<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>(2)</td>
<td>2.</td>
<td>(1)</td>
<td>3.</td>
<td>(4)</td>
</tr>
<tr>
<td>6.</td>
<td>(3)</td>
<td>7.</td>
<td>(1)</td>
<td>8.</td>
<td>(1)</td>
</tr>
<tr>
<td>11.</td>
<td>(4)</td>
<td>12.</td>
<td>(1)</td>
<td>13.</td>
<td>(4)</td>
</tr>
<tr>
<td>16.</td>
<td>(1)</td>
<td>17.</td>
<td>(3)</td>
<td>18.</td>
<td>(4)</td>
</tr>
<tr>
<td>21.</td>
<td>(3)</td>
<td>22.</td>
<td>(2)</td>
<td>23.</td>
<td>(1)</td>
</tr>
<tr>
<td>26.</td>
<td>(3)</td>
<td>27.</td>
<td>(3)</td>
<td>28.</td>
<td>(2)</td>
</tr>
<tr>
<td>31.</td>
<td>(1)</td>
<td>32.</td>
<td>(2)</td>
<td>33.</td>
<td>(Bonus)</td>
</tr>
<tr>
<td>36.</td>
<td>(3)</td>
<td>37.</td>
<td>(4)</td>
<td>38.</td>
<td>(1)</td>
</tr>
<tr>
<td>41.</td>
<td>(2)</td>
<td>42.</td>
<td>(3)</td>
<td>43.</td>
<td>(3)</td>
</tr>
<tr>
<td>46.</td>
<td>(3)</td>
<td>47.</td>
<td>(1)</td>
<td>48.</td>
<td>(4)</td>
</tr>
<tr>
<td>51.</td>
<td>(3)</td>
<td>52.</td>
<td>(4)</td>
<td>53.</td>
<td>(3)</td>
</tr>
<tr>
<td>56.</td>
<td>(2)</td>
<td>57.</td>
<td>(3)</td>
<td>58.</td>
<td>(1)</td>
</tr>
<tr>
<td>61.</td>
<td>(3)</td>
<td>62.</td>
<td>(2)</td>
<td>63.</td>
<td>(4)</td>
</tr>
<tr>
<td>66.</td>
<td>(1)</td>
<td>67.</td>
<td>(4)</td>
<td>68.</td>
<td>(1)</td>
</tr>
<tr>
<td>71.</td>
<td>(1)</td>
<td>72.</td>
<td>(4)</td>
<td>73.</td>
<td>(2)</td>
</tr>
<tr>
<td>76.</td>
<td>(2)</td>
<td>77.</td>
<td>(4)</td>
<td>78.</td>
<td>(2)</td>
</tr>
<tr>
<td>81.</td>
<td>(4)</td>
<td>82.</td>
<td>(1)</td>
<td>83.</td>
<td>(4)</td>
</tr>
<tr>
<td>86.</td>
<td>(2)</td>
<td>87.</td>
<td>(4)</td>
<td>88.</td>
<td>(3)</td>
</tr>
<tr>
<td>91.</td>
<td>(2)</td>
<td>92.</td>
<td>(4)</td>
<td>93.</td>
<td>(2)</td>
</tr>
<tr>
<td>96.</td>
<td>(4)</td>
<td>97.</td>
<td>(4)</td>
<td>98.</td>
<td>(2)</td>
</tr>
<tr>
<td>101.</td>
<td>(4)</td>
<td>102.</td>
<td>(4)</td>
<td>103.</td>
<td>(4)</td>
</tr>
<tr>
<td>106.</td>
<td>(2)</td>
<td>107.</td>
<td>(3)</td>
<td>108.</td>
<td>(3)</td>
</tr>
<tr>
<td>111.</td>
<td>(3)</td>
<td>112.</td>
<td>(4)</td>
<td>113.</td>
<td>(4)</td>
</tr>
<tr>
<td>116.</td>
<td>(4)</td>
<td>117.</td>
<td>(3)</td>
<td>118.</td>
<td>(1)</td>
</tr>
<tr>
<td>121.</td>
<td>(4)</td>
<td>122.</td>
<td>(4)</td>
<td>123.</td>
<td>(3)</td>
</tr>
<tr>
<td>126.</td>
<td>(2)</td>
<td>127.</td>
<td>(3)</td>
<td>128.</td>
<td>(2)</td>
</tr>
<tr>
<td>131.</td>
<td>(1)</td>
<td>132.</td>
<td>(4)</td>
<td>133.</td>
<td>(3)</td>
</tr>
<tr>
<td>136.</td>
<td>(4)</td>
<td>137.</td>
<td>(3)</td>
<td>138.</td>
<td>(4)</td>
</tr>
<tr>
<td>141.</td>
<td>(4)</td>
<td>142.</td>
<td>(3)</td>
<td>143.</td>
<td>(3)</td>
</tr>
<tr>
<td>146.</td>
<td>(1)</td>
<td>147.</td>
<td>(4)</td>
<td>148.</td>
<td>(3)</td>
</tr>
<tr>
<td>151.</td>
<td>(3)</td>
<td>152.</td>
<td>(2)</td>
<td>153.</td>
<td>(3)</td>
</tr>
<tr>
<td>156.</td>
<td>(1)</td>
<td>157.</td>
<td>(1)</td>
<td>158.</td>
<td>(1)</td>
</tr>
<tr>
<td>161.</td>
<td>(1)</td>
<td>162.</td>
<td>(1)</td>
<td>163.</td>
<td>(3)</td>
</tr>
<tr>
<td>166.</td>
<td>(4)</td>
<td>167.</td>
<td>(2)</td>
<td>168.</td>
<td>(4)</td>
</tr>
<tr>
<td>171.</td>
<td>(2)</td>
<td>172.</td>
<td>(4)</td>
<td>173.</td>
<td>(3)</td>
</tr>
<tr>
<td>176.</td>
<td>(1)</td>
<td>177.</td>
<td>(1)</td>
<td>178.</td>
<td>(4)</td>
</tr>
</tbody>
</table>

CENTERS: MUMBAI / DELHI / AKOLA / LUCKNOW / NAGPUR / NASHIK / PUNE / GOA / BOKARO / DUBAI
3. Correct option is (4)
   Solution:
\[ S_{\text{th}} = u + \frac{a}{2}(2n - 1) \]

\[ S_{\text{th}} = 10 + \frac{10}{2}(2 \times 3 - 1) = 10 + 25 = 35 \text{ m} \]

\[ S_{\text{ph}} = 10 + \frac{10}{2}(2 \times 2 - 1) = 10 + 15 = 25 \text{ m} \]

\[ S_{\text{th}} : S_{\text{ph}} :: 7 : 5 \]

4. **Correct option is (4)**
   **Solution:**
   From given graphs:
   \[ F_x = \frac{3}{4} x + 10, \quad F_y = -\frac{4}{3} y + 20, \quad F_z = \frac{4}{3} z - 16 \]
   \[ W = \int \vec{F} \cdot d\vec{r} = \int_0^8 F_x \, dx + \int_5^{20} F_y \, dy + \int_{12}^0 F_z \, dz \]
   \[ W = 104 + 50 + 96 = 250 \text{ J} \]

5. **Correct option is (2)**
   **Solution:**
   \[ x = \frac{0 \times \pi (28)^2 - 7 \times \pi (21)^2}{\pi (28)^2 - \pi (21)^2} \]
   \[ x = \frac{-7\pi (21)^2}{\pi \times 7 \times 49} = -9 \text{ cm} \]
   distance from origin = 9 cm

6. **Correct option is (3)**
   **Solution:**
   \[ x = 3t^3 - 6t \quad y = t^2 - 2t \]
   \[ v_x = \frac{dx}{dt} = 6t - 6 \quad v_y = \frac{dy}{dt} = 2t - 2 \]
   at \( t = 1 \text{ sec} \quad v_x = 0 \quad \text{and} \quad v_y = 0 \]
   hence \[ v = \sqrt{v_x^2 + v_y^2} = 0 \]
\[ W = F \cdot d\theta 
\]
\[ = -\int_{0}^{\frac{\pi}{2}} d\theta = -0.61 \int_{0}^{\frac{\pi}{2}} 2 \theta \]
\[ z = \frac{-0.61 \times 500}{2} = -25 \]

\[ W = \Delta KE 
\]
\[ -25 = \frac{1}{2} m v_f^2 - \frac{1}{2} m v_i^2 
\]
\[ 475 = \frac{1}{2} m v_f^2 
\]

\[ m = \text{mass} 
\]

\[ \text{Power} = k = f \cdot v 
\]

\[ \frac{mv}{dt} = f - V 
\]

\[ v \cdot dv = \frac{k}{m} \cdot dt 
\]

\[ \frac{1}{2} v^2 = \frac{k}{m} t 
\]

\[ v = \sqrt{\frac{2k}{m} t} 
\]

\[ a = \frac{dv}{dt} = \sqrt{\frac{m}{2} \cdot \cdot \frac{k}{v^2 \cdot t}} 
\]

\[ f = ma = \sqrt{mk} 
\]
9. Correct option is (3)
Solution:
\[
\frac{I_2}{I_1} = \frac{m_2 r_2^2}{m_1 r_1^2} = \left(\frac{A \times 2\pi r_2}{A \times 2\pi r_1}\right) \frac{r_2^2}{r_1^2} = \frac{r_2^3}{r_1^3}
\]
\[
\frac{r_2}{r_1} = (4)^{1/3}
\]

10. Correct option is (4)
Solution:
\[
\vec{F}_A + \vec{F}_B + \vec{F}_C + \vec{F}_D + \vec{F}_E = (100 \times 3) \hat{i} = 300 \hat{i}
\] ---- (1)
\[
\vec{F}_B + \vec{F}_C + \vec{F}_D + \vec{F}_E = (100 \times 1) \left(-\hat{i}\right) = -100 \hat{i}
\] ---- (2)
\[
\vec{F}_A + \vec{F}_C + \vec{F}_D + \vec{F}_E = (100 \times 24) \hat{j} = 2400 \hat{j}
\] ---- (3)
From (1) & (2) \( \Rightarrow \vec{F}_A = 400 \hat{i} \)
From (1) & (3) \( \Rightarrow \vec{F}_B = -300 \hat{i} - 2400 \hat{j} \)
So, when A & B pulling the cart then acceleration
\[
\vec{a} = \frac{\vec{F}_A + \vec{F}_B}{m} = \frac{700 \hat{i} - 2400 \hat{j}}{100} = (7 \hat{i} - 24 \hat{j}) \text{ m/s}^2
\]
\[
|\vec{a}| = 25 \text{ m/s}^2
\]

11. Correct option is (4)
Solution:
\[
\omega_A \omega_C = \frac{V_A}{r_A} \frac{r_C}{V_C} = \frac{r_C}{r_A}
\]
\[
= \frac{a}{2a} = \frac{1}{2}
\]

12. Correct option is (1)
Solution:
\[
I = \frac{2}{5} MR^2
\]
\[
I' = \frac{2}{5} MR^2 + \frac{2}{5} MR^2 + \frac{7}{5} MR^2 + \frac{7}{5} MR^2
\]
\[
I' = \frac{18}{5} mR^2 = 9I
\]
13. Correct option is (4)
Solution:
\[ v_{\text{avg}} = \frac{\text{distance}}{\text{time}} \]
\[ v_{\text{avg}} = \frac{1}{2} (1 + 2) \times \frac{1}{1} \]
\[ = \frac{3}{2} = 1.5 \text{ m/s} \]

15. Correct option is (2)
Solution:
\[ mgh = \frac{1}{2} mv^2 + \frac{1}{2} Iw^2 \]
\[ mgh = \frac{1}{2} mv^2 + \frac{1}{2} MR^2 \times \frac{v^2}{R^2} \]
\[ v = \sqrt{\frac{4mgh}{2m + M}} \]

\[
\begin{align*}
\text{(16)} & \quad \frac{dT}{dt} = -k(T - T_0) \\
10 & \quad z = -k(65 - T_0) = 2 \\
5 & \quad z = -k(57 - T_0) = 6 \\
5 & \quad z = -k(57 - T_0) = \frac{6}{5} \\
65 - T_0 & \quad z = \frac{5}{3} \\
57 - T_0 & \quad z = \frac{195 - 3T_0}{5} \\
28.5 - 5T_0 & \quad z = 195 - 3T_0 \\
90 & \quad z = 45^\circ C
\end{align*}
\]
17. Correct option is (3)
Solution:
\[ v \cos 45^\circ = 150 \cos 60^\circ \Rightarrow v = 75 \sqrt{2} \text{ m/s} \]
\[ v_y = u_y + a_y t \quad \Rightarrow v \sin 45^\circ = 150 \sin 60^\circ - g \times t \]
\[ t = \frac{150 \sin 60^\circ - v \sin 45^\circ}{10} = 7.5(\sqrt{3} - 1) \text{ sec} \]

19. Correct option is (2)
Solution:
\[ W = \frac{mg \ell}{2n^2} \quad \text{where} \quad n = \frac{200}{60} = \frac{10}{3} \]
\[ W = \frac{4 \times 10 \times 2 \times 9}{2 \times 10 \times 10} = 3.6 \text{ J} \]
21. **Solution:**

Given, temperature, \( T_1 = 5760 \text{ K} \)

Given that energy of radiation emitted by the body at wavelength 250 nm in \( U_1 \), at wavelength 500 nm is \( U_2 \) and that at 1000 nm is \( U_3 \).

Now, according to Wein's law, we get

\[ \lambda_m T = b \]

where, \( b = \text{Wien's constant} = 2.88 \times 10^6 \text{ nmK} \)

\[ \Rightarrow \lambda_m = \frac{b}{T} \]

\[ \Rightarrow \lambda_m = \frac{2.88 \times 10^6 \text{ nmK}}{5760 \text{ K}} \]

\[ \Rightarrow \lambda_m = 500 \text{ nm} \]

\( \lambda_m \) is the wavelength corresponding to maximum energy, so \( U_2 > U_1 \).

23. **Correct option is (1)**

**Solution:**

\[ \ddot{r} = \frac{d\dot{r}}{dt} = \frac{d}{dt} (\dot{r} \times p) = m \frac{d}{dt} (\dot{r} \times \vec{v}) \]

\[ \ddot{r} = [16 \, t] \hat{k} \]

at \( t = 2 \)

\[ \ddot{r}_{t=2} = (16 \times 2) \hat{k} = 32 \hat{k} \text{ N-m} \]

\( Q = 10 \)

\[ \int \frac{V}{R} = \frac{10V}{1000\Omega} = 10^{-2} \]
25. Correct option is (1)
Solution:
Let \( \vec{A} = 2\hat{i} + 3\hat{j} \) and \( \vec{B} = \hat{i} + \hat{j} \)

Component of \( \vec{A} \) in direction of \( \vec{B} = \frac{(\vec{A} \cdot \vec{B})\vec{B}}{B^2} \)

\[
= \frac{(2 \times 1 + 3 \times 1) (\hat{i} + \hat{j})}{2} = \frac{5}{2} (\hat{i} + \hat{j})
\]

Magnitude of component = \( \frac{5}{\sqrt{2}} \)

27. Correct option is (3)
Solution:
P = \( \tau \cdot \omega \)

\[
P = I \cdot \alpha \cdot \omega = I \left( \omega \frac{d\omega}{d\theta} \right) \omega
\]

\[
\omega^2 \, d\omega = \frac{P}{I} \, d\theta
\]

\( \omega \propto \theta^{\frac{1}{3}} \)

\( \omega \propto (n)^{\frac{1}{3}} \)
28. Correct option is (2)

Solution:

\[ W = \Delta K \Rightarrow O = \int_0^S \left( mg \sin \theta - \mu mg \cos \theta \right) dx \]

\[ (mg \sin \theta)S = (mg \cos \theta) \frac{KS^2}{2} \]

\[ S = \frac{2 \tan \theta}{K} \]
32. **Correct option is (2)**

Solution:

\[ I_R = I_1 + I_2 + 2\sqrt{I_1 I_2} \cos \phi \]

\[ 7I = 1 + 9I + 2(3I) \cos \phi \]

\[ -3I = 6I \cos \phi \]

\[ \cos \theta = -\frac{1}{2} \]

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

**Solution:**

Particles vibrate in out of phase in successive loops

34. **Correct option is (1)**

**Solution:**

\[ F = \mu \frac{d}{dt} = \nu \frac{d}{dt} a \rho \ell = a \nu \frac{d}{dt} \ell = a \nu^2 \]

\[ F = 2a \rho gh \]

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

**Solution:**

\[ I = 2\sin(100t) \]

Current will be 1A after time \( t \)

\[ I = 2\sin (100 t) \]

\[ \sin 100t = 1/2 = \sin \frac{\pi}{6} \]

\[ |e| = \left| -L \frac{dI}{dt} \right| \]

\[ \Rightarrow t = \frac{\pi}{600} \]

\[ \frac{dI}{dt} = -200 \cos (100 t) \]

at \( t = \pi/600 \)

\[ \frac{dI}{dt} = -200 \cos \left( \frac{100 \times \pi}{600} \right) \]

\[ c = L \frac{dI}{dt} = 10^{-2} \times 200 \frac{\sqrt{3}}{2} = \sqrt{3} \text{ V} \]
36. Correct option is (3)
Solution:
\[
\frac{1}{f_{eq}} = \frac{2}{f_f} - \frac{1}{f_m} \quad \text{[formula of combination of lens & mirror]}
\]
\[
\Rightarrow + \frac{1}{f_{eq}} = \frac{2}{15} - \frac{1}{\infty} = -\frac{1}{7.5} \text{ cm}^{-1}
\]
Now \( f = 7.5 \)
\[
\Rightarrow \frac{1}{v} + \frac{1}{u} = \frac{1}{f}
\]
\[
\Rightarrow \frac{1}{v} = -\frac{1}{7.5} + \frac{1}{20}
\]
\[
\Rightarrow v = \frac{120}{12.5} = 12 \text{ cm}.
\]

37. Correct option is (4)
Solution:
Before \( \text{Fig} \to u \text{ Fig} \)
\[
\text{after \( \text{Fig} \to \frac{(1-c)u}{2} \text{ Fig} \to \frac{(1+c)u}{2} \)}
\]

38. Correct option is (1)
Solution:
\[
V_a - V_b = \pm \left[ \frac{(3a)}{(1)} - \frac{(3a)}{(1)} \right]
\]
\[
V_a - V_b = -\text{ve}
\]
\[
V_b > V_a
\]

39. Correct option is (4)
Solution:
At \( a/2 \) from axis
\[
B_1 \left( \frac{2\pi a}{2} \right) = \mu_0 \frac{1}{\pi a^2} \cdot \frac{\pi a^2}{4}
\]
\[
B_1 = \frac{\mu_0 I}{4\pi a}
\]
At \( 2a \) from axis
\[
B_2 = 2\pi \mu_0 I
\]
\[
B_2 = \frac{\mu_0 I}{4\pi a} \quad \Rightarrow \frac{B_1}{B_2} = 1
\]
40. Correct option is (2)  
Solution:  
\[ \lambda = \frac{h}{mv} \quad v = \sqrt{2gH} \]

\[ \lambda = \frac{h}{m\sqrt{2gH}} \quad \Rightarrow \lambda \propto H^{1/2} \]

41. Correct option is (2)  
Solution:  
Lorentz force  
\[ F = (-e) (\vec{v} \times \vec{B}) \]

\[ = (-e) (v_0 \hat{k} \times \vec{B}_0 \hat{j}) \]

\[ = ev_0 \hat{B}_0 \hat{i} \]

42. Correct option is (3)  
Solution:  
As refractive index  
\[ \mu = \frac{\text{Real depth}}{\text{Apparent depth}} \]

\[ \begin{align*}
x/2 & \quad \text{Oil } \mu_i \\
\text{x/2} & \quad \text{Water } \mu_2 \\
\end{align*} \]

\[ \therefore \text{ Apparent depth of the vessel when viewed from above is}, \]

\[ d_{\text{apparent}} = \frac{x}{2\mu_1} + \frac{x}{2\mu_2} = \frac{x}{2} \left( \frac{1}{\mu_1} + \frac{1}{\mu_2} \right) \]

\[ = \frac{x}{2} \left( \frac{\mu_2 + \mu_1}{\mu_1 \mu_2} \right) = \frac{x(\mu_1 + \mu_2)}{2\mu_1 \mu_2} \]
46. (3)

\[ \frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2} \]

If

\[ T_2 = 2T_1 \]

\[ P_2 = \frac{1}{2} P_1, \ V_2 = ? \]

\[ \frac{P_1 V_1}{T_1} = \frac{P_1 \times V_2}{2 \times 2T_1} \]

\[ V_1 = \frac{V_2}{4} \]

\[ V_2 = 4V_1 \]

47. (1)

Boron trihalides are Lewis acids. The order of their acidic strength is as:

\[ BF_3 < BCl_3 < Br_3 < Br_5 \]

48. (4)

Calcium carbide reacts with water to form ethyne.

\[ CaC_2 + 2H_2O \rightarrow Ca(OH)_2 + HC \equiv CH \]

49. (3) Due to Frenkel defect, density of a crystal remains unchanged.
50. (1) For 0.1 M acetic acid or C = 0.1 M L⁻¹
   \[ K_a = 1.74 \times 10^{-5} \]
   According to ostwald dilution formula,
   \[ [H^+] = \sqrt{K_a \cdot C} \]
   \[ = \sqrt{1.74 \times 10^{-5} \cdot 0.1} \]
   \[ = \sqrt{0.017 \times 10^{-4}} \]
   \[ \text{pH} = -\log_{10}[H^+] \]
   \[ = -\log_{10}\left(\sqrt{0.017 \times 10^{-4}}\right) \]
   \[ \text{pH} = 2.88 \]

51. (3) 20 ml of 0.1 NHCl
   \[ = \frac{0.1}{1000} \times 20 \text{ g eq} = 2 \times 10^{-2} \text{ g eq} \]
   20 ml of 0.001 NaOH
   \[ = \frac{0.001}{1000} \times 20 \text{ g eq} = 2 \times 10^{-4} \text{ g eq} \]
   \[ \implies \text{HCl left unneutralised} \]
   \[ = 2 \times 10^{-5} (1 - 0.01) \]
   \[ = 2 \times 0.99 \times 10^{-5} = 1.98 \times 10^{-5} \text{ g eq} \]
   Volume of solution = 40 ml
   \[ [\text{HCl}] = \frac{1.98 \times 10^{-5}}{40} \times 1000 \text{ M} = 4.95 \times 10^{-4} \]
   \[ \text{pH} = -\log[4.95 \times 10^{-4}] = 2 - \log 4.95 = 2 - 0.7 = 1.3 \]

52. (4) Zr and Hf possesses similar atomic size and hence are called twins of periodic table. It is due to lanthanide contraction.

53. (3) Barbituric acid is used as tranquilizer.

54. (1) Invar, an alloy of Fe and Ni is used in watches and meter scale. Its characteristic property is small coefficient of expansion.

55. (2) Fornic acid (\(\text{H-C} = \text{O}\)) contains \(-\text{COOH}\) as well as \(-\text{CHO}\) group.

56. (2) Pyrolusite \((\text{MnO}_2)\) is an ore of Mn.
57. (3) Acrolein is formed from glycerol by heating with $\text{K}_2\text{SO}_4$.

\[
\begin{align*}
\text{CH}_3\text{OH} & \quad \text{CH}_2 \\
\text{CH}_2\text{OH} & \quad \text{CH} \\
\text{CH}_2\text{OH} & \quad \text{CH}_3\text{CH}_2\text{OH} \\
\text{Acrolein}
\end{align*}
\]

58. (1) Normality of oxalic acid solution

\[
\frac{6.3 \times 1000}{250} \text{ ml} = 0.4 \text{ N}
\]

\[
N_i V_i = N_i^* V_i^*
\]

\[
10 \times 0.4 = V_i \times 0.1
\]

\[
V_i = 40 \text{ ml}
\]

59. (4) $\text{KCl} \rightarrow \text{K}^+ + \text{Cl}^-$

1 mole of $\text{KCl}$ will give 2 mole particles and $i = 2$

\[
\Delta T = i K_i m
\]

\[
\Delta T = 0 - (-8.0) = 8^\circ \text{C}, i = 2
\]

\[
K_i = 1.86^\circ \text{C} \text{kg mol}^{-1}
\]

\[
8 = 2 \times 1.86 \times m
\]

\[
m = 2.15 \text{ mol/kg}
\]

Grams of $\text{KCl} = 2.15 \times 74.5 = 160.2 \text{ g/kg}$

Hence 160.2 g of $\text{KCl}$ should be added to 1 kg of water.

60. (4) The green house effect is caused by carbon dioxide due to which the atmospheric temperature is increased.

61. (3) $K = \frac{0.693}{t_i} = \frac{0.693}{6770} = 1.2 \times 10^{-4} \text{ year}^{-1}$

$N_0 = 100, N = 60$

\[
t' = \frac{2.303 \log N_0}{\log \frac{N}{N_0}}
\]

\[
t' = \frac{2.303}{1.2 \times 10^{-4}} \log \frac{100}{60} = 4258 \text{ year}
\]
62. \[ \text{Bond order of } O_2 = 2 \]
\[ \text{Bond order of } O_2^+ = 2.5 \]
\[ \text{Bond order of } O_2^- = 1.5 \]
Hence, the order of bond order is as \( O_2^+ > O_2 > O_2^- \).

63. (4) \( \text{CH}_3\text{COOH AND CH}_3\text{COONa} \) is a acidic buffer solution because it is a mixture of weak acid and its salt with strong base.

64. (4)

For first order reaction,
\[ t_{1/2} = \frac{0.693}{K} \]
Hence, half-life period of first order reaction is independent of the initial concentration of the reactant.

65. (1)
When a mixture of ammonium chloride and sodium nitrite is heated. The nitrogen and sodium nitrite is heated. The nitrogen gas is evolved.
\[ \text{NH}_4\text{Cl} + \text{NaNO}_2 \rightarrow \text{NH}_4\text{NO}_2 + \text{NaCl} \]
\[ \text{NH}_4\text{NO}_2 \rightarrow \text{N}_2 + 2\text{H}_2\text{O} \]

66. (1)

67. (4) Enzymes are proteins produced by living organisms. They catalyse specific reactions and the activity of enzyme is affected by the temperature. The pH of the solution has a very marked effect on the rate of an enzyme reaction.

68. (1)
\[ F_{\text{cell}} = \frac{RT}{nF} \ln K_c \]
\[ \ln K_c = \frac{nF E_{\text{cell}}}{RT} \]
69. \( \text{Cu}^{2+} + 2e^- \rightarrow \text{Cu} \)

\[
E = E^0 - \frac{0.0591}{n} \log \frac{1}{[\text{Cu}^{2+}]} \\
= 0.34 - \frac{0.0591}{2} \log \frac{1}{0.01} \\
= 0.2809 \text{ V}
\]

70. \( \frac{1}{2} X_2 + \frac{3}{2} Y_2 \rightarrow XY_3 \)

\[
\Delta S_{\text{reaction}} = S_{\text{product}} - S_{\text{reactant}} \\
\Delta S_{\text{reaction}} = 50 - \left( \frac{3}{2} \times 40 + \frac{1}{2} \times 60 \right) \\
= -40 \text{ J mol}^{-1} \\
\Delta G = \Delta H - T \cdot \Delta S
\]

At equilibrium, \( \Delta G = 0 \)

\[
\Delta H = T \Delta S \\
T = \frac{-\frac{\Delta H}{\Delta S}}{40} = 750 \text{ K}
\]

71. The crystal field splitting energy for octahedral complex, \( \Lambda_i \), depends upon the strength of negative ligand. The strength of splitting is as:

\( \text{CO} > \text{CN}^- > \text{NO}_2^- > \text{en} > \text{NH}_3 > \text{Py} > \text{NCS}^- > \text{H}_2\text{O} \)

\( > \text{O}^{2-} > \text{OX}^{2-} > \text{OH}^- > \text{F}^- > \text{Cl}^- \\
> \text{SCN}^- > S^{2-} > \text{Br}^- > \text{I}^- \)

72. Nucleophilic substitution bimolecular (S_N^2) prefers less sterically hindered site to attack. Lesser the steric hindrance better the \( S_N^2 \) reaction. So ease the reaction is \( 1^o > 2^o > 3^o \). \( S_N^2 \) involves inversion of configuration stereochemically.

73. Isoelectronic species have same number of electrons. \( \text{NO}^-, \text{C}_2^- \text{O}, \text{CN}^- \) and \( N_2 \) all have 14 electrons hence these are isoelectronic species.

74. Titration of oxalic acid by KMnO_4 in the presence of HCl gives unsatisfactory result because HCl is a better reducing agent than oxalic acid and HCl reduces preferably permanganate ion (MnO_4^-) to Mn^{2+}. 

CENTERS: MUMBAI / DELHI / AKOLA / LUCKNOW / NAGPUR / NASHIK / PUNE / GOA / BOKARO / DUBAI # 18
75. (4) 

RSiCl₄ gives cross linked silicone polymer on hydrolysis.

\[
\begin{array}{c}
\text{R-Si-Cl} \xrightarrow{H_2O} \text{R-Si-OH} \\
\end{array}
\]

76. (2) 

Dipole moment (\(\mu\)) for CO₂ and SiF₄ is zero because they have symmetrical structure. 

\[
\text{O} = \text{C} = \text{O} \quad \text{and} \\
\text{NO}_2 \quad \text{and} \quad \text{O}_3 \quad \text{are bent molecules with permanent dipole moment.}
\]

77. (4) 

Heat evolved from decomposition of 1g NH₄NO₃  

\[
= 1.23 \times 6.12 \text{ kJ}
\]

Heat evolved from 1 mol of NH₄NO₃ (i.e. 80 g)  

\[
= 1.23 \times 6.12 \times 80 = 602 \text{ kJ}
\]

78. (2) With increase in temperature ionic product increases because dissociation of H₂O molecules increases giving more H⁺ and OH⁻ ions.

79. (3) 

\[
\text{K}_2\text{Cr}_2\text{O}_7 + \text{H}_2\text{SO}_4 + 4\text{H}_2\text{O}_2 \rightarrow \text{K}_2\text{SO}_4 + 2\text{CrO}_3 \\
+ 5\text{H}_2\text{O}
\]

CrO₃ is peroxide of Cr which dissolves in ether producing blue colour.

80. (4) Sodium has low ionization energy hence elemental sodium loses its valence s-electron easily and undergoes oxidation.

81. (4) Ozone reacts with BaO₂ to give BaO and oxygen. 

\[
\text{BaO}_2 + \text{O}_3 \rightarrow \text{BaO} + 2\text{O}_2
\]

82. (1) Water in presence of oxygen reacts with lead pipes to form soluble Pb(OH)₂ which gives poisonous Pb²⁺ ions in solution.
83. (4) Due to non-availability of vacant d-orbitals carbon cannot accommodate electron pairs from Cl\(^-\) ions and hence cannot expand its valence shell to form \([\text{CCl}_6]^{2-}\) ion.

84. (1) \(\text{SiCl}_4\) fumes in moist air due to its hydrolysis and thus dense white smoke screen is formed which is used in warfare.

\[\text{SiCl}_4 + 4\text{H}_2\text{O} \rightarrow \text{Si(OH)}_4 + 4\text{HCl}\]

85. (1) Stability of hydrides increases gradually from \(\text{BiH}_3\) to \(\text{NH}_3\). The reason being that the strength of the M-H bond increases due to decrease in the atomic size of the element in this order.

86. (2)

\[
\begin{align*}
\text{CH}_3\text{Br} & \xrightarrow{\text{Zn, CS}} \text{C}_2\text{H}_6\text{OH} & \rightarrow & \text{CH}_4 + \text{HBr} \\
2\text{CH}_3\text{Br} + 2\text{Na} & \xrightarrow{\text{lit reaction}} \text{C}_2\text{H}_6 + 2\text{NaBr}
\end{align*}
\]

87. (4)

88. (3) Soft drinks and baby feeding bottles are generally made up of polystyrene.

90. (2)

\[
\begin{align*}
\left(\text{C}_9\text{H}_{10}\text{O}_5\right)_n + n\text{H}_2\text{O} & \xrightarrow{\text{Bacterial}} n\text{C}_{12}\text{H}_{22}\text{O}_{11} \\
\text{C}_{12}\text{H}_{22}\text{O}_{11} + n\text{H}_2\text{O} & \xrightarrow{\text{Maltase}} 2\text{C}_6\text{H}_{12}\text{O}_6 \\
\text{C}_6\text{H}_{12}\text{O}_6 & \xrightarrow{\text{Zymase}} 2\text{C}_2\text{H}_5\text{OH} + 2\text{CO}_2
\end{align*}
\]

91. Respiration – Pyruvate kinase – catalyses formation of pyruvic acid

92. Sexual reproduction – Pg 30

93. Mineral nutrition – Pg 199

94. Morphology – Pg 76

95. Molecular – Pg 120

96. Antherozoids represents motile male gametes

97. Cell division NCERT pg 166

98. Principles – Holandric genes are present on ‘y-chromosome’

99. Sexual reproduction - NCERT Pg 33

100. Living world – pg – 9
101. Sexual reproduction in flowering plants – pg 36
102. Camblum ring is partly primary & partly secondary
103. Molecular basis – pg 116
104. Reproduction In Organism – pg 10
105. NADH – NAD$^+$ occurs in both (1) and (3)
106. GUG normally codes for valine but at initiating position can code for methionine too
107. Plant growth & development Pg 248
108. Respiration in Plants – Pg – 230
109. Morphology – pg 75
110. Photosynthesis – pg 207, 208
111. Solanaceae is a family
112. Microbes – pg 183
113. Strategies – pg 175
114. Diccinys leads to cross pollination as male & female flowers are not present on same plant
115. Biodiversity – pg 262
116. Anatomy – pg 96
117. Ecology explains interaction between organisms, as well as surrounding abiotic factor
118. PePcase is primary carboxylating enzyme found in MSC of C$_4$
119. Sexual reproduction – Pg 34
120. Transport – pg 186
121. Morphology – pg 81
122. Biodiversity – NCERT Pg - 264
123. Principles – Pg 89
124. Elaioplast stores fat
   Mitochondria – contains oxysomes
   Cilia – Tubulin
   Microfilaments – contractile
125. Strategies – Pg 171
126. Reproduction In Organism – pg 5,6,7
127. Environmental issues – pg 272
128. Principles – pg 91
129. Microbes – pg 183
130. Plant growth & development – pg – 248, 249
131. Principles – pg 92
132. Ecosystem – pg 243
133. Environmental issues – pg 276
134. Cell – Pg 137, 138
135. Cell division – pg 168
136. (4) Spleen is secondary lymphoid organ
137. (3) Somatostatin secreted by hypothalamus inhibits GH.
139. (4) Myocardial infarction means heart attack whereas myocardial ischemia means slow blood supply to heart
140. (1) Saheli inhibits implantation of embryo.
141. (4) Simple squamous epithelium lines the peritoneum of the body.
142. (3) Metaphysis and articular cartilage is present in adults
143. (3) Cockroach has open circulatory system and a 13 chambered heart.
144. (4) Female cockroach has collateral glands
145. (4) Leydig cells and some immunocompetent cells are found in interstitial space.
146. (1) Semen is seminal fluid containing sperms.
147. (4) Meiosis in oocyte is unequal
148. (3) Ascariasis – Ascaris
Malaria transmitted by the bite of infected – Female *Anopheles*

149. (1) Histamine is inflammatory.

150. (1)

151. (3) Limulus is an Arthropod. *Adamsia* is a coelenterate. *Ichthyophis* is an amphibian.

152. (2) Pg 58.

153. (3) Pg 55, last para

154. (4) Anterior choroid plexus is found in the roof of Diencephalon.

155. (1) 5th cranial nerve arises from pons and has 3 branches.

156. (1) Parasympathetic stimulation promotes sugar storage.

157. (1) Alcohol inhibits ADH secretion.

158. (1) Sex hormones are steroid hormones.

159. (2) Thyroid gland is the only gland which can store its hormones for 2 months.

160. (4) Silk is secreted by salivary glands of silkworm.

161. (1) NCERT XI pg 307 (Motor unit)

162. (1) Pg 309 NCERT XI

163. (3) Lippe’s loop is as IUD. Saheli and Mala-D are OCP.

164. (2) Ova is implanted into oviduct for in vitro fertilization.

165. (2)

166. (4)

167. (2) REN are molecular or biological scissors

168. (4) Cloning vector or vehicle DNA

169. (3)

170. (2) Its unicellular and divides faster

171. (2) Mass of nodal tissue seen in the lower left corner of the right atrium is *Atrio-ventricular* node. The nodal musculature has the ability to generate action potentials without any external stimuli. The SAN can generate the maximum number of action potentials, i.e., 70-75 min⁻¹

172. (4)

173. (3)

174. (3) All premolars are monophyodont in nature.

175. (1) Urine of diabetic patient contains ketone bodies formed due to break down of fats.

176. (1)

177. (1)

178. (4) Malic acid is a competitive inhibitor of succinic acid

179. (4)

180. (4) The process mentioned is haemodialysis.