**SECTION A – Multiple-choice questions**

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| **Instructions for Section A**  Answer **all** questions.  Choose the response that is **correct** or **best answers** the question.  A correct answer scores 1, an incorrect answer scores 0.  No mark will be given if more than one answer is completed for any question.  Marks will **not** be deducted for incorrect answers. |

**Question 1**

Select the correct description of the bonding in water.

**A**. The intermolecular forces are relatively weak and the intramolecular bonding is strong

**B**. The intermolecular forces are strong and the intramolecular bonding is weak.

**C**. The intermolecular forces are relatively high and the intramolecular bonding is strong

**D**. The intermolecular forces are relatively weak and the intramolecular bonding is weak.

**Question 2**

The unique properties of water are a result of

**A**. the significant dipoles present in the linear molecules.

**B**. the strong covalent bonds in the linear molecules.

**C**. the strong dispersion forces between the V-shaped molecules.

**D**. the significant dipoles present in the V-shaped molecule .

**Question 3**

Which of the following is NOT a property of pure water?

**A**. The density of ice is lower than the density of water.

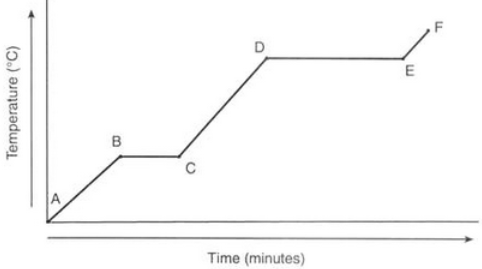
**B**. The specific heat capacity of water is relatively high.

**C**. Water can be found on Earth in all three states, solid, liquid or gas.

**D**. The latent heat of vaporisation of water is very low.

*Use the following information to answer Questions 4 and 5*

A sample of ice is placed on a hot plate and heated until all the ice has been boiled away as steam.



**Question 4**

The latent heat of fusion is the evident between times

**A**. A and B

**B**. B and C

**C**. C and D

**D**. D and E

**Question 5**

Select the correct alternative that can be deduced from this graph.

**A**. It takes the same amount of energy to go from 30 to 40 0C as 60 to 70 0C.

**B**. When ice is turning to water, the temperature rises quickly.

**C**. The hot plate was obviously turned off at two different times.

**D**. The specific heat capacity of water is low.

**Question 6**

Select the correct statement about the boiling point of water.

**A**. The boiling point of water is always 100 0C.

**B**. The boiling point of water does not depend upon its level of purity.

**C**. The boiling point of water can be well over 100 0C if the water is under high pressure.

**D**. Water will boil at the same temperature in all countries.

**Question 7**

Humans sweat to cool themselves down. The property of water that makes sweating so effective is its

**A**. low electrical conductivity.

**B**. high latent heat of fusion.

**C**. relatively high melting point.

**D**. high latent heat of vaporisation.

**Question 8**

When a sample of water is frozen

**A**. its volume will increase causing its density to decrease.

**B**. its volume will increase causing its density to increase.

**C**. its mass will decrease causing its density to decrease**.**

**D**. the strength of the bonding will increase, lowering the density.

**Question 9**

The specific heat capacity of water refers to

**A**. the energy required to raise the temperature of 100 g of water by 1.0 0C.

**B**. the energy required to raise the temperature of 1.0 g of water by 1.0 0C.

**C**. the energy required to raise the temperature of 1.0 g of water by 100 0C.

**D**. the energy required to boil 1.0 g of water.

**Question 10**

The energy required to lift the temperature of 1.0 kg of water from 20 0C to 100 0C is, in kJ,

**A**. 334

**B**. 800

**C**. 4180

**D**. 3.34 x 105

**SECTION B- Short-answer questions**

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| **Instructions for Section B**  Questions must be answered in the spaces provided in this book. To obtain full marks for your responses you should   * Give simplified answers with an appropriate number of significant figures to all numerical questions; unsimplified answers will not be given full marks. * Show all workings in your answers to numerical questions. No credit will be given for an incorrect answer unless it is accompanied by details of the working.   Make sure chemical equations are balanced and that the formulas for individual substances include an indication of state; for example, H2(g); NaCl(s) |

**Question 1** (16 marks)+

Water is a substance we take for granted but as a chemical it is a very unique substance with some unusual properties.

**a. i**. Draw an electron dot diagram of water. 1 mark

**ii**. Draw a diagram that shows the shape of a water molecule. 1 mark

**iii**. Show the dipoles on the water molecule you have drawn. 1 mark

**iv**. Water is a polar molecule. Explain what this means. 2 marks

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**b**. **i**. Draw a water molecule showing its dipoles. 1 mark

**ii**. Draw a second water molecule near the first showing how the dipoles will interact when

water is to form a solid. 1 mark

**iii**. Use your diagram to explain clearly what hydrogen bonding is. 2 marks

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**iv**. Refer to your diagram to explain what bonds are breaking when water boils. 1 mark

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**c**. The freezing point and boiling point of water are commonly listed as 0 0C and 100 0C

respectively.

**i**. Is the freezing point of water exactly 0 0C? Discuss with reference to instances where water

is found as a liquid on Earth at temperatures lower than 0 0C. 3 marks

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**ii**. Is the boiling point of water exactly 100 0C? Discuss with reference to variables that

influence the boiling point. 3 marks

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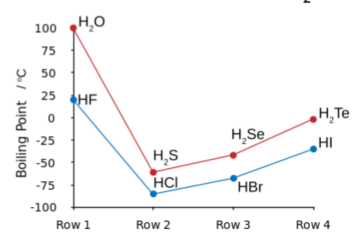
**Question 2** (15 marks)

The graph below is used to compare the boiling point of water with the boiling points of the other hydrides of Group 16 elements.

**a**. What property of water does this graph highlight? 2 marks

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**b**. Explain why water has this property. 2 marks

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**c**. This property of water is important for life on Earth as we know it. Explain clearly why this

is the case. 2 marks

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**d**. Three beakers are placed on a hot plate together. The first beaker contains 50 mL of water,

the second 50 mL of ethanol and the third 50 mL of ethanoic acid.

**i.** Will the contents of the beakers all heat up at the same rate? (Will they all reach 60 0C at

the same time?) 1 mark

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**ii**. What is the name given to the property of the liquids that this demonstration is referring to?

1 mark

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**iii**. This property of water is also important to our everyday life. Give two instances of where

it might be relevant. 2 marks

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**e**. Calculate the energy required to

**i**. heat a 650 g sample of water from 36 0C to 61 0C. 2 marks

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**ii**. boil 2.3 kg of water in a kettle. The initial temperature is 18.3 0C and the final temperature

100.0 0C. 3 marks

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**Question 3** (9 marks)

A student records the following measurements:

mass of 10 mL measuring cylinder 34.60 g

mass of 10 mL measuring cylinder and 9.1 mL of water 43.58 g

The student then places the measuring cylinder and water in the freezer until the water turns to ice.

The volume is now measured as 9.18 mL.

**a**. Calculate the density of

**i**. the water 2 marks

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**ii**. the ice 1 mark

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iii. What conclusion can the student draw from this experiment? 2 marks

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**b.** A chemistry data book shows the following information about water:

Latent heat of fusion:  6.0 kJ mol-1

Latent heat of vaporization: 40.7 kJ mol-1

**i**. Explain what the latent heat of fusion is. 1 mark

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**ii**. Calculate the energy required to evaporate 800 g of water at 100 0C. 1 mark

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**iii**. How is the process of sweating related to the latent heat of vaporization? 2 marks

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**END OF KEY TOPIC TEST**