2. Biological Molecules

2.4 Water

Paper 1

Question Paper

1 What is the maximum number of hydrogen bonds that can form between a single water molecule and other water molecules?

A 1 **B** 2 **C** 3 **D** 4

2 Which statement correctly explains why blood plasma can be maintained at a stable temperature?

A It has a low specific heat capacity.

B It has a high specific heat capacity.

C It has a low latent heat of vaporisation.

D It has a high latent heat of vaporisation.

3 What is the correct term to describe intermolecular hydrogen bonding between water molecules?

A adhesion

B cohesion

C osmosis

D diffusion

4 What is the maximum number of hydrogen bonds that can form between two single water molecules?

A 1 **B** 2 **C** 3 **D** 4

5 The specific heat capacity of different substances is shown.

substance	specific heat capacity / J g^{-1} °C
air	1.0
hydrogen gas	14.3
water (liquid)	4.2
water (steam)	2.1

Which statement is correct?

A Air is a more stable environment than water because it is more resistant to changes in temperature.

B It takes more energy to raise the temperature of hydrogen gas than it does to raise the temperature of water.

C A specific heat capacity of 4.2 J g^{-1} °C means that it takes 4.2 J of energy to vaporise 1.0 g of liquid water.

D There are more hydrogen bonds between water molecules in a gas than between water molecules in a liquid.

6 Which have properties that are dependent on hydrogen bonds?

1 cellulose

2 a molecule of haemoglobin

3 water

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

7 A student wrote four statements about water.

1 Water has a high specific heat capacity which maintains the temperature of water within cells.

2 Mammals rely on water having a relatively low latent heat of vaporisation to keep them cool.

3 When a negatively charged ion is added to water, the δ^+ charge on the hydrogen atom is attracted to the ion.

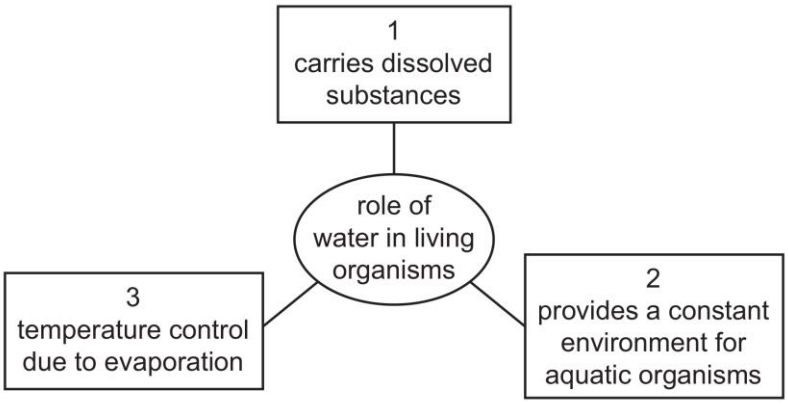
4 When surrounded by water, non-polar molecules tend to be pushed apart from one another.

Which statements are correct?

	1	2	3	4
A	✓	✗	✓	✓
B	✓	✗	✓	✗
C	✗	✓	✗	✓
D	✗	✓	✗	✗

key
✓ = correct
✗ = not correct

8 The diagram represents roles of water in living organisms.



Which roles are dependent upon hydrogen bonds between water molecules?

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

9 Which properties of water reduce temperature changes inside cells?

1 cohesion

2 latent heat of vaporisation

3 specific heat capacity

A 1 and 2 **B** 1 and 3 **C** 2 and 3 **D** 3 only

10 Which molecules have properties that are dependent on hydrogen bonds?

1 cellulose

2 glycogen

3 haemoglobin

4 water

A 1, 2 and 3 **B** 1, 2 and 4 **C** 1, 3 and 4 **D** 2, 3 and 4

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C	✗	✓	✗	✓
D	✗	✓	✗	✗

key

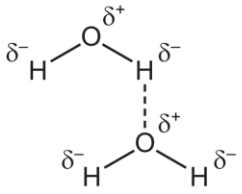
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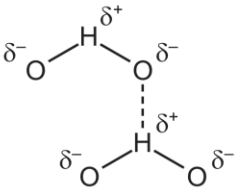
12 Which diagram correctly shows hydrogen bonding between water molecules?

The symbol δ indicates the partial charge on an atom in the water molecule.

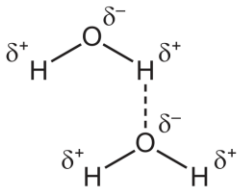
A



B



C



D

