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

**Solution 1 (2)**

\[ v \propto s^3 \]

\[ \frac{\Delta v}{v} = \frac{3 \Delta s}{s} \]

\[ = 6 \% \]

**Solution 2 (2)**

\[ v = \frac{dx}{dt} \rightarrow \text{slope of } \alpha-t \text{ graph} \]

\[ v_{\max} \text{ is at point } C \]

**Solution 3 (1)**

\[ x = (t + s)^{-1} \]

\[ v = \frac{dx}{dt} = -(t + s)^{-2} \]

\[ a = (t + s)^{-3} \]

\[ a \propto v^{3/2} \]

**Solution 4 (2)**

\[ \text{Vector diagram with distances and velocities} \]

\[ \text{VBA} = 10 \sqrt{2} \text{ north east} \]

\[ \text{BC} = 100 \text{ km/h} \times 45 = \frac{100}{\sqrt{2}} \]

\[ t = \frac{\text{BC}}{\text{VBA}} = \frac{100}{\sqrt{2} \times 10 \sqrt{2}} = 5 \text{ h} \]
Solt 5 (1)
\[ mg - f = ma \]
\[ f - (m - m')g = (m - m')a \]
\[ mg - mg + m'g = (m - m')a + ma \]
\[ m'g + m'a = 2ma \]
\[ m' = \frac{2ma}{g + a} \]

Solt 6 (1)
\[ \frac{1}{2} m v^2 = \frac{1}{2} k x^2 \]
\[ 0.5 \times (1.5)^2 = 50 \times x^2 \]
\[ x = \frac{0.5 \times (1.5)^2}{50} \]
\[ x = \frac{1.5}{10} = 0.15 \text{ m} \]

Solt 7 (2)
\[ P = F \cdot v \]
\[ P = 8 \frac{dV}{dt} \]

Pumping rate = \[ \frac{dV}{dt} = \frac{5 \times 10^3 \text{ m}^3}{60} \]
\[ P = 8gh \cdot \frac{dV}{dt} < 1.70 \text{ watt} \]
\[ \text{(1)} \quad 2 = I\alpha \]

\[ MgL = \frac{ML^2}{3} \]

\[ \frac{3g}{2L} = \alpha \]

\[ \text{(2)} \quad \frac{GM_1M_2}{r^2} = M_1\omega^2r \]

\[ \omega^2 = \frac{GM}{r^3} \]

\[ T = \frac{2\pi}{\omega} \]

\[ T^2 = \left(\frac{2\pi}{\omega}\right)^2 = \frac{4\pi^2}{\omega^2} \]

\[ T^2 = \frac{4\pi^2M_1}{GM} \]

\[ T^2 = kM^3 \]

\[ K = \frac{4\pi^2}{GM} \]
\[ \text{Sol10 (4) Theoretical} \]

\[ \frac{dA}{dt} = \frac{KA(T_1-T_2)}{L} \]

\[ \text{Sol12 (1)} \quad PV = nRT \]

\[ n = \frac{5}{32} \]

\[ \text{Sol13 (1)} \quad \Delta U_1 = \Delta U_2 = \Delta U_3 \rightarrow \text{state function} \]

\[ \Delta Q = \Delta W + \Delta U \]

\[ W_1 > W_2 > W_3 \]

\[ \therefore \Delta Q_1 > \Delta Q_2 > \Delta Q_3 \]

\[ \text{Sol14 (2)} \quad \text{Let the block is displaced by} \ x \]

\[ \text{Upthrust} = -Ax \, g \]

\[ ma = -Ax \, g = -mw^2c \]

\[ \omega^2 = \frac{Ax \, g}{m} \]

\[ T = \frac{2Ax}{\omega} = 2\pi \sqrt{\frac{m}{Ax \, g}} \]

\[ \Rightarrow T \propto \frac{1}{\sqrt{\omega}} \]
\[ V = \omega \sqrt{A^2 - x^2} \]
\[ V_1 = \omega \sqrt{A^2 - x_1^2} \]
\[ V_2 = \omega \sqrt{A^2 - x_2^2} \]
\[ V_1^2 = \omega^2 (A^2 - x_1^2) \]
\[ \frac{V_1^2}{\omega^2} = A^2 - x_1^2 \]
\[ \frac{V_1^2}{\omega^2} + x_1^2 = A^2 \]
\[ \frac{V_2^2}{\omega^2} + x_2^2 = A^2 \]
\[ \frac{V_1^2}{\omega^2} + x_1^2 = \frac{V_2^2}{\omega^2} + x_2^2 \]
\[ \frac{V_1^2}{\omega^2} - \frac{V_2^2}{\omega^2} = x_2^2 - x_1^2 \]
\[ \sqrt{\frac{V_1^2 - V_2^2}{x_2^2 - x_1^2}} = \omega \]
\[ T = \frac{2\pi}{\omega} = 2\pi \sqrt{\frac{x_2^2 - x_1^2}{V_1^2 - V_2^2}} \]
\[ v = f \lambda \]

\[ = \frac{\omega}{2\pi} \frac{2\pi}{k} \]

\[ = \frac{\omega}{k} = \frac{4\pi \times 0.5 \times 40}{0.5 \times 75} = 8 \text{ m/s} \]

\[ f = \frac{n \nu}{2l} \]

\[ 420 = \frac{n \nu}{2 \times 75} \]

\[ 315 = (n-1) \frac{\nu}{2 \times 75} \]

\[ \frac{420}{315} = \frac{n}{n-1} \]

\[ 420n - 420 = 315n \]

\[ (420 - 315)n = 420 \]

\[ n = \frac{420}{105} = \frac{420}{105} \]

\[ 420 = \frac{420}{105} \frac{\nu}{2l} \]

\[ f = \frac{\nu}{2l} = 105 \]
\[ \text{Sol 18} \] (3) \[ \frac{kq}{a^2} = Aa \]
\[ q = \frac{\pi \varepsilon_0 Aa^3}{3} \]

\[ \text{Sol 19} \] (4) \[ W = \left( \frac{kq}{3L} - \frac{kq}{L} \right) \Omega \]
\[ = -\frac{q\Omega}{6\pi\varepsilon_0 L} \]

\[ \text{Sol 20} \] (1) \[ \frac{A}{P l_1} + \frac{A}{P l_2} = \frac{3}{8} \]
\[ p \left( l_2 + l_1 \right) = 12 \]
\[ \frac{l_1}{l_2} = \frac{1}{2} \]

\[ \text{Sol 21} \]
\[ K l_1 = R(1) \]
\[ K l_2 = (R + x)1 \]
\[ R = K l_1 \]
\[ x = K \left( l_2 - l_1 \right) \]
\[ I = I_0 \left( \frac{S + R_0}{S} \right) \]

\[ S = 1 \left( \frac{60 + S}{S} \right) \]

\[ 5S = 60 + S \]

\[ 4S = 60 \]

\[ S = \frac{60}{4} = 15 \]

\[ \text{Sol 23 (3)} \]

\[ Z = jAB\sin \theta \]

\[ A = \frac{\sqrt{3}}{4} L^2 \quad \theta = 90^\circ \]

\[ Z = \frac{\sqrt{3}}{4} L^2 B \sin 90^\circ j \]

\[ l = 2 \left( \frac{Z}{\sqrt{3}Bi} \right)^\frac{1}{2} \]

\[ \text{Sol 24 (4)} \]

\[ e = -\frac{d\phi}{dt} \]

\[ e_A = \frac{dI}{dt} \]

\[ \text{Sol 25} \]

\[ \text{Band} = \frac{x_L - x_C}{R} \]

\[ R = \frac{x_L - x_C}{R} \]

\[ x_L = R + x_L \]
\[ x_c = R + \frac{1}{2\pi fL} \]

\[ f_{2\pi c} = R + 2\pi fL \]

\[ \frac{1}{2\pi f (R + 2\pi fL)} = C \]

**Sol 26**

CE amplifier gives phase difference of \( \pi \)

b/w i/p o/p

Voltage gain = 150

\[ A_v = \frac{V_o}{V_{in}} \]

So \( V_o = A_v V_i \)

\[ V_o = 300 \cos \left( 150^\circ + \frac{\pi}{3} \right) \]

**Sol 27**

Theoretical

\[ \frac{A'}{A} = \frac{\mu - 1}{\mu} \]

\[ \frac{15}{A'} = \frac{1.75 - 1}{1.5 - 1} \]

\[ \frac{15}{A'} = 0.75 \]

\[ A' = 10^\circ \]
\[ u = \sin \left( \frac{A + \delta m}{2} \right) \]

\[ \cot \frac{A}{2} = \frac{\sin \left( \frac{A + \delta m}{2} \right)}{\sin \frac{A}{2}} \]

\[ \sin \left( \frac{A + \delta m}{2} \right) = \sin \left( \frac{\pi}{2} - \frac{A}{2} \right) \]

\[ A + \delta m = \pi - A \]

\[ \delta \text{min} = 180 - 2A \]

\[ \beta = \frac{2D \lambda}{\alpha} \]

\[ \beta_d = \frac{2D \lambda}{\alpha} \]

\[ \beta = \frac{\lambda D}{\alpha} \]

\[ \frac{10 \lambda D}{d} = \frac{2 \lambda D}{\alpha} \]

\[ \alpha = \frac{d}{S D} = 0.2 \text{mm} \]
$$E - \phi = KE$$

$$E - \phi = 0.5$$

$$E + 0.8E - \phi = 0.8$$

$$E = 0.5 + \phi$$

$$1.2E = 0.8 + \phi$$

$$\frac{10}{12} = 0.5 + \phi$$

$$\frac{12}{0.8 + \phi}$$

$$5(0.8 + \phi) = 6(0.5 + \phi)$$

$$4 + 5\phi = 3 + 6\phi$$

$$\phi = 1eV$$

$$\text{Sol. 33.} \quad KE = 1TE$$

$$\rho E = 2TE$$

$$\text{Sol. 34.} \quad \text{For Lyman}$$

$$\frac{1}{\lambda_{\text{max}}} = R(1)^2 \left[ \frac{1}{12} - \frac{1}{22} \right]$$

$$(\lambda_{\text{max}})_L = \frac{4}{3R}$$

$$\text{For Balmer}$$

$$\left(\frac{1}{\lambda_{\text{max}}}_B\right)_B = R(1)^2 \left( \frac{1}{2^2} - \frac{1}{3^2} \right)$$
\[
\lambda_{\text{max}} = \frac{36}{5R} \\
\frac{\lambda_{\text{max}, L}}{\lambda_{\text{max}, B}} = \frac{5}{2^t} \\

\text{Sol 35} \\
V_{\text{Bal,m}} = \frac{c}{\lambda_{\text{max}}} = R_c \left( \frac{1}{2^2} - \frac{1}{3^2} \right) = \frac{5RC}{36} \\
\frac{hc}{\lambda_1} + \frac{hc}{\lambda_2} = \frac{hc}{\lambda_3} \\
\lambda_3 = \frac{\lambda_1 \lambda_2}{\lambda_1 + \lambda_2} \\

\text{Sol 36} \\
\frac{N_x}{N_y} = \frac{1}{7} \\
\frac{N_x}{N_x + N_y} = \frac{1}{8} = \left( \frac{1}{2} \right)^3 \\
3 \text{ half lives} \\
t = 3T_{1/2} = 3 \times 1.4 \times 10^9 = 4.2 \times 10^9 \text{ yr}
Sol 37. 
no. of holes > no. of electrons
p type

Sol 38. 
\[ A \propto \beta \frac{R_L}{R_1} \]
\[ \alpha = \left( \frac{\beta}{R_1} \right) R_L \]
\[ = g_m R_L \]
\[ \frac{\alpha_2}{\alpha_1} = \frac{g_{m_2}}{g_{m_1}} \]
\[ \alpha_2 = \frac{0.02}{0.03} \times \alpha_1 = \frac{2}{3} \alpha_1 \]

Sol 39. 
The given characteristic represents the V-I characteristics of a solar cell.

Sol 40. 
\[ m \propto \alpha^x \beta^y \gamma^z \]
\[ [\alpha] = [M LT^{-2}] \]
\[ [\beta] = [LT^{-1}] \]
\[ [\gamma] = [T] \]
\[\text{Sol. 41}\]
\[
P = F_1 V
\]
\[
K = m d\frac{V}{dt}
\]
\[
\frac{Kdt}{m} = v dv
\]
\[
V = \sqrt{\frac{2Kt}{m}}
\]
\[
F = m \frac{dv}{dt}
\]
\[
F = m \frac{1}{2} \left( \frac{2Kt}{m} \right)^{-\frac{1}{2}}
\]
\[
= \sqrt{\frac{km}{2}} t^{-\frac{1}{2}}
\]

\[\text{Sol. 42}\]
\[
W_{\text{all}} = \Delta KE
\]
\[
0 - 0 = mg \sin\theta x_1 - \frac{umg \cos \theta x_1}{2}
\]
\[
\sin \theta = \frac{\text{area} \theta}{2}
\]
\[
\mu = 2 \tan \theta
\]

\[\text{Sol. 43}\]
\[
\text{Theoretical}
\]

\[\text{Sol. 44}\]
\[
V_{\text{read}} = \frac{E_{11}y_2 + E_{22}y_1}{y_1 + y_2} = 14V
\]

\[\text{Sol. 45}\]
\[
F = \sqrt{(F_3 - F_1)^2 - F_2^2}
\]
46. (1) Conceptual

47. (2) Conceptual

48. (2) p-nitrophenol (III) > phenol (I) > p-cresol (II).

49. (3) The tendency to form pπ backbonding decreases in the order BBr3 > BCl3 > BF3.

50. (2) Be2+ and Li+ both have 2 electrons. Thus, both are isoelectronic species.

51. (3)

52. (1) Conceptual

53. (2) Conceptual

54. (1) - NO2 is a meta-directing group. As it is also a deactivating group so no chance of introduction of second – Br atom.

55. (2)

56. (2) Conceptual

57. (3) Hydration energy decreases down the group, whereas lattice energy remains almost constant. Thus, hydration enthalpy is higher than the lattice enthalpy in case of BeSO4.

58. (2)

59. (1) As same charges are present at nearest position (less stable)

60. (4)

61. (1)

62. (1)

63. (3) Conceptual

64. (2) Let the solubility of CaF2 is x mol/L/

Let the solubility of CaF2 is x mol/L/

\[ \text{CaF}_2 \xrightarrow{\text{Moles after dissolution}} \text{Ca}^{2+} + 2\text{F}^- \]

\[ K_{sp} = [\text{Ca}^{2+}][\text{F}^-]^2 = x \times (2x)^2 = 4x^3 \]

\[ K_{sp} = 3.2 \times 10^{-11} \quad \text{(given)} \]

\[ 3.2 \times 10^{-11} = 4x^3 \]

\[ x = \sqrt[3]{\frac{3.2 \times 10^{-11}}{4}} = 2 \times 10^{-4} \text{ mol/L} \]
65. (3) Conceptual
66. (3) Conceptual
67. (1)
68. (1)
69. (2) Conceptual
70. (1) Conceptual
71. (4)
72. (4) Conceptual
73. (2)
74. (3)
75. (2)
76. (1) Conceptual
77. (2) Conceptual
78. (2)
1, 3, 4 \rightarrow \text{contains plane of symmetry}

\begin{center}
\begin{tikzpicture}
\node (a) at (0,0) {\text{CH}_2};
\node (b) at (1,0) {\text{H}};
\node (c) at (1.5,0) {\text{OH}};
\node (d) at (2,0) {\text{Chiral center}};
\draw (a) -- (b);
\draw (b) -- (c);
\draw (c) -- (d);
\end{tikzpicture}
\end{center}
79. (4)
80. (4)
81. (4)
82. (4)
83. (3)
84. (2)
85. (1) Conceptual
86. (2)

\[
\text{H-C-N} \quad \overset{\text{H}_2\text{O}^+}{\longrightarrow} \quad \text{H-COOH} + \text{CH}_3\text{N-H} \quad \overset{\text{Ph-SO}_2\text{Cl}}{\longrightarrow} \quad \text{CH}_3\text{-N-SO-Ph} \quad \overset{\text{NaOH}}{\longrightarrow} \quad \text{Silver mirror test}
\]

87. (3)

88. (2)

\[
\left[ \text{Mg}^{+2} \right] \left[ \text{OH}^- \right]^2 = 10^{-11}
\]

\[
\left[ \text{OH}^- \right]^2 = \frac{10^{-11}}{0.1} = 10^{-10} \Rightarrow P_{\text{OH}} = 5
\]

PH=9

89. (3)

\[
\begin{array}{c}
\text{Stability order of C^+}
\end{array}
\]

90. (1)

91 (4) Egg (n)=8 pg. Somatic cell (mitosis) is diploid(2n)=16. At S phase doubling of DNA takes place and thus the amount doubles to 32. G2 phase is followed after S phase and thus has four times the DNA of the gamete.

92 (4) NCERT XI (pg.no.231)

93 (3) NCERT XI (pg. no. 89)

94 (2) NCERT XII (pg.no.276)

95 (3) NCERT XI (pgno.70)

96 (2) NCERT XI (pg. no. 131)

97 (3)

<table>
<thead>
<tr>
<th></th>
<th>X^c</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>X^-</td>
<td>X^cX^-</td>
<td>X^-X^-</td>
</tr>
<tr>
<td>Y</td>
<td>X^-Y</td>
<td>XY</td>
</tr>
</tbody>
</table>

The Woman will have X^cX as her genotype as her mother is normal but father is colorblind. She marries a haemophilic man with hypertrichosis. Haemophilia is X linked disorder while hypertrichosis is Y linked disorder. Thus his genotype will be X^cY. According to the cross shown above 25% of the progeny will show colour blindness with haemophilia in while 25% of the progeny will show colorblindness with hypertrichosis. Therefore 50% of the progeny will show two of the traits out of the three.

98 (4) NCERT XI (pg.no. 208)

99 (1) NCERT XI (pg.no.246)

100 (4) NCERT XI (pg.no.246)
101 (3) NCERT XII (pg. no. 28)
Commelina exhibit cleistogamy

102 (3) NCERT XI (pg.no. 198)

103 (3) Not given in NCERT

104 (4) NCERT XI (pg. no. 71)

105 (3) NCERT XII Pg.no.187

106 (2) NCERT XII (pg.no.36)

107 (3) i. As we go higher from species to kingdom, the number of common characteristics goes on decreasing.
ii. Higher the category, greater is the difficulty of determining the relationship to other taxa at the same level.
iii. All organisms, including those in plants and animal kingdoms have species as the lowest obligate category.

108 (3) Sugarcane is a monocot thus its vascular bundles are scattered. We cannot precisely remove the phloem as a ring as we can in dicots.

109 (1) (2) A given species can occupy more than one trophic level in the same ecosystem at the same time
(3) In most ecosystems, producers are always more in number and biomass than the herbivores
(4) Pyramid of energy is always upright.

110 (3) The germinal cells are diploid and act as meiocytes, which undergo meiosis to produce haploid gametes. Thus meiocytes have diploid (2n) number of chromosomes, same as that of somatic cells.

111 (4) NCERT XI (pg.no. 95)

112 (4) NCERT XI (pg.no.218)

113 (1) NCERT XII (pg.no.288: Pleiotropy, Supplementary Material)

114 (2) NCERT XI (Pg. no. 23,14)

115 (3) NCERT XII (pg.no.96)

116 (4) NCERT XI (pg.no. 236)

117 (3) NCERT XI (pg. no. 42)

118 (3) endosperm is triploid (3n=24). Therefore haploid(n=8). Root cell is diploid(2n) which is16.

119 (1) NCERT XI (pg no. 26)

120 (2) NCERT XII (pg.no.255)

121 (2) NCERT XI (pg.no. 233)

122 (2) NCERT XI (pg.no. 36)

123 (1) One MMC undergoes meiosis to produce four megaspores of which three degenerate while only one survives called as functional megaspore. This functional megaspore undergoes three mitotic divisions to form female gametophyte. Such formation of embryo-sac is called monosporic embryo-sac.

124 (2) NCERT XII (pg.no.183)
Fungus *Trichoderma polyspora* produces cyclosporin A which has immunosuppressive property. Streptokinase enzyme is clot buster which is obtained from haemolytic streptococcus.

125 (3) I. Nuclear envelope consists of two parallel membranes having space between them called as perinuclear space.
II. The outer membrane usually remains continuous with ER
IV. Larger and more numerous nucleoli are present in cells actively carrying out protein synthesis

126 (2) Not given in NCERT

127 (3) NCERT XI (pg.no.252)

128 (2) NCERT XI (pg.no.66)

129 (3) NCERT XI (pg.no.212)

130 (3) NCERT XI (pg.no.88)

131 (3) NCERT XI (pg.no. 178)
Soyabean cultivation has led to habitat loss and fragmentation.

In all the other three, the stop codon is at the end while in option (d) the stop codon is in middle and thus complete translation of the mRNA segment is not possible.

Total individuals died/initial population i.e., $\frac{3}{18} = 0.166$

Since both mother and daughter are affected with the daughter being eldest (14 yrs) the given diagram represents the condition. Option 2 also shows mother and daughter affected but according to the pedigree analysis the daughter should be shown first followed by two son’s thus options 2 is incorrect.
170. (2) NCERT XII pg 203
171. (4) NCERT XI pg 293
172. (2) NCERT XII pg 208 - 209
173. (4)
174. (4) NCERT XI pg 334
175. (2) Synarthroses are fibrous joints
176. (4) NCERT XI pg 333
177. (3) NCERT XI pg 321
178. (4)
179. (1) NCERT XI pg 323
180. (3) Only one end of each semicircular canal has ampulla.