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BEDOK GREEN SECONDARY SCHOOL

**2E**

Mid-Year Examination 2017

**2E****SCIENCE**Question Booklet for **SECTION A**

5 May 2017

2 hours

Additional Materials: Optical Mark Sheet

**READ THESE INSTRUCTIONS FIRST**

Do not open this booklet until you are told to do so.

Write your name, register number and class on the optical mark sheet provided.

There are thirty questions in this paper. Answer **all** questions. For each question, there are four possible answers, **A, B, C** and **D**. Choose the one you consider to be correct and record your choice in soft pencil on the optical mark sheet.

Read very carefully the instructions on the optical mark sheet.**INFORMATION FOR CANDIDATES**

Each correct answer will score one mark.

Any rough working should be done in this booklet.

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**Turn Over**

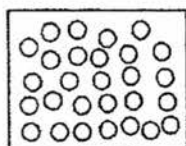
**Section A: Multiple Choice Questions (30 marks)**  
**Answer all questions on the optical mark sheet.**

- 1 The change in the state of matter is due to the change in the
- A size of the molecules.
  - B mass of the molecules.
  - C arrangement of the molecules.
  - D type of atoms present in the molecules.
- 2 In which of these substances are the particles furthest apart?
- A air
  - B cold water.
  - C liquefied nitrogen
  - D a cube of common salt
- 3 When water at a temperature of 100 °C is cooled to room temperature, which of the following statements **best** describes the number of particles?
- A increase
  - B decrease
  - C becomes zero
  - D remain unchanged
4. Which of the following correctly describe the volume and shape of a gas or liquid?

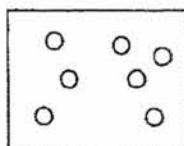
|   | gas or liquid | volume    | shape     |
|---|---------------|-----------|-----------|
| A | gas           | fixed     | not fixed |
| B | gas           | not fixed | not fixed |
| C | liquid        | fixed     | fixed     |
| D | liquid        | not fixed | fixed     |

- 5 What can be deduced about a sodium atom from the symbol  $^{23}_{11}\text{Na}$ ?
- A It has an atomic mass of 11.
  - B Its nucleus has 23 electrons.
  - C Its nucleus has 11 protons and 12 neutrons.
  - D Its nucleus has 12 protons and 11 electrons.

- 6 The diagram shows the arrangement of molecules of a substance X at different temperatures.



at 75 °C



at 120 °C

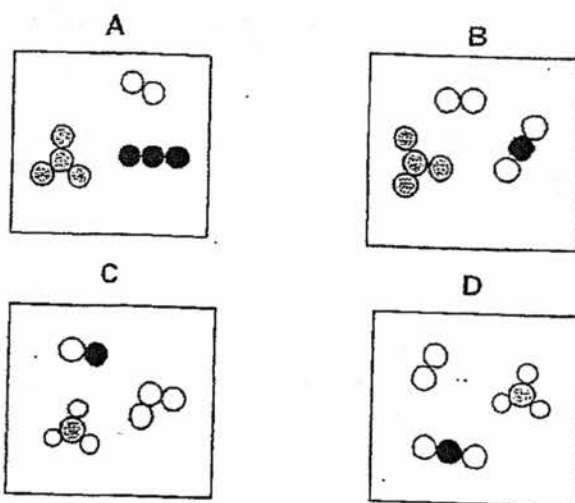
Which of the following shows the melting and boiling points of substance X?

|   | melting point / °C | boiling point / °C |
|---|--------------------|--------------------|
| A | -130               | -76                |
| B | 30                 | 130                |
| C | 70                 | 150                |
| D | 70                 | 100                |

- 7 Which of the following statements explains why an atom is electrically neutral?
- A The number of positively charged protons is equal to the number of negatively charged electrons in an atom.
  - B The number of positively charged protons is equal to the number of negatively charged neutrons in an atom.
  - C The number of positively charged electrons is equal to the number of negatively charged neutrons in an atom.
  - D The number of positively charged neutrons is equal to the number of negatively charged electrons in an atom.
- 8 Butanol, which is also known as butyl alcohol, refers to a four-carbon alcohol with a formula of  $C_4H_9OH$ . Which of the following statements about butanol is correct?
- A Each molecule of butanol is made up of 4 atoms.
  - B Each molecule of butanol is made up of 15 atoms.
  - C Each molecule of butanol is made up of only 4 types of elements.
  - D Each molecule of butanol is made up of only 15 types of elements.
- 9 How many types of elements does a molecule of magnesium sulfate ( $MgSO_4$ ) contain?
- A 3
  - B 4
  - C 6
  - D 7

Over

- 10 Which of the following diagrams represents a mixture of oxygen ( $O_2$ ), ammonia ( $NH_3$ ) and carbon dioxide ( $CO_2$ ) gases?



- 11 Which of the following physical changes involves heating?
- A dissolving of salt in water
  - B freezing of water to become ice
  - C melting of candle to become wax
  - D condensing of water vapour to form water droplets
- 12 When mercury oxide powder is heated, it forms mercury and oxygen. Which of the following shows the correct word equation of this reaction?
- A mercury + oxygen  $\rightarrow$  mercury oxide
  - B mercury oxide  $\rightarrow$  mercury + oxygen
  - C mercury  $\rightarrow$  mercury oxide + oxygen
  - D mercury oxide + oxygen  $\rightarrow$  mercury
- 13 Which of the following chemical changes involve light?
- |                    |                                         |
|--------------------|-----------------------------------------|
| (I) photosynthesis | (II) photography                        |
| (III) respiration  | (IV) formation of vitamin D in the skin |
- A I and II only
  - B II and III only
  - C III and IV only
  - D I, II and IV only

- 14 Which of the following methods is used to decompose copper chloride into copper and chlorine?
- A add chlorine
  - B heat strongly
  - C expose to light
  - D pass electricity through a solution
- 15 Which of the following word equations shows the reaction involving acid and alkali?
- A acid + alkali  $\rightarrow$  salt + water
  - B acid + alkali  $\rightarrow$  acid + water
  - C alkali + salt  $\rightarrow$  alkali + water
  - D alkali + water  $\rightarrow$  salt + water
- 16 Which of the following compounds on photographic film reacts with light and what is the colour change that occurs during the reaction?
- |   | compound       | colour change |
|---|----------------|---------------|
| A | silver bromide | white to grey |
| B | silver bromide | grey to white |
| C | silver nitrate | white to grey |
| D | silver nitrate | grey to white |
- 17 The pH of an aqueous solution of hydrochloric acid is 2. What will be the most likely pH of the solution formed after an equal amount of potassium hydroxide is added to it?
- A 1
  - B 2
  - C 8
  - D 12
- 18 Which of the following properties is **not** a property of an acid?
- A It reacts with sodium.
  - B It has a pH less than 7.
  - C It turns blue litmus paper red.
  - D It turns Universal Indicator purple.
- 19 Which of the following gases is produced when marble chips (calcium carbonate) react with dilute hydrochloric acid?
- A hydrogen
  - B oxygen
  - C sulfur dioxide
  - D carbon dioxide

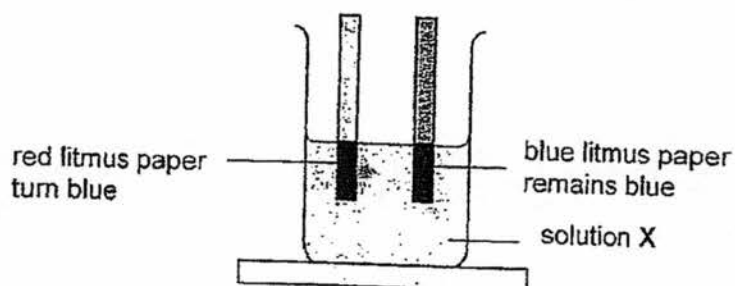
Over

20 Which of the following statements about mixing of substances is/are correct?

- I Mixing of substances does not involve heat.
- II Mixing of substances cannot produce new substances.
- III Mixing of substances can be a physical change or a chemical change.

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

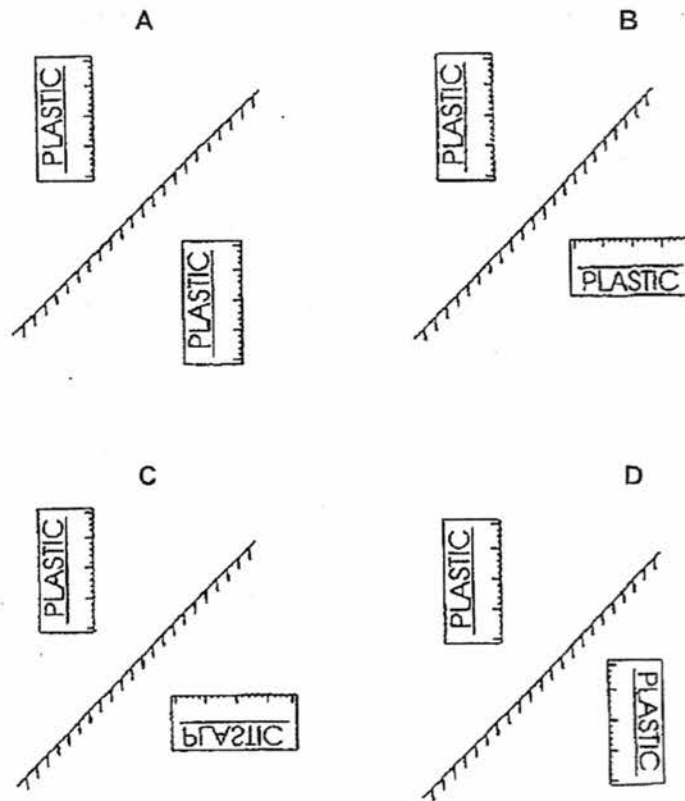
21 John wants to identify an unknown solution X. He dipped red and blue litmus papers into solution X. The diagram below shows the results he obtained.



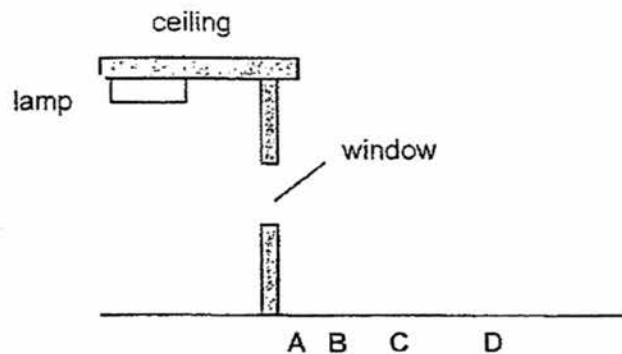
Which of the following substances is solution X?

- A vinegar (pH 3)
- B lime juice (pH 4)
- C distilled water (pH 7)
- D detergent (pH 13)

22 Which diagram correctly shows the image of a plastic ruler in a plane mirror?



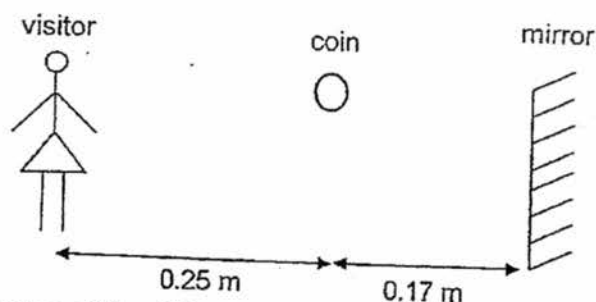
23 The diagram shows a light shining from the ceiling lamp through the window to the floor outside.



Which region on the floor is the brightest?

Over

- 24 An old coin is displayed 0.17 m from a vertical mirror in a museum as shown in the diagram. A visitor stands 0.25 m away from the coin looks at the image of the coin.

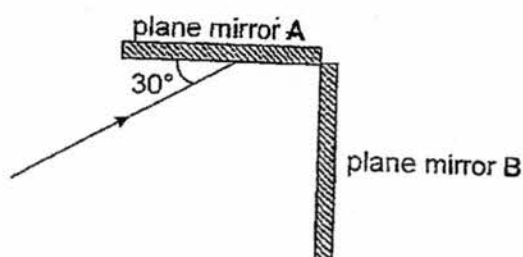


What is the distance of the visitor to the image of the coin?

- A 0.42 m
  - B 0.59 m
  - C 0.67 m
  - D 0.84 m
- 25 What is the speed of light in air?

- A 3 000 m/s
- B 30 000 m/s
- C 300 000 m/s
- D 300 000 000 m/s

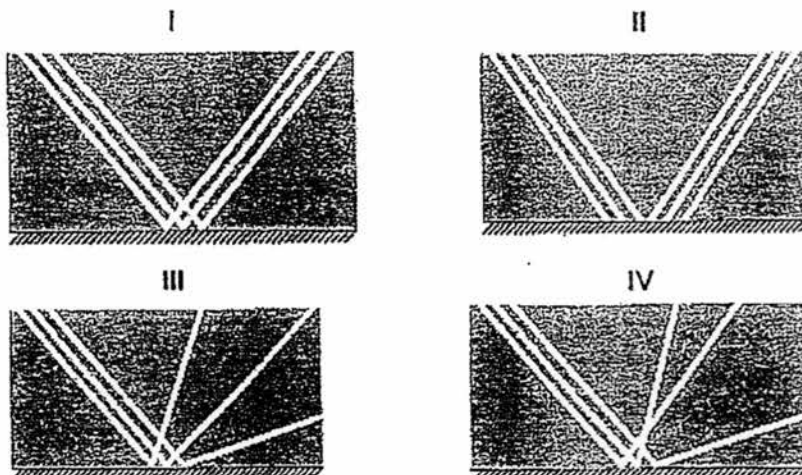
- 26 The diagram shows a single ray of light being directed at plane mirror A.



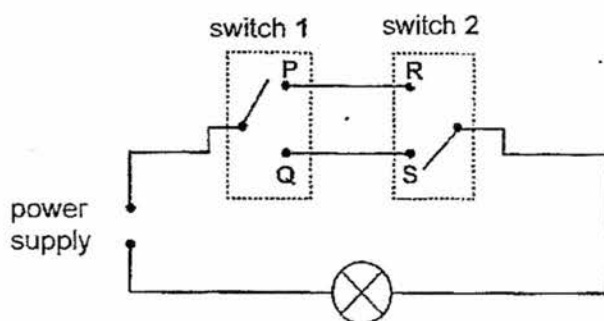
What is the angle of reflection when the light ray bounces off plane mirror B, which is positioned perpendicular to plane mirror A?

- A 30°
- B 40°
- C 50°
- D 60°

- 27 Which of the following diagrams show a parallel beam of light striking a rough surface?



- A I and II only  
 B I and III only  
 C III and IV only  
 D II, III and IV only
- 28 In a toy house, a 6 V lamp can be operated by switch 1 and switch 2 as shown in the circuit diagram below.



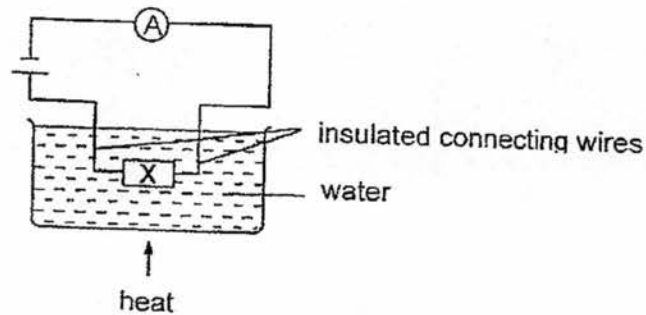
Which of the following positions of the switches will light up the lamp?

|     | switch 1   | switch 2   |
|-----|------------|------------|
| I   | position P | position R |
| II  | position P | position S |
| III | position Q | position R |
| IV  | position Q | position S |

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

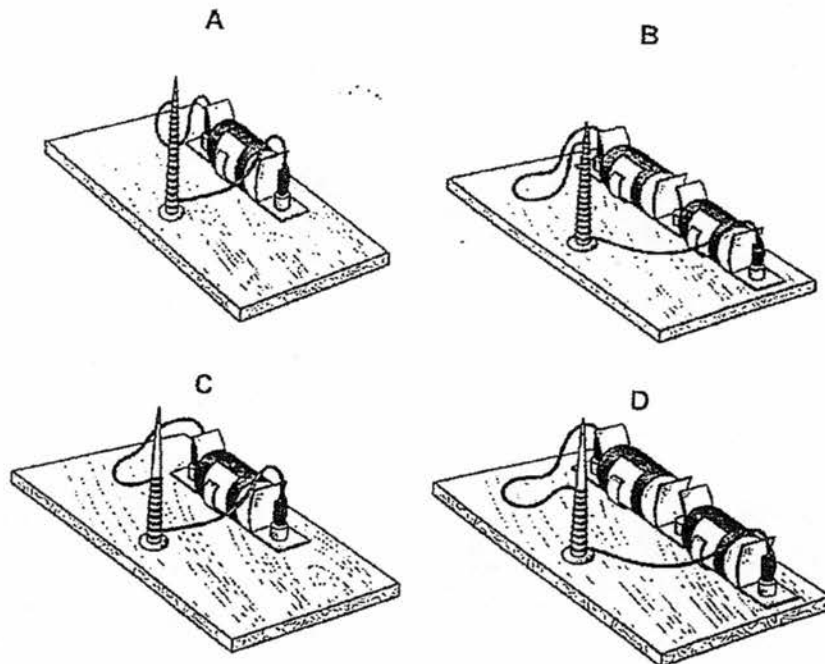
n Over

- 29 An electronic component X decreases in resistance when the temperature increases. It is immersed in a basin of water which is heated.



Which of the following statements describe the reading on the ammeter?

- A The reading increases.
  - B The reading decreases.
  - C The reading remains unchanged.
  - D The reading decreases then increases.
- 30 Which of the following will give the strongest electromagnet? The cells, nails and wires are identical.



End of Section A

|       |                  |        |
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| Name: | Register Number: | Class: |
|-------|------------------|--------|

**2E****BEDOK GREEN SECONDARY SCHOOL****Mid-Year Examination 2017****2E****SCIENCE**Answer Booklet for **SECTION B****5 May 2017**

Candidates answer on the Answer Booklet.

**2 hours****READ THESE INSTRUCTIONS FIRST**

Write your name, register number and class on all the work you hand in.

Write in dark blue or black pen on both sides of the paper.

You may use a soft pencil for any diagrams or graphs.

Do not use staples, paper clips, highlighters, glue or correction fluid.

**Section B**Answer **all** questions.

Write your answers in the spaces provided.

At the end of the examination, hand in Section A, B and C separately.

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

| For Examiner's Use |  |
|--------------------|--|
| A [ 30 marks]      |  |
| B [ 30 marks]      |  |
| C [ 40 marks]      |  |
| Total [ 100 marks] |  |

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**Section B: Structured questions (30 marks)**  
Answer all questions in the spaces provided.

- 1 Use the Particulate Model of Matter to explain the following observations:

(a) It is easier to squeeze a bottle filled with air than a balloon filled with water. [2]

.....

.....

.....

(b) Insecticide sprayed in one corner of a room can be smelt in another corner after a short while. [1]

.....

.....

.....

- 2 A student heats an unknown liquid to  $85^{\circ}\text{C}$  as shown in Fig. 2.1. A thermometer is used to monitor the temperature change.



Fig. 2.1

- (a) Describe the changes in the speed of the particles and the distance between the particles (if any) as

(i) the substance is heated, [2]

speed .....

.....

distance .....

.....

over

3

- (ii) the substance boils.

[2]

speed .....

.....

distance .....

.....

- (b) The student realises that the temperature of the substance remains constant as it boils, even though heat is still supplied to the substance. Explain why.

[2]

.....

.....

.....

- (c) Fig. 2.2 shows the heating curve of the substance.

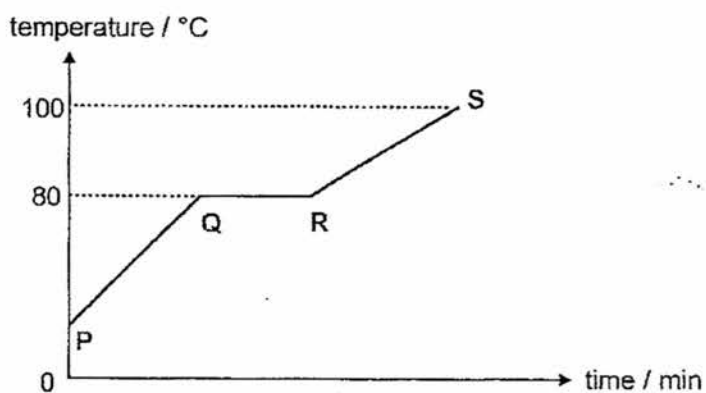


Fig. 2.2

Write the state of the substance in regions

- (i) QR .....

[1]

- (ii) RS .....

[1]

4

- 3 A student heats some substances. His observations are shown in Fig 3.1.

| substance        | appearance          |                       |                       |
|------------------|---------------------|-----------------------|-----------------------|
|                  | before heating      | during heating        | on cooling            |
| magnesium ribbon | dull grey solid     | white fumes           | white solid           |
| wax              | soft, white solid   | hot colourless liquid | liquid wax solidifies |
| copper wire      | reddish brown solid | black solid           | black solid           |
| iodine crystals  | dark purple solid   | purple vapour         | dark purple solid     |

Fig 3.1

- (a) State one example from the table that shows a physical change. Explain your answer.

[2]

.....

.....

- (b) Write a word equation for the heating of magnesium ribbon.

[1]

.....

- (c) What is the black solid that was seen when copper wire was heated in air?

[1]

.....

over

5

- 4 An object is placed in front of a plane mirror as shown in Fig. 4.1.

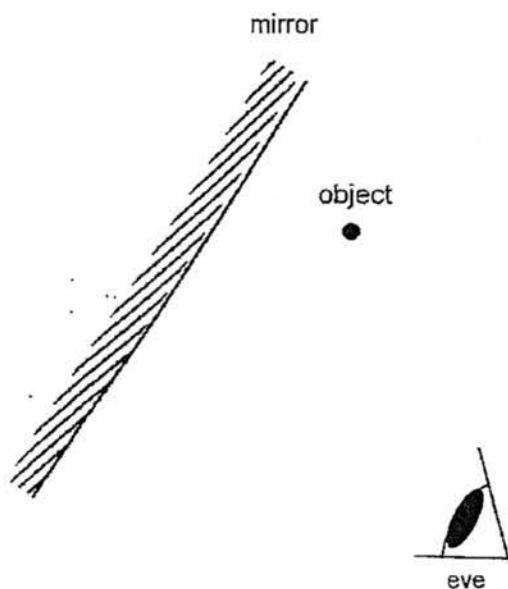


Fig. 4.1

- (a) Locate the position of the image and label it as I. [1]
- (b) Draw **two** rays which leave the object and enter the eye after reflection at the mirror to show how the image I is formed. [3]
- (c) State **two** characteristics of the image formed in a plane mirror. [2]

.....

.....

6

- 5 Fig. 5.1 shows a dentist tool and a blind spot mirror.

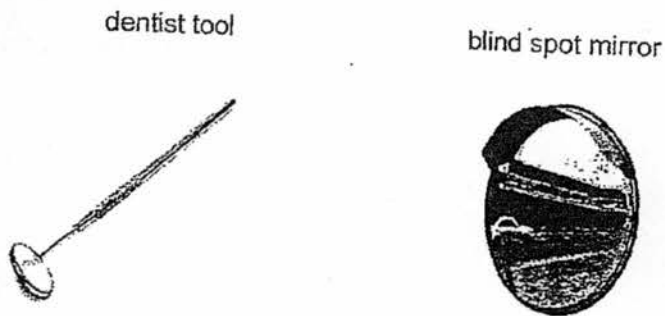


Fig. 5.1

- (a) What type of mirror is used in the dentist tool? ..... [1]
- (b) State one characteristic of the image formed in
- (i) the dentist tool, ..... [1]
- (ii) the blind spot mirror. .... [1]
- (c) Explain why plane mirror is not used as security mirror in shops. .... [1]
- 6 An astronaut has a mass of 80 kg on Earth. Given that the gravitational field strength on the Moon is 1.67 N/kg and the gravitational field strength on Earth is 10 N/kg.
- (a) What is the mass of the astronaut on the Moon? ..... [1]
- (b) Calculate the weight of the astronaut on the Moon. .... [2]

7

- 7 Fig 7.1 shows a rocket moving through the Earth's atmosphere.

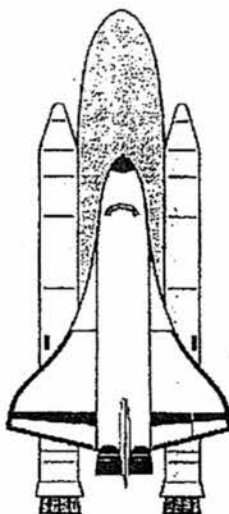


Fig 7.1

- (a) Explain why the shape of the rocket is streamlined.

[1]

.....  
.....

- (b) The rocket becomes very hot when moving through the Earth's atmosphere. Explain why.

[1]

.....  
.....

END OF SECTION B

|       |                  |        |
|-------|------------------|--------|
| Name: | Register Number: | Class: |
|-------|------------------|--------|

**2E****BEDOK GREEN SECONDARY SCHOOL****Mid-Year Examination 2017****2E****SCIENCE**

Answer Booklet for SECTION C

5 May 2016

Candidates answer on the Answer Booklet.

2 hours

**READ THESE INSTRUCTIONS FIRST**

Write your name, register number and class on all the work you hand in.  
 Write in dark blue or black pen on both sides of the paper.  
 You may use a soft pencil for any diagrams or graphs.  
 Do not use staples, paper clips, highlighters, glue or correction fluid.

**Section C**

There are five questions in this section. Answer any **four** questions.  
 Write your answers in the spaces provided.  
 Write the question numbers which you attempted in the box below.

**At the end of the examination, hand in Section A, B and C separately.**

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

| For Examiner's Use |       |
|--------------------|-------|
| Question Number    | Marks |
|                    |       |
|                    |       |
|                    |       |
|                    |       |
|                    |       |
| Total [ 40 marks]  |       |

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**[Turn Over]**

**Section C: Free Response Questions (40 marks)**Answer any **four** questions in the spaces provided.

- 8 (a) The melting and boiling points of some substances are shown in Fig. 8.1.

| substance | melting point (°C) | boiling point (°C) |
|-----------|--------------------|--------------------|
| A         | -81                | 400                |
| B         | -17                | -10                |
| C         | 46                 | 280                |
| D         | 87                 | 450                |
| E         | 1255               | 2150               |

**Fig. 8.1**

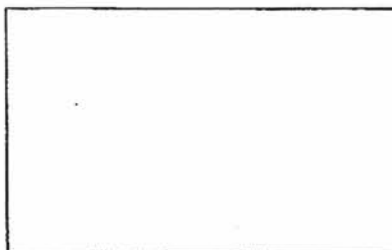
- (i) Which substance is a solid at 1100 °C? [1]

.....

- (ii) Which substance undergoes a change in state when the temperature increases from 0 °C to 50 °C? [1]

.....

- (iii) Sketch the arrangement of the particles in substance D at 25 °C in the given space. [1]



- (b) Alice prepares some notes to revise for her examination. The following incorrect statements are picked up from her notes.

Explain why the statements are **incorrect**.

- (i) All atoms contain protons, neutrons and electrons. [1]

.....

.....

3

- (ii) The nucleus of an atom is positively charged due to the presence of neutrons. [2]
- .....
- .....
- (iii) An atom can be identified if the number of neutrons is known. [2]
- .....
- .....
- (iv) When  $50 \text{ cm}^3$  of alcohol and  $50 \text{ cm}^3$  of water are mixed in a beaker, the total volume of the mixture is  $100 \text{ cm}^3$ . [2]
- .....
- .....

4

- 9 Fig. 9.1 shows a ray of light incident on a glass block. A plane mirror is placed in the glass block.

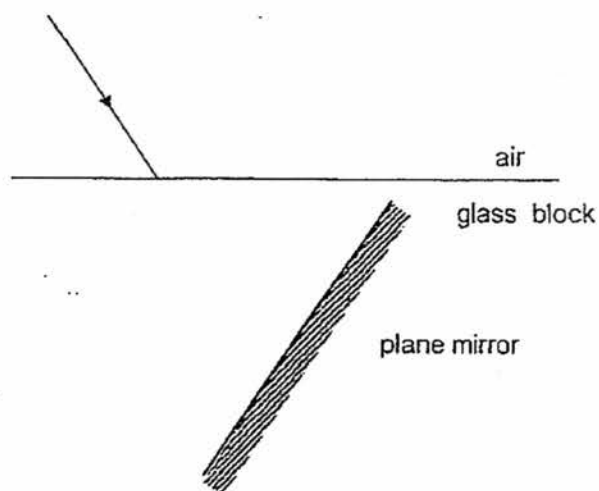


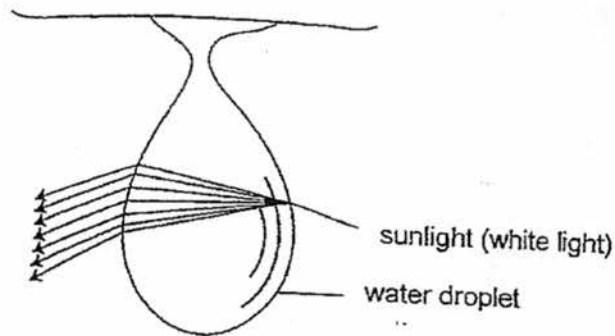
Fig. 9.1

- (a) (i) Complete the diagram to show how the light bends when it enters the glass block, indicating the normal clearly. [1]
- (ii) State whether the speed of light – **increases, decreases** or **remain unchanged** when it enters the glass block. [1]
- .....
- (iii) Explain your answer to (ii). [2]
- .....
- .....
- (iv) The ray of light strikes the plane mirror. Complete Fig. 9.1 above to show the path of the ray of light, indicating the normal clearly. [1]

Turn over

5

- (b) Fig. 9.2 shows a rainbow forming when sunlight passes through a water droplet that is about to fall off a surface.



Explain how rainbow is formed.

[3]

.....

.....

.....

.....

- (c) Detective Adam was involved in a murder case which occurred at night in which the murderer was seen wearing a green shirt. On surveying the murder site, he noticed that the street lamps gave out yellow light. Subsequently, three suspects were caught: A wore yellow, B wore red and C wore cyan.

- (i) Which suspect is mostly likely to be at the murder site?

[1]

.....

- (ii) Explain your answer in (ci).

[1]

.....

.....

.....

over

6

- 10 A hiker of mass 72 kg walks on a ground covered with snow. Each footwear has an area of  $0.016 \text{ m}^2$  in contact with the ground.

(a) Calculate the pressure exerted by the hiker on the ground when she is standing on the pair of footwear.

[3]

(b) Fig. 10.1 shows two types of footwear A and B.



footwear A



footwear B

Fig. 10.1

Explain why the hiker chooses to wear footwear B.

[2]

.....

.....

.....

.....

- 7  
(c) The hiker saw a dead fish in a frozen lake as shown in Fig. 10.2.

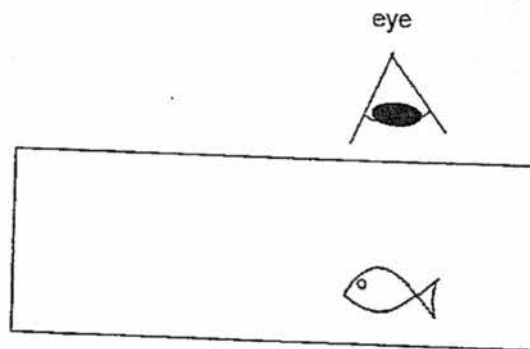


Fig. 10.2

On Fig. 10.2, mark X to show the position of where the fish will appear to the hiker who is looking at it above the lake?

[1]

- (d) Is the image virtual or real? Explain your answer.

[2]

.....

.....

- (e) The hiker walks across the slippery frozen lake. Suggest a modification on her shoes to increase the grip with the ice. Explain your answer.

[2]

.....

.....

.....

.....

over

8

- 11 (a) Fig. 11.1 shows a 12 V battery connected to two identical lamps,  $L_1$  and  $L_2$ . The reading on ammeter  $A_3$  is 6 A.

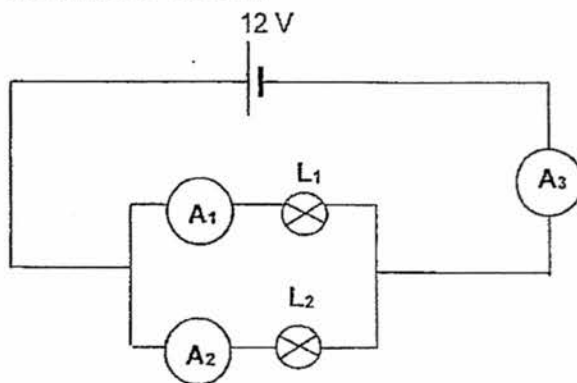


Fig. 11.1

- (i) Calculate the reading on ammeter  $A_1$ . [1]
- (ii) Calculate the resistance of  $L_1$ . [2]
- (iii) Calculate the total resistance of the circuit. [2]

9

- (b) The circuit is rearranged as shown in Fig. 11.2. The reading on ammeter  $A_1$  is 1.5 A.

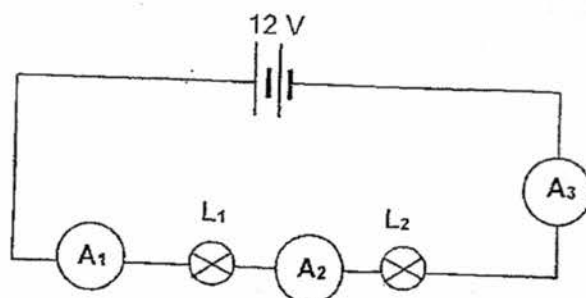


Fig. 11.2

- (i) State the reading on ammeter  $A_2$ . [1]
- .....
- (ii) What is the voltage across  $L_2$ ? [1]
- .....
- .....
- (iii) A variable resistor is set to  $10\ \Omega$  and placed in series with the two lamps. State and explain how the brightness of the lamps changes. [2]
- .....
- .....
- (iv)  $L_1$  is removed from the circuit. State how the brightness of  $L_2$  changes? [1]
- .....
- .....

over

10

- 12 Jack works in a coffee shop. He uses hot water to make hot drinks by heating the water in a metal urn. The urn is connected to the main supply by using a 3-pin plug and the heater in the urn has a power rating of 2 400 W.

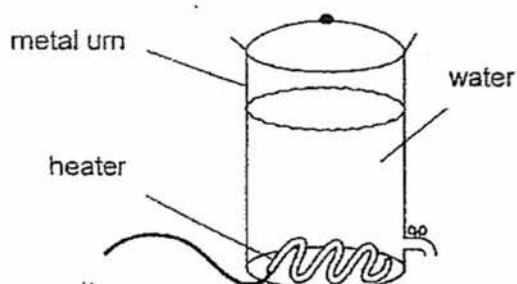


Fig. 12.1

- (a) State the colour of an Earth wire. [1]
- .....
- (b) Explain the function of the Earth wire in the 3-pin plug. [3]
- .....
- .....
- .....
- .....
- (c) Explain why some electrical appliances do not need an earth wire. [1]
- .....
- .....
- (d) State one safety precaution when using the metal urn. [1]
- .....
- .....

11

- (e) The heater is used 8 hours a day. Calculate the energy used by the heater in kilowatt-hours in 1 day.

[3]

- (f) Using your answer to (e), calculate the cost of using the heater for 5 days. The cost of 1 kWh of energy is \$0.23.

[1]

End of Paper

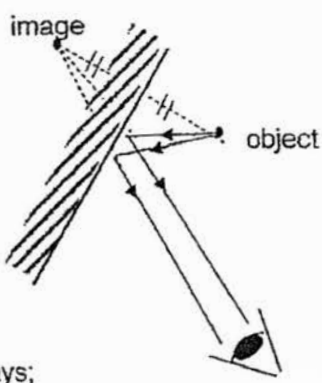
## Marking Scheme Science 2E SA1 2017

### Section A (MCQ) - 30 marks

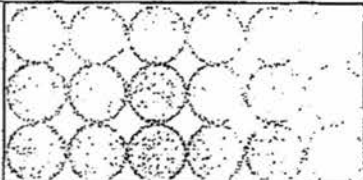
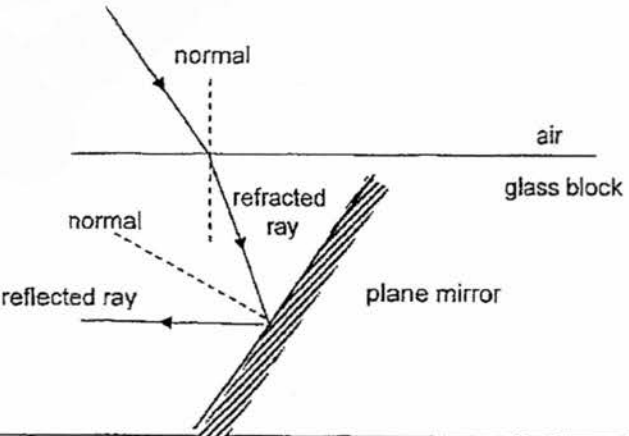
|   |   |    |   |    |   |    |   |    |   |    |   |
|---|---|----|---|----|---|----|---|----|---|----|---|
| 1 | C | 6  | D | 11 | C | 16 | A | 21 | D | 26 | A |
| 2 | A | 7  | A | 12 | B | 17 | C | 22 | C | 27 | C |
| 3 | D | 8  | B | 13 | D | 18 | D | 23 | C | 28 | B |
| 4 | B | 9  | A | 14 | D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

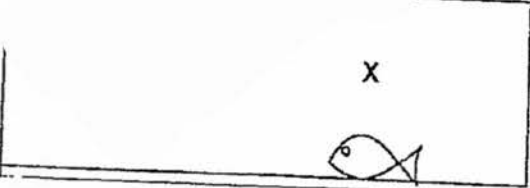
### Section B (Structured Questions) - 30 marks

| Qn   | Answer                                                                                                                                                                                                                                                                                                      | Sub marks | Total marks |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------|
| 1a   | Air in bottle can be compressed as the air particles are <u>far apart and</u><br><u>there is space for particles to move closer together</u><br>Water particles are closer together and move over <u>short distances</u><br>There is little space between particles for them to <u>move closer together</u> | 1<br>1    | 2           |
| 1b   | The particles in gas <u>move freely in high speed</u> <del>thus the particles can</del><br><u>be smelt in another corner after a short while.</u>                                                                                                                                                           | 1         | 1           |
| 2ai  | The speed of the particles <u>increases.</u><br>The distance between the particles <u>increases.</u>                                                                                                                                                                                                        | 1<br>1    | 2           |
| 2aii | The speed of the particles <u>remain unchanged.</u><br>The distance between the particles <u>increases</u>                                                                                                                                                                                                  | 1<br>1    | 2           |
| 2b   | Heat supplied to the substance is used, to <u>overcome the force of</u><br><u>attraction</u><br>It is <u>not used</u> to increase the temperature.                                                                                                                                                          | 1<br>1    | 2           |
| 2ci  | <u>liquid + gas</u>                                                                                                                                                                                                                                                                                         | 1         | 1           |
| 2cii | <u>gas</u>                                                                                                                                                                                                                                                                                                  | 1         | 1           |
| 3a   | <u>Wax.</u><br>There is <u>no new substance</u> formed<br>or <u>iodine crystal.</u><br>There is <u>no new substance</u> formed.                                                                                                                                                                             | 1<br>1    | 2           |
| 3b   | <u>magnesium + oxygen → magnesium oxide</u>                                                                                                                                                                                                                                                                 | 1         | 1           |
| 3c   | <u>copper oxide</u>                                                                                                                                                                                                                                                                                         | 1         | 1           |

| Qn   | Answer                                                                                                                                                                                                                            | Sub marks   | Total marks |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|
| 4a   | correct location of Image, I                                                                                                                                                                                                      | 1           | 1           |
| 4b   |  <ul style="list-style-type: none"> <li>• 2 incident rays;</li> <li>• 2 reflected rays</li> <li>• Dotted lines for virtual light rays</li> </ul> | 1<br>1<br>1 | 3           |
| 4c   | laterally inverted<br>same size as the object<br>object distance equals to image distance<br>upright<br>virtual                                                                                                                   | 1m<br>each  | 2           |
| 5a   | concave mirror                                                                                                                                                                                                                    | 1           | 1           |
| 5bi  | upright when near magnified                                                                                                                                                                                                       | 1           | 1           |
| 5bii | upright / diminish/ wider field of view                                                                                                                                                                                           | 1           | 1           |
| 5c   | Plane mirrors do not give a large 'field of view', thus they do not allow many things to be seen.                                                                                                                                 | 1           | 1           |
| 6a   | 80 kg (with unit)                                                                                                                                                                                                                 | 1           | 1           |
| 6b   | $W = mg$<br>$= 80 \times 1.67$<br>$= 133.61 \text{ N (with unit)}$                                                                                                                                                                | 1<br>1      | 2           |
| 7a   | The streamlined shape reduces friction (air resistance) from the air so that the rocket will not slow down.                                                                                                                       | 1           | 2           |
| 7b   | The friction (air resistance) between the air and the fast moving rocket produces heat.                                                                                                                                           | 1           | 2           |

Section C (Free Response Questions) - 40 marks

| Qn             | Answers                                                                                                                                                                                  | Sub marks                                                                                                                                   | Total marks |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| 8ai            | E                                                                                                                                                                                        | 1                                                                                                                                           | 1           |
| 8aii           | C                                                                                                                                                                                        | 1                                                                                                                                           | 1           |
| 8aiii          |                                                                                                         | 1                                                                                                                                           | 1           |
| 8bi            | Hydrogen atom which has a mass number and atomic number of 1 does not have a neutron.                                                                                                    | 1                                                                                                                                           | 1           |
| 8bii           | The nucleus of an atom is positively charged due to the presence of protons which are positively charged. Neutrons have no charges and hence do not make the nucleus positively charged. | 1                                                                                                                                           | 2           |
| 8biii          | An atom can be identified if the number of protons, which is unique to each atom, is known. Different atoms can have the same number of neutrons.                                        | 1<br>1                                                                                                                                      | 2           |
| 8biv           | There is space between the particles. OR Alcohol particles fill up the space between the water particles. The volume is less than 100 cm <sup>3</sup> .                                  | 1<br>1                                                                                                                                      | 2           |
| 9(ai)<br>(aiv) |                                                                                                      | (ai)<br>refracted<br>ray with<br>arrow and<br>normal<br>dotted 1m<br><br>(aiv)<br>reflected<br>ray with<br>arrow and<br>normal<br>dotted 1m | 1<br><br>1  |

| Qn     | Answers                                                                                                                                                                                                                                                                                                                                                     | Sub marks   | Total marks |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|
| 9a ii  | The speed of light <u>decreases</u> .                                                                                                                                                                                                                                                                                                                       | 1           | 1           |
| 9a iii | Glass block is <u>optically denser than air</u> , the speed of <u>light slows down</u> when it enters an optically denser medium.                                                                                                                                                                                                                           | 1           | 2           |
| 9b     | The different colour components of white light <u>slow down at different speeds</u> when they enter a denser medium. As a result, they are <u>refracted at different angles</u> or <u>bend towards the normal at different angles</u> . Upon leaving the droplet, the spectrum will <u>bend away from the normal</u> to produce the colours of the rainbow. | 1<br>1<br>1 | 3           |
| 9c i   | suspect C                                                                                                                                                                                                                                                                                                                                                   | 1           | 1           |
| 9c ii  | under yellow light, cyan will appear green because <u>green light is reflected</u> and red light is absorbed                                                                                                                                                                                                                                                | 1           | 1           |
| 10a    | Weight = $72 \times 10$<br>= 720 N<br>pressure = force / contact area<br>= $720 / (2 \times 0.016)$<br>= 22 500 Pa                                                                                                                                                                                                                                          | 1<br>1<br>1 | 3           |
| 10b    | Footwear B has a <u>larger contact area</u> than footwear A. Since pressure = force / contact area <u>footwear B exerts lesser pressure on the ground given that weight of the hiker remains the same</u> . Hence it prevents the hiker from sinking into the snow                                                                                          | 1<br>1      | 2           |
| 10c    |                                                                                                                                                                                                                                                                          | 1           | 1           |

| Qn     | Answers                                                                                                                                                                                                                                                                                                                                                                                                     | Sub marks       | Total marks |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------|
| 10d    | virtual<br>It cannot be formed / captured on a screen.                                                                                                                                                                                                                                                                                                                                                      | 1<br>1          | 2           |
| 10e    | Attach spikes to his footwear.<br>It will increase the pressure on the ground causing the spikes to penetrate the ground.<br>(Accept other possible answers)                                                                                                                                                                                                                                                | 1               | 2           |
| 11ai   | $6/2 = 3A$                                                                                                                                                                                                                                                                                                                                                                                                  | 1               | 1           |
| 11aii  | $R = V/I$<br>$= 12/3$<br>$= 4 \Omega$                                                                                                                                                                                                                                                                                                                                                                       |                 | 2           |
| 11aiii | $R = V/I$<br>$= 12/6$<br>$= 2 \Omega$<br>Or<br>$R = (1/4 + 1/4)^{-1}$<br>$= 2 \Omega$                                                                                                                                                                                                                                                                                                                       | 1               | 2           |
| 11bi   | 1.5 A<br>$V = IR$<br>$12 = I(8)$<br>$= 1.5 A$                                                                                                                                                                                                                                                                                                                                                               | 1               | 1           |
| 11bii  | $12/2 = 6 V$                                                                                                                                                                                                                                                                                                                                                                                                | 1               | 1           |
| 11biii | Since the resistance increase the <u>current will</u> decrease and the the lamp will be dimmer.                                                                                                                                                                                                                                                                                                             | 1<br>1          | 2           |
| 11biv  | $L_2$ will become brighter.                                                                                                                                                                                                                                                                                                                                                                                 | 1               | 1           |
| 12a    | yellow green                                                                                                                                                                                                                                                                                                                                                                                                | 1               | 1           |
| 12b    | When a fault occurs such that the <u>live wire touches the metal casing causing it to become 'live'.</u><br>The user will get an electric shock if he touches the metal casing of the urn. The earth wire <u>creates a short circuit</u> and a build up of current which will <u>melt the fuse and break the circuit.</u><br>This prevents the user from getting an electric shock when he touches the urn. | 1<br><br>1<br>1 | 3           |

| Qn  | Answers                                                                                                                                                                                                            | Sub marks   | Total marks |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|
| 12c | The internal components are also <u>insulated from the external casing</u> . Or It has <u>double insulation</u> .                                                                                                  | 1           |             |
| 12d | <ul style="list-style-type: none"> <li>• He should not touch the bare or broken wires</li> <li>• He should not touch the plugs or switches with wet hands.</li> <li>• He should not overload a circuit.</li> </ul> | any 1       | 1           |
| 12e | $2500 \text{ W} = 2.5 \text{ kW}$<br>$E = P \times T$<br>$= 2.4 \times 8$<br>$= 19.2 \text{ kWh}$                                                                                                                  | 1<br>1<br>1 |             |
| 12f | $19.2 \times 5 \times 0.23$<br>$= \$22.08$                                                                                                                                                                         | 1           | 1           |