Platypus) is the only poisonous mammal.

141. Cellulose structure

142. $Q_{10}$ temperature coefficient is a measure of the rate of change of a biological or chemical system as a consequence of increasing the temperature by 10 °C.

$$Q_{10} = \left( \frac{R_2}{R_1} \right)^{10/(T_2-T_1)}$$

For most biological systems, the $Q_{10}$ value is ~2 to 3.

143. Exclusive chordate characters-
Hollow dorsal nerve cord, ventral solid notochord, pharyngeal gill slits & post anal tail.

145. (c) Chameleon- Shows camouflage.
147. Find the odd one out based on its monomer
   (a) inulin- Its monomer is **Fructose (Ketose sugar)** unlike others which have Glucose (Aldose sugar) as monomer.
150. Both classes Aves & Mammalia are homeothermic (warm-blooded).
151. (b) Ureters are histologically composed of transitional epithelium.
152. 2. Palmitic acid has 14 –CH₂ groups in its structure.
155. In allergies- Eosinophils, Ig E & ESR increase.
158. Cockroach blood (Haemolymph) lacks RBCs or Haemoglobin (Respiratory pigment). Earthworm lacks RBCs but contains Hb.
159. (b) Myosin shows ATPase activity.
162. Among mammals Elephants have intra-abdominal testes & Whales show seasonal descent of testes. Humans have extra-abdominal testes as Spermatogenesis requires 1-8°C lower temperature than body (37°C).
163. Pecten in their eyes, uropygeal gland & Sternum with keel; all these are Avian characters.
165. Parts of leg of cockroach:
   (a) Coxa- widest segment
   (c) Tibia- longest segment
166. (d) Hump of camel is composed of up to 80 pounds of fat (which yields metabolic water on oxidation). Baby camels are born without humps & do not develop it unless they eat solid food.
167. *Pterophyllum* (Angel fish) - aquatic
*Gavialis* (Crocodile) - aquatic
*Aptenodytes* (The great Penguins) - aquatic
*Balaenoptera* (Blue whale) - aquatic
*Apteryx* (Kiwi)
*Calotes* (Lizard)

172. (b) Inner lining of cheeks: Stratified squamous epithelium.

174. Label D: Gizzard.
Refer NCERT Biology Class 11th Chapter 7, Page 113.

175. Label A: Spermatheca.
Refer NCERT Biology Class 11th Chapter 7, Page 115.

177. **R:** These fibres are *uninucleate* & branched.

178. **R:** Tight junctions help to stop substance from leaking across a tissue.