1.1 Biological Molecules: 10-minute Pack

AQA 7402 · Calculator allowed · about 10 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Water is essential to living organisms because of properties that arise from its molecular structure.

(a) State what is meant by describing a water molecule as polar. **(1)**

(b) Explain, using the polarity of water, why hydrogen bonds form between neighbouring water molecules. **(2)**

(c) Water has a high specific heat capacity. Explain why this property is significant for organisms living in aquatic habitats. **(2)**

(d) Explain why water is described as a good solvent for ions such as sodium (Na^+) and chloride (Cl^-). **(2)**

(Total for Question 1 is 7 marks)

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Mark scheme · 1.1 Biological Molecules: 10-minute Pack

Question 1

(a) a molecule with an uneven/unequal distribution of charge, having partially positive and partially negative regions oe **B1**

(a) Answer: A molecule with an unequal distribution of charge across it.

(b) oxygen is more electronegative than hydrogen, so shared electrons are pulled towards oxygen, making oxygen slightly negative (delta-) and hydrogen slightly positive (delta+) oe **M1**

(b) the delta+ hydrogen of one water molecule is attracted to the delta- oxygen of a neighbouring water molecule, forming a hydrogen bond oe **A1**

(b) Answer: Electronegativity difference creates delta+/delta- charges, allowing attraction (hydrogen bonding) between neighbouring molecules.

(c) a high specific heat capacity means a large amount of energy must be absorbed or released before the temperature of water changes noticeably, so temperature changes slowly oe **M1**

(c) this buffers aquatic habitats against rapid temperature fluctuations, providing a relatively stable thermal environment for organisms/enzymes oe **A1**

(c) Answer: Water resists rapid temperature change, giving aquatic organisms a thermally stable habitat.

(d) the delta+ hydrogens of water molecules are attracted to (surround) negative ions such as Cl^-, and the delta- oxygens are attracted to (surround) positive ions such as Na^+ oe **M1**

(d) this hydration shell separates the ions from one another, allowing them to dissolve/move in solution oe **A1**

(d) Answer: Polar water molecules surround and separate ions, dissolving them.

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