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|-------|--------|-----------|
| NAME: | CLASS: | INDEX NO: |
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QUEENSWAY SECONDARY SCHOOL  
MID YEAR EXAMINATION 2017  
SECONDARY 2EXPRESS

Parent's Signature:

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**LOWER SECONDARY SCIENCE**

**8May 2017**  
**1 hour 30 minutes**

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No additional materials are required.

**READ THESE INSTRUCTIONS FIRST**

Write your name and index number on all the work you hand in.  
Write in dark blue or black pen.  
You may use an HB pencil for any diagrams or graphs.  
Do not use staples, paper clips, glue or correction fluid.

There are **two** sections. Answer **all** questions.

**Section 1: Physics (35 marks)**

Answer **all** questions in the spaces provided.

**Section 2: Chemistry(45 marks)**

Answer **all** questions in the spaces provided.

The number of marks is given in brackets [ ] at the end of each question or part question.  
At the end of the examination, hand in your answers to Section 1 and Section2 separately.

A copy of the Periodic Table is printed on page 22.

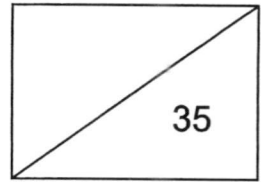
The use of an approved scientific calculator is expected, where appropriate.

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This document consists of **22**printed pages.

Setters: Mr Jimmy Ong, Mrs Sassi (Phy)  
Ms Lim SK, Mr Wilson Ng (Chem)

**[Turn over**

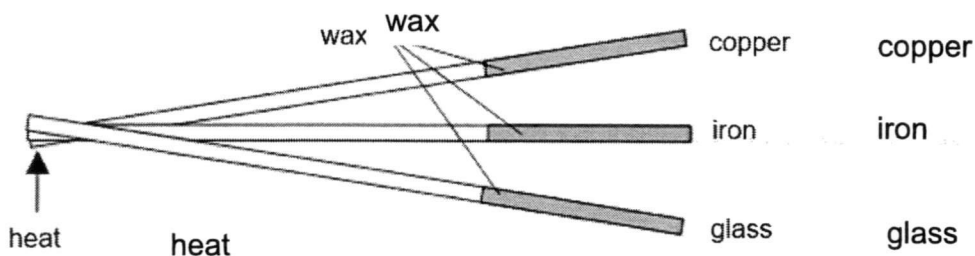


## SECTION 1: PHYSICS SECTION

### SECTION 1 (A): Multiple Choice Questions (10 marks)

Answer **all** the questions in this section in the table on **page 5**.

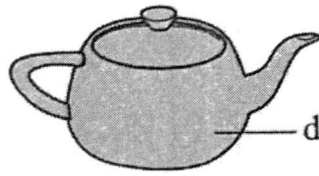
- 1 Which of the following statements about effects of thermal energy on solids, liquids and gases is **incorrect**?
  - A Liquid expands more than solid.
  - B Gas expands more than liquid.
  - C Solid contracts more than liquid.
  - D Gas contracts more than liquid.
  
- 2 In a simple experiment to test the thermal conductivity of copper, iron and glass, one end of each rod is coated with wax and the other end was heated as shown below.



It was found that the wax coated on copper rod started to melt first, followed by iron rod and lastly glass rod. What can you deduce from the above observation?

- A Copper is a better conductor of thermal energy than iron and glass.
- B Copper is a better insulator of thermal energy than iron and glass.
- C Iron is a better conductor of thermal energy than copper and glass.
- D Iron is a better insulator of thermal energy than copper and glass.

- 3 Equal volumes of hot water at  $95^{\circ}\text{C}$  are poured into two tea pots of the same size. One tea pot is made of dull metal and the other tea pot made of shiny metal.



dull dull metal

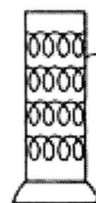
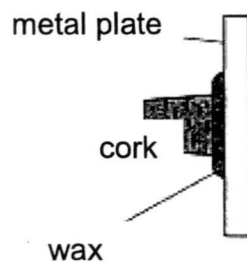


shiny shiny metal

What is the likely temperature in each tea pot after 10 minutes?

|   | Dull metal           | Shiny metal          |
|---|----------------------|----------------------|
| A | $95^{\circ}\text{C}$ | $95^{\circ}\text{C}$ |
| B | $70^{\circ}\text{C}$ | $60^{\circ}\text{C}$ |
| C | $60^{\circ}\text{C}$ | $70^{\circ}\text{C}$ |
| D | $60^{\circ}\text{C}$ | $60^{\circ}\text{C}$ |

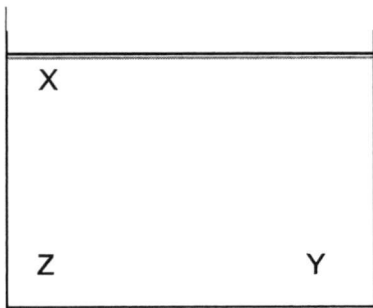
- 4 Sheep have thick layers of fur covering their bodies which help to keep them warm in cold climates. Which of the following best explains how sheep are kept warm?
- A The fur traps air, and air is a poor conductor of thermal energy.  
 B The fur traps air, and air is a good conductor of thermal energy.  
 C The fur is a solid, and solids are poor conductors of thermal energy.  
 D The fur is a solid, and solids are good conductors of thermal energy.
- 5 A small cork is fixed with wax onto a metal plate as shown below. An electric heater is placed close to the plate. After some time, the wax melts and the cork drops off. How does thermal energy reach the wax from the heater?



electric electric heater

- A By conduction only.  
 B By convection and conduction.  
 C By convection and radiation.  
 D By radiation and conduction.

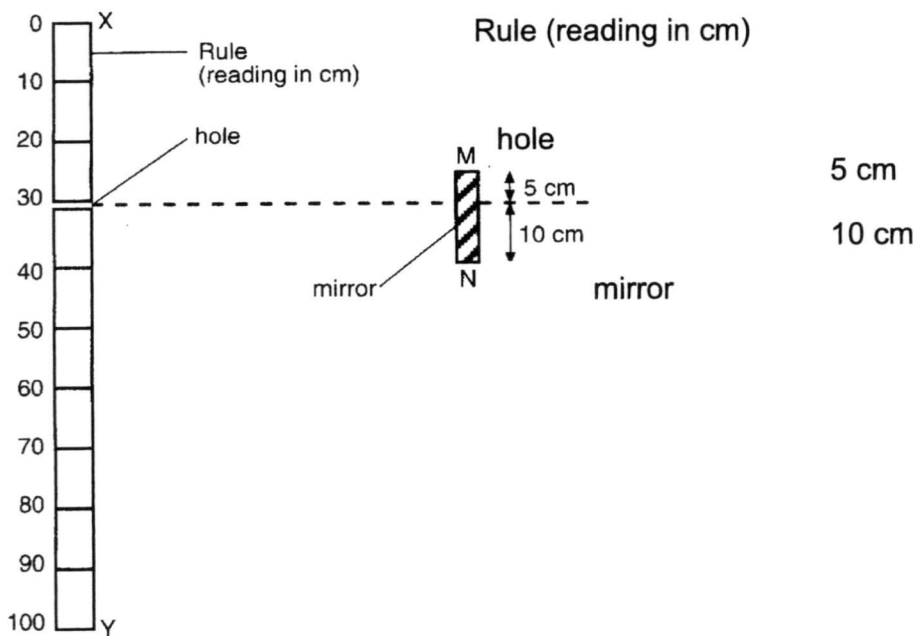
**6** Which of the following will produce a convection current in the container of water below?



- 1 Heat at position Z.
- 2 Cool position X by placing an ice cube.
- 3 Cool position Y by wrapping an ice cube with wire gauze.

- A** 2 only  
**B** 1 and 2 only  
**C** 2 and 3 only  
**D** 1, 2 and 3

7 The diagram below shows a metre rule **XY** with a small hole drilled at the 30 cm mark. A plane mirror **MN** is placed in front of the ruler and is parallel to it. If an observer peeps through the hole and looks at the mirror, the greatest extent to which he can see the metre rule is between the \_\_\_\_\_.



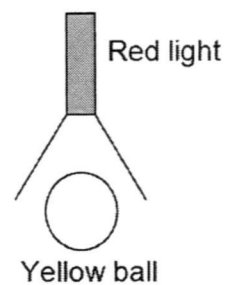
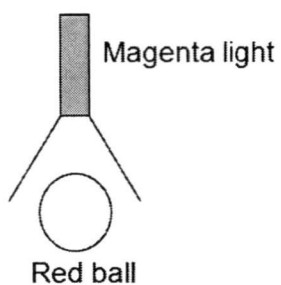
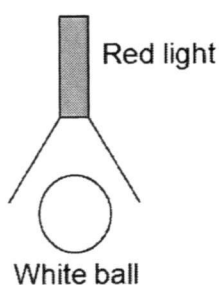
- A** 0 cm and 90 cm mark.  
**B** 10 cm and 70 cm mark.  
**C** 20 cm and 50 cm mark.  
**D** 20 cm and 60 cm mark.

8 Concave mirrors are used as \_\_\_\_\_.

- I side mirrors on cars
- II shaving mirrors
- III cosmetic mirrors
- IV car headlights

- A II and III only
- B I, III and IV only
- C II, III and IV only
- D I, II, III and IV

9 In how many of the setups shown below would the ball appear to be red?



- A 3
- B 2
- C 1
- D 0

10 The formation of a rainbow is the result of light undergoing \_\_\_\_\_.

- A deflection
- B dispersion
- C irregular reflection
- D regular reflection

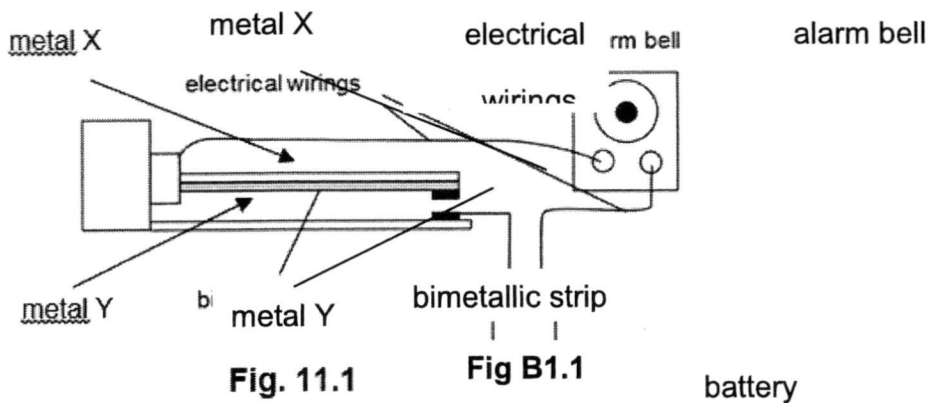
|            |          |          |          |          |           |
|------------|----------|----------|----------|----------|-----------|
| <b>Qns</b> | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> | <b>5</b>  |
| <b>Ans</b> |          |          |          |          |           |
| <b>Qns</b> | <b>6</b> | <b>7</b> | <b>8</b> | <b>9</b> | <b>10</b> |
| <b>Ans</b> |          |          |          |          |           |

**END OF SECTION 1 (A)**

**SECTION 1 (B): Structured Questions (17 marks)**

Answer **all** the questions in this section in the spaces provided.

- B1** Alan has to construct a fire alarm system as shown in **Fig. B1.1** for his Science project. He was asked to choose from five different metals **A, B, C, D** and **E** to form the bimetallic strip. The rates of expansion of the five metals are shown in **Table B1.2**, with 4 being the metal that expands the most and 1 being the metal that expands the least.



**Table B1.2**

| metal    | rates of expansion |
|----------|--------------------|
| <b>A</b> | 2                  |
| <b>B</b> | 1                  |
| <b>C</b> | 3                  |
| <b>D</b> | 4                  |
| <b>E</b> | 3                  |

- (a) Describe how the fire alarm system works.

.....  
 .....  
 .....[2]

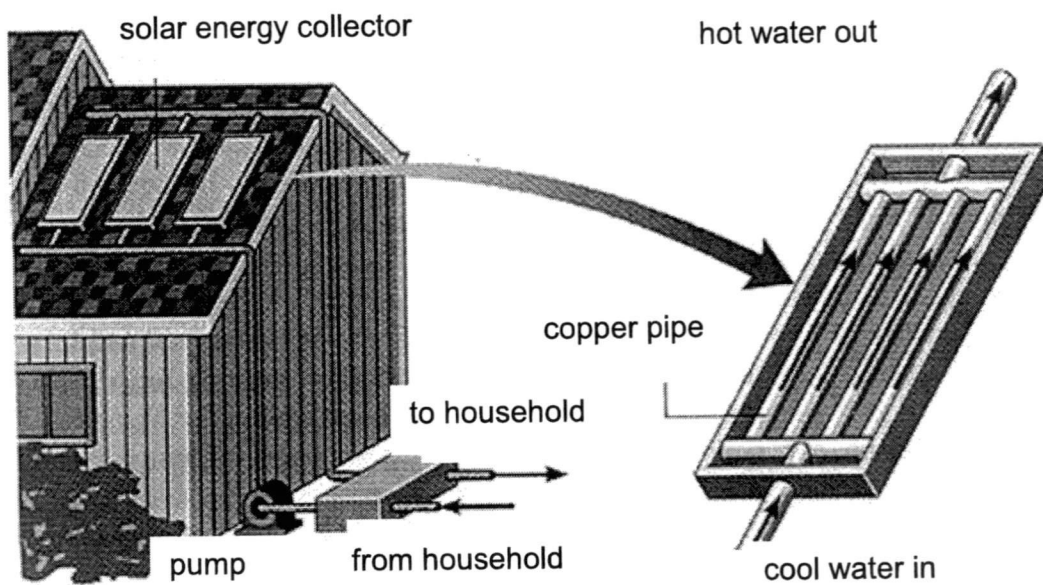
- (b) Identify two metals from Table B1.2 which should **not** be used in the bimetallic strip. Explain your answer.

.....  
 .....[2]

- (c) Suggest the two **best** metals from **Table B1.2** that Alan can use as metal X and metal Y in the fire alarm system. Explain your answer.

.....  
 .....[2]

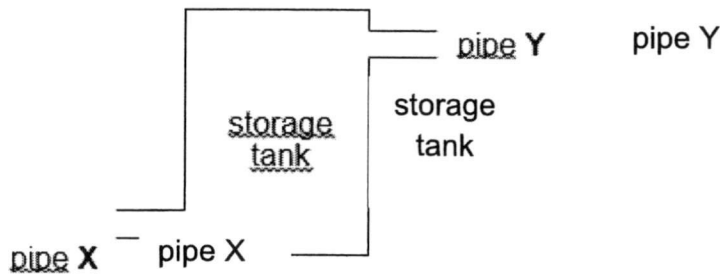
- B2** (a) **Fig. B2.1** shows a solar energy collector used to heat water in a household.



**Fig. B2.1**

- (i) State how thermal energy from the sun reaches the Earth.  
 .....[1]
- (ii) Suggest the colour that should be painted on the copper pipes to maximize the amount of solar energy collected. Explain your choice.  
 .....  
 .....  
 .....[2]
- (iii) Explain why there are multiple rows of copper pipes in the solar energy collector.  
 .....  
 .....  
 .....[2]

- (b) The heated water from the copper pipes is pumped into a storage tank containing cold water. A simplified diagram of the tank is shown in **Fig. B2.2**.



**Fig. B2.2**

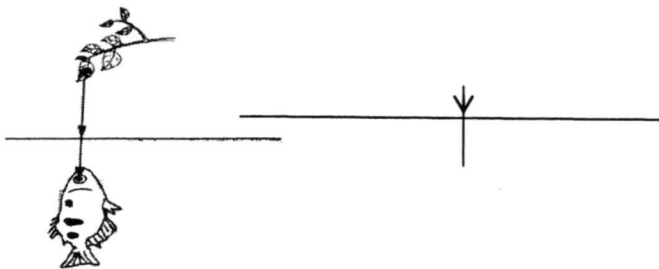
State whether the heated water should enter the tank through pipe **X** or **Y** in order to heat up all the cold water within the tank. Explain your choice.

.....

.....

.....[2]

- B3** (a) The archer fish has a unique way of catching its prey. It shoots a jet of water upwards to knock insects off from low branches. The prey falls to the water and is eaten up by the archer fish as shown in **Fig. B3.1**.



**Fig. B3.1**

Using your understanding of refraction of light, explain why the fish always shoots from a position directly underneath the prey.

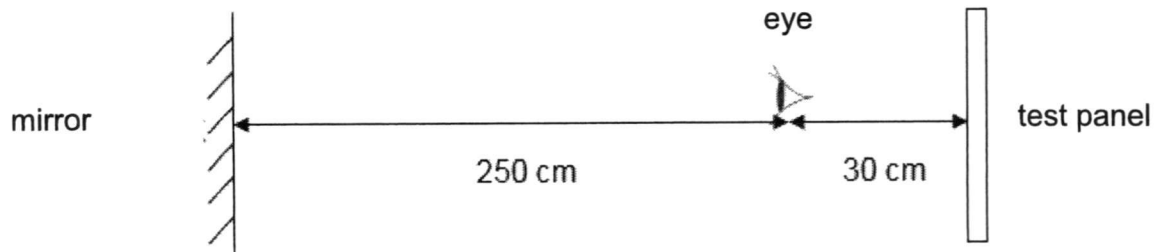
.....

.....

.....

.....[3]

- (b) An optician's test panel is located 30 cm behind the eyes of a patient who looks at a plane mirror 250 cm in front of him, as shown in **Fig. B3.2**.



**Fig. B3.2**

Calculate the distance of the image of the test panel in the mirror from the patient's eyes.[1]

**END OF SECTION 1 (B)**

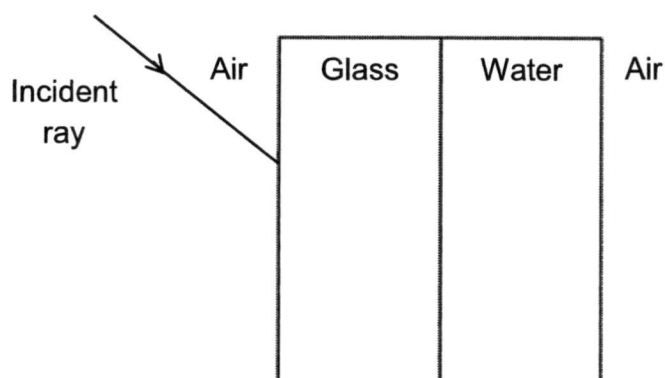
**SECTION 1 (C): Structured Questions (8 marks)**

Answer **all** the questions in this section in the spaces provided.

- C4 (a)** Define refraction.

.....  
 .....[2]

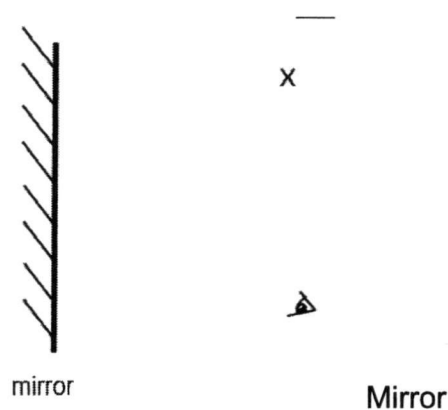
- (b)** Complete the path of the light ray in **Fig. C4.1** until it exits back into air again. Indicate all your rays in your answer. [3]



**Fig. C4.1**

- (c) (i)** **Fig.C4.2** shows how an eye sees an image of object 'X' in the mirror. Draw the image of X in the mirror. [1]

- (ii)** On **Fig. C4.2**, complete the ray diagram to show how the eye sees object 'X'. [2]



**Fig. C4.2**

**END OF SECTION 1**

**QUEENSWAY SECONDARY SCHOOL**  
**Science Department**

**MID-YEAR EXAMINATION 2017**

|                    |
|--------------------|
| <b>MARK SCHEME</b> |
|--------------------|

**Level: 2 Express**

**Subject: Lower Secondary Science  
(Physics)**

**Total Marks: 35**

**Setter: Mr Jimmy Ong/ Mrs Sassi**

**Section A [10 marks]**

| Qn  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|-----|---|---|---|---|---|---|---|---|---|----|
| Ans | C | A | C | A | D | B | C | C | A | B  |

**Section B [17 marks]**

- B1**    (a)    During a fire, the bimetallic strip will be heated and **metal X will expand more than metal Y, causing the strip to bend downwards** and come into contact with the electrical contact. This **completes the circuit, causing the fire alarm to be set off.**    1
- (b)    **C and E.**    1  
                  They have the **same rate of expansion and hence would not bend when heated.**    1  
                  OR Bimetallic strip requires two metals with different rate of expansion in order to bend when heated.
- (c)    Metal X is **D** and metal Y is **B.**    1  
                  These two metals have the **greatest difference in expansion, leading to better response to fire.**    1

---

Total = 6

---

|           |              |                                                                                                                                                   |   |
|-----------|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------|---|
| <b>B2</b> | <b>(a)</b>   | <b>(i)</b> Radiation                                                                                                                              | 1 |
|           |              | <b>(ii)</b> Black.                                                                                                                                | 1 |
|           |              | Black surface is a good absorber of thermal energy.                                                                                               | 1 |
|           | <b>(iii)</b> | This arrangement <b>increases the total surface area</b> of the pipes exposed to the sun's radiation so that <b>rate of absorption is higher/</b> | 1 |
|           |              | water heats up faster.                                                                                                                            | 1 |
|           | <b>(b)</b>   | Pipe X.                                                                                                                                           | 1 |
|           |              | A convection current can be set up in the water since <b>hot water rises because its less dense and cold water sinks because its dense.</b>       | 1 |

---

Total = 7

---

|           |            |                                                                                                                                                                                                                                                               |   |
|-----------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| <b>B3</b> | <b>(a)</b> | Light ray entering the fish's eyes <b>coincides with the normal to the water surface/</b> has an angle of incidence of zero, and the <b>light ray does not bend/refract.</b> Fish's aim will be accurate as it <b>sees the actual position of the insect.</b> | 1 |
|           |            |                                                                                                                                                                                                                                                               | 1 |
|           |            |                                                                                                                                                                                                                                                               | 1 |
|           | <b>(b)</b> | Image distance                                                                                                                                                                                                                                                |   |
|           |            | = 30 cm + 250 cm + 250 cm                                                                                                                                                                                                                                     |   |
|           |            | = 530 cm                                                                                                                                                                                                                                                      | 1 |

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Total = 4

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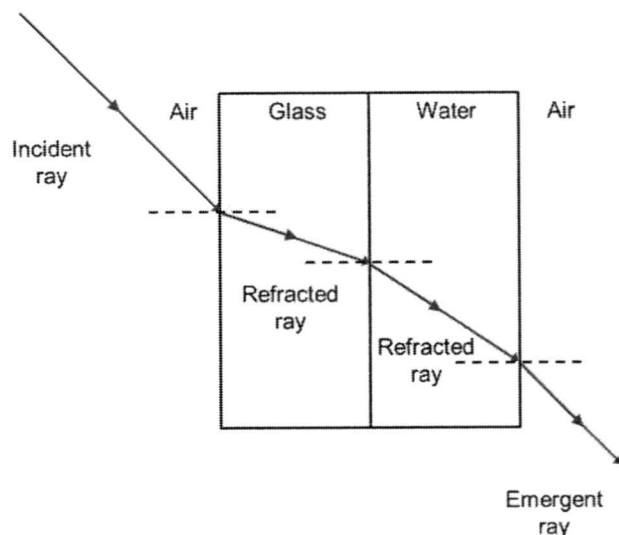
**Section C [8 marks]**

**C1 (a)** Refraction is the **bending of light ray** as it passes from one **medium to another medium of different optical density**.

1  
1

**(b)**

3



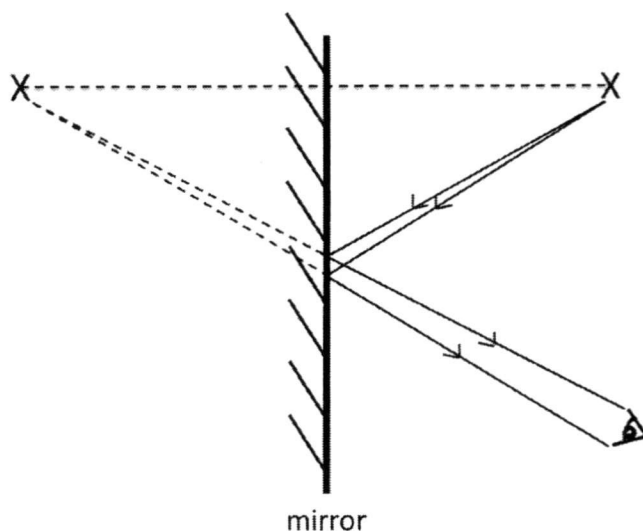
1m: refracted ray in glass towards normal

1m: refracted ray in water away from normal (but not as much as air)

1m: emergent ray away from normal parallel to incident ray

**(c)**

3



1m: Image distance equals object distance. Image labelled correctly.

1m: Straight lines from object to eye and from image to eye.

1m: Arrows to show direction of light ray travelling from object to eye.

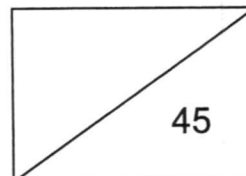
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Total = 8

The End

|       |        |           |
|-------|--------|-----------|
| NAME: | CLASS: | INDEX NO: |
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## SECTION 2: CHEMISTRY SECTION



**SECTION 2 (A): Multiple Choice Questions (15 marks)**  
 Answer **all** the questions in this section in the table on **page 14**.

1 Which of the following compounds contains the greatest number of different elements?

- A**  $\text{H}_2\text{SO}_4$       **B**  $\text{C}_3\text{H}_7\text{COOH}$       **C**  $\text{LiAl}(\text{OH})_4$       **D**  $\text{KMnO}_4$

2 A particle has 7 protons, 10 electrons and 8 neutrons.

Which of the following statements about this particle is correct?

- A** It is found in Group VII.  
**B** It is a positively charged ion.  
**C** It has a nucleon number of 17.  
**D** It has 2 fully filled electron shells.

3 Which of the following contributes the **least** to the mass of an atom?

- A** proton      **B** electron      **C** neutron      **D** nucleus

4 The electronic configuration of an ion is 2.8.8.

Which of the following is a possible identity of this ion?

|          | $\text{S}^{2-}$ | $\text{Ca}^{2+}$ |
|----------|-----------------|------------------|
| <b>A</b> | ✓               | ✓                |
| <b>B</b> | ✓               | x                |
| <b>C</b> | x               | ✓                |
| <b>D</b> | x               | x                |

5 What will be the chemical formula of a compound formed from  $\text{Y}^{3+}$  and  $\text{X}^{2-}$ ?

- A**  $\text{X}_3\text{Y}_2$       **B**  $\text{X}_2\text{Y}_3$       **C**  $\text{Y}_3\text{X}_2$       **D**  $\text{Y}_2\text{X}_3$

6 What is the chemical formula of iron(II) carbonate?

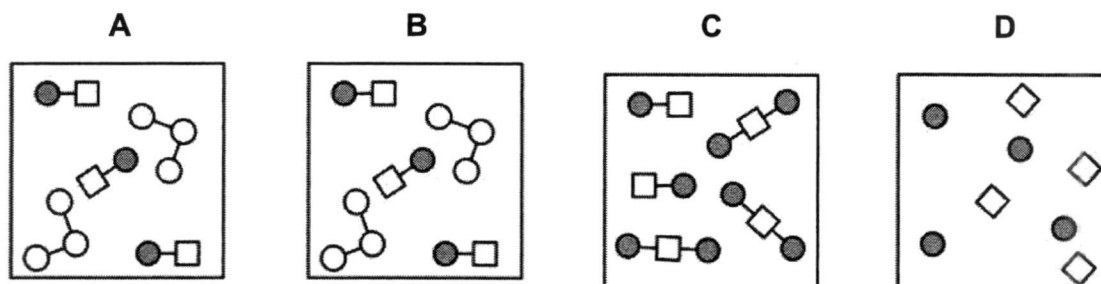
- A**  $\text{Fe}_2\text{CO}_3$       **B**  $\text{Fe}(\text{CO})_3$       **C**  $\text{Fe}_2(\text{CO})_3$       **D**  $\text{FeCO}_3$

- 7 When sodium (Na) reacts with chlorine gas ( $\text{Cl}_2$ ), it forms sodium chloride.

What will be the correct chemical equation for this reaction?

- A  $\text{Na} + \text{Cl} \rightarrow \text{NaCl}$   
 B  $\text{Na} + \text{Cl}_2 \rightarrow \text{NaCl}_2$   
 C  $\text{Na}_2 + \text{Cl}_2 \rightarrow 2\text{NaCl}$   
 D  $2\text{Na} + \text{Cl}_2 \rightarrow 2\text{NaCl}$

- 8 Which of the diagrams represents a mixture of an element and a compound made up of two elements?



- 9 Copper(II) sulfate is a salt. Its crystals are blue in colour.

Which of the following statements best shows that copper(II) sulfate is a mixture?

- A Copper(II) sulfate solution contains copper(II) ions and sulfate ions.  
 B The crystals can be obtained by evaporating the salt solution.  
 C The crystals can dissolve in water without any heat needed.  
 D The crystals dissolve in water to give a blue solution.

- 10 The table below contains information about four elements.

| element | nucleon number | proton number |
|---------|----------------|---------------|
| P       | 3              | 2             |
| Q       | 7              | 3             |
| R       | 9              | 4             |
| S       | 12             | 6             |

Which element(s) is/are metallic in nature?

- A P only                      B PandS                      C Q and R                      D R and S

- 11 A compound has the chemical formula  $\text{Mn}_2(\text{CO}_3)_3$ .

How many elements and atoms are present in the compound?

|          | numberof elements | numberof atoms |
|----------|-------------------|----------------|
| <b>A</b> | 2                 | 10             |
| <b>B</b> | 2                 | 15             |
| <b>C</b> | 3                 | 12             |
| <b>D</b> | 3                 | 14             |

- 12 A pupil adds some black crystals to hot water in a test tube. After stirring, the water turns brown.

Which of the following correctly identifies the solution, the solute and the solvent?

|          | solution         | solute         | solvent          |
|----------|------------------|----------------|------------------|
| <b>A</b> | black crystals   | brown water    | colourless water |
| <b>B</b> | colourless water | brown water    | black crystals   |
| <b>C</b> | brown water      | black crystals | colourless water |
| <b>D</b> | colourless water | black crystals | brown water      |

- 13 Tom carried out an experiment on a colourless liquid **Q**. He observed that there was no residue when liquid **Q** was filtered.

What could he deduce about liquid **Q**?

- |                                    |                                          |
|------------------------------------|------------------------------------------|
| <b>A</b> The liquid is water.      | <b>B</b> The liquid is a salt solution.  |
| <b>C</b> The liquid is a compound. | <b>D</b> The liquid is not a suspension. |

- 14 A tablespoonful of sugar was added to a saturated sugar solution.

How could one dissolve the sugar crystals in the solution?

- |                                             |                                               |
|---------------------------------------------|-----------------------------------------------|
| <b>A</b> Stir the solution more vigorously. | <b>B</b> Stir the solution for a longer time. |
| <b>C</b> Cool the solution.                 | <b>D</b> Heat the solution.                   |

- 15 Ali's shirt has an ink stain on it. The stain remains when it is cleaned with large amount of water but disappears when it is cleaned with a small amount of turpentine.

What conclusion could you draw from this observation?

- A** The ink is soluble in hot water but not cold water.  
**B** The ink is soluble in small amount of water.  
**C** Water is not a solvent for the ink.  
**D** Both water and turpentine are solvents for the ink.

|            |           |           |           |           |           |
|------------|-----------|-----------|-----------|-----------|-----------|
| <b>Qns</b> | <b>1</b>  | <b>2</b>  | <b>3</b>  | <b>4</b>  | <b>5</b>  |
| <b>Ans</b> |           |           |           |           |           |
| <b>Qns</b> | <b>6</b>  | <b>7</b>  | <b>8</b>  | <b>9</b>  | <b>10</b> |
| <b>Ans</b> |           |           |           |           |           |
| <b>Qns</b> | <b>11</b> | <b>12</b> | <b>13</b> | <b>14</b> | <b>15</b> |
| <b>Ans</b> |           |           |           |           |           |

**END OF SECTION 2 (A)**

**SECTION 2 (B): Structured Questions (21 marks)**

Answer **all** the questions in this section in the spaces provided.

- B1** A student heated some elements, named **X**, **Y** and **Z**, in air and tabulated the results in **Table B1.1** given below. **X**, **Y** and **Z** are not the chemical symbols of these elements.

**Table B1.1**

| Element  | Observations        |                              |                    |
|----------|---------------------|------------------------------|--------------------|
|          | before heating      | during heating               | after heating      |
| <b>X</b> | silvery grey solid  | bright glow was given off    | white solid        |
| <b>Y</b> | reddish brown solid | black solid                  | black solid        |
| <b>Z</b> | silvery grey solid  | molten silvery grey droplets | silvery grey solid |

- (a) Decide whether each substance in the '**after heating**' column should be classified as an element, compound or mixture. Show your decision by ticking (✓) the correct box for each substance in the table below.

| Substance          | Element | Compound | Mixture |
|--------------------|---------|----------|---------|
| white solid        |         |          |         |
| black solid        |         |          |         |
| silvery grey solid |         |          |         |

[2]

- (b) (i) The student claims that elements **Y** and **Z** underwent a chemical change. Is the student correct? Explain your answer, supported with evidence from **Table B1.1**.

.....  
 .....  
 .....[2]

- (ii) During heating of element **X**, a bright glow was given off. What does the observation of the bright glow indicate?

.....  
 .....  
 .....[1]

- B2 (a)** The diagrams below show models of molecules of carbon dioxide, water and oxygen gas.

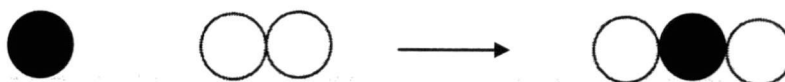
**S1****S2****S3**

- (i) Identify the atoms, labelled **E1** to **E3**, as represented in the models.

|      | <b>E1</b> | <b>E2</b> | <b>E3</b> |
|------|-----------|-----------|-----------|
| atom |           |           |           |
| name |           |           |           |

[1]

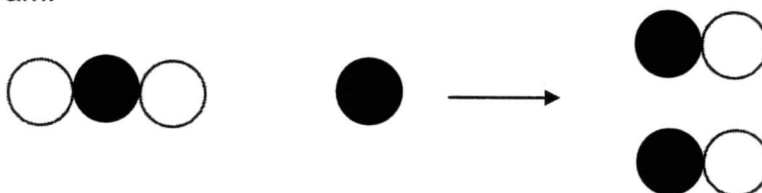
- (ii) A molecule of **S3** is produced when **S2** reacts with **E2**.  
The equation for the reaction can be diagrammatically represented as follows:



Write the chemical equation as represented by the above diagram.

.....[1]

- (iii) The reaction between **S3** and **E2** can be represented in the following diagram:



- 1 Suggest the chemical formula of the compound formed in the reaction.

.....[1]

- 2 Write also the chemical equation to represent the above reaction.

.....[1]

(b) Barium (Ba) is a Group II element while iodine (I) is a Group VII element.

- (i) Complete **Table B2.1** below by filling in the missing chemical formulae.  
*The first one has been done for you.*

**Table B2.1**

| name of compound    | chemical formula  | chemical formula |                 |
|---------------------|-------------------|------------------|-----------------|
|                     |                   | positive ion     | negative ion    |
| hydrochloric acid   | HCl               | H <sup>+</sup>   | Cl <sup>-</sup> |
| aluminium hydroxide |                   | Al <sup>3+</sup> | OH <sup>-</sup> |
| barium iodide       | BaI <sub>2</sub>  |                  |                 |
| silver nitrate      | AgNO <sub>3</sub> |                  |                 |

[3]

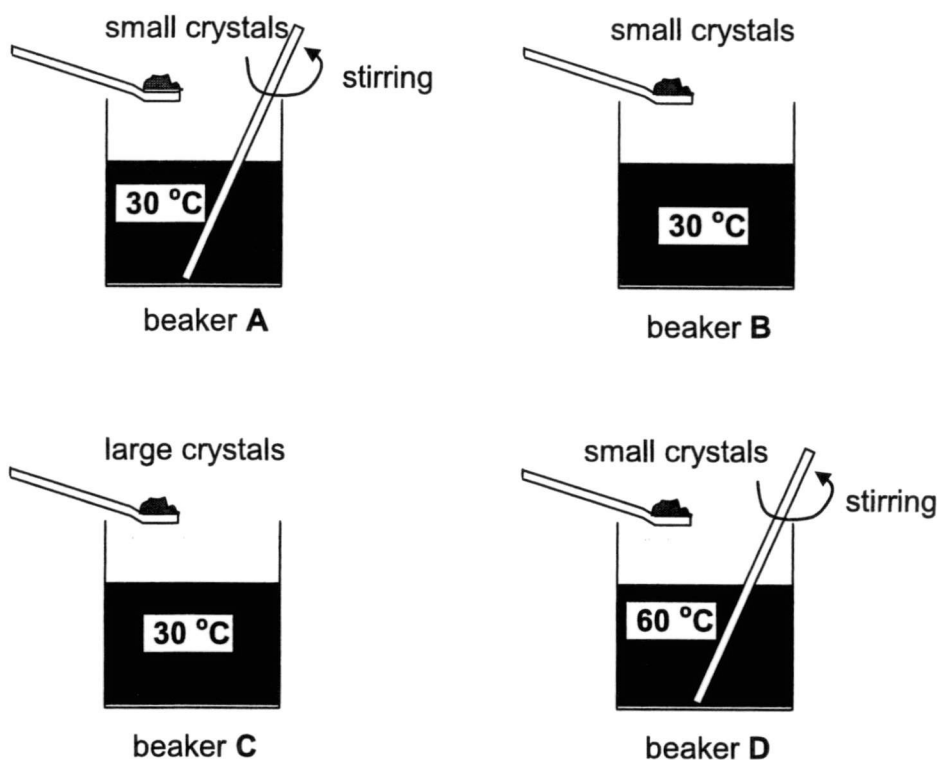
- (ii) Barium iodide reacts with silver nitrate to form barium nitrate and silver iodide. Write a **balanced** chemical equation for the reaction.

.....[2]

- B3** An experiment was carried out to investigate the factors affecting the rate of dissolving salt crystals in water.

Four samples, each weighing 10 g, of salt crystals were added to separate beakers, **A**, **B**, **C** and **D**, containing 25 cm<sup>3</sup> of water at 0900hrs.

The salt crystals dissolved in the water under different conditions are shown in the diagram below.



- (a) The time when all the crystals had dissolved in the water were recorded in the table below.

Complete the table by writing the beaker label, **A**, **B**, **C** or **D**, that matches the time.

| Time   | 0908hrs | 0920hrs | 1005hrs | 1115hrs |
|--------|---------|---------|---------|---------|
| Beaker |         |         |         |         |

[2]

- (b) (i) With reference to the results, explain how size of crystals affect the rate at which the crystals dissolve.

.....  
.....[2]

- (ii) Which beakers, **A**, **B**, **C** or **D**, could be used to support your answers in (b)(i)?

.....[1]

- (c) What factors, other than size of crystals, affect the rate at which the crystals dissolve in the above experiment?

.....  
.....[2]

**END OF SECTION 2 (B)**

**SECTION 2 (C): Free-Response Questions (9 marks)**

Answer **all** the questions in this section in the spaces provided.

**C1** Group VII elements are known as halogens. The name 'halogen' means 'salt-producing' and halogens tend to react with metals to form many salts, such as sodium chloride and magnesium fluoride.

(a) Tennessine, Ts, is an element newly discovered in 2010 and named after the state of Tennessee in USA. It is located in Group VII below astatine.

(i) Tennessine has two naturally occurring isotopes,  $^{294}_{117}\text{Ts}$  and  $^{293}_{117}\text{Ts}$ . Complete **Table C1.1**.

**Table C1.1**

|                     | $^{294}_{117}\text{Ts}$ | $^{293}_{117}\text{Ts}$ |
|---------------------|-------------------------|-------------------------|
| Number of protons   |                         |                         |
| Number of neutrons  |                         |                         |
| Number of electrons |                         |                         |

[2]

(ii) Which period is tennessine in?

Period .....[1]

(iii) State the chemical formula of tennesside ion.

.....[1]

(iv) Table C1.2 provides information about four substances, A, B, C and D.

**Table C1.2**

| substance | melting point / °C | boiling point / °C | electrical conductivity as a solid | electrical conductivity as a liquid |
|-----------|--------------------|--------------------|------------------------------------|-------------------------------------|
| <b>A</b>  | 650                | 1091               | good                               | good                                |
| <b>B</b>  | 776                | 1497               | poor                               | good                                |
| <b>C</b>  | 350                | 610                | poor                               | poor                                |
| <b>D</b>  | 1607               | 2227               | poor                               | poor                                |

1 Which substance could be magnesium?

.....[1]

2 Which substance could be tennessine?

.....[1]

(b) In the space below, draw the dot-and-cross diagram for magnesium fluoride.

[3]

**END OF PAPER**

# The Periodic Table of Elements

| Group |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | III | IV | V | VI                | VII | 0 |
|-------|----|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----|----|---|-------------------|-----|---|
| I     | II |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |    |   |                   | 2   |   |
|       |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |    |   | He<br>helium<br>4 |     |   |
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|       |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |    |   |                   |     |   |
|       |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |    |   |                   |     |   |
|       |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |    |   |                   |     |   |
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|       |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |    |   |                   |     |   |
|       |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |    |   |                   |     |   |
|       |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |    |   |                   |     |   |
|       |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |    |   |                   |     |   |
|       |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |    |   |                   |     |   |
|       |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |    |   |                   |     |   |
|       |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |    |   |                   |     |   |
|       |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |    |   |                   |     |   |
|       |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |    |   |                   |     |   |
|       |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |    |   |                   |     |   |
|       |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |    |   |                   |     |   |
|       |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |    |   |                   |     |   |
|       |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |    |   |                   |     |   |
|       |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |    |   |                   |     |   |
|       |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |    |   |                   |     |   |
|       |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |    |   |                   |     |   |
|       |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |    |   |                   |     |   |
|       |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |    |   |                   |     |   |
|       |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |    |   |                   |     |   |
|       |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |    |   |                   |     |   |
|       |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |    |   |                   |     |   |
|       |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |    |   |                   |     |   |
|       |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |    |   |                   |     |   |
|       |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |    |   |                   |     |   |
|       |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |    |   |                   |     |   |
|       |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |    |   |                   |     |   |
|       |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |    |   |                   |     |   |
|       |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |    |   |                   |     |   |
|       |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |    |   |                   |     |   |
|       |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |    |   |                   |     |   |
|       |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |    |   | </                |     |   |

lanthanoids

actinoids

|                                                                              |                                                                            |                                                                                 |                                                                              |                                                                             |                                                                             |                                                                             |                                                                               |                                                                            |                                                                               |                                                                              |                                                                           |                                                                               |                                                                              |                                                                              |
|------------------------------------------------------------------------------|----------------------------------------------------------------------------|---------------------------------------------------------------------------------|------------------------------------------------------------------------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------|----------------------------------------------------------------------------|-------------------------------------------------------------------------------|------------------------------------------------------------------------------|---------------------------------------------------------------------------|-------------------------------------------------------------------------------|------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| <div> <div>57</div> <div>La</div> <div>lanthanum</div> <div>139</div> </div> | <div> <div>58</div> <div>Ce</div> <div>cerium</div> <div>140</div> </div>  | <div> <div>59</div> <div>Pr</div> <div>praseodymium</div> <div>141</div> </div> | <div> <div>60</div> <div>Nd</div> <div>neodymium</div> <div>144</div> </div> | <div> <div>61</div> <div>Pm</div> <div>promethium</div> <div>-</div> </div> | <div> <div>62</div> <div>Sm</div> <div>samarium</div> <div>150</div> </div> | <div> <div>63</div> <div>Eu</div> <div>europlum</div> <div>152</div> </div> | <div> <div>64</div> <div>Gd</div> <div>gadolinium</div> <div>157</div> </div> | <div> <div>65</div> <div>Tb</div> <div>terbium</div> <div>159</div> </div> | <div> <div>66</div> <div>Dy</div> <div>dysprosium</div> <div>163</div> </div> | <div> <div>67</div> <div>Ho</div> <div>holmium</div> <div>165</div> </div>   | <div> <div>68</div> <div>Er</div> <div>erbium</div> <div>167</div> </div> | <div> <div>69</div> <div>Tm</div> <div>thulium</div> <div>169</div> </div>    | <div> <div>70</div> <div>Yb</div> <div>ytterbium</div> <div>173</div> </div> | <div> <div>71</div> <div>Lu</div> <div>lutetium</div> <div>175</div> </div>  |
| <div> <div>89</div> <div>Ac</div> <div>actinium</div> <div>-</div> </div>    | <div> <div>90</div> <div>Th</div> <div>thorium</div> <div>232</div> </div> | <div> <div>91</div> <div>Pa</div> <div>protactinium</div> <div>231</div> </div> | <div> <div>92</div> <div>U</div> <div>uranium</div> <div>238</div> </div>    | <div> <div>93</div> <div>Np</div> <div>neptunium</div> <div>-</div> </div>  | <div> <div>94</div> <div>Pu</div> <div>plutonium</div> <div>-</div> </div>  | <div> <div>95</div> <div>Am</div> <div>americium</div> <div>-</div> </div>  | <div> <div>96</div> <div>Cm</div> <div>curium</div> <div>-</div> </div>       | <div> <div>97</div> <div>Bk</div> <div>berkelium</div> <div>-</div> </div> | <div> <div>98</div> <div>Cf</div> <div>californium</div> <div>-</div> </div>  | <div> <div>99</div> <div>Es</div> <div>einsteinium</div> <div>-</div> </div> | <div> <div>100</div> <div>Fm</div> <div>fermium</div> <div>-</div> </div> | <div> <div>101</div> <div>Md</div> <div>mendelevium</div> <div>-</div> </div> | <div> <div>102</div> <div>No</div> <div>nobelium</div> <div>-</div> </div>   | <div> <div>103</div> <div>Lr</div> <div>lawrencium</div> <div>-</div> </div> |

The volume of one mole of any gas is 24 dm<sup>3</sup> at room temperature and pressure (r.t.p.).

**QUEENSWAY SECONDARY SCHOOL**  
**Science Department**

**MID YEAR EXAMINATION 2017**

**MARK SCHEME**

**Level: 2 Express**

**Subject: Lower Secondary Science  
(Chemistry)**

**Total Marks: 45**

**Setter: Lim SK & Wilson Ng**

**SECTION 2(A): Multiple Choice Questions [15 marks]**

|   |   |   |   |   |   |    |   |    |   |
|---|---|---|---|---|---|----|---|----|---|
| 1 | C | 4 | A | 7 | D | 10 | C | 13 | D |
| 2 | D | 5 | D | 8 | B | 11 | D | 14 | D |
| 3 | B | 6 | D | 9 | B | 12 | C | 15 | C |

**SECTION 2(B): Structured Questions [21 marks]**

**B1 (a)**

[2]

| Substance          | Element | Compound | Mixture |
|--------------------|---------|----------|---------|
| white solid        |         | ✓        |         |
| black solid        |         | ✓        |         |
| silvery grey solid | ✓       |          |         |

3 correct answers [2]

2 correct answers [1]

0 to 1 correct answer(s) [0]

**(b) (i)** No, he is not.

Only element Y underwent a chemical change because the **reddish brown** element became a **black** solid after heating, which indicates that a **new substance is formed**.

[1]

Element Z did not undergo a chemical change because the **silvery grey solid remained as a silvery grey solid**/there was **no change in colour** after heating, indicating that no new substance is formed/no chemical reaction happened.

[1]

**(ii)** The bright glow indicates that a chemical reaction took place.

[1]

B2 (a) (i)

|      | E1                                                                                | E2                                                                                | E3                                                                                  |
|------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| atom |  |  |  |
| name | hydrogen                                                                          | carbon                                                                            | oxygen                                                                              |

[1]

(ii)  $C + O_2 \rightarrow CO_2$

[1]

|     |      |                                                                                                                            |                     |                  |                              |     |
|-----|------|----------------------------------------------------------------------------------------------------------------------------|---------------------|------------------|------------------------------|-----|
| (b) | (i)  |                                                                                                                            |                     |                  |                              |     |
|     |      | name of compound                                                                                                           | chemical formula    | chemical formula |                              |     |
|     |      |                                                                                                                            |                     | positive ion     | negative ion                 |     |
|     |      | hydrochloric acid                                                                                                          | HCl                 | H <sup>+</sup>   | Cl <sup>-</sup>              |     |
|     |      | aluminium hydroxide                                                                                                        | Al(OH) <sub>3</sub> | Al <sup>3+</sup> | OH <sup>-</sup>              | [1] |
|     |      | barium iodide                                                                                                              | BaI <sub>2</sub>    | Ba <sup>2+</sup> | I <sup>-</sup>               | [1] |
|     |      | silver nitrate                                                                                                             | AgNO <sub>3</sub>   | Ag <sup>+</sup>  | NO <sub>3</sub> <sup>-</sup> | [1] |
|     | (ii) | BaI <sub>2</sub> + 2AgNO <sub>3</sub> → Ba(NO <sub>3</sub> ) <sub>2</sub> + 2AgI<br>(Eqn correct : [1]; balanced eqn :[1]) |                     |                  |                              | [2] |

B3 (a)

|        |      |      |      |      |
|--------|------|------|------|------|
| Time   | 0908 | 0920 | 1005 | 1115 |
| Beaker | D    | A    | B    | C    |

[1]

(b) (i) The smaller crystals will **dissolve faster** as they **have bigger surface area**. [2]

(ii) **B and C** [1]

(c) 1. Temperature of the solvent/water [1]  
2. Act of stirring [1]

**SECTION 2(C): Free-Response Questions [9 marks]**

C1 (a) (i)

[2]

**Table 1.1**

|                         | $^{294}_{117}\text{Ts}$ | $^{293}_{117}\text{Ts}$ |
|-------------------------|-------------------------|-------------------------|
| <b>No. of protons</b>   | <b>117</b>              | <b>117</b>              |
| <b>No. of neutrons</b>  | <b>177</b>              | <b>176</b>              |
| <b>No. of electrons</b> | <b>117</b>              | <b>117</b>              |

2 marks for all boxes correct  
1 mark for at least 4 boxes correct  
0 mark for 3 or less boxes correct

(ii) 7

[1]

(iii)  $\text{Ts}^-$

[1]

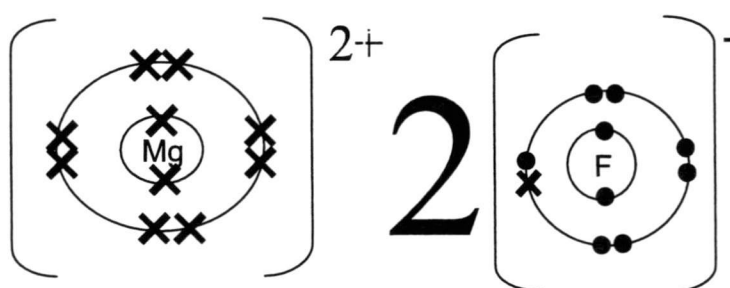
(iv) 1 A  
2 C

[1]

[1]

(b)

[3]



Correct ratio of magnesium ion to fluoride ions [1]  
Correct labelling of charges and chemical formulae of elements [1]  
Correct drawing of dots and crosses [1]  
Reject:  
hollow dots, all valence electrons of fluoride ion are dots/cross