New Document 1

Name: _____

Class: _____

Date: _____

Time: **25 minutes**

Marks: **25 marks**

Comments:

Q1.

This question is about sodium chloride and iodine.

(a) Describe the structure and bonding in sodium chloride.

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(b) When sodium chloride solution is electrolysed, one product is chlorine.

Name the **two** other products from the electrolysis of sodium chloride solution.

_____

_____

(2)

(c) Many people do not have enough iodine in their diet.

Sodium chloride is added to many types of food. Some scientists recommend that sodium chloride should have a compound of iodine added.

Give **one** ethical reason why a compound of iodine should **not** be added to sodium chloride used in food.

_____

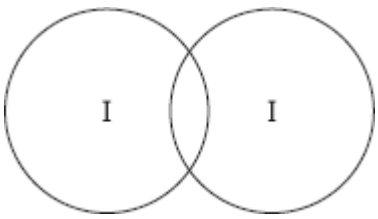
_____

(1)

(d) The bonding in iodine is similar to the bonding in chlorine.

(i) Complete the diagram below to show the bonding in iodine.

Show the outer electrons only.



(2)

(ii) Explain why iodine has a low melting point.

_____

_____

_____

_____

_____

_____

(3)

(iii) Explain, in terms of particles, why liquid iodine does not conduct electricity.

_____

_____

_____

_____

(2)

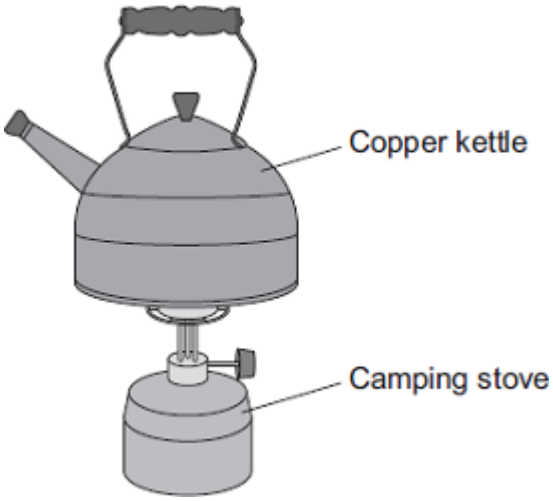
(Total 14 marks)

Q2.

The picture shows a copper kettle being heated on a camping stove.

Copper is a good material for making a kettle because:

- it has a high melting point
- it is a very good conductor of heat.



(a) Explain why copper, like many other metals, has a high melting point.

Your answer should describe the structure and bonding of a metal.

_____

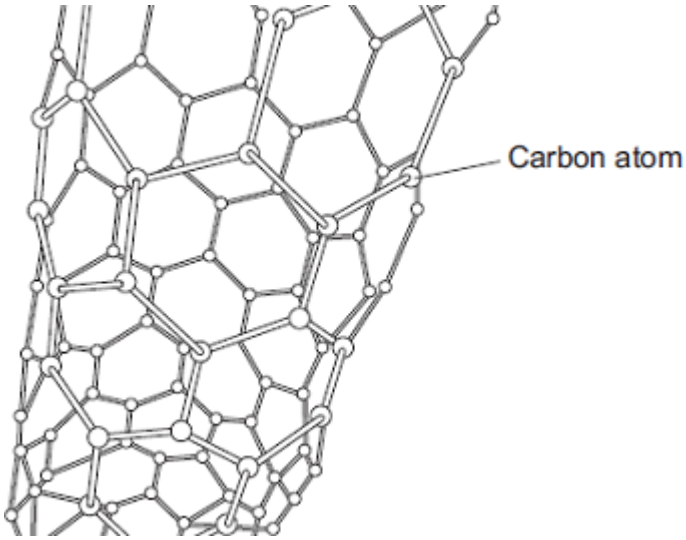
_____

(4)

(b) Aeroplanes contain many miles of electrical wiring made from copper. This adds to the mass of the aeroplane.

It has been suggested that the electrical wiring made from copper could be replaced by carbon nanotubes which are less dense than copper.

The diagram shows the structure of a carbon nanotube.



(i) What does the term ‘nano’ tell you about the carbon nanotubes?

(1)

(ii) Like graphite, each carbon atom in the carbon nanotube is joined to three other carbon atoms.

Explain why the carbon nanotube can conduct electricity.

(2)

(Total 7 marks)

Q3.

Millions of years ago the Earth formed as a giant ball of molten rock. The outer surface cooled forming a thin, solid outer crust. Volcanic activity on the surface produced an atmosphere containing the compounds carbon dioxide, ammonia, methane and water vapour.

Describe the bonding in any **one** of these compounds. You must include electronic structures in your explanation.

(Total 4 marks)

Mark schemes

Q1.

(a) lattice / giant structure

*max **3** if incorrect structure or bonding or particles*

1

ionic **or** (contains) ions

1

Na^+ **and** Cl^-

accept in words or dot and cross diagram: must include type and magnitude of charge for each ion

1

electrostatic attraction

allow attraction between opposite charges

1

(b) hydrogen

allow H_2

1

sodium hydroxide

allow NaOH

1

(c) any **one** from, eg:

- people should have the right to choose
- insufficient evidence of effect on individuals
- individuals may need different amounts.

allow too much could be harmful

ignore religious reasons

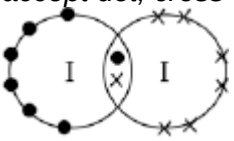
ignore cost

ignore reference to allergies

1

(d) (i) one bonding pair of electrons

accept dot, cross or e or − or any combination, eg



1

6 unbonded electrons on each atom

1

(ii) simple molecules

*max **2** if incorrect structure or bonding or particles*

accept small molecules

accept simple / small molecular structure

1

with intermolecular forces

accept forces between molecules

must be no contradictory particles

1

which are weak **or** which require little energy to overcome − must be linked to second marking point

reference to weak covalent bonds negates second and third marking points

1

(iii) iodine has no delocalised / free / mobile electrons or ions

1

so cannot carry charge

*if no mark awarded iodine molecules have no charge gains **1** mark*

1

[14]

Q2.

(a) *reference to incorrect bonding **or** incorrect structure **or** incorrect particles = max **3***

giant structure / lattice

ignore many bonds

1

made up of <u>positive</u> ions surrounded by delocalized / free electrons

allow <u>positive</u> ions surrounded by a sea of electons

1

with strong bonds / attractions

allow hard to break for strong

1

so a lot of energy is needed to break these bonds / attractions / forces

ignore high temperature

ignore heat

1

(b) (i) that they are <u>very</u> small

or

1-100 nanometres **or** a few(hundred) atoms

accept tiny / really small / a <u>lot</u> smaller / any indication of very small eg. microscopic, smaller than the eye can see

ignore incorrect numerical values if very small is given

1

(ii) delocalised / free electrons

allow sea of electrons

1

one <u>non-bonded</u> electron from each atom

accept electron(s) <u>moving through the structure / nanotube</u>

allow electron(s) carry / form / pass current / charge

1

[7]

Q3.

answers apply to:

accept diagrams and/or descriptions

carbon dioxide CO_2

ammonia NH_3

methane CH_4

water H_2O

*outer electronic structure of one atom correct **or** needs correct number of electrons to complete outer shell

1

*outer electronic structure of other atom correct **or** needs correct number of electrons to complete outer shell

1

*one shared **pair** of electrons (as one covalent bond)

use of ions or reference to ionic bonding negates this mark

1

*outer electronic structure of compound correct **or** each atom now has a full outer shell/noble gas electron structure

1

[4]