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Name	Class	Index Number
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**ANG MO KIO SECONDARY SCHOOL  
MID YEAR EXAMINATION 2017  
SECONDARY ONE EXPRESS**

**SCIENCE**

**Total Mark: 100**

**02 May 2017 / Tuesday**

Setter: Mrs Luei Sin Yen Joselyn

**2 hours**

Additional Materials: OTAS Paper, Writing Papers

**READ THESE INSTRUCTIONS FIRST**

Write your name, class and index number in the spaces at the top of this paper.  
You may use a soft pencil for any diagrams, graphs or rough working.  
You should show the essential steps in any calculations and leave your answers in 3 significant figures.

No marks will be awarded for answers that are NOT clearly shown.

Do **not** use paper clips, highlighters, glue or correction fluid/tape.

**Section A**

Answer **all** the questions in Section A on the OTAS paper provided. Write your name, class and index number on the OTAS paper in the spaces provided. **Use only 2B pencil on the OTAS paper.**

**Section B**

Answer **all** the questions in Section B in the spaces provided on the question paper.

**Additional papers attached will not be marked.**

**Section C**

Answer any **4 out of 5** questions. Begin each question on a **FRESH** page of the writing paper.

At the end of the examination, staple your writing paper for answers to Section C.

Hand in the OTAS, question paper, Section B and Section C separately.

The number of marks is given in brackets [ ] at the end of each question or part question.

	<b>For Examiner's use</b>	
	<b>Section A</b>	
	<b>Section B</b>	
	<b>Section C</b>	
	<b>TOTAL</b>	

This document consists of **21** printed pages, including the cover page.

**Section A: Multiple-Choice Questions (30 marks)**

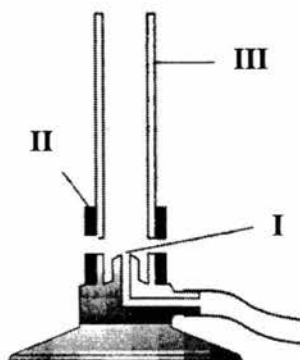
For each of the questions, four suggested answers are given. You are to choose the most appropriate ONE and indicate your answer on the OTAS sheet provided.

- A1.** What does 'open-mindedness' of a good scientist refer to?
- A.** To stick to the truth until the scientist's discovery is proven.
  - B.** To want to know more about the unexpected results that may be observed.
  - C.** To be willing to accept that something could happen contrary to popular belief.
  - D.** To follow the facts and not be influenced by what is widely believed by others.
- A2.** A container of a substance displays the hazard symbols as shown in the figure. The substance could be \_\_\_\_\_.



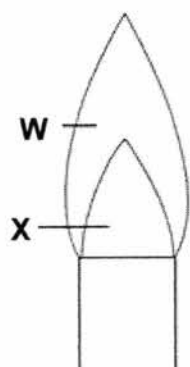
- A.** acid
  - B.** alcohol
  - C.** mercury
  - D.** uranium
- A3.** The volume of water in a measuring cylinder should be read at the \_\_\_\_\_ of the meniscus in order to prevent \_\_\_\_\_ error.
- A.** top, zero
  - B.** bottom, zero
  - C.** top, parallax
  - D.** bottom, parallax

- A4.** The picture shows a Bunsen burner. Which one of the following alternatives given below correctly represents **I**, **II** and **III**?

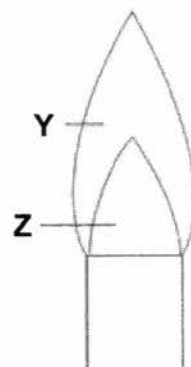


	<b>I</b>	<b>II</b>	<b>III</b>
<b>A.</b>	gas jet	collar	barrel
<b>B.</b>	collar	barrel	gas jet
<b>C.</b>	barrel	collar	gas jet
<b>D.</b>	barrel	gas jet	collar

- A5.** The air-hole of a Bunsen burner can be opened or closed to obtain two types of flame. The colours of the flame are labelled in the diagram below.



flame of a Bunsen burner  
with the air-hole open



flame of a Bunsen burner  
with the air-hole closed

Which of the following option correctly states the colours of **W**, **X**, **Y** and **Z**?

	<b>W</b>	<b>X</b>	<b>Y</b>	<b>Z</b>
<b>A.</b>	dark blue	orange	dark blue	orange
<b>B.</b>	orange	dark blue	orange	dark blue
<b>C.</b>	orange	dark blue	blue	dark blue
<b>D.</b>	blue	dark blue	orange	dark blue

**A6.** Which of the following options correctly states the disadvantage of a technology that benefits society.

- A.** Taking X-ray photographs too often may cause cancerous tumours.
- B.** Too many motor vehicles on the roads pollute the water.
- C.** Antibiotics increase our bodies' resistance to superbugs.
- D.** Styrofoam pollutes the environment when it decomposes naturally.

**A7.** The apparatus shown below is commonly found in the laboratory.



What is the function of the apparatus?

- A.** For isolating setups from the outside.
- B.** To contain and mix chemicals and liquids.
- C.** To mix and heat chemicals and liquids evenly.
- D.** To collect gases released from chemical reactions.

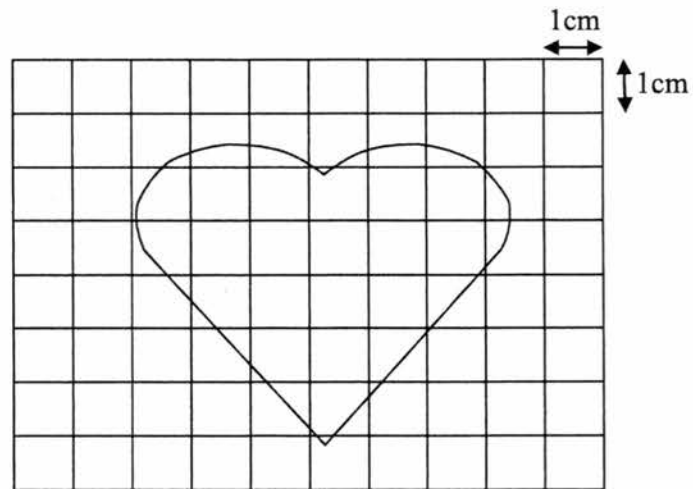
**A8.** Which one of the following has the same value as  $75 \text{ cm}^2$ ?

- A.**  $0.0075 \text{ m}^2$
- B.**  $0.075 \text{ m}^2$
- C.**  $0.75 \text{ m}^2$
- D.**  $75 \text{ m}^2$

**A9.** What are the smallest lengths that can be measured by a pair of vernier calipers and micrometer screw gauge?

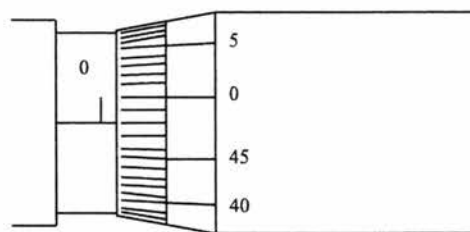
	<b>Vernier calipers</b>	<b>Micrometer screw gauge</b>
<b>A.</b>	0.1 mm	0.01 mm
<b>B.</b>	0.01 mm	0.001 mm
<b>C.</b>	0.1 cm	0.01 cm
<b>D.</b>	0.01 cm	0.001 cm

**A10.** What is the estimated area for the diagram shown below?



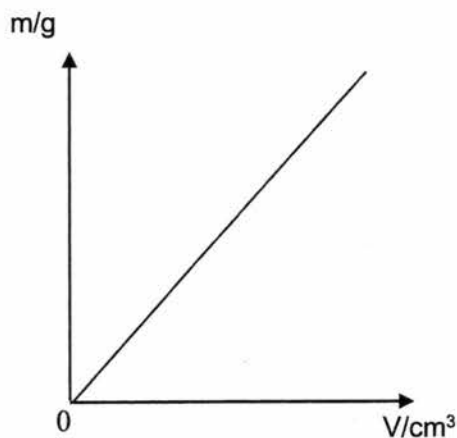
- A. 16 cm<sup>2</sup>
- B. 18 cm<sup>2</sup>
- C. 20 cm<sup>2</sup>
- D. 22 cm<sup>2</sup>

**A11.** The diagram below shows the reading on a micrometer screw gauge when its jaws are closed. What is the zero error of the instrument?



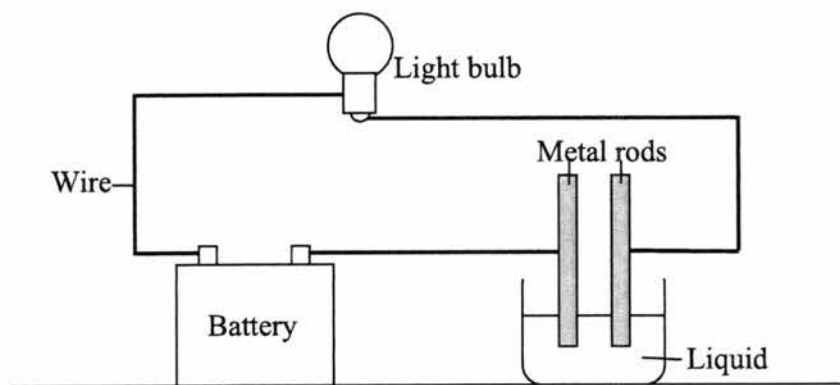
- A. + 0.02 mm
- B. - 0.02 mm
- C. - 0.20 mm
- D. + 0.48 mm

- A12.** The graph below shows the variation of the mass,  $m$ , of an object with its volume,  $V$ .



Which of the following statements about the graph above is correct?

- A.** The density of the object varies as volume increases.
  - B.** The density of the object remains constant as volume increases.
  - C.** The density of the object increases as volume increases.
  - D.** The density of the object decreases as volume increases.
- A13.** The diagram below shows an experiment to test a certain property of liquids.



Which of the following property is being tested?

- A.** density
- B.** electrical conductivity
- C.** magnetism
- D.** solubility

**A14.** Most metals such as copper and iron have high melting points. Which of the following is an advantage of this property?

- A. It prevents machine parts made of metal from rusting.
- B. It allows metal parts to be reshaped more easily.
- C. It keeps cars from becoming too hot on sunny days.
- D. It enables people to use pots and pans made of metal to cook food.

**A15.** According to the data in the table below, which sample of matter is most likely to be a plastic?

Sample	Characteristics		
	Lustre (shiny)	Flexible	Electrical Conductivity
1	No	No	Conductor
2	High	No	Insulator
3	High	Yes	Conductor
4	Low	Yes	Insulator

- A. sample 1
- B. sample 2
- C. sample 3
- D. sample 4

**A16.** Elements can be classified into \_\_\_\_\_.

- A. metals and non-metals
- B. mixtures and solutions
- C. solutions and suspensions
- D. chemical formulae and symbols

**A17.** Which of the following is a mixture of elements only?

- A. air
- B. brass
- C. chalk
- D. water

**A18.** When sugar is heated, decomposition occurs, forming carbon and water vapour. Which of the following statements about decomposition is true?

- A. Compounds are broken down into simpler substances.
- B. Elements are broken down into simpler substances.
- C. Compounds combine to form new compounds.
- D. Elements combine to form compounds.

**A19.** How many different types of elements are present in ammonium sulfate,  $(\text{NH}_4)_2\text{SO}_4$ ?

- A. 3
- B. 4
- C. 10
- D. 15

**A20.** The rate of dissolving of a solute refers to \_\_\_\_\_.

- A. how much a solute dissolves in a fixed volume of solvent
- B. how much a solute dissolves in any volume of solvent
- C. how fast a solute dissolves in a fixed volume of solvent
- D. how fast a solute dissolves in any volume of solvent

**A21.** Which of the following pair of substances forms a solution with water?

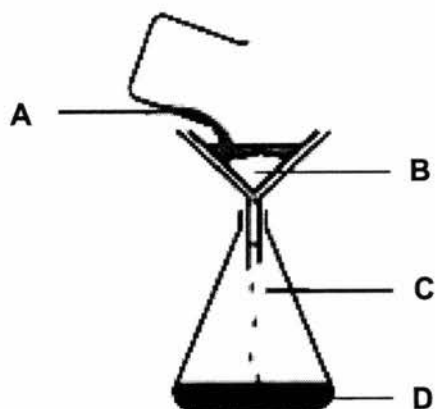
- A. glass and carbon
- B. glass and plastic
- C. plastic and sugar
- D. sugar and common salt

**A22.** Which of the following applications does not depend on water as the solvent?

- A. Making alcoholic drinks.
- B. Making cooking oil.
- C. Making detergent.
- D. Making shampoo.

- A23.** Which of the following will form a suspension with water?
- A. ethanol
  - B. bread crumbs
  - C. carbon dioxide gas
  - D. ribena syrup
- A24.** Which of the following mixtures can be separated by magnetic attraction?
- A. bronze and brass buttons
  - B. copper and gold coins
  - C. iron and zinc pins
  - D. silver and aluminium foil
- A25.** What is the correct order of steps to separate salt from a mixture of soluble salt and insoluble pepper?
- A. filtration → dissolving → evaporation
  - B. dissolving → filtration → evaporation
  - C. filtration → evaporation → dissolving
  - D. evaporation → dissolving → filtration
- A26.** Which of the following can be separated by simple distillation?
- A. alcoholic beverages
  - B. pulp from orange juice
  - C. pen ink
  - D. seawater
- A27.** Which property of a mixture enables paper chromatography to be used as a suitable separation technique?
- A. Different extent of solubility of the substances in the mixture.
  - B. Different melting point of the substances in the mixture.
  - C. Different electrical conductivity of the substances in the mixture.
  - D. Different density of the substances in the mixture.

- A28.** The diagram below shows the process of filtration. At which point, **A**, **B**, **C** or **D**, represents the residue of the filtration?



- A29.** When a mixture undergoes evaporation, \_\_\_\_\_.
- A.** both the solvent and solute are left behind
  - B.** both the solvent and solute are completely evaporated
  - C.** the solute is completely evaporated while only the solvent is left behind
  - D.** the solvent is completely evaporated while only the solute is left behind
- A30.** In an experiment, a student mixed some sand, water and an unknown substance in a beaker. He then filtered the mixture. The student observed that the filtrate was a clear liquid that did not contain any solids. The only residue obtained was sand.

Which of the following conclusions can the student make?

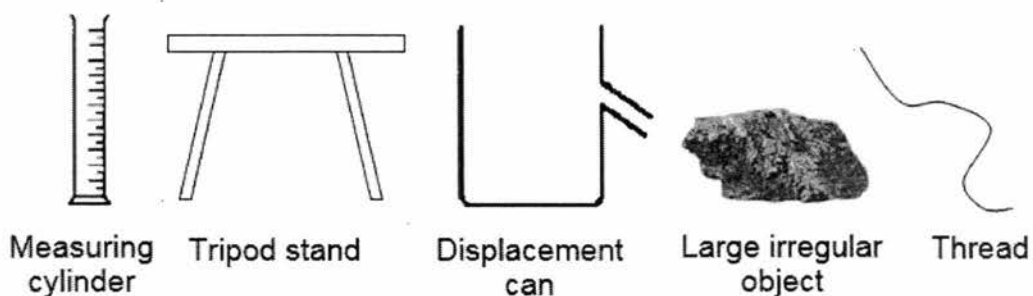
- A.** The filtrate is pure water.
- B.** The filtrate contains dissolved sand.
- C.** The unknown substance is soluble in water.
- D.** The unknown substance is a liquid at room temperature.

~ End of Section A ~

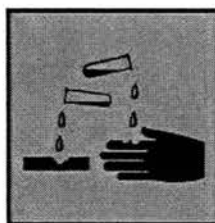
**Section C: Free Response Questions (40 marks)**

Answer any four questions on the writing papers provided. Begin each question on a fresh page of the writing paper.

- C1. (a) (i) Draw a **well-labelled diagram** to show how you would measure [ 3 ]  
the volume of a **large irregular object**. You may use the  
apparatus provided below.

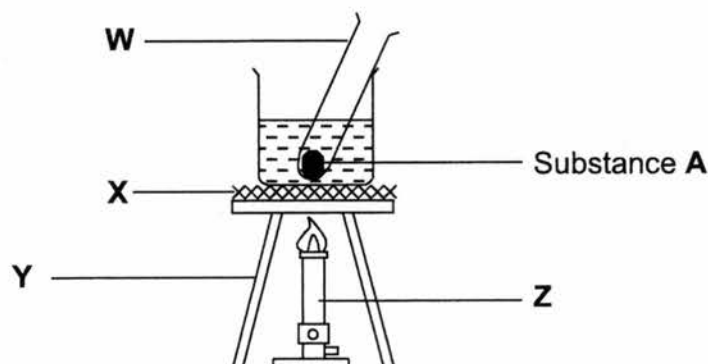


- (ii) Describe how the displacement can should be filled at the start [ 1 ]  
of the experiment.
- (iii) In this experiment, explain how the measuring cylinder can be [ 3 ]  
used to determine the volume of the large irregular object.
- (b) In a school laboratory, a bottle with the following symbol is placed on the  
bench.



- (i) What is the meaning of this symbol? [ 1 ]
- (ii) What could the substance in the bottle be? [ 1 ]
- (iii) Give **one** safety precaution when handling this bottle. [ 1 ]

C2. (a) The diagram below shows the set-up of an experiment.



- (i) Substance **A** in **W** is a solid. Suggest a reason why substance **A** is heated in a water bath. [ 1 ]
- (ii) State the function of **W** and **Y**. [ 2 ]
- (iii) State two safety precautions that should be followed when using **Z**. [ 2 ]
- (b) A piece of gold with a mass of 120 g and density of  $19.3 \text{ g/cm}^3$  is melted together with a piece of brass of mass 400 g and density  $8.5 \text{ g/cm}^3$ .
- (i) Calculate the volume of gold. Show your workings clearly. [ 1 ]
- (ii) Calculate the volume of brass. Show your workings clearly. [ 1 ]
- (iii) Calculate the total volume of the alloy formed. Show your workings clearly. [ 1 ]
- (iv) Hence, calculate the overall density of the alloy formed. Show your workings clearly. [ 2 ]

**C3.** (a) Read the descriptions below:

**W** is a silvery solid with shiny surface at room temperature. It melts at a fixed temperature and is made up of only 1 type of atom.

**X** is a yellowish gas and cannot be further broken down into simpler substances.

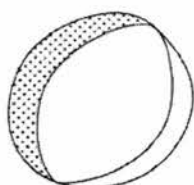
Substance **W** and **X** chemically reacts to produce **U**, a white solid.

Substance **U** readily dissolves in water to form a homogeneous solution **T**.

- (i) Which of the above substances is an element? Briefly explain your answer. [ 2 ]
- (ii) Which of the above substance is a compound? Briefly explain your answer. [ 2 ]
- (iii) State two differences between compounds and mixtures. [ 2 ]
- (iv) Which of the above substances is a mixture of compounds? [ 1 ]

(b) Ann learnt that in making jewellery, copper, which is a cheaper metal, is often mixed with gold. The amount of gold present in the mixture is indicated by the number of 'carats'. A 24-carat ring is pure gold with no copper present.

She did an experiment on density using two rings, where ring A is 18-carat gold and ring B is 9-carat gold. She measured the mass and volume of the two rings.



Ring A  
mass = 35.8 g  
volume = 2.0 cm<sup>3</sup>



Ring B  
mass = 36.0 g  
volume = 3.3 cm<sup>3</sup>

- (i) Find the density of ring A. Show your workings clearly. [ 1 ]
- (ii) Find the density of ring B. Show your workings clearly. [ 1 ]
- (iii) If pure gold has a density of  $19.3 \text{ g/cm}^3$  and pure copper has a density of  $8.9 \text{ g/cm}^3$ , which ring has a higher percentage of copper? [ 1 ]

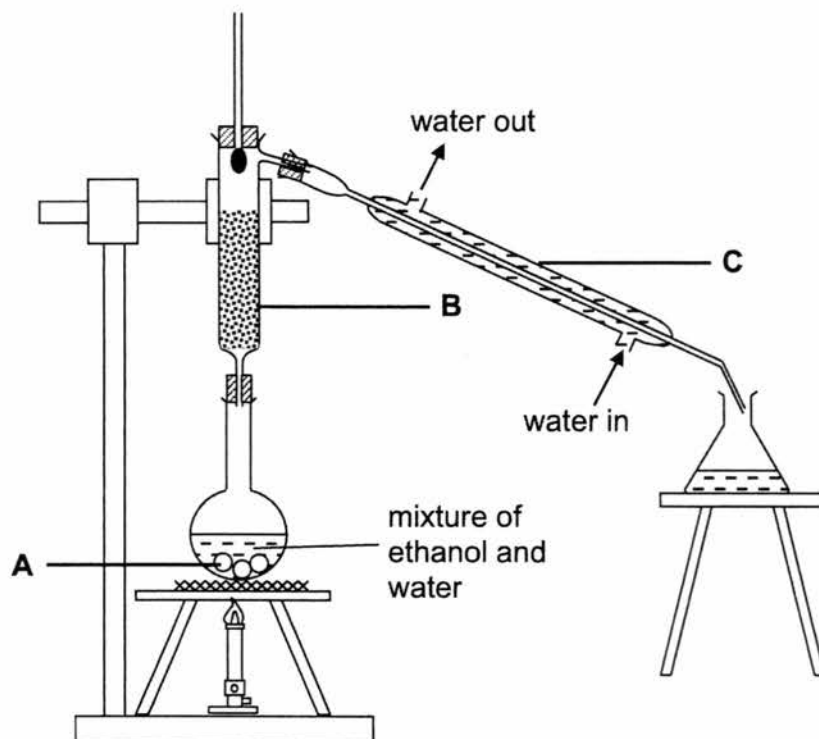
**C4.** Jason was given a mixture of sugar, chalk and food colouring. He was given the following information about the components of the mixture.

Substance	Solubility in Water	Solubility in Alcohol
Sugar crystals	Soluble	Soluble
Chalk dust	Insoluble	Insoluble
Food colouring powder	Insoluble	Soluble

To separate them, the mixture is first added to water.

- (a) (i) List two ways to increase the rate of dissolving of sugar crystals. [ 2 ]
- (ii) Explain why the mixture is heterogeneous before chalk powder and food colouring powder are removed. [ 1 ]
- (iii) Describe one characteristic of the nature of the mixture described in **4a(ii)**. [ 1 ]
- (b) How could Jason obtain a pure dry sample of the different components of
- (i) sugar crystal, [ 3 ]
- (ii) chalk dust and [ 2 ]
- (iii) food colouring powder respectively? [ 1 ]

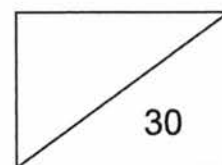
- C5. (a) The diagram below shows the experimental set-up for the separation of a mixture of ethanol and water.



- (i) Name the separation method which uses the set-up above. [ 1 ]
- (ii) Identify the parts labelled **A**, **B** and **C** in the diagram. [ 2 ]
- (iii) What is the function of **B**? [ 1 ]
- (iv) What is the function of **C**? [ 1 ]
- (v) State one industrial usage of this separation technique. [ 1 ]
- (b) Which material is the most suitable for making the following applications?  
Using their physical properties, explain your choice of answer.
- (i) Wire in electrical appliances. [ 2 ]
- (ii) Drinking straws. [ 2 ]

~ End of Section C ~

**Ang Mo Kio Secondary School**  
**Mid Year Examination 2017**  
**Secondary One Express Science**



Name: \_\_\_\_\_ (    )

Class: \_\_\_\_\_

**Section B: Structured Questions (30 marks)**

Answer **ALL** the questions in the space provided.

**B1.** In the Science laboratory, Ariel carried out an experiment involving heating of a solid in a test tube.

- (a) Ariel thought that test tubes should not be made of glass as glass is [ 2 ]  
 fragile and breaks easily. Give **two** reasons why most scientific apparatus are made of glass even though glass breaks easily.

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- (b) Ariel was taught that to be a good scientist, she has to use her [ 1 ]  
 senses to make accurate observations. However, why should the sense of taste never be used when investigating chemicals?

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- (c) What type of flame should Ariel use when she is temporarily not [ 2 ]  
 heating anything? Provide a reason to support your answer.

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**B2.** Convert each of the following to the required unit. [ 3 ]

(a)  $378 \text{ mm} = \underline{\hspace{4cm}} \text{ m}$

(b)  $135 \text{ g} = \underline{\hspace{4cm}} \text{ kg}$

(c)  $0.004 \text{ km}^2 = \underline{\hspace{4cm}} \text{ m}^2$

**B3.** The thickness of a metal coin is measured twice using the vernier callipers. The figures below show the two readings on the scale.

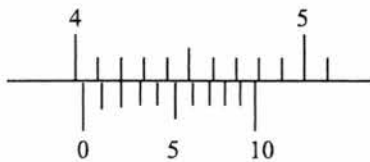


Figure 1

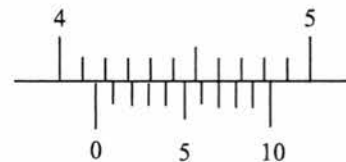


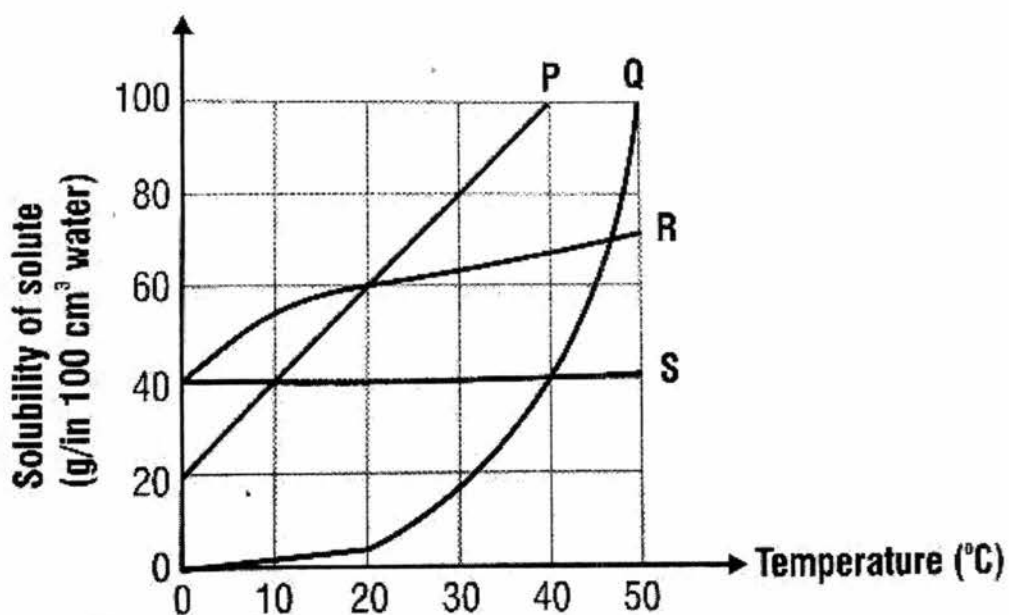
Figure 2

(a) Write down the two readings of the thickness of the metal coin. [ 2 ]

Readings	
Figure 1	Figure 2

(b) Find the average, **correct to 2 decimal places**, of the thickness of the metal coin. [ 1 ]

- B4. The graph below shows the solubility of four different substances against temperature in water.



- (a) From the graph, state the substance that has solubility **most** affected [ 2 ]  
by temperature. Explain your answer.

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- (b) From the graph, state the substance that has solubility **least** affected [ 2 ]  
by temperature. Explain your answer.

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- (c) Which two substances have the same solubility in water at 20°C? [ 1 ]

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- (d) From the graph, predict the amount of substance Q that can dissolve [ 1 ]  
in 100 cm<sup>3</sup> of water at 35°C.

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- B5.** (a) Define the term 'element'. [ 1 ]

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- (b) State **one** characteristic of the elements in:

- (i) the same group; and [ 1 ]

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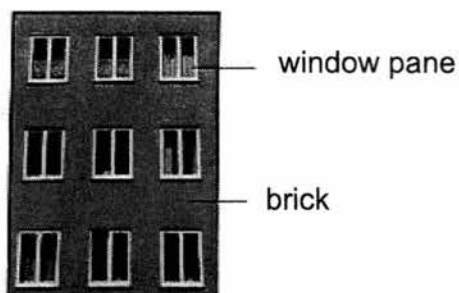
- (ii) the same period. [ 1 ]

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- B6.** The picture below shows the physical appearance of an apartment.



- (a) What is meant by the **strength** of a substance? [ 1 ]

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- (b) Why is the strength of material important to the structure of the apartment? [ 1 ]

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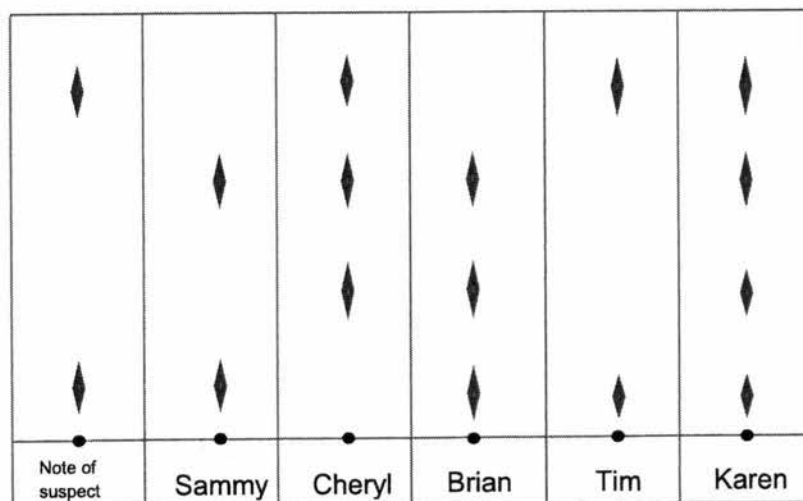


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- (c) With reference to the picture of the apartment, complete the following table. [3]  
table.

Structure	Material	Physical property	Reason
Window pane	Glass		
Wall	Brick	Poor conductor of heat	

- B7.** A school principal had received an anonymous note from a student in Secondary 1, demanding for longer recess time. The principal appointed Mr Lim, the Head of Chemistry, to analyse the note to find the culprit. Mr Lim carried out a chromatographic separation of ink samples from different students whom he suspected might have written the note. His results are shown in the following chromatogram.



- (a) How many colours are there in the suspect's ink? [ 1 ]

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- (b) Which two students have the same number of colours, as the suspect, [ 1 ]  
in their inks?

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- (c) Which student is most likely to be guilty? Explain your answer. [ 2 ]

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- (d) State one other industrial usage of this separation technique. [ 1 ]

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~ End of Section B ~

## Sec 1E Science SA1 2017 – Answers and Markers Report

## Section A

1	C	11	B	21	D
2	B	12	B	22	B
3	D	13	B	23	B
4	A	14	D	24	C
5	D	15	D	25	B
6	A	16	A	26	D
7	B	17	B	27	A
8	A	18	A	28	B
9	D	19	B	29	D
10	C	20	C	30	C

## Section B

Qn	Answers	Remarks
B1a	<p>Glass is <u>transparent</u> and allows us to <u>observe chemical change in the test tube</u>. [1]            Glass has <u>high melting point / heat resistance</u> which allows <u>heating of chemicals</u> to take place without melting. [1]</p>	<p>Reject:</p> <ul style="list-style-type: none"> <li>Poor/ bad conductor or insulator of electricity or heat (poor conductor of heat, so when someone touch it, it will not burn them)</li> <li>Insulator of heat</li> <li>High melting point to store hot liquids</li> <li>Glass is transparent allowing us to see through ( see inside the test tube).</li> <li>Glass is transparent, allows reading to be made easily.</li> <li>Glass is light.</li> <li>Glass is cheap.</li> <li>Glass has a high melting point, will not melt easily (when heated).</li> </ul> <p>Accepted:</p> <ul style="list-style-type: none"> <li>Glass do not react with most chemicals. Thus, suitable for storing chemicals for experiments.</li> <li>Glass does not corrode easily, thus able to store corrosive substances like acid.</li> <li>Glass is transparent, allows us to see what is inside the test tube.</li> </ul>

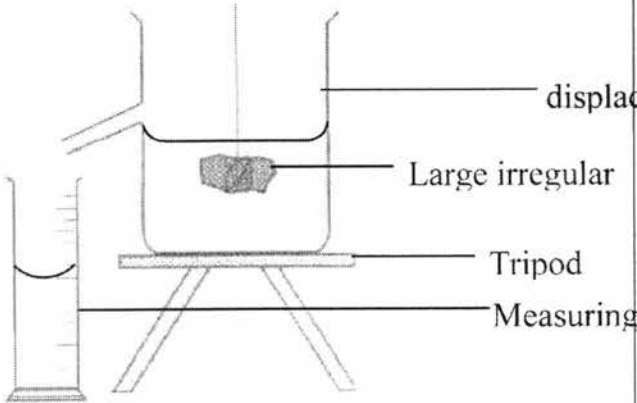
B1b	Most chemicals in the laboratory are <u>poisonous/toxic/harmful</u> . Therefore, tasting chemicals is dangerous. [1]	Reject: <ul style="list-style-type: none"> <li>Tasting chemicals might lead to death.</li> <li>Substances are bad for you.</li> <li>It may have negative effective.</li> </ul> Accept: <ul style="list-style-type: none"> <li>Most substances in the laboratory are safe for consumption.</li> </ul>						
B1c	Luminous flame [1] A luminous flame is <u>easily seen</u> [1] and can prevent the other users from being burnt accidentally.	Reject: <ul style="list-style-type: none"> <li>Not as hot as luminous flame and will not scald anyone who put their hand over the flame.</li> <li>Air hole is closed so a strike back will not occur.</li> </ul> No ECF if student wrote non-luminous flame.						
B2a	0.378 m [1]							
B2b	0.135 kg [1]							
B2c	4000 m <sup>2</sup> [1]							
B3a	<table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th colspan="2">Reading</th> </tr> <tr> <th>Figure 1</th> <th>Figure 2</th> </tr> </thead> <tbody> <tr> <td>4.02 cm [1]</td> <td>4.17 cm [1]</td> </tr> </tbody> </table>	Reading		Figure 1	Figure 2	4.02 cm [1]	4.17 cm [1]	Common errors: 4.17- 4.02 = 0.15 (take difference) 0.15/2= 0.75cm Did not leave answer in 2dp. No units , wrong units
Reading								
Figure 1	Figure 2							
4.02 cm [1]	4.17 cm [1]							
B3b	Average $= \frac{4.02 + 4.17}{2} = 4.10 \text{ cm (2 d.p) [1]}$	<ul style="list-style-type: none"> <li></li> </ul>						
B4a	Q. [1].Solubility of Solute Q increases the most as temperature increases.[1]	Reject : <ul style="list-style-type: none"> <li>It changes the most as temperature increases.</li> <li>What is it? Substance Q or solubility of substance Q.</li> </ul> OR <ul style="list-style-type: none"> <li>Substance Q increases a lot from temperature increases.</li> </ul>						
B4b	S. [1] The <u>solubility remains constant when the temperature increases</u> . [1]							

B4c	P and R [1]	<ul style="list-style-type: none"> <li>Reject:</li> <li>All values outside of acceptable range.</li> <li>Wrong units E.g. g/in</li> </ul>												
B4d	26-28 g [1]	<ul style="list-style-type: none"> <li>Many students missed out "chemical methods"</li> </ul>												
B5a	An element is a substance that cannot be broken down into two or more simpler substances by chemical methods. [1]	Reject: <ul style="list-style-type: none"> <li>Same chemical properties</li> <li>Same or similar physical properties</li> <li>similar properties</li> <li>elements in the group are metals or non-metals. (grp 4 is a mixture of metals and non-metals)</li> </ul>												
B5bi	They have similar chemical properties. [1]	Reject: <ul style="list-style-type: none"> <li>They are all metals or non-metals.</li> <li>They share the same state of matter.</li> <li>All elements in the group are either good or poor conductors of heat.</li> <li>All elements have the same symbol</li> <li>melting point decreases from left to right.</li> <li>similar chemical properties.</li> </ul>												
B5bii	Their properties gradually change from those of metals to those of non-metals moving from left to right of the period. / Their proton numbers are in increasing order. / Their atom size gets larger. [1]													
B6a	Strength is the ability of a substance to <u>support a heavy load without breaking</u> . [1]	Accept: It is the amount of force it can withstand before breaking.												
B6b	The apartment needs to <u>withstand heavy load from the weight of people and furniture residing in it</u> . [1]	Reject: <ul style="list-style-type: none"> <li>Heavy winds or winds.</li> <li>Withstand heavy weight w/o making reference to contents of building.</li> <li>structure of the building (from stem of question)</li> </ul>												
B6c	<table border="1"> <thead> <tr> <th>Structure</th> <th>Material</th> <th>Physical property</th> <th>Reason</th> <th></th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>				Structure	Material	Physical property	Reason						
Structure	Material	Physical property	Reason											

	Window pane	Glass	<u>Transparent</u> [1]	<u>It allows light to enter the room.</u> [1]	Reject: <ul style="list-style-type: none"> <li>• high melting point</li> <li>• hard</li> <li>• poor conductor of heat</li> <li>• waterproof</li> <li>• poor conductor of light</li> </ul> Accept: <ul style="list-style-type: none"> <li>• Transparent – see through /look in / look out.</li> </ul>
	Wall	Brick	Poor conductor of heat	It does not conduct heat well, the <u>apartment can be kept cool</u> or a hot day. [1]	Reject: <ul style="list-style-type: none"> <li>• Prevent building from getting too hot ( w/o elaboration about condition outside E.g. hot day, summer )</li> <li>• House will not catch on fire.</li> <li>• Link heat to humidity</li> <li>• People will not get scalded</li> <li>• Bricks will not expand and crack.</li> </ul>
B7a	Two [1]			Reject : 1	
B7b	Sammy and Tim [1]			Common errors: Tim and Karen	
B7c	Tim. [1] The colour spots on Tim's chromatogram have travelled to the same position/ same level as the suspect's chromatogram.[1]			Reject: <ul style="list-style-type: none"> <li>• Same solubility</li> <li>• Fit perfectly</li> <li>• Identical</li> <li>• Same colour</li> </ul>	
B7d	Checking for harmful food colouring [1]			Accept: <ul style="list-style-type: none"> <li>• Identify harmful substances in food</li> <li>• Sports doping</li> <li>• Drug testing</li> </ul> Reject: <ul style="list-style-type: none"> <li>• Ink or forgery related ( question asks for other examples)</li> </ul>	

- |  |  |  |
|--|--|--|
|  |  | <ul style="list-style-type: none"><li>• Police investigation</li><li>• Food processing</li><li>• Find out what colours used in ink</li><li>• Separating food colouring</li><li>• Separating dyes</li></ul> |
|--|--|--|

## Section C

Qn	Answers	Remarks
C1ai	 <p>[3m for well labelled diagram]</p> <ul style="list-style-type: none"> <li>- Thread and object submerged in water [1]</li> <li>- Displacement can on top of tripod stand [1]</li> <li>- Correct positioning of measuring cylinder. [1]</li> </ul>	<p>1 mark is deducted if students did not label the diagram.</p> <p>Reject:</p> <ul style="list-style-type: none"> <li>• Did not indicate hanging object is submerged in water</li> <li>• No tripod is used to lift the beaker</li> </ul>
C1aii	<p><u>Fill the displacement can with water until it overflows.</u> [1]</p> <p>The <b>measuring cylinder</b> collects the water that overflows.</p> <p>When water stops flowing out from the spout, remove the measuring cylinder.</p>	<p>Generally many of them did not mention the need to fill to the brim.</p> <p>Reject:</p> <ul style="list-style-type: none"> <li>• Fill up to opening/spout/hole</li> <li>• Fill below the hole</li> </ul>
C1aiii	<ol style="list-style-type: none"> <li>1. Place the dry <b>measuring cylinder</b> beneath the spout of the displacement can. [1]</li> <li>2. <b>Lower the large object</b> slowly into the displacement can until it is completely submerged in the water. [1]</li> <li>3. The <b>volume</b> of water collected in the measuring cylinder is equal to the volume of the large object. [1]</li> </ol>	<p>Many of them lost marks for not describing the preparation required.</p> <p>Reject:</p> <ul style="list-style-type: none"> <li>• some water displaced into can</li> <li>• <b>amount</b> of water (did not specify it is the <u>volume</u> of water which is being measured).</li> </ul>

	4.	
C1bi	The substance is <u>corrosive</u> . [1]	Some suggested substance is acidic, eat away another substance. Specific term is required for this hazard symbol.
C1bii	acid / alkali [1]	
C1biii	Do not taste or inhale it. / Store it in a safe place./ Wear safety goggles when handling it. / Wear hand gloves when handling it. [1]	Accept: <ul style="list-style-type: none"> <li>do not use bare hands</li> <li>use test tube holder/ tongs</li> </ul> <p>Question emphasized the need to <u>handle</u> the bottle so the following were rejected.</p> <ul style="list-style-type: none"> <li>Inform teacher of spillage</li> <li>Experiment must be carried out under supervision</li> <li>Prevent spillage</li> <li>Avoid contact with skin</li> </ul>
C2ai	Substance A may be <u>flammable / volatile/ will decompose</u> if heated in direct flame [1]	Accept: <ul style="list-style-type: none"> <li>To be heated evenly</li> </ul> <p>Reject:</p> <ul style="list-style-type: none"> <li>Prevent from burning</li> </ul>
C2aii	W (test tube): For <b>containing</b> small amounts of chemicals for heating/ mixing [1]  Y(tripod stand): To <b>support / hold up</b> the apparatus that is being heated [1]	Reject: <p>(W)</p> <ul style="list-style-type: none"> <li>Heat and mix small amount of substance</li> <li>Melt and boil faster</li> </ul> <p>(Y)</p> <ul style="list-style-type: none"> <li>Stabilize the set-up</li> <li>Carry the set-up</li> </ul>
C2aiii	Adjust the air hole opening to obtain the desired flame / Light up match right <b>before</b> turning on the gas or shortly after turning on gas / <b>turn off gas</b> after use / make sure <b>air hole is closed</b> before lighting the flame/ <b>Safety goggles</b> must be worn [either 2, 2m]	Reject: <ul style="list-style-type: none"> <li>Close air hole when temporarily not using</li> <li>Do not place near flammable substances</li> <li>Wear safety goggles (spelling error)</li> <li>Gas tube to be connected properly</li> <li>Do not touch the barrel when hot</li> </ul>

C2bi	Volume of gold = $(120 / 19.3) = 6.21762 \text{ cm}^3$ [1]	<ul style="list-style-type: none"> <li>Working to be shown.</li> <li>Answers to be round off to 3 significant figures <b>with unit</b>.</li> </ul>
C2bii	Volume of brass = $(400 / 8.5) = 47.059 \text{ cm}^3$ = 47.1 (3 sf) [1]	
C2biii	Total Volume of alloy formed = $(120 / 19.3) + (400 / 8.5)$ = 6.22 + 47.1 = 53.3 $\text{cm}^3$ [1]	
C2biv	Density of alloy = $(120 + 400) / 53.276$ [1] = 9.76 $\text{g/cm}^3$ [1]	Allow ecf
C3ai	<u>Substance W [1]</u> is an element as it contains <u>only one type of atoms</u> . [1] OR <u>Substance X [1]</u> is an element as it <u>cannot be broken down into simpler substance</u> . [1]	<p>Generally did well. Many of them state both substance W and X and provide explanation.</p> <p>Reject:</p> <ul style="list-style-type: none"> <li>Fixed temperature (this only indicate pure substance, not necessarily element)</li> </ul>
C3aii	<u>Substance U [1]</u> is a compound because it is <u>formed when W and X reacts together/ it is not the simplest substance as it contains W and X</u> . [1]	<p>Reject:</p> <ul style="list-style-type: none"> <li><b>Chemically mixed</b> together</li> <li>No mention about substance contain W and X.</li> </ul>

C3aiii		<b>Compounds</b>	<b>Mixture</b>
	Composition	Elements are in <b>fixed</b> proportion by mass	Elements are mixed in <b>variable</b> proportion
	Melting/Boiling points	Have <b>fixed</b> melting and boiling points	Melts/ boils over a <b>range of temperature</b>
	Properties	<b>Different</b> physical and chemical properties from constituent elements	Have the properties of the substances that make them up
	Separation	Can only be separated by <b>chemical/electrical</b> methods	Can be separated by <b>physical</b> means
	Energy Changes	Usually <b>involve heat</b> or <b>light</b> energy	Usually <b>do not involve heat</b> or <b>light</b> energy

[any 2 difference, 2m]

Reject:

- Mixture can be physically or chemically broken down.
- Compound is chemically combined while mixture is physically combined. (Need to state that '**the elements**' are chemically/ physically combined)

C3aiv	<u>Substance T</u> is a mixture of compound. [1]	Generally well answered.
C3bi	Density of ring A = $35.8 \text{ g} / 2 \text{ cm}^3$ = $17.9 \text{ g/cm}^3$ [1m]	Generally well answered.
C3bii	Density of ring B = $36.0 \text{ g} / 3.3 \text{ cm}^3$ = $10.9 \text{ g/cm}^3$ [1m]	Generally well answered.
C3biii	Ring B has a higher percentage of copper. [1]	Generally well answered. ECF allowed.

C4ai	<u>Increase the temperature of water / stir the mixture / crush the sugar into finer powder</u> [2] to dissolve sugar at a faster rate.	Generally well answered. Reject: - Increase volume of water. - Increase temperature of solute (sugar) → decomposition will take place if sugar is heated
C4aii	The mixture is <u>not evenly mixed</u> because <u>chalk powder and food colouring powder do not dissolve / insoluble in water.</u> [1]	Reject: - mixture is milky
C4aiii	The mixture <u>does not allow light to pass through / cloudy / solute settles to the bottom when left to stand.</u> [any 1, 1m]	Reject: - can be separated by physical methods. - unclear - opaque - translucent - not clear in colour
C4bi	<u>Add water to mixture and stir to dissolve sugar. Filter the mixture to obtain sugar solution as filtrate [1], chalk dust and food colouring powder as residue. Evaporate to obtain saturated solution [1]. Cool and crystallise the saturated solution to obtain sugar crystal.</u> [1]	Badly done. Reject: - if pupils did not mention <b>sugar solution obtained as filtrate.</b> - sugar and water mixture
C4bii	<u>Add alcohol to the residue of chalk dust and food colouring.</u> [1] <u>Filter to obtain chalk powder as the residue [1] and food colouring as filtrate.</u>	Reject: - if pupils did not mention chalk powder collected as <b>residue.</b>
C4biii	<u>Gently warm the filtrate / leave the filtrate to evaporate naturally to obtain the food colouring powder.</u> [1]	Generally well answered.
C5ai	Fractional distillation [1]	Reject: - if <b>fractional</b> is not provided
C5aii	A – boiling chips / porcelain chips / calcium carbonate chips / marble chips B – fractionating column C – condenser [3 correct -2m; 2 correct- 1m; 1 correct – 0m]	Badly done.
C5aiii	Fractionating column provides a <u>larger surface area for condensation of vapour to take place.</u> [1]	Badly done. Reject: - large area - if <b>vapour</b> is not stated

C5aiv	Condenser allows <u>maximum condensation of vapour</u> into a liquid, which will then be collected as distillate in conical flask. [1]	Generally well answered.
C5av	Fractional distillation of liquefied air / fractional distillation of crude oil [1]	Badly done. Accept: - Making perfume - desalination plant - obtain mint oil from leaves Reject: - obtaining water from sea water.
C5bi	Metal / copper [1]. Metals are <u>good conductor of electricity</u> which allows current to flow through easily / <u>ductile</u> so it can be pulled into wires / <u>good conductor of heat</u> to within the heat given off when current flow through the wire. [1]	Generally well answered. Reject: - Malleable - Flexible **Mark not awarded if redundant properties are written.
C5bii	Plastic [1]. Plastics are <u>light / can be bent into shapes / cannot corrode / flexible / waterproof / durable</u> [1], which is suitable for making straws for drinking.	Generally well answered. Reject: - Poor conductor of heat - High melting point - strong **Mark not awarded if redundant properties are written.