| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 1(a) | 1. idea of large surface area to volume ratio or that it is thin (body) ;<br><br>2. idea that this helps diffusion e.g. short diffusion distance, faster diffusion ; | 1. IGNORE flat, small unqualified, thin membrane, thin skin etc<br>NOT cell wall<br><br>2. IGNOR gas exchange<br>NOT osmosis | (2) |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 1(b)(i) | 1. solubility of oxygen decreases as temperature increases / eq ;<br><br>2. credit correct manipulation of figures ; | 1. ACCEPT converse, negative correlation<br><br>2. units not required but if given then they must be correct e.g. 8.2 mg $dm^{-3}$ difference in solubility between 0 and 40 $^{o}$C, solubility halved between 5 $^{o}$C and 40 $^{o}$C | (2) |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 1(b)(ii) | 1. idea that there is quite a lot of dissolved oxygen in the water at this temperature ;<br><br>2. idea of oxygen concentration gradient (between water and flatworm's cells) ;<br><br>3. idea of enzyme activity being temperature-dependent ;<br><br>4. idea that water below 15$^{o}$C would be too cold for {enzymes / metabolism / eq} to work effectively ;<br><br>5. idea that it is a balance between oxygen availability and {enzyme activity / kinetic effects /eq} ; | IGNORE there is most oxygen available<br><br>1. ACCEPT sufficient $O_2$, not enough $O_2$ at higher temps.<br><br>2. Re to diffusion or gas exchange alone, not sufficient for the mark<br><br>3. CCEPT e.g. 15$^{o}$C is optimum for their enzymes<br>NB: This is for linking enzymes and temperature, Mp4 is a development of Mp3 stating something specific.<br><br>4. IGNO ref to effects above 15$^{o}$C | (3) |
| Question Number | Answer | Additional Guidance | Mark |

| | | | |
|---|---|---|---|
| **1(c)** | 1. heart needed to {pump / move / eq} blood (around the body) ;<br><br>2. reference to mass flow ;<br><br>3. idea that many animals have a small surface area to volume ratio ;<br><br>4. idea that a circulatory system is needed to overcome limitations of diffusion / eq ;<br><br>5. credit correctly named molecule transported (in blood) ;<br><br>6. idea that many animals have a high metabolic rate ; | 4. CCEPT idea that diffusion is not sufficient<br><br>5. oxygenated blood t enough by itself<br>ACCEPT any appropriate molecule in the blood<br>ACCEPT idea of thermoregulation e.g. heat | **(4)** |