



ANSWER BOOK

Water and inorganic ions: the properties life depends on

Biological molecules, water and inorganic ions · Unit B02

AQA 3.1.7, 3.1.8 · OCR A 2.1.2 · CAIE 2.4

8 questions · 25 marks

NAVY EDITION

SECTION B · Standard, 3 to 5 marks

- B1** **B1** any one property: high specific heat capacity, high latent heat of vaporisation, cohesion and high surface tension, or ice being less dense than liquid water. **B1** a consequence of that property, for example that the temperature of a cell or a habitat changes slowly. **B1** a second property from the same list. **B1** a consequence of the second property, for example that evaporation of sweat removes a large amount of heat. [4]
- B2** **B1** the oxygen atom attracts the shared electrons of each covalent bond more strongly than the hydrogen atoms do, so the oxygen is slightly negative and the hydrogens are slightly positive. **B1** the molecule is therefore polar. **B1** a slightly positive hydrogen atom of one molecule is attracted to the slightly negative oxygen atom of a neighbouring molecule, and that attraction is the hydrogen bond. [3]
- B3** **B1** water has a high specific heat capacity, so a large amount of energy is needed to raise the temperature of a given mass of it. **B1** much of the energy absorbed goes into breaking hydrogen bonds between the water molecules rather than into increasing their kinetic energy. **B1** so the temperature of the lake rises slowly, and organisms living in it are not exposed to rapid changes in temperature. [3]
- B4** **B1** water in sweat evaporates from the surface of the skin, and the energy needed for this is taken from the body. **B1** evaporation requires the hydrogen bonds between water molecules to be broken. **B1** so water has a high latent heat of vaporisation, and a small mass of water removes a large amount of heat as it evaporates. [3]
- B5** **B1** when water freezes, the hydrogen bonds lock the molecules into an open lattice that holds them further apart than in the liquid. **B1** so ice is less dense than liquid water and floats, forming a layer at the surface. **B1** the ice insulates the water beneath it, so the water stays liquid and fish and invertebrates survive the winter in it. [3]
- B6** **B1** water molecules are polar, with a slightly negative oxygen end and slightly positive hydrogen ends. **B1** the slightly negative ends are attracted to the sodium ions and the slightly positive ends to the chloride ions, so the ions are separated from the crystal and held in solution. **B1** a triglyceride is non-polar and carries no charge, so no such attraction forms and it is not separated by water. [3]
-

- B7** **B1** iron(II) ions are part of the haem group of haemoglobin, where one oxygen molecule binds to each. **B1** phosphate ions join one nucleotide to the next in the backbone of DNA and RNA; also accepted are their presence in ATP or in the hydrophilic head of a phospholipid. **B1** calcium ions trigger the release of neurotransmitter at a synapse; also accepted are their role in muscle contraction or in the middle lamella between plant cells. [3]
- B8** **B1** nitrate ions are absorbed by the roots and supply the nitrogen the plant needs. **B1** nitrogen is required to make amino acids, and therefore proteins including enzymes, so growth is reduced. **B1** nitrogen is also required to make chlorophyll, so less is produced and the leaves are pale, which reduces the rate of photosynthesis. [3]