# Using Resources 1

Name: _____

Class: _____

Date: _____

Time: **61 minutes**

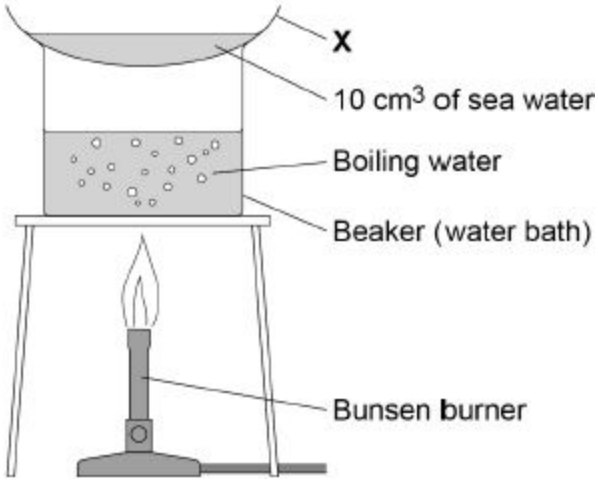
Marks: **59 marks**

Comments:

**1.** A student tested a sea water sample for dissolved solids.

**Figure 1** shows the apparatus.

**Figure 1**




(a) What is apparatus **X** on **Figure 1**?

Tick **one** box.

Boiling tube ☐

Condenser ☐

Funnel ☐

Watch glass ☐

**(1)**

(b) The student did the test four times.

The student calculated the mass of solid on apparatus **X** after heating.

The table below shows the student's results.

| | **Test 1** | **Test 2** | **Test 3** | **Test 4** |
|---|---|---|---|---|
| **Mass of solid in grams** | 0.12 | 0.29 | 0.14 | 0.15 |

Calculate the mean mass of solid.

Do not include the anomalous result in your calculation.

Give your answer to 2 significant figures.

_____

_____

_____

_____

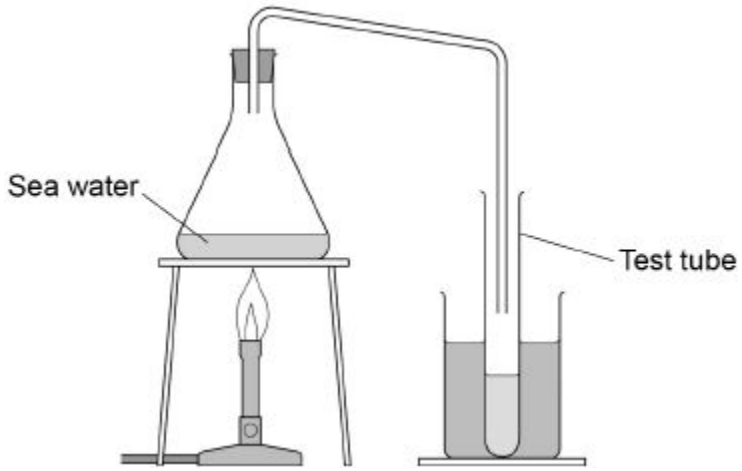
_____

Mean mass = _____ g

**(3)**

The student distilled a sample of sea water in the apparatus shown in **Figure 2**

**Figure 2**




(c) What change of state is happening at the surface of the sea water in **Figure 2**?

_____

**(1)**

(d) Describe how the water in the test tube in **Figure 2** is different from the sea water.

_____

_____

**(1)**

(e) Why does producing drinking water from sea water using distillation cost a lot of money?

_____

_____

**(1)**

(f) River water is filtered then sterilised to make drinking water.

Why are these **two** processes done?

Filtering _____

_____

Sterilising _____

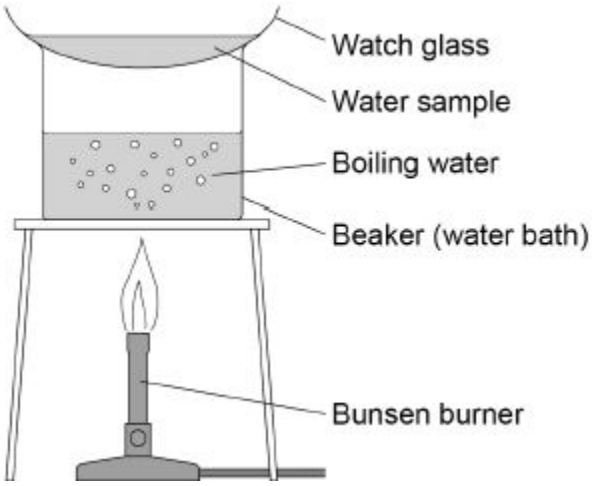
_____

**(2)**

**(Total 9 marks)**

**2.** A student investigated the mass of dissolved solids in 5 $cm^3$ samples of water.

The diagram below shows the apparatus.




The table below shows the student's results.

| Type of water | Mass in g | | | |
|---|---|---|---|---|
| | **Watch glass** | **Watch glass and dissolved solids** | **Dissolved solids in 5 $cm^3$ of water** | **Dissolved solids in 1000 $cm^3$ of water** |
| Sea water | 9.34 | 9.48 | 0.14 | 28.00 |
| River water | 9.15 | 9.23 | 0.08 | **X** |
| Rainwater | 8.93 | 8.93 | 0.00 | 0.00 |

(a) Calculate mass **X** in the table above.

Mass **X** = _____ g

**(1)**

(b) 5 $cm^3$ is a small volume of water for each experiment.

Give **one** advantage and **one** disadvantage of using a larger volume.

Advantage _____

Disadvantage _____

**(2)**

(c) Potable water is **not** pure water.

Describe the difference between potable water and pure water.

**(1)**

(d) Potable water is obtained from both groundwater **and** from sea water.

Describe how groundwater and sea water are treated to produce potable water.

**(3)**

(e) The percentage by mass of dissolved solids in a 6.50 g sample is 2.2%

Calculate the mass of the dissolved solids.

_____

_____

_____

_____

Mass of dissolved solids = _____ g

**(2)**

**(Total 9 marks)**

**3.** This question is about drinking water.

(a) Name **two** methods of treating water from rivers, lakes or the sea to produce drinking water.

Tick **two** boxes.

| | |
|---|---|
| Anaerobic digestion | ☐ |
| Cracking | ☐ |
| Desalination | ☐ |
| Electrolysis | ☐ |
| Sterilising | ☐ |

**(2)**

(b) The table below shows the amounts of dissolved ions in a sample of drinking water.

| **Dissolved ion** | **Mass in mg per $dm^3$** |
|---|---|
| $Cl^-$ | 250 |
| $Na^+$ | 200 |
| $NO_3^+$ | 40 |

What is the name of the ion with the symbol $Cl^-$?

Tick **one** box.

Calcium ion ☐

Carbonate ion ☐

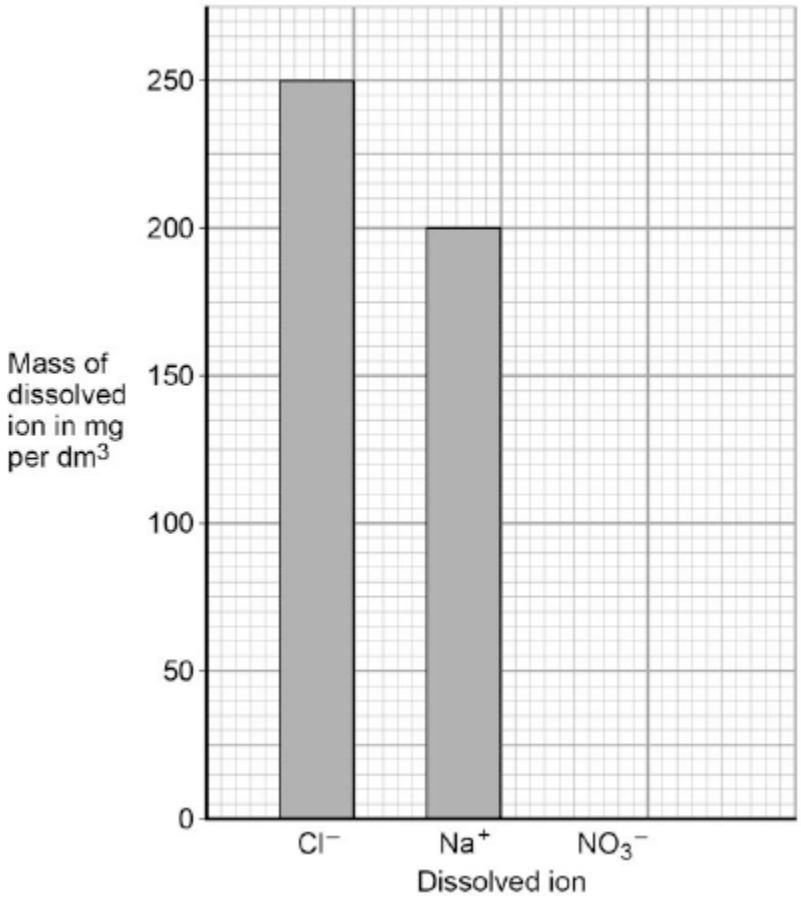
Chloride ion ☐

Chlorine ion ☐

**(1)**

(c) Use the information in the table above to complete the bar chart in **Figure 1**.

**Figure 1**




**(1)**

(d) Look at the questions labelled **A, B, C, D**.

**A** How many substances are there in drinking water?

**B** How much fluoride is in drinking water?

**C** Is fluoride soluble in drinking water?

**D** Should fluoride be added to drinking water?

Which **one** of the questions cannot be answered by science alone?

Tick **one** box.

| **A** | | **B** | | **C** | | **D** | |
|---|---|---|---|---|---|---|---|

**(1)**

(e) Give **two** reasons why the answer you have chosen cannot be answered by science alone.

1. _____

_____

2. _____

_____

**(2)**

(f) A sample of drinking water contains 1.5 mg of fluoride per $dm^3$ of water.
A person drinks 1 $dm^3$ of this water.

The recommended daily amount of fluoride is 4.0 mg.

Which calculation gives the percentage of the recommended daily amount of fluoride in 1 $dm^3$ of this water?

Tick **one** box.

$\frac{1.5}{4.0} \times 100$ ☐

$\frac{1.5}{100} \times 4.0$ ☐

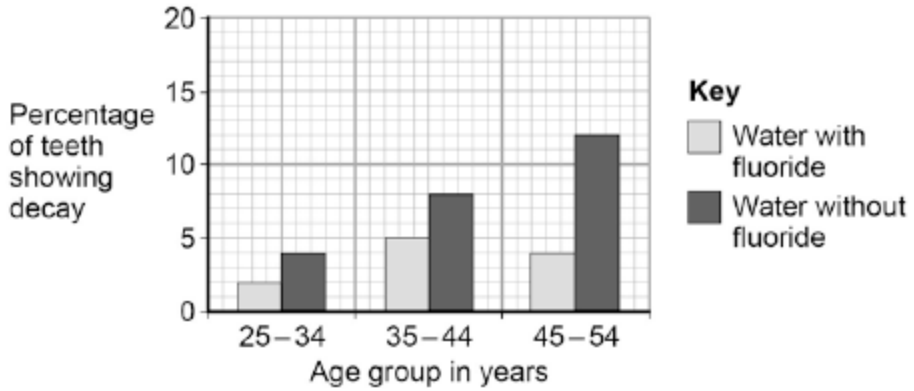
$\frac{4.0}{1.5} \times 100$ ☐

$\frac{100}{1.5} \times 4.0$ ☐

**(1)**

(g) **Figure 2** shows the effect of fluoride in drinking water on tooth decay in different age groups.

**Figure 2**




Describe the pattern of tooth decay in **Figure 2** for water without fluoride.

Use data to justify your answer.

_____

_____

_____

_____

**(2)**

(h) Describe the effect of adding fluoride to drinking water for the age groups in **Figure 2**.

_____

_____

_____

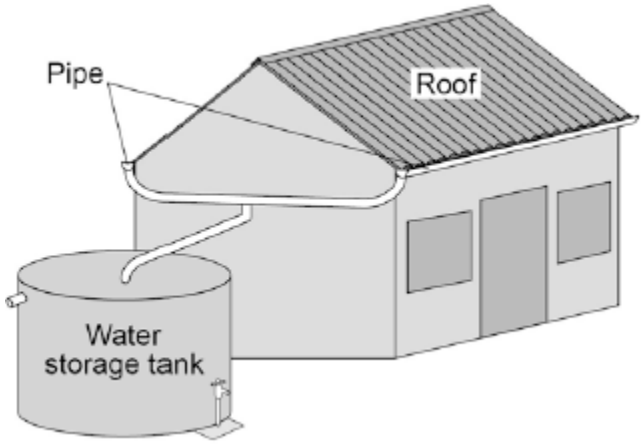
_____

**(2)**

**(Total 12 marks)**

**4.** Rainwater is collected from the roofs of houses as shown in **Figure 1**.

**Figure 1**




(a) The water in the storage tank is **not** potable.

What does potable mean?

Tick **one** box.

Contains dissolved substances ☐

Pure ☐

Safe to drink ☐

Tastes nice ☐

**(1)**

(b) Why should the water in the tank be filtered to make it potable?

Tick **one** box.

To kill microbes ☐

To remove dissolved gases ☐

To remove dissolved solids ☐

To remove undissolved solids ☐

**(1)**

(c) A gas which bleaches litmus paper can be added to the water to make it potable.

Name this gas and explain why it is added.

_____

_____

_____

_____

**(2)**

(d) The storage tank is made from concrete reinforced with steel wire, as shown in **Figure 2.**

**Figure 2.**

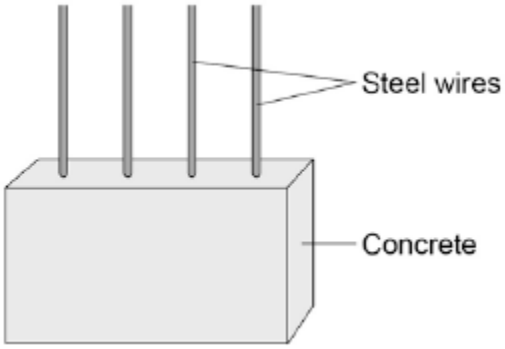
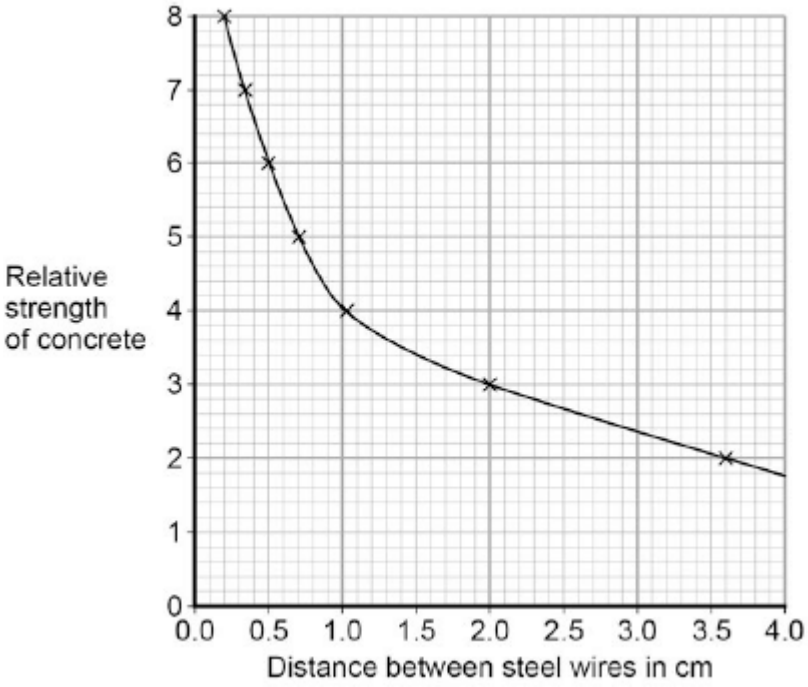



**Figure 3** shows how the distance between the steel wires affects the relative strength of the concrete.

**Figure 3**




Use values from **Figure 3** to describe the relationship shown by the graph.

_____

_____

_____

_____

**(2)**

**(Total 6 marks)**

**5.** Metals are extracted from ores in the Earth's crust.

(a) Why is copper used in the manufacture of computers?

Tick (✓) **one** box.

Because it has a high density. ☐

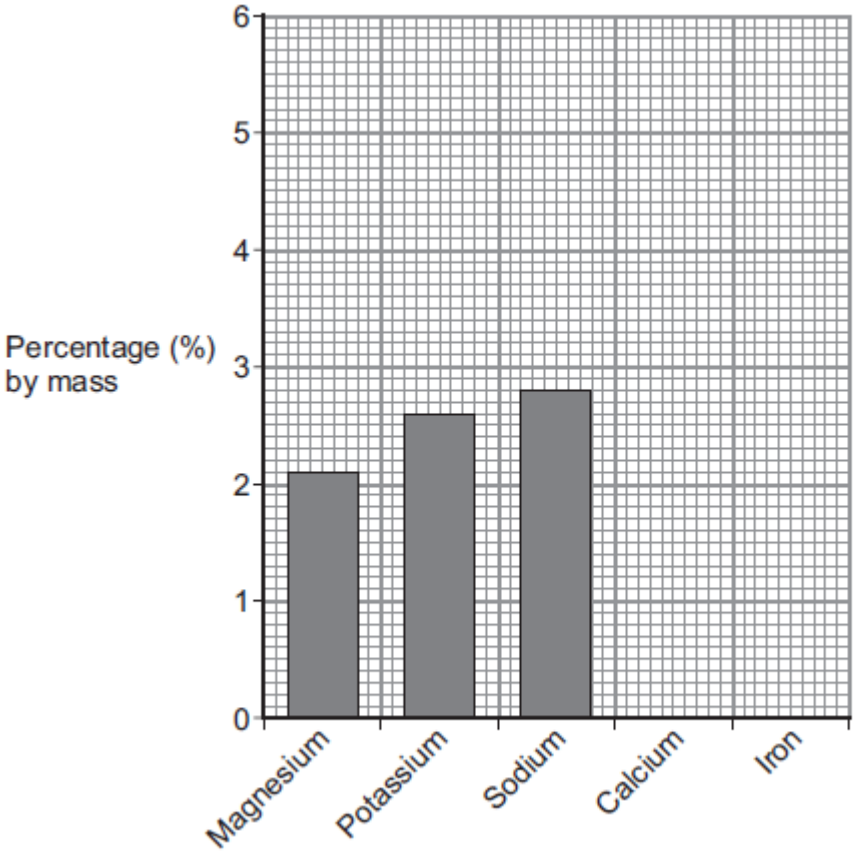
Because it does not react with water. ☐

Because it is a good conductor of electricity. ☐

**(1)**

(b) **Figure 1** shows the percentage (%) by mass of some metals in the Earth's crust.

**Figure 1**




(i) What is the percentage by mass of magnesium in the Earth's crust?

_____ %

**(1)**

(ii) On **Figure 1** draw the bars for:

- calcium at 3.6% by mass
- iron at 5.0% by mass.

**(2)**

(c) An ore of zinc contains zinc carbonate.

The equation for the reaction when zinc carbonate is heated is:

$$\underset{\text{zinc carbonate}}{ZnCO_3} \longrightarrow \underset{\text{zinc oxide}}{ZnO} + \underset{\text{carbon dioxide}}{CO_2}$$

(i) What is the name of this type of reaction?

Tick (✓) **one** box.

corrosion ☐

decomposition ☐

electrolysis ☐

**(1)**

(ii) Which substance in the equation is a gas at room temperature (20 °C)?

Tick (✓) **one** box.

zinc carbonate ☐

zinc oxide ☐

carbon dioxide ☐

**(1)**

(iii) Complete the table below to show the number of atoms of carbon and oxygen in the formula of zinc carbonate.

| **Element** | **Number of atoms in the formula $ZnCO_3$** |
|---|---|
| zinc, Zn | 1 |
| carbon, C | |
| oxygen, O | |

**(2)**

(iv) When 125 g zinc carbonate is heated, 81 g zinc oxide is produced.

Calculate the mass of carbon dioxide produced.

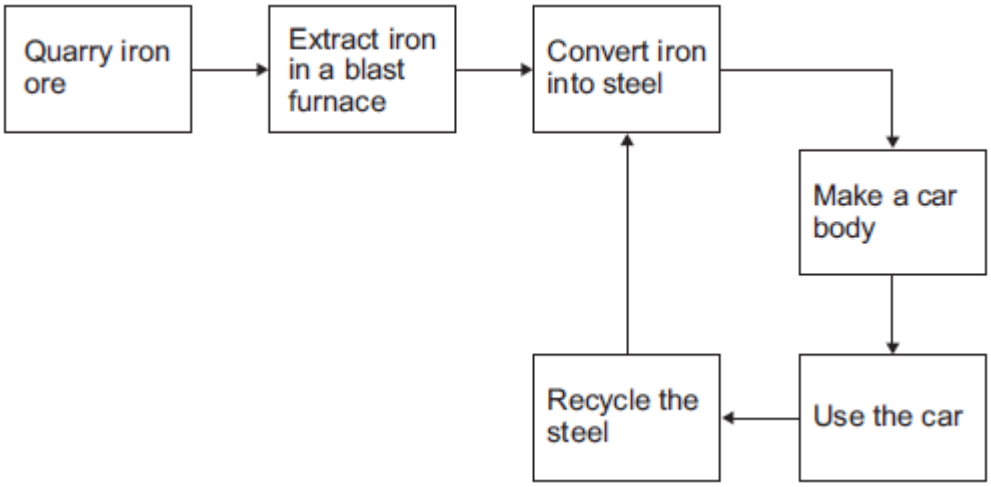
_____

Mass of carbon dioxide = _____g

**(1)**

(d) **Figure 2** shows a simple life cycle of a car body.

**Figure 2**




(i) What is **one** reason why iron from the blast furnace is converted into steel?

Tick (✓) **one** box.

To make the iron pure. ☐

To make the iron more brittle. ☐

To make alloys for specific uses. ☐

**(1)**

(ii) Apart from cost, give **three different** reasons why steel should be recycled.

1. _____

_____

2. _____

_____

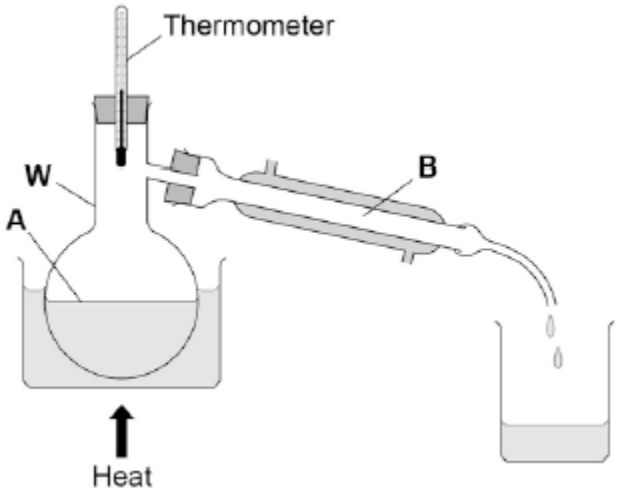
3. _____

_____

**(3)**

**(Total 13 marks)**

**6.** The apparatus in the figure below is used to separate a mixture of liquids in a fuel.




(a) What is apparatus **W** on above the figure above?

Tick **one** box.

Beaker ☐

Boiling Tube ☐

Flask ☐

Jug ☐

**(1)**

(b) What is the name of this method of separation?

Tick **one** box.

Crystallisation ☐

Electrolysis ☐

Filtration ☐

Distillation ☐

**(1)**

(c) Name the changes of state taking place at **A** and **B** in the figure above.

Use words from the box.

| **boiling** | **condensing** | **freezing** | **melting** |
|---|---|---|---|

Change of state at **A**: _____

Change of state at **B**: _____

**(2)**

(d) **Table 1** shows the boiling points of the hydrocarbons in the fuel.

**Table 1**

| Hydrocarbon | Boiling point in °C |
|---|---|
| Pentane | 36 |
| Hexane | 69 |
| Heptane | 98 |
| Octane | 125 |

Which hydrocarbon will be the last to collect in the beaker?

Tick **one** box.

Pentane ☐

Hexane ☐

Heptane ☐

Octane ☐

**(1)**

(e) The fuel is a mixture of liquids that has been designed as a useful product.

What name is given to this type of mixture?

Tick **one** box.

- Catalyst ☐
- Formulation ☐
- Polymer ☐
- Solvent ☐

**(1)**

(f) Describe how this fuel is different from crude oil.

_____

_____

_____

_____

**(2)**

(g) A student measured the melting point of a solid hydrocarbon four times.

The student's results are in **Table 2**.

**Table 2**

| | **Trial 1** | **Trial 2** | **Trial 3** | **Trial 4** |
|---|---|---|---|---|
| Melting point in °C | 35 | 48 | 37 | 37 |

Calculate the mean melting point of the hydrocarbon, leaving out any anomalous result.

Give your answer to two significant figures.

_____

_____

Mean melting point = _____ °C

**(2)**

**(Total 10 marks)**

**1.**

(a) watch glass

**1**

(b) identify 0.29 as anomaly

**1**

$$\frac{0.12 + 0.14 + 0.15}{3}$$

**or**

$$\frac{0.41}{3}$$

*allow* $\frac{0.12 + 0.29 + 0.14 + 0.15}{4}$

***or***

$\frac{0.70}{4}$

**1**

(=) 0.14 (g)

*allow 0.18 (g) if first marking point not awarded*

**1**

*an answer of 0.14 (g) scores **3** marks*

(c) evaporating

**or**

vaporisation

*allow from liquid to vapour / gas*

*do **not** accept boiling*

**1**

(d) pure

**or**

no salt

*allow converse answers relating to seawater*
*allow not a mixture*
*allow desalinated*

*do **not** accept less salt*
*do **not** accept filtered*

**1**

(e) uses (a lot of) energy

*allow needs heating*
*allow needs electricity*
*allow needs fuel **or** any suitable fuel*

*ignore references to equipment*
*ignore references to time*

**1**

(f) filtering removes particles

*allow solids **or** suitable named solids*

**1**

sterilising kills bacteria / microbes

*allow destroys viruses*
*allow kills viruses*

**1**

**[9]**

**2.** (a) 16(.0)

**1**

(b) advantage: more accurate result

*do **not** accept reliable*

**1**

disadvantage: takes a long(er) time, more energy needed (to heat more water)

*ignore expensive*

**1**

(c) pure: no dissolved solids / impurities
**or** no (dissolved) chlorine

*allow only water / $H_2O$*
*ignore safe to drink*

**and**
potable: has dissolved solids / impurities
**or** has (dissolved) chlorine

*ignore safe to drink*

**1**

*a clear comparative statement referring to solutes gains the mark*

(d) groundwater:
- filtered

*allow acceptable method of filtration*

**1**

- sterilised

*allow acceptable method of sterilisation*

**1**

groundwater:
- distilled **or** reverse osmosis

*allow desalination*
*ignore salt removed*
*ignore boiling alone*
*ignore filtering*
*do **not** accept fractional distillation*

**1**

(e) $\frac{2.2}{100} \times 6.50$

1

(=) 0.143 (g)

1

*an answer of 0.143 (g)*
***or** 0.14 (g) scores **2** marks*

**[9]**

**3.** (a) Desalination

1

Sterilising

1

(b) Chloride ion

1

(c) correct bar for $NO_3^-$

1

(d) **D**

1

(e) any **two** from:
- people have the right to choose (opinion)
- ethical / moral question
- cannot be tested by experiment

2

(f) $\frac{1.5}{4.0} \times 100$

1

(g) the percentage tooth decay increases with age

1

by 4 % for each increasing age group

1

(h) reduces tooth decay (for all age groups)

1

greater reduction in older people

1

**[12]**

**4.** (a) Safe to drink

1

(b) To remove undissolved solids

1

(c) the gas is chlorine / $Cl_2$

1

which sterilises water

1

(d) as distance between steel increases strength of concrete decreases

1

change above and change below 1.0 cm separation is compared and described

*must refer to graph values for this mark*

1

**[6]**

**5.** (a) because it is a good conductor of electricity.

1

(b) (i) 2.1 (%)

1

(ii) correct bar for calcium at 3.6 %

1

*allow error of +/– 0.05%*

correct bar for iron at 5.0 %

1

*allow error of +/– 0.05%*

(c) (i) decomposition

1

(ii) carbon dioxide

1

(iii) carbon = 1

*allow one*

1

oxygen = 3

*allow three*

1

(iv) 44 (g)

*allow forty four*

1

(d) (i) to make alloys for specific uses.

1

(ii) any **three** from:

- to conserve resources of iron or iron ore
  *allow steel instead of iron or iron ore*
  *allow limited resource or non-renewable*
- to avoid the need for quarrying/mining
- to conserve energy resources or fossil fuels
- to limit the amount of carbon dioxide produced or to reduce global warming
- to reduce the amount of landfill

*"it" = steel*

*ignore cost and reuse and time and waste*

**3**

**[13]**

**6.** (a) Flask

**1**

(b) Fractional distillation

**1**

(c) **A** – boiling

*in this order*

**1**

**B** – condensing

**1**

(d) Octane

**1**

(e) Formulation

**1**

(f) the fuel is a pure compound

**1**

and crude oil is a mixture

**or**

the fuel is made up of four hydrocarbons

*allow crude oil contains a large number of compounds and the fuel contains four*

and crude oil could have many more

**1**

(g) (35 + 37 + 37 / 3) = 36.33

**1**

36

**1**

*allow (35 + 48 + 37 + 37 / 4 =) 39(.25) for **1** mark*

**[10]**