**Higher Chemistry Unit 1 – Chemical Changes and Structure Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**HW 1 Periodicity (a) /10**

Key Area - The first 20 elements in the periodic table are categorised according to bonding and structure. Periodic trends and underlying patterns and principles.

1. Information about 4 solids A, B, C and D is shown.

C

A

B

D

|  |
| --- |
| Electrical Conduction of a solid |
| A non-conductor Mpt B conductor  C conductor  D non-conductor |

In which solid is it most likely that only van der Waals forces are overcome when the substance melts? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (1)

2. What type of bonding is present in a sample of hydrogen gas?

A ionic

B London dispersion forces

C hydrogen

D covalent (polar) (1)

Questions 3 and 4 refer to the following substances.

A chlorine

B carbon (diamond)

C carbon (graphite)

D boron

3. Identify the substance with discrete covalent molecules. \_\_\_\_\_\_\_\_\_\_\_\_\_\_ (1)

4. Identify the substance, which can conduct electricity because of delocalised electrons.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (1)

5.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Li | Be | B | C | N | O | F | Ne |
| Na | Mg | Al | Si | P | S | Cl | Ar |
| K | Ca |  |  |  |  | Br | Kr |
| A |  |  | B |  | C |  | D |

1. Name the **type of structure** found in each of the four sections. (2)

|  |  |
| --- | --- |
| **Section** | **Type of Structure** |
| **A** |  |
| **B** |  |
| **C** |  |
| **D** |  |

(b) Graphite is a type of carbon – name the other two types of carbon. (1)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(c) **Explain** why graphite can be used as an effective lubricator? (1)

|  |
| --- |
|  |
|  |
|  |

(d) Using **examples** from the periodic table above, **explain** briefly the difference between a covalent molecular substance and a covalent network substance. (2)

|  |
| --- |
|  |
|  |
|  |
|  |

**Higher Chemistry Unit 1 – Chemical Changes and Structure Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**HW 2 Periodicity (b) /10**

Key Area - Covalent radius, ionisation energy, electronegativity and trends in groups related to atomic structure.

1. Which of the following equations represents the first ionisation enthalpy of magnesium?

A ½ Mg(g) ½ Mg2+(g) + e-

B Mg(s) Mg2+(aq) + 2e-

C Mg(g) Mg+(g) + e-

D Mg(s) Mg+(aq) + e-  (1)

For questions 2 and 3 choose your answers from the list of elements below.

A caesium C fluorine

B iodine D oxygen

2. Which element has the greatest attraction for bonded electrons? \_\_\_\_\_\_\_\_ (1)

3. Which element has the lowest ionisation energy? \_\_\_\_\_\_\_\_ (1)

4. Which statement concerning the radii of atoms and ions is correct?

The radius of

A Cl- is less than that of Cl

B H-  is greater than that of H+

C Na+ is greater than that of Na

D Mg2+ is greater than that of Mg (1)

5. The graph below shows the boiling point of the group 7 elements.

**Explain** why the boiling points increase down the group.

(1)

Br

I

Cl

F

6. The graph below shows the first ionisation energy for some of the elements in group 1

First Ionisation Energy

kJ mol-1

Li

Na

K

Rb

# Cs

**(a) Explain** the trend in ionisation energy as you go down group 1 metals. (2)

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

(b) Why is there no value given in the data booklet for the fourth ionisation energy of lithium? (1)

|  |
| --- |
|  |

8. **Explain** why the covalent radius:

(a) increases down the group from magnesium to barium? (1)

|  |
| --- |
|  |
|  |
|  |

(b) decreases across the period from magnesium to sulphur. (1)

|  |
| --- |
|  |
|  |
|  |

**Higher Chemistry Unit 1 – Chemical Changes and Structure Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**HW 3 – Bonding and Properties /10**

Key Area - Bonding continuum. Polar covalent bonds and their position on the bonding continuum, dipole formation and notation, δ+ δ- eg Hδ- - Cl δ-

1. Which of the following molecules is a non-polar compound?

A CH3OH

B NH3

C C2H6

D H2O (1)

1. Which of the following compounds will have the least ionic character?

A magnesium fluoride

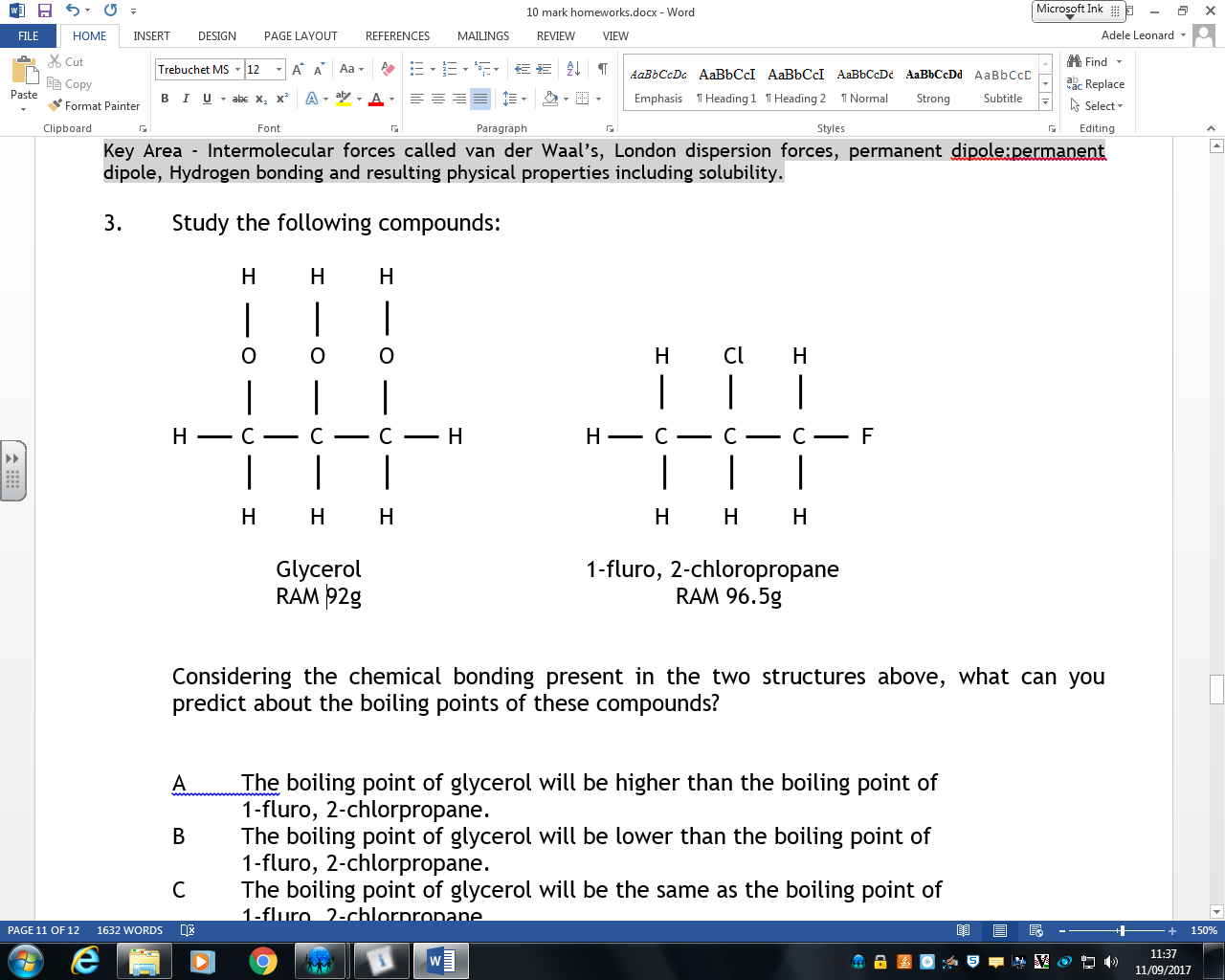
B magnesium chloride

C calcium fluoride

D calcium chloride (1)

Key Area - Intermolecular forces called van der Waal’s, London dispersion forces, permanent dipole:permanent dipole, Hydrogen bonding and resulting physical properties including solubility.

1. Study the following compounds:



Considering the chemical bonding present in the two structures above, what can you predict about the boiling points of these compounds?

A The boiling point of glycerol will be higher than the boiling point of

1-fluro, 2-chlorpropane.

B The boiling point of glycerol will be lower than the boiling point of

1-fluro, 2-chlorpropane.

C The boiling point of glycerol will be the same as the boiling point of

1-fluro, 2-chlorpropane.

D No predictions can be made with the information given. (1)

1. At room temperature, carbon dioxide is a gas and silicon dioxide is a solid. Which of the following could explain this difference?

A London dispersion forces are much weaker than covalent bonds.

B Carbon dioxide contains double covalent bonds, whereas silicon dioxide contains single covalent bonds.

C Carbon-oxygen covalent bonds are less polar than silicon-oxygen covalent bonds.

D The relative atomic mass of carbon dioxide is less than the relative atomic mass of silicon dioxide.

(1)

5. **Explain** why sulphur dioxide has a melting point of –72.7oC but magnesium oxide has a melting point of 2852oC. (2)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

6. Study the following information about the following group 7 compounds.

|  |  |  |
| --- | --- | --- |
| **Compound** | **Formula** | **Boiling Point (K)** |
| Hydrogen fluoride | H-F | 290 |
| Hydrogen chloride | H-Cl | 182 |
| Hydrogen bromide | H-Br | 205 |
| Hydrogen iodide | H-I | 235 |

(a) Why is the boiling point of hydrogen iodide greater than the boiling point of hydrogen bromide? (1)

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

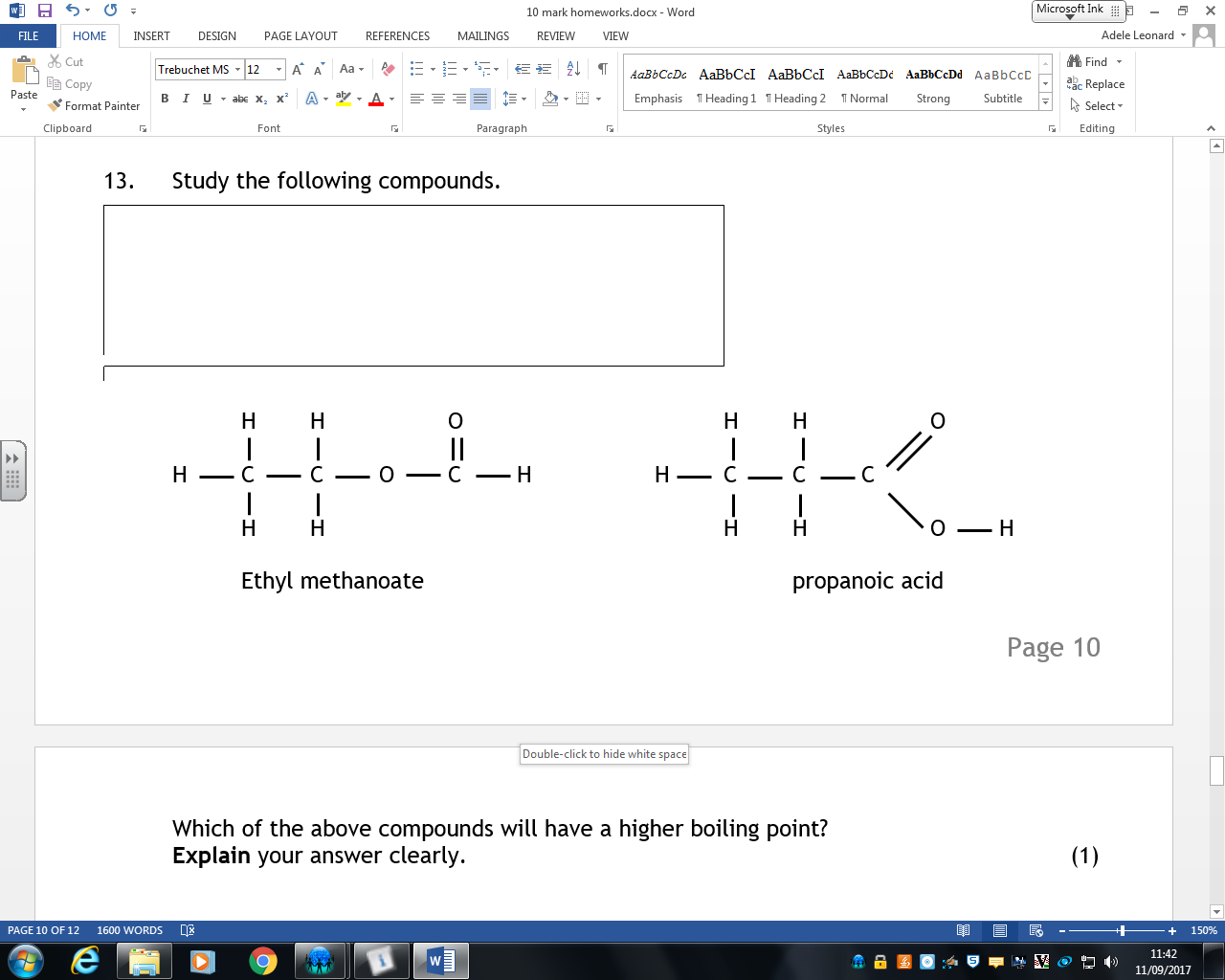
(b) **Explain** clearly why hydrogen fluoride has a surprisingly high boiling point. (1)

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

7. Study the following compounds.



Which of the above compounds will have a higher boiling point?

**Explain** your answer clearly. (1)

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

8. **Explain** the statement “Sodium chloride will dissolve in water but not in tetrachloromethane”. (1)

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_