

6 <b>C</b> Carbon	7 <b>N</b> Nitrogen	1 <b>H</b> Hydrogen	16 <b>S</b> Sulfur
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**Chemistry Department**

# **S3 Chemistry**

**Chemical Changes and Structure**

**(b) Bonding, Structure and Properties**

**HOMEWORK**



## Homework 6

## Covalent bonding 1

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1. The atoms in a hydrogen molecule are held together by a covalent bond. Explain what is meant by:
- a molecule
  - a covalent bond
  - Draw a diagram to show how two hydrogen atoms combine to form a molecule of hydrogen.
2. There are 7 elements in the periodic table that exist as diatomic elements.
- Copy and complete the paragraph below by choosing one bold answer to fill the blank.

*A diatomic molecule is a molecule containing two **metal/non-metal** atoms joined together by covalent bonds. A diatomic element is when a diatomic molecule is formed from two **identical/non-identical** atoms.*

- Make a list of all the diatomic molecules contained in the box below:

HCl	CH <sub>4</sub>
H <sub>2</sub> O	NO <sub>2</sub>
CO	NH <sub>3</sub>
Br <sub>2</sub>	N <sub>2</sub>

3. By means of diagrams showing only outer electrons, show how covalent bonds form in the following diatomic molecules:
- chlorine
  - oxygen
  - nitrogen

## Homework 7

## Covalent bonding 2

/10

1. Draw diagrams to show how the outer electrons are shared to form the covalent bonds in molecules of:
- hydrogen iodide HI
  - nitrogen trichloride NCl<sub>3</sub>
  - tetrachloromethane CCl<sub>4</sub>
2. a) Make a drawing to show the shape of each of the following molecules:
- |                       |              |
|-----------------------|--------------|
| i) water              | iii) ammonia |
| ii) hydrogen fluoride | iv) methane  |
- b) Name the molecule, from the list above, which is
- linear
  - pyramidal
- a) What name is given to the shape of a methane molecule?

**Homework 8****Properties of substances 1****/10**

1. a) Use your data booklet to complete the table:

Compound	Melting Point (°C)	Boiling Point (°C)
Carbon dioxide		
Silicon dioxide		

- b) Explain why, although both of these compounds contain covalent bonds, carbon dioxide is a gas at room temperature, whereas silicon dioxide is a solid. (4)

2. Name the type of bond that forms between a metal and a non-metal atom. (1)

3. A compound is formed from a group 1 element and a group 7 element. Choose 2 elements and show by means of a diagram what happens to the outer electrons of the atoms involved. (2)

4. Hydrogen chloride is made up of molecules but sodium chloride exists as a crystal lattice.

a) Explain what is meant by a lattice

b) Explain why ionic compounds have such high melting and boiling points (2)

- 5.

<b>A</b> CH <sub>4</sub>	<b>B</b> H <sub>2</sub> S	<b>C</b> KNO <sub>3</sub>
<b>D</b> O <sub>2</sub>	<b>E</b> CaCl <sub>2</sub>	<b>F</b> NH <sub>3</sub>

Which box (or boxes) in the grid show the chemical formula of a substance which is an ionic compound? (1)

**Homework 9****Properties of substances 2****/14**

1. A pupil investigated the properties of three compounds and obtained the following results:

Substance	Melting point	Electrical conduction
A	high	does not conduct in any state
B	low	does not conduct in any state
C	high	conducts in solution and molten

For each of A, B and C state whether the structure is covalent molecular, covalent network or ionic and give the reasons for your choice. (3)

2. a) By means of a labelled diagram, show the experimental apparatus which can be used to classify substances into conductors and non-conductors. (1)
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- b) Arrange the following solids into two columns headed conductors and non-conductors.

**Nickel, iodine, magnesium, sulfur, phosphorus**  
**sodium, scandium, copper**

(2)

HOMEWORK 9 CONTINUES ON NEXT PAGE

- c) Arrange the following liquids into two columns headed conductors and non-conductors.

***Copper sulfate solution, silicon tetrachloride, liquid oxygen,  
molten sulfur, sodium chloride solution, mercury, molten iron,***

(3)

3. The table contains some information about some substances:

Substance	Melting point/°C	Boiling point/°C	Conducts as a solid	Conducts as a liquid
A	-7	59	no	no
B	1492	2897	yes	yes
C	1407	2357	no	no
D	606	1305	no	yes
E	-39	357	yes	yes
F	-78	-33	no	no

- Identify the substance which is a gas at 0°C.
- Identify the two substances which exist as molecules.
- Identify the substance which exists as a covalent network.
- Identify the substance which exists as an ionic lattice.
- Identify the two substances which are metals.

(5)

## Homework 10

## Chemical formulae 1

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1. Write the chemical formulae for the following:

- Sulfur trioxide
- Dinitrogen oxide
- Silicon tetrafluoride
- Carbon monoxide

(4)

2. Write the chemical formulae for the following:

- Hydrogen iodide
- Magnesium chloride
- Calcium sulfide
- Lithium oxide
- Potassium fluoride
- Aluminium bromide

(6)