Name: ……..

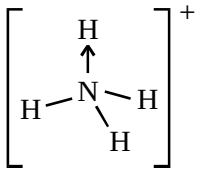
Date Due: ……..

80%	A
70%	B
60%	C
50%	D
40%	E
Below	U

1.3
Assessed Homework
Bonding

%
55

1. (a) An ammonium ion, made by the reaction between ammonia molecule and a hydrogen ion, can be represented as shown in the diagram below.



(i) Name the type of bond represented in the diagram N-H

……

(ii) Name the type of bond represented in the diagram by N→H

……

(iii) In terms of electrons, explain why an arrow is used to represent this N → H bond

……

……

(iv) In terms of electron pairs, explain why the bond angles in the NH_4^+ ion are all $109^o28'$

……

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……

……

(7)

(b) Define the term electronegativity

……

……

(2)

(c) A bond between nitrogen and hydrogen can be represented as $\overset{\delta-}{N}-\overset{\delta+}{H}$

(i) In this representation, what is the meaning of the symbol δ^+?

……

(ii) From this bond representation, what can be deduced about the electronegativity of hydrogen relative to that of nitrogen?

……

……

(2)

(Total 11 marks)

2. (a) Both HF and HCl are molecules having a polar covalent bond. Their boiling points are 293 K and 188 K respectively.

(i) State which property of the atoms involved causes a bond to be polar.

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(ii) Explain, in terms of the intermolecular forces present in each compound, why HF has a higher boiling point than HCl.

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(4)

(b) When aluminium chloride reacts with chloride ions, as shown by the equation below, a co-ordinate bond is formed.

$$AlCl_3 + Cl^- \rightarrow AlCl_4^-$$

Explain how this co-ordinate bond is formed.

.....

.....

.....

(2)

(c) Draw the shape of the PCl_5 molecule and of the PCl_4^+ ion. State the value(s) of the bond angles.

PCl_5 PCl_4^+

Bond angle(s) ..... *Bond angle(s)* .....

(4)

(Total 10 marks)

3. Lithium hydride, LiH, is an ionic compound containing the hydride ion, H^-
The reaction between LiH and aluminium chloride, $AlCl_3$, produces the ionic compound $LiAlH_4$

(a) Balance the equation below which represents the reaction between LiH and $AlCl_3$

$$LiH + AlCl_3 \rightarrow LiAlH_4 + LiCl$$

(1)

(b) Give the electronic configuration of the hydride ion, H^-

.....

(1)

(c) Predict the shape of the AlH_4^- ion. Explain why it has this shape.

Shape .....

Explanation .....

.....

.....

(3)

(d) A bond can be represented by H → Al
Name this type of bond and explain how it is formed.

Type of bond .....

Explanation .....

.....

(3)

(Total 8 marks)

4. The table below shows some values of melting points and some heat energies needed for melting.

Substance	I_2	NaCl	HF	HCl	HI
Melting point/K	387	1074	190	158	222
Heat energy for melting /kJ mol^{-1}	7.9	28.9	3.9	2.0	2.9

(a) Name three types of intermolecular forces

Force 1 ……..

Force 2 ……..

Force 3 ……..

(3)

(b) (i) Describe the bonding in a crystal of iodine

……

……..

(ii) Name the crystal type which describes an iodine crystal

……

(iii) Explain why heat energy is required to melt an iodine crystal.

……

……

(4)

(c) In terms of intermolecular forces involved, suggest why

(i) hydrogen fluoride requires more heat energy for melting than does of hydrogen chloride

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……

……

……..

(ii) Hydrogen iodide requires more heat energy for melting than does hydrogen chloride.

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(5)

(d) (i) Explain why the heat energy required to melt sodium chloride is large

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(ii) The heat energy need to vaporise one mole of sodium chloride (171 KJ mol^{-1}) is much greater than the heat energy required to melt one mole of sodium chloride. Explain why this is so.

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(3)

(e) In terms of structure and bonding, suggest why graphite has a very high melting and boiling point

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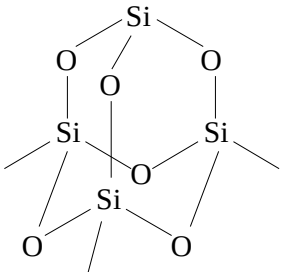
(2)

(Total 17 marks)

5. The diagram below represents a section of a crystal of silicon dioxide.



(a) Name an element which has a structure similar to this.

…….. **(1)**

(b) Name the type of bonding between silicon and oxygen in this crystal

……..

(1)

(c) Name the type of structure illustrated by this diagram

……..

(1)

(d) Describe the motion of the atoms in this crystalline solid

……

……..

(2)

(e) In terms of structure and bonding, describe what happens to the atoms in this crystal when it melts

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(f) Explain why this crystal is a non conductor of electricity in the solid state and why graphite is a good conductor.

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(4)

(Total 9 marks)