



education

Department of  
Education  
FREE STATE PROVINCE

**GRADE 8**

**NATURAL SCIENCES**

**NOVEMBER 2022**

**TIME: 2 HOURS**

**MARKS: 90**

This question paper consists of 16 pages.

## INSTRUCTIONS AND INFORMATION:

1. Write your name, grade, and class on the ANSWER BOOK.
2. The question paper consists of TWO SECTIONS divided into 9 questions.
3. Answer ALL questions in the ANSWER BOOK.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Leave one line between two sub-questions, for example between QUESTION 2.1 and QUESTION 2.2.
6. Write neatly and legibly.

## SECTION A

### QUESTION 1

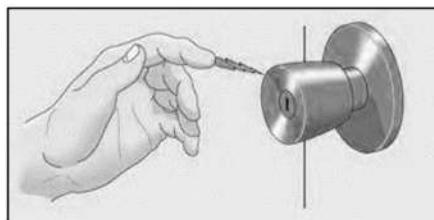
- 1.1 Various options are provided as possible answers to the following questions. Choose the correct answer and write only the letter (A – D) next to the question number (1.1.1 to 1.1.10) in the answer book e.g., 1.1.12 D.

1.1.1 What causes the build-up of charge when a balloon is rubbed against a woollen jersey?

- A Friction
- B Current
- C Resistance
- D Static energy

(1)

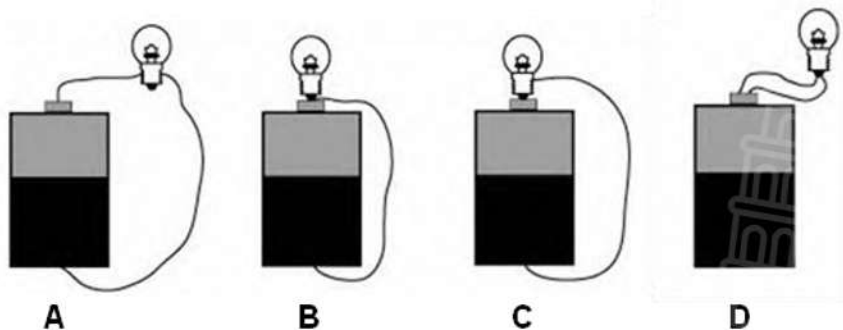
1.1.2 The spark between the finger and the doorknob is caused by ...



- A friction.
- B electricity.
- C electrostatic forces.
- D a discharge of electrons.

(1)

1.1.3 Study the connections in each of the diagrams below. In which ONE of the diagrams will the bulb light up?



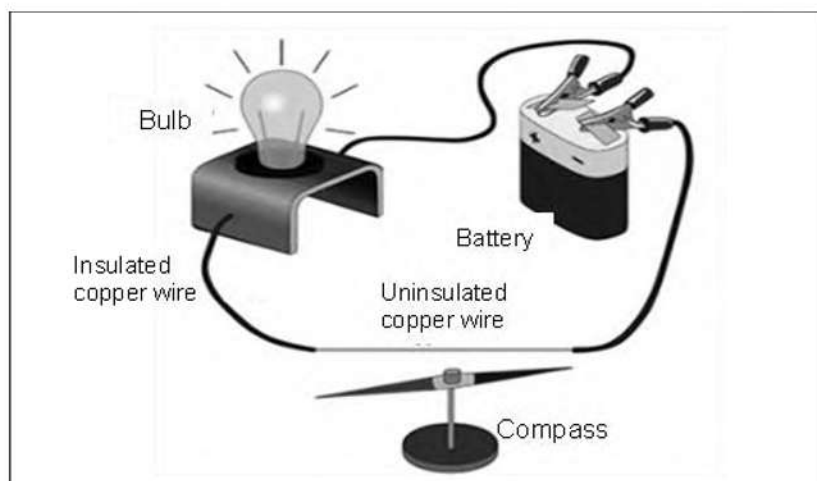
(1)

1.1.4 The heating effect of an electric current is illustrated when:

- A an electromagnet is used to pick up a piece of metal.
- B a teaspoon is covered with a layer of silver.
- C wind is blowing from a fan.
- D a kettle is used to boil water.

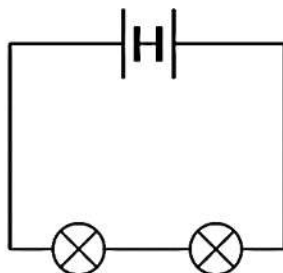
(1)

1.1.5 When the current starts to flow through the copper wire, the magnetic needle of the compass deviates (rotates) because ...



- A of an electrostatic force between the wire and the needle.
  - B a magnetic field is created around the wire.
  - C of the chemical effect of an electric current.
  - D of the heating effect of a current.
- (1)

1.1.6 Which statement is TRUE for the circuit below?



- A None of the bulbs glow.
  - B The two cells are connected in parallel.
  - C The two cells are connected in series.
  - D The bulbs glow with equal brightness.
- (1)

1.1.7 All the bulbs and cells in the circuits below are identical.

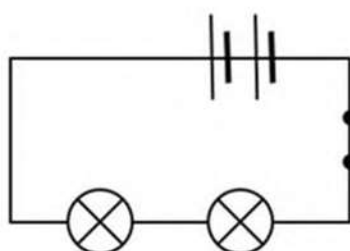


Diagram 1

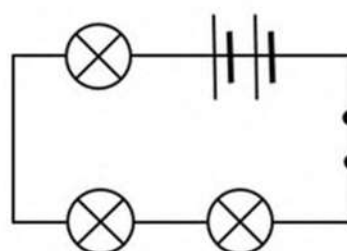


Diagram 2

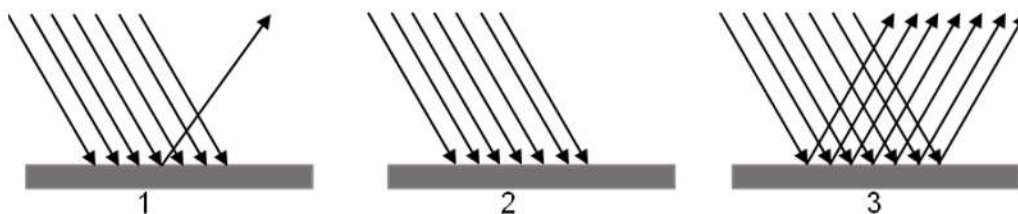
Which statement is TRUE?

- A The current in diagram 2 is greater than in diagram 1.
- B The bulbs in diagram 1 glow dimmer than the bulbs in diagram 2.
- C The total resistance in diagram 1 is more than in diagram 2.
- D The total resistance in diagram 2 is more than in diagram 1. (1)

1.1.8 When the number of resistors in parallel increases, then the:

- A total current decreases.
- B total current increases.
- C total resistance increases.
- D brightness of the bulbs decreases. (1)

1.1.9 White light shines on three different surfaces. Based on the reflection of the light, determine the colour of surface 1, 2 and 3.



	Colour of surface 1	Colour of surface 2	Colour of surface 3
A	Black	White	Green
B	White	Black	Green
C	Green	White	Black
D	Green	Black	White

(1)

1.1.10 The distance between the Sun and the Earth is:

- A 1 light year
- B 4,2 light years
- C 8 light minutes
- D 4,2 light minutes

(1)  
[10]



- 1.2 Give the correct SCIENTIFIC TERM for each of the following descriptions.  
Write only the number and the answer.



- 1.2.1 Two or more cells connected to each other. (1)
- 1.2.2 When an electric current follows the path of least resistance. (1)
- 1.2.3 The colour of light with the highest frequency and the shortest wavelength. (1)
- 1.2.4 The part of the eye where the image of what we see is formed. (1)
- 1.2.5 The distance that light travels in one year. (1)

**[5]**

- 1.3 Choose a word from COLUMN B that matches the description in COLUMN A. Write only the letter next to the question number in the answer book, for e.g., 1.3.6 M.

COLUMN A		COLUMN B	
1.3.1	A region very far away from the Sun where comets come from.	A	Universe
1.3.2	What an asteroid is called when it enters Earth's atmosphere and is seen as a "shooting star".	B	Route
1.3.3	ALL the planets, stars, solar systems, and galaxies.	C	Meteorite
1.3.4	The path that one object takes to move around another object.	D	Oort Cloud
1.3.5	An object that moves around a planet.	E	Moon
		F	Meteor
		G	Star
		H	Orbit
		I	Solar system

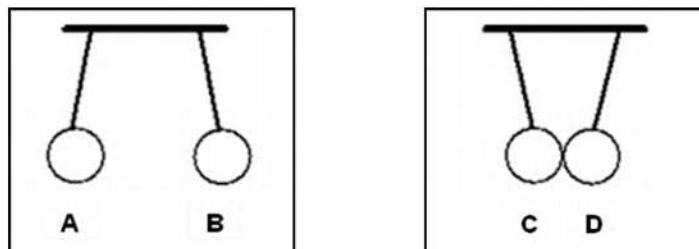
**[5]**

**TOTAL SECTION A: 20**

## SECTION B

### QUESTION 2

2.1 Spheres A, B, C and D shown below, all carry electrostatic charges.

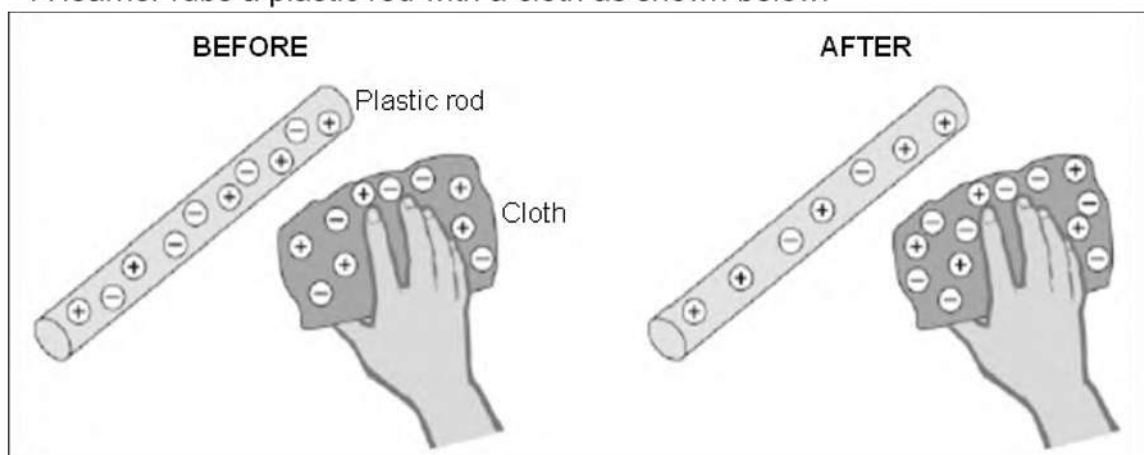


2.1.1 Which two spheres have like charges? (1)

2.1.2 Which two spheres attract each other? (1)

2.1.3 Redraw spheres C and D in your answer book and indicate the possible charge on each sphere. (1)

2.2 A learner rubs a plastic rod with a cloth as shown below.



Use the **DIAGRAM** to answer the questions.

2.2.1 What is the charge on the plastic rod **BEFORE** it is rubbed with the cloth? (1)

2.2.2 Give a reason for your answer in question 2.2.1. (1)

2.2.3 What is the charge on the rod **AFTER** rubbing? (1)

2.2.4 The **INCORRECT** explanation for the charge on the rod **AFTER** rubbing is given below.

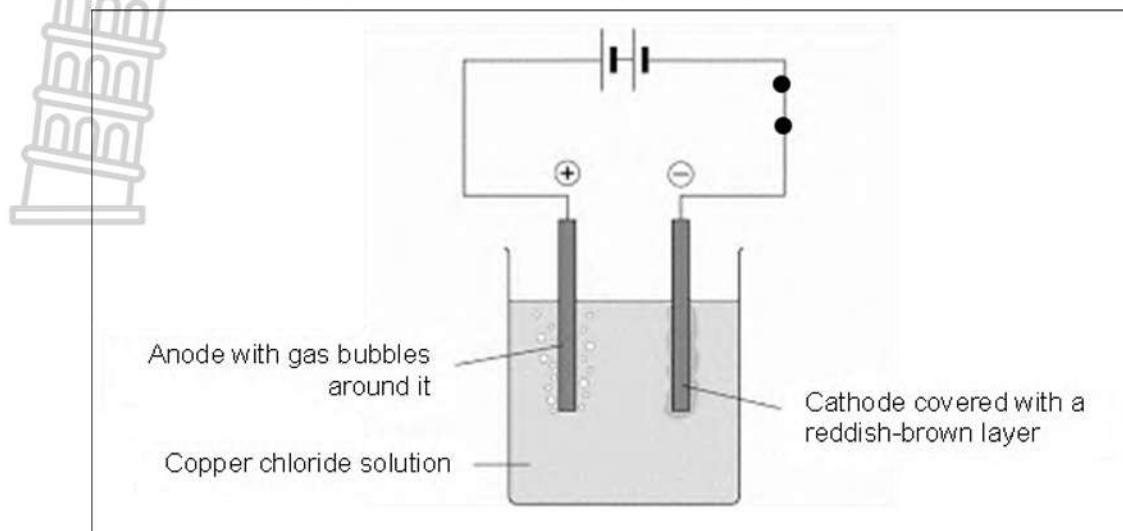
***Due to friction between the hand and the cloth, protons move from the rod to the cloth.***

Identify the **TWO** mistakes in the explanation. Rewrite the sentence and correct **BOTH** mistakes.

(2)  
[8]

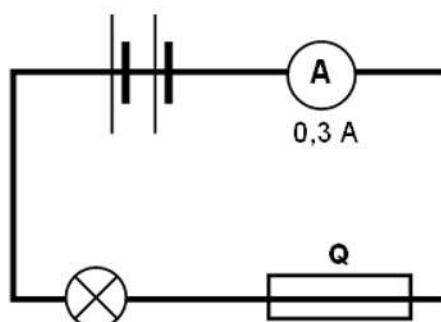
### QUESTION 3

- 3.1 In the diagram below, two cells are connected to two carbon electrodes which are immersed in a blue copper chloride solution.



The gas that forms at the anode smells like bleach (Jik), while a reddish-brown layer forms on the cathode.

- 3.1.1 What is the process called where a chemical compound is broken down into elements when an electric current flows through the solution? (1)
- 3.1.2 Complete the WORD equation for the chemical reaction caused by the electric current:  
Copper chloride  $\rightarrow$  ... + ... (2)
- 3.1.3 When the switch is opened, no more gas bubbles are formed. Explain this observation. (1)
- 3.2 A current of 0,3 A is flowing through the circuit below.

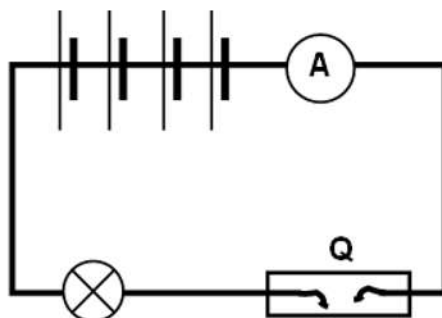


- 3.2.1 Two more cells are added in series to the circuit. Accept that all the cells are identical. What will the new reading on the ammeter be? (1)

The bulb in the circuit can handle a **MAXIMUM** current of 0,4 A. Immediately after the extra cells were added, the bulb stopped glowing, but it DID NOT FUSE (DID NOT BURN OUT).



Below, is what the circuit looks like now:



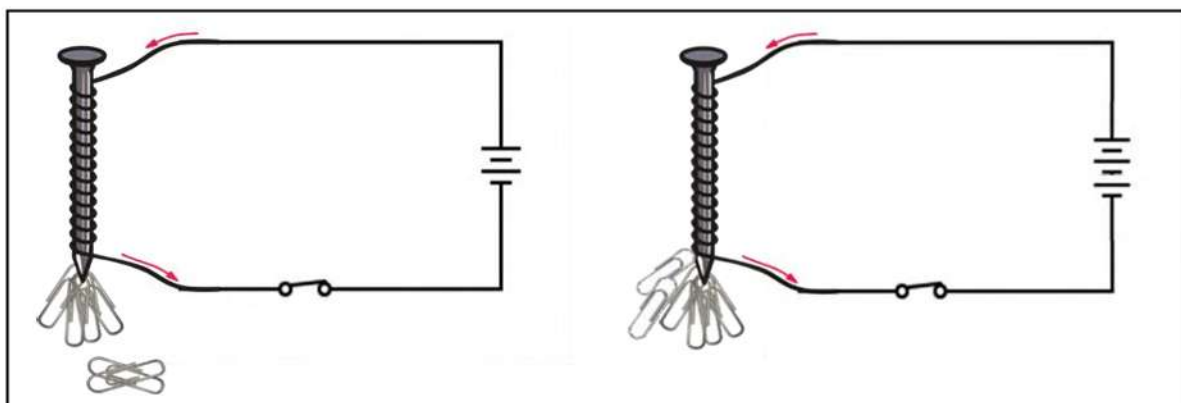
3.2.2 Identify component Q. (1)

3.2.3 Explain why the bulb did not fuse (did not burn out) and what the function of component Q is. (2)  
[8]

#### QUESTION 4

The aim of the scientific investigation below is to determine how the number of cells connected in series affects the strength of an electromagnet.

An electromagnet (with an iron nail as the core) connected to two cells picks up FOUR iron paper clips. When the same electromagnet is connected to three cells, it picks up SIX paper clips.



4.1 For this investigation, identify the following:

4.1.1 the independent variable. (1)

4.1.2 the dependent variable. (1)

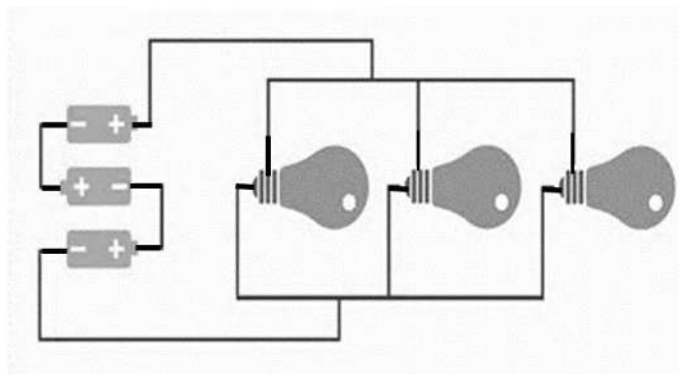
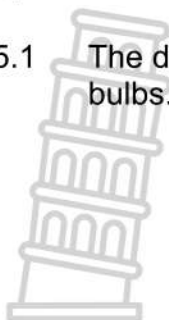
4.1.3 two variables that must be controlled to make this a fair test. (2)

4.2 Use the diagram to formulate the relationship between the number of cells and the strength of an electromagnet. (1)

4.3 Why will the electromagnet NOT be able to pick up paper clips made of copper? (1)  
[6]

## QUESTION 5

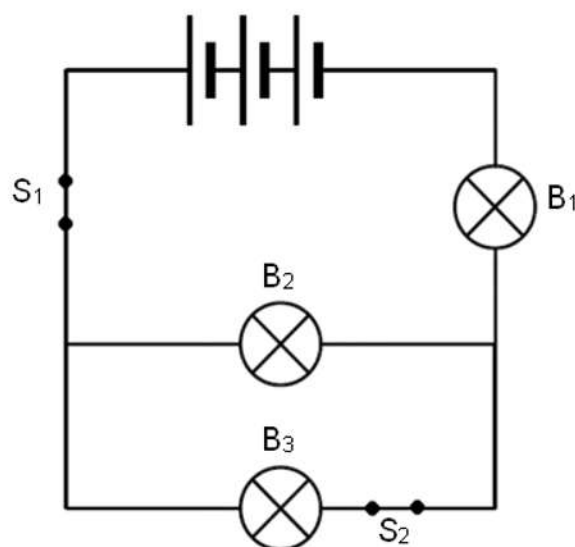
5.1 The diagram below illustrates a circuit that consists of three cells and three bulbs.



5.1.1 In the diagram above, are the cells connected in SERIES or PARALLEL? Motivate your answer. (2)

5.1.2 Using the correct symbols for the components and draw the circuit diagram for the circuit above in your answer book. (4)

5.2 Study the circuit below.



5.2.1 Which bulb(s) will glow if  $S_2$  is opened? (1)

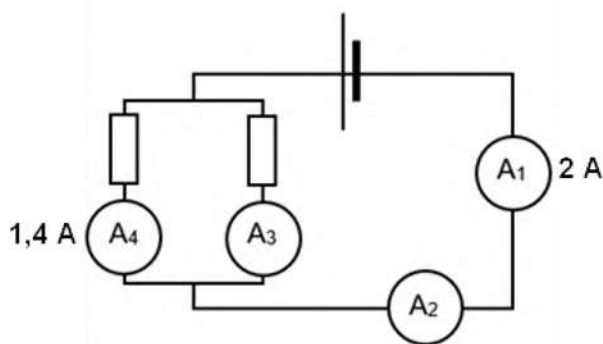
5.2.2 Which bulb(s) will glow if  $S_2$  is closed but  $S_1$  is opened? (1)

$S_1$  and  $S_2$  are closed. **Bulb  $B_2$  is now completely REMOVED from the circuit.**

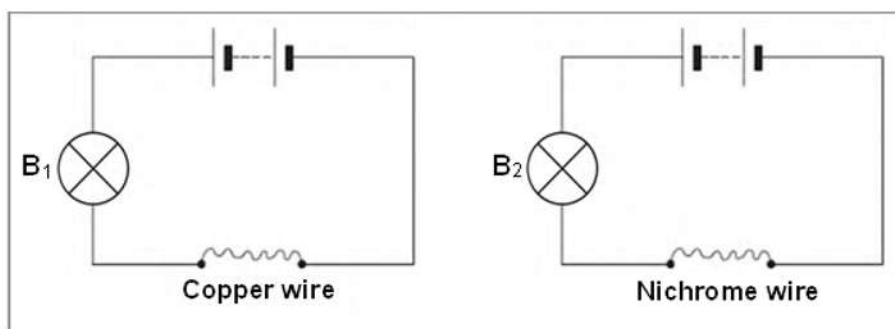
5.2.3 Fully explain why the brightness of  $B_1$  decreases. (3)

5.2.4 Give one reason why the lights in our homes are connected in parallel. (1)

- 5.3 Study the circuit diagram below. The reading on  $A_1$  is 2 A and the reading on  $A_4$  is 1,4 A.



- 5.3.1 What is the reading on  $A_2$ ? (1)
- 5.3.2 Calculate the reading on  $A_3$ . (2)
- 5.4 Study the two circuit diagrams below. All bulbs and cells are identical.

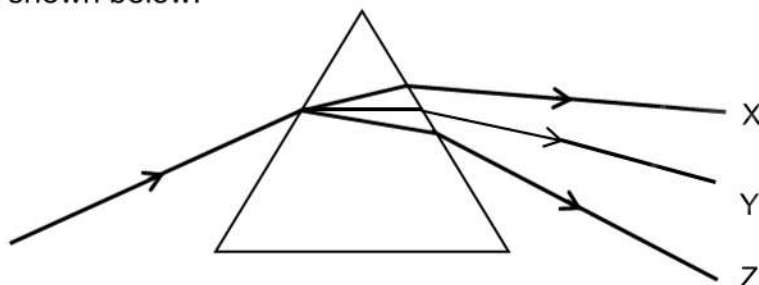


Compare the resistance of copper with the resistance of nichrome if bulb  $B_1$  glows BRIGHTER than bulb  $B_2$ . Explain your answer.

(2)  
[17]

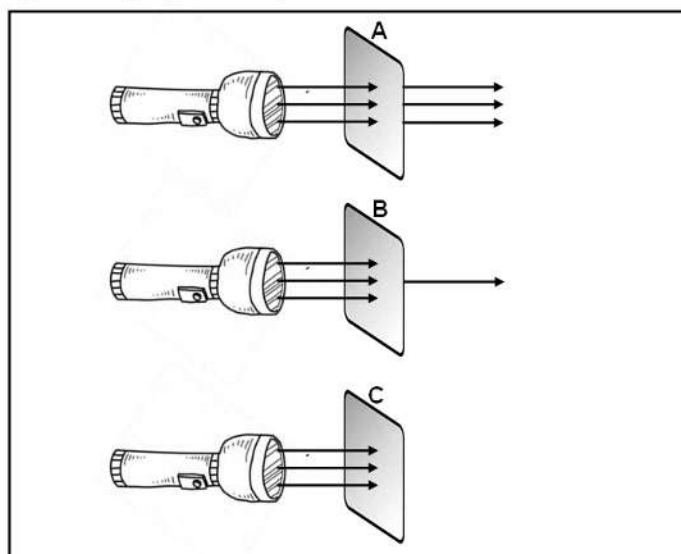
## QUESTION 6

- 6.1 A ray of white light enters a triangular prism and separates into the colours of the rainbow as shown below.



- 6.1.1 What is the range (rainbow) of different colours called? (1)
- 6.1.2 Which letter in the diagram probably represents green light? (1)
- 6.1.3 Which colour of light is represented by X? (1)

- 6.2 Light from a torch, shines on each of three objects (A, B and C). The amount of light passing through each object is observed.

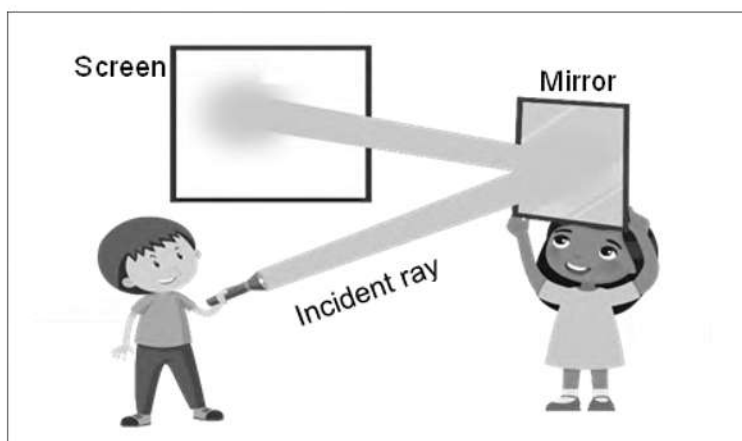


Write down the LETTER (A, B or C) for the object that:

- |   |            |
|---|------------|
| 6.2.1 is opaque.  | (1)        |
| 6.2.2 is completely transparent.                          | (1)        |
| 6.2.3 transmits some light but absorbs most of the light. | (1)        |
| 6.2.4 will cast a very clear shadow.                      | (1)        |
|   | <b>[7]</b> |

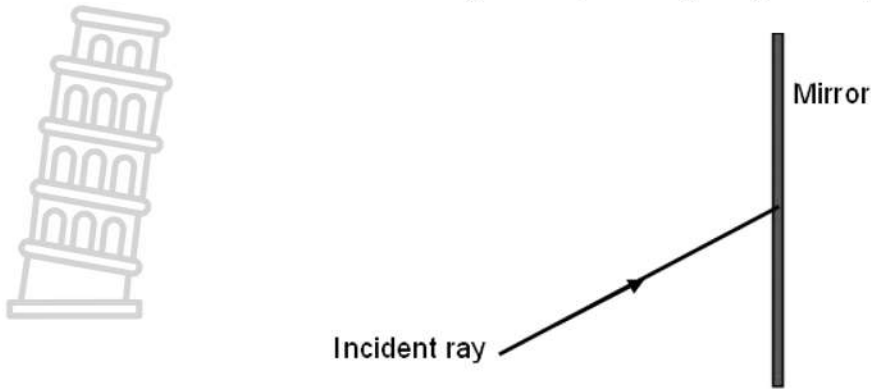
## QUESTION 7

- 7.1 The reflection of light is investigated by shining light onto a mirror and then observing the reflected light on a screen or wall.





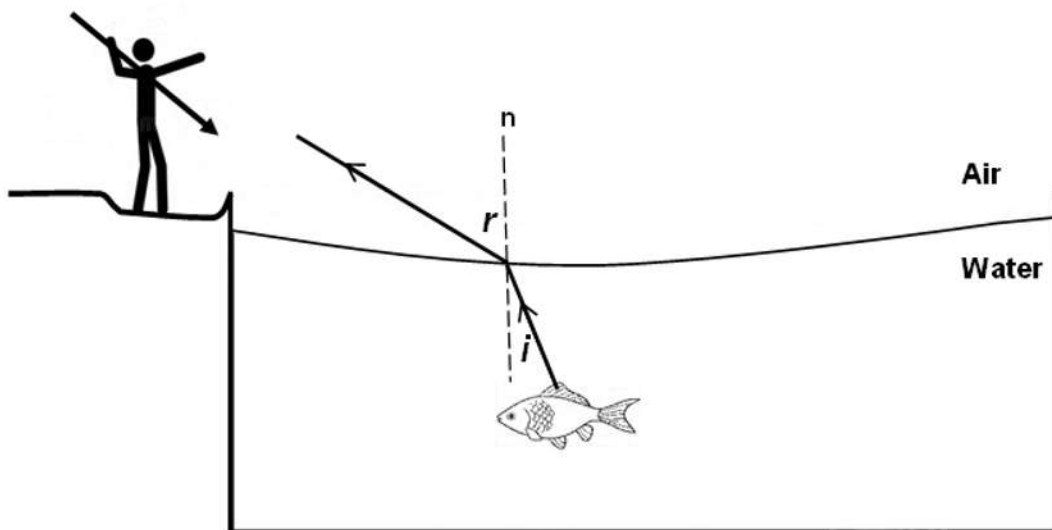
7.1.1 Redraw the following incomplete ray diagram in your answer book.



COMPLETE the ray diagram to illustrate the Law of Reflection demonstrated in 7.1. Label the normal, the reflected ray, the angle of incidence ( $i$ ) and the angle of reflection ( $r$ ). (3)

7.1.2 How does the size of the angle of incidence compare with the size of the angle of reflection? (1)

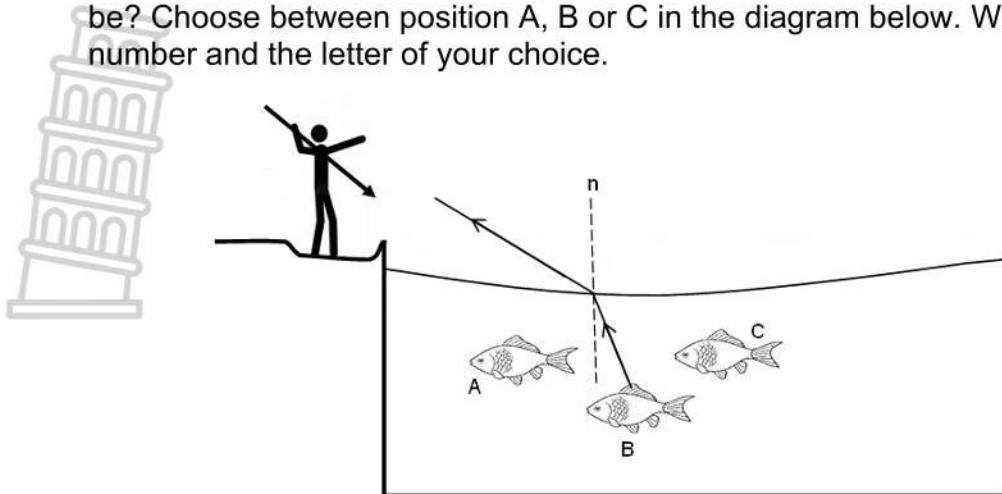
7.2 The diagram below shows a man trying to kill a fish with a spear. The ray diagram shows the light moving from the fish to the eyes of the man. The angle of incidence is indicated by  $i$  and the angle of refraction is indicated by  $r$ .



7.2.1 Why is the light refracted at the surface of the water? (1)

7.2.2 Is the ray of light moving from the water into the air, being refracted TOWARDS or AWAY from the normal? Give a reason for your answer. (2)

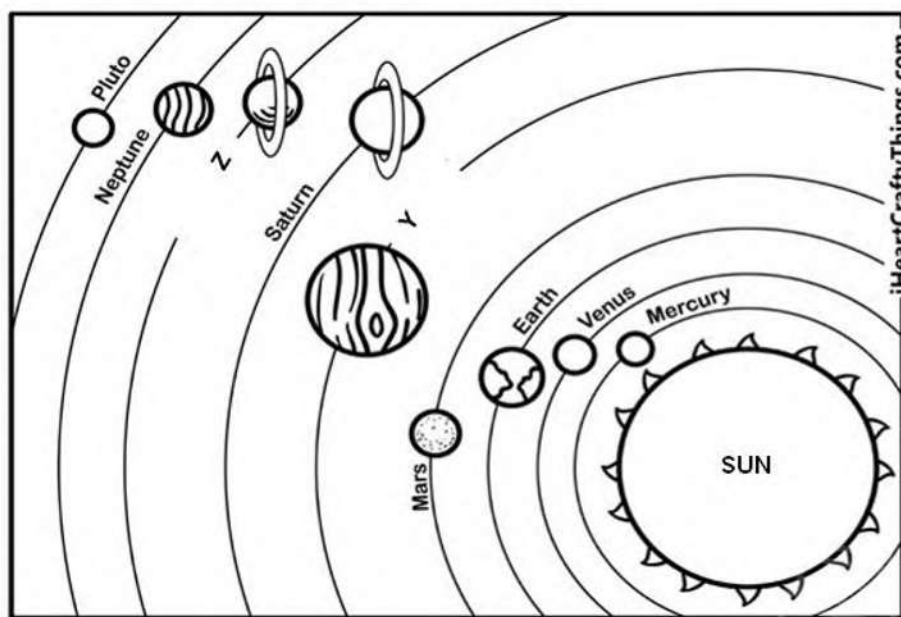
7.2.3 Where will the man see the fish; in other words where does the fish appear to be? Choose between position A, B or C in the diagram below. Write only the number and the letter of your choice.



(1)  
[8]

### QUESTION 8

Study the diagram of the solar system below and answer the questions that follow.

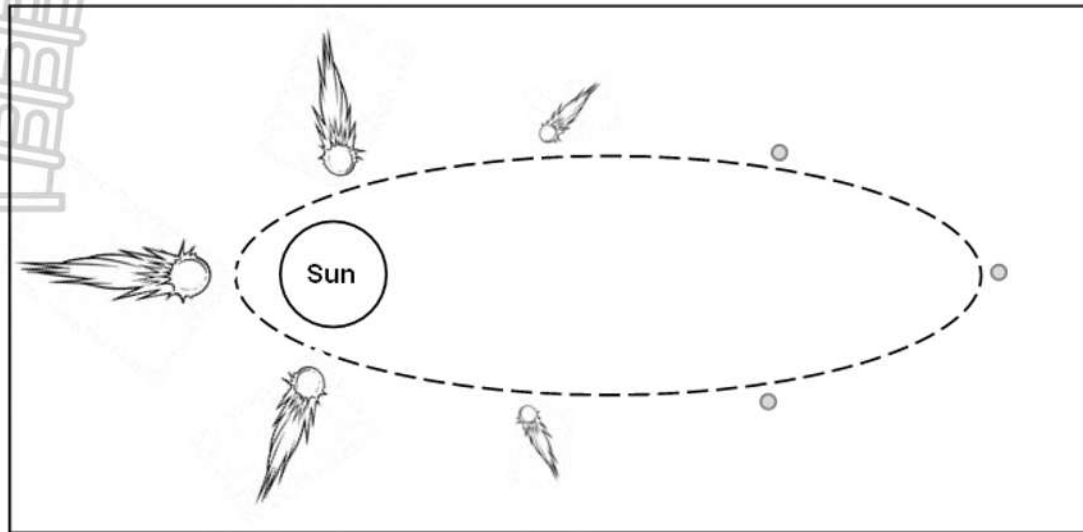


- 8.1 Why is the Sun called a star? (1)
- 8.2 Give the NAME of the biggest planet in the solar system. (1)
- 8.3 Which body in the diagram above is regarded as a dwarf-planet? (1)
- 8.4 Name Planet Z. (1)
- 8.5 Where in the solar system is the Asteroid Belt located? (1)
- 8.6 Give THREE reasons why Earth can sustain life. (3)

[8]

## QUESTION 9

9.1 The diagram below shows a comet orbiting the Sun.

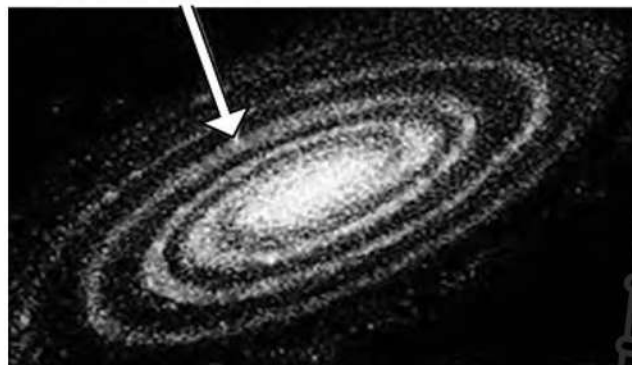


9.1.1 What do comets consist of? (What are comets made of?) (2)

9.1.2 When the comet is far away from the Sun, no tail is visible but as the comet comes closer to the Sun, a white tail becomes clearly visible. Explain this observation. (2)

9.2 Galaxies come in many different shapes and sizes. Our galaxy has a spiral shape as shown below. The arrow shows where our solar system is located.

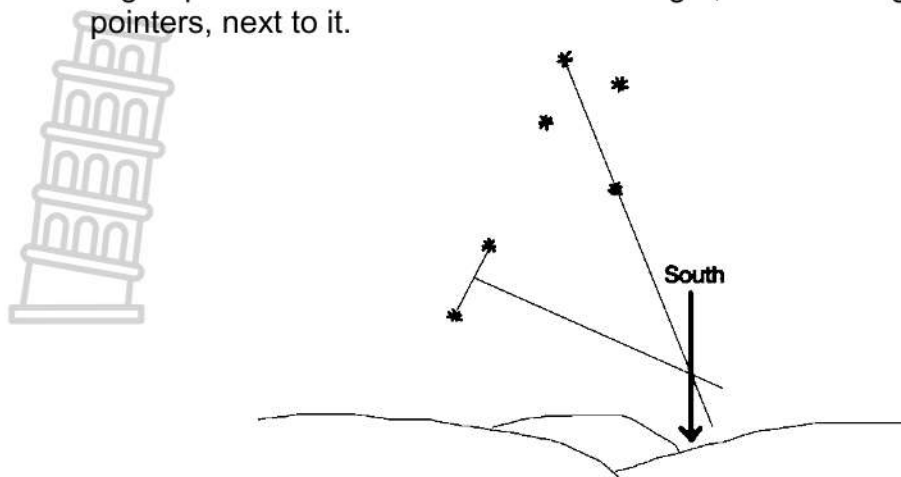
We are here!



9.2.1 What is the name of our galaxy? (1)

9.2.2 What force keeps all the billions of stars together in a galaxy? (1)

- 9.3 A group of FOUR stars can be seen at night, with two bright stars called its pointers, next to it.



9.3.1 What is the constellation of four stars called? (1)

9.3.2 The brightest star of the two pointers is the closest star to our Sun.  
What is the name of this star? (1)  
[8]

**TOTAL SECTION A: 20**

**TOTAL SECTION B: 70**

**GRAND TOTAL: 90**





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**MARKING GUIDELINES**

**TIME: 2 HOURS**

**MARKS: 90**

These marking guidelines consist of 6 pages.

## SECTION A

### QUESTION 1

- 1.1.1 A✓  
 1.1.2 D✓  
 1.1.3 C✓  
 1.1.4 D✓  
 1.1.5 B✓  
 1.1.6 A✓  
 1.1.7 D✓  
 1.1.8 B✓  
 1.1.9 D✓  
 1.1.10 C✓

[1 x 10 = 10]

- 1.2.1 Battery✓  
 1.2.2 Short circuit✓  
 1.2.3 Violet✓  
 1.2.4 Retina✓  
 1.2.5 Light year✓

[1 x 5 = 5]

- 1.3.1 D✓  
 1.3.2 F✓  
 1.3.3 A  
 1.3.4 H✓  
 1.3.5 E✓

[1 x 5 = 5]

**TOTAL SECTION A: 20**

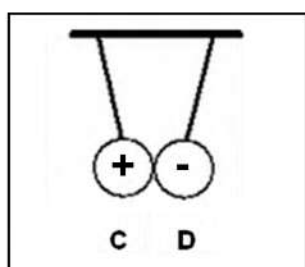
## SECTION B

### QUESTION 2

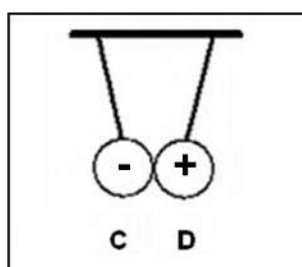
- 2.1.1 A and B✓  
 2.1.2 C and D✓  
 2.1.3

(1)

(1)



OR



✓

(1)

- 2.2.1 Neutral✓ (1)
- 2.2.2 Equal number of positive and negative charges.✓  
**OR**  
 Equal number of protons and electrons. ✓  
**OR**  
 The rod has 5 positive and 5 negative charges. ✓ (1)
- 2.2.3 Positive✓ (1)
- 2.2.4 Due to friction between the **ROD**✓ and the cloth, **ELECTRONS**✓ move from the rod to the cloth. (2)  
**[8]**

### QUESTION 3

- 3.1.1 Electrolysis✓ (1)
- 3.1.2 Copper chloride → copper✓ + chlorine✓ (NOT chloride)  
 (Accept: Copper chloride → Cu✓ + Cl<sub>2</sub> ✓) (2)
- 3.1.3 Current does not flow anymore.  
 No electrical energy available✓ to keep the reaction going.  
**OR**  
 Electrolytic reactions need a source of energy / electrical energy must be converted to chemical energy.  
 If circuit is broken, no energy can be transferred. ✓ (1)
- 3.2.1 0,6 A ✓ (0,3 A x 2) (1)
- 3.2.2 Fuse✓ (1)
- 3.2.3 When the current increased (to 0,6 A), the fuse overheated and melted. ✓  
 The circuit was broken.  
 The fuse protected the bulb,✓ which can only handle 0,4 A, from fusing. (2)  
**[8]**

### QUESTION 4

- 4.1.1 Number of cells✓ (1)
- 4.1.2 The strength of the electromagnet✓  
 (Accept: Number of paper clips picked up) (1)
- 4.1.3 -The same electromagnet must be used **OR** the same iron nail with the same number of wire windings around it. ✓  
 -The type and size of paper clips must be the same. ✓  
 (Accept: Identical cells must be used, although it is not crucial in this case.) (2)
- 4.2 More cells increase the strength of the electromagnet. ✓  
**OR**  
 If the number of cells increases, the electromagnet gets stronger. ✓  
 (Only 1 mark for the **relationship**; variables were given in the question.) (1)
- 4.3 Copper is non-magnetic / not ferromagnetic. ✓ (1)  
**[6]**

## QUESTION 5

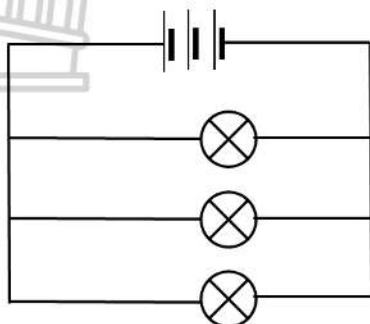
### 5.1.1 Series✓

The positive pole / terminal of one cell is connected to the negative pole / terminal of the next cell. ✓

OR

There is only one pathway for current to flow through the three cells. ✓ (2)

### 5.1.2



Correct symbol for a cell ✓  
Correct symbol for a bulb ✓  
3 Cells connected in series ✓  
3 Bulbs connected in parallel ✓

(4)

5.2.1 B<sub>1</sub> and B<sub>2</sub> ✓ (BOTH for one mark)

(1)

5.2.2 No bulbs will glow ✓

(1)

5.2.3 **If Bulb B<sub>2</sub> is removed:**

There are LESS bulbs in parallel. ✓

Total resistance increases. ✓

Total current decreases. ✓

Brightness of B<sub>1</sub> decreases.

(3)

5.2.4 Lights can be switched on and off independently from one another. ✓

If a light bulb fuses, the others will still glow. ✓

If more bulbs are connected in parallel, the brightness of the bulbs remain the same. ✓

(ANY ONE) (1)

5.3.1 Reading on A<sub>2</sub> = 2 A ✓

(1)

5.3.2 Reading on A<sub>3</sub> = 2 - 1,4 ✓

= 0,6 A ✓ (answer WITH unit)

(2)

5.4 **Because B<sub>1</sub> is glows brighter:**

Total current is higher. ✓

Therefore, copper has a lower resistance than nichrome ✓

OR

**Because B<sub>2</sub> is glows dimmer:**

Total current is smaller. ✓

Therefore, nichrome has a higher resistance than copper ✓

(2)

[17]

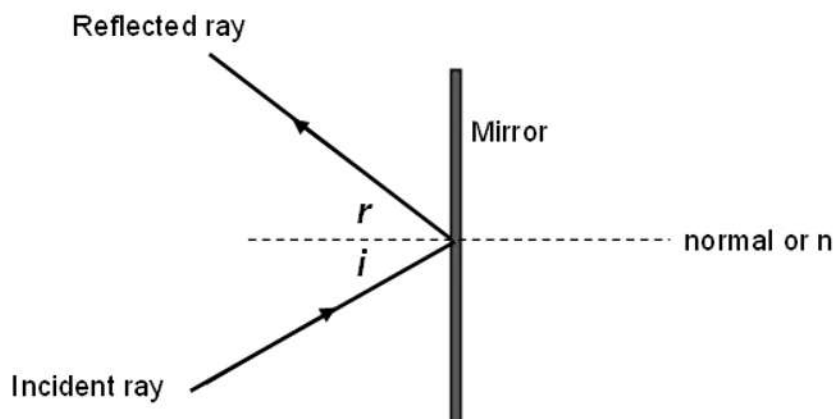


### QUESTION 6

- 6.1.1 Spectrum✓ of white light (Rainbow is **NOT** acceptable) (1)
- 6.1.2 Y✓ (1)
- 6.1.3 Red✓ (1)
- 6.2.1 C✓ (1)
- 6.2.2 A✓ (1)
- 6.2.3 B✓ (1)
- 6.2.4 C✓ (1)
- [7]**

### QUESTION 7

7.1.1



Marking criteria	Marks
Reflected ray correctly drawn and the <b>direction</b> is indicated	✓
Angle of incidence ( $i$ ), indicated between the $n$ and the incident ray	✓
Angle of reflection ( $r$ ), indicated between the $n$ and the reflected ray	✓

(3)

- 7.1.2 Angle of incidence ( $i$ ) = Angle of reflection ( $r$ ) ✓  
(Accept: The angles / They are equal, or they have the same size) (1)

- 7.2.1 Light is refracted / bends / changes direction when moving from one medium to another. ✓  
**OR**  
Where two different (optical) mediums / water and air meet, light bends / changes direction. ✓ (1)

7.2.2 AWAY✓ from the normal.

Angle of refraction ( $r$ ) is greater than the angle of incidence ( $i$ );  $r > i$ ✓

OR

Angle of incidence ( $i$ ) is smaller than the angle of refraction ( $r$ );  $i < r$ ✓

OR

The light moves from an optically denser medium to an optically less dense medium. ✓ (2)

7.2.3 At C✓

(1)

[8]

### QUESTION 8

8.1 The Sun produces its own light. ✓

(1)

8.2 Jupiter✓

(1)

8.3 Pluto✓

(1)

8.4 Uranus✓ (NOT Saturn)

(1)

8.5 Between Mars and Jupiter✓

(1)

8.6 -Earth's distance from the sun provides the ideal **temperature** range / Earth is not too hot or too cold. ✓

-Earth has just the right temperatures so that **water** can be in each of the three phases: solid, liquid and gas. ✓

-Earth gets the right amount of **sunlight** to provide energy for food chains / photosynthesis. ✓

-Earth has the right amount of **oxygen** needed for respiration / support life. ✓

(ANY THREE) (3)

[8]

### QUESTION 9

9.1.1 Ice, ✓ rock, ✓ dust, ✓ frozen gases✓

(ANY TWO) (2)

9.1.2 As the comets come closer to the Sun:

The Sun heats / melts✓ the outer layers of the solid ice / dust / frozen gases to form liquids.

Liquids evaporate to form gases✓ causing the white tail. (2)

(Learners do not have to explain why the tail always point away from the Sun.)

9.2.1 Milky Way✓ Galaxy

(1)

9.2.2 Gravity / Gravitational force✓

(1)

9.3.1 Southern Cross✓

(1)

9.3.2 Alpha Centauri✓

(1)

[8]

TOTAL SECTION B: 70

GRAND TOTAL: 90