**Unit 2 Key Topic Test 1 – Water SOLUTIONS**

**SECTION A: Multiple-choice questions (1 mark each)**

**Question 1**

*Answer:* C

*Explanation:*

For a molecular substance, the inter molecular bonding is strong and the covalent intramolecular bonds are strong.

**Question 2**

*Answer:* D

*Explanation:*

Water is a small but highly polar molecule. It is the polarity that leads to its unique properties.

**Question 3**

*Answer:* D

*Explanation:*

The latent heat of vaporisation of water is high.

**Question 4**

*Answer:* B

*Explanation:*

The latent heat of fusion refers to the transition from solid to liquid.

**Question 5**

*Answer:* A

*Explanation:*

The graph is linear when the water is heating. This indicates the water temperature is rising the same amount each time interval.

**Question 6**

*Answer:* C

*Explanation:*

Boiling point depends upon pressure of the air above the liquid. At high pressure the boiling is more difficult so the boiling point is increased.

**Question 7**

*Answer:* D

*Explanation:*

When we sweat water turns to steam on our skins. The high latent heat of vaporisation means that a significant amount of energy is required for this.

**Question 8**

*Answer:* A

*Explanation:*

The density of ice is lower than that of water, meaning the volume of the ice is greater.

**Question 9**

*Answer:* B

*Explanation:*

Specific heat capacity refers to the energy required to raise 1 g of a substance by 1 0C.

**Question 10**

*Answer:* A

*Explanation:*

Energy = 4.18 x m x ∆T = 4.18 x 1000 x 80 = 334000 J = 334 kJ

**SECTION B: Short-answer questions**

**Question 1** (16 marks)

**a. i**. 1 mark

 **ii**. 1 mark



  **iii**. 1 mark

 **iv**. A polar molecule will have dipoles\* and those dipoles do not cancel each other out\*

 2 marks

**b**. **i**.

 1 mark

  **ii**. As above with the positives and negative dipoles attracting each other. 1 mark

 **iii**. Hydrogen bonding refers to dipole-to-dipoles bonds\* like water has but one of the atoms

 involved is hydrogen.\* Usually associated with bonds between hydrogen and nitrogen or

 oxygen 2 marks

 **iv**. When water boils it is the intermolecular bonds that break, the hydrogen bonds between

 the water molecules 1 mark

**c**. **i**. The freezing point depends upon the purity of the water and whether the water has room to

 expand as it freezes. Salt is commonly mixed with ice on roads to lower the freezing points

 and to clear the roads. Sea water does not freeze at 0 0C due to its salt content. 3 marks

 **ii**. Boiling point depends upon air pressure and purity. A car radiator might have water

 present at 120 0C as it is under pressure while the low pressure on top of Mt Everest allows

 water to boil lower than 100 0C. 3 marks

**Question 2** (15 marks)

**a**. The graph shows that the boiling point of water is not consistent with the trend in the other

 Group 16 hydrides\*. The boiling point of water is significantly higher than expected.\*

2 marks

**b**. It is the hydrogen bonding that leads to this high boiling point\*. Other hydrides do not have

 electronegative elements like oxygen so have lower boiling points. \* 2 marks

**c**. The high boiling point of water ensures that our lakes and oceans don’t evaporate away. \* It

 would be difficult to maintain liquid water on the planet under other conditions. \*

2 marks

**d**.  **i.** No, water will not heat as quickly as the other liquids, due to the high specific heat

 capacity of water. 1 mark

 **ii**. specific heat capacity 1 mark

 **iii**. Similar to part c – if water has a high specific heat capacity it takes a lot of energy to boil a

 kettle or run a clothes dryer. 2 marks

**e**. **i**. energy = 4.18 x 650 x 25 = 67900 J 2 marks

 **ii**. energy = 4.18 x 2300 x 81.7 = 7.85 x 105 J 3 marks

**Question 3** (9 marks)

**a**. **i**. d = m/v = 8.98/9.1 = 0.99 g mL-1 2 marks

 **ii**. d= m/v = 8.98/9.18 = 0.98 g mL-1 1 mark

 iii. The density of ice is less than that of liquid water. This is an unusual property of water.

 2 marks

**b.**   **i**. latent heat of fusion is: the energy required to convert 1 mole of a substance from a solid

 to a liquid at its melting point. 1 mark

 **ii**. 800/18 x 40.7 = 1810 kJ 1 mark

 **iii**. The body uses sweating as a means of cooling. The high latent heat of vaporization of water means that the evaporation of water on your skin acts to cool the body. 2 marks