education

Department of Education
FREE STATE PROVINCE

GRADE 9

NATURAL SCIENCES

NOVEMBER 2022

MARKS: 100

TIME: 2 HOURS

This question paper consists of 15 pages

INSTRUCTIONS

1 This paper consists of TWO sections and ELEVEN questions.

SECTION A: 20 marks
SECTION B: 80 marks

2 Number ALL your answers correctly according to the numbering system used in this question paper.

3 In the case of calculations, show ALL steps.

4 Round answers to TWO decimal places, where applicable.

5 Graph paper is attached for QUESTION 6.3.

6 Write neatly and legibly.

SECTION A

QUESTION 1

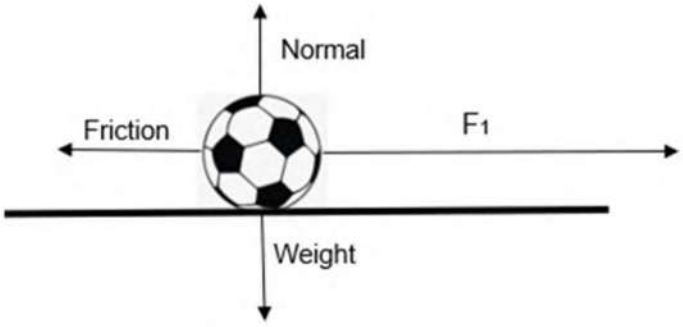
Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A – D) next to the question number (1.1 – 1.10), e.g., 1.11 B.

1.1 The picture below shows a sky diver using a parachute to safely fall towards the Earth.

What type of force is acting on the sky diver in the upward direction?

A Magnetic force
B Applied force
C Gravitational force
D Frictional force (1)

1.2 The diagram below represents forces acting on a ball moving across a horizontal surface.



Which one of the following forces acting on the ball is a non-contact force?

A Normal
B F_1
C Friction
D Weight (1)

1.3 Gravitational force is the force that pulls objects towards the centre of the earth.

What is the relationship between mass and gravitational force?

A The weight of and object is not dependent on the mass of the object.
B The greater the mass of an object, the smaller the gravitational force.
C The greater the mass of an object the greater the gravitational force.
D The mass of an object is always greater than the gravitational force. (1)

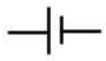
1.4. When a glass rod is rubbed with a piece of silk and the rod becomes positively charged, …

A protons are removed from the silk.
B protons are added to the silk.
C protons are added to the rod.
D electrons are removed from the rod. (1)

1.5 The magnetic field lines OUTSIDE a bar magnet:

A Start at the south pole and end at the north pole.
B Start at the north pole and end at the south pole.
C Start at both poles and end up at infinity.
D Magnetic field lines only exist inside the bar magnet. (1)

1.6 Which one of the following circuit components provides the energy needed for electric charges to move?

A 

B 

C 

D 

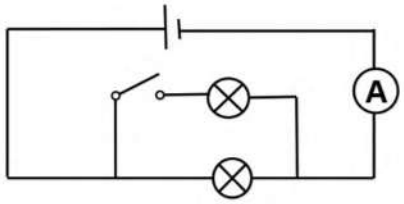
(1)

1.7 Which one of the following pieces of copper wire has the greatest resistance?

A piece of copper wire that is …

A long, thin and hot.
B short, thin and cool.
C long, thick and hot.
D short, thin and cool. (1)

1.8 The reading on the ammeter in the following circuit diagram is 2A.



What will happen to the ammeter reading when the switch is closed?
You can assume that the bulbs used in the circuit are similar.

A The reading will not be affected.
B The reading will increase to 4 A.
C The reading will decrease to 1 A.
D The reading will be 0 A. (1)

1.9 Molten rock material called magma is generally found in the …

A hydrosphere.
B troposphere.
C lithosphere.
D atmosphere. (1)

1.10 Which one of the following is an example of a sedimentary rock?

A Iron ore
B Basalt
C Marble
D Coal (1)
[10]

QUESTION 2

Give the SCIENTIFIC TERM for each of the following descriptions. Write ONLY the correct term next to the question number (2.1 – 2.5) in your answer book.

2.1 The SI unit of force. (1)

2.2 The gas that makes up most of the Earth's atmosphere. (1)

2.3 All weather on earth occurs in this layer of the atmosphere. (1)

2.4 Fossils are typically found in this type of rock. (1)

2.5 The layer of gas in the Earth's atmosphere which protects living organisms from the harmful UV radiation from the sun. (1)
[5]

QUESTION 3

Choose a word from COLUMN B that matches the description in COLUMN A. Write only the letter (A – K) next to the question number (3.1 – 3.5) in your answer book.

COLUMN A	COLUMN B
3.1 The unit of electrical power.	A live wire
3.2 Resistors in parallel.	B potential difference
3.3 A non-contact force.	C coulomb
3.4 The flow of charges in a conductor.	D current dividers
3.5 Brown electrical wire.	E joule
	F potential dividers
	G watt
	H electrical current
	I magnetic force
	J normal force
	K neutral wire

[5]

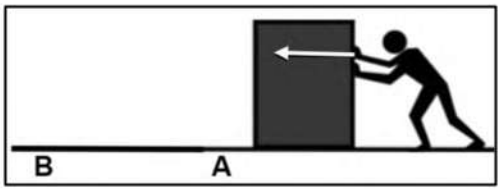
TOTAL SECTION A: 20

SECTION B

QUESTION 4

4.1. State any TWO effects of forces. (2)

4.2 The following diagram shows a man pushing a crate from point A to B across a smooth horizontal surface. **TAKE NOTE:** There is no friction between the surface and the crate.



4.2.1 Name all the forces acting on the crate. (3)

4.2.2 Name the force, acting on the crate, that is equal in size but opposite in direction to the normal force. (1)

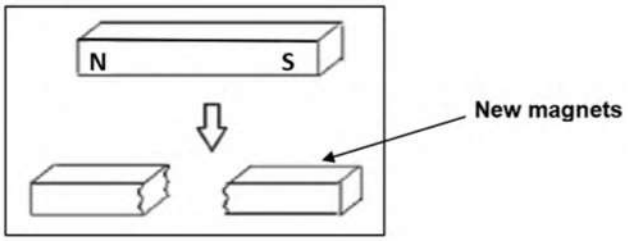
4.3 A balloon becomes negatively charged by rubbing it against a woollen scarf.

4.3.1 Name the sub-atomic particles that can move from one object to another. (1)

4.3.2 Explain how the balloon became negatively charged by referring to the movement of sub-atomic particles. (2)

4.3.3 Will the balloon experience a force of attraction OR repulsion when brought closer to the scarf? Explain your answer. (2)

4.4 A bar magnet is broken in half and the two pieces are separated. The two halves can be considered as two new magnets.



Re-draw the two new magnets in your answering book and indicate the polarity (north and south poles) of both magnets. Draw magnetic field lines to indicate the magnetic field that exists between the magnets. (3)

[14]

QUESTION 5

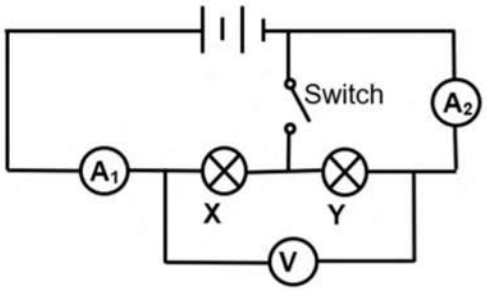
5.1 Draw a circuit diagram in your answering book that consists of the following components:

- A battery, made up of two cells connected in parallel
- An open switch, through which the main current will pass when closed.
- Two bulbs connected in parallel (3)

5.2 Give TWO advantages of connecting bulbs in parallel. (2)

5.3 What useful energy conversion takes place in the light bulbs when the switch is closed in question 5.1? (2)

5.4. Consider the following circuit diagram and answer the questions that follow:
You can assume that all the bulbs in the circuit diagram have the same resistance.



5.4.1 Compare the reading on ammeter A_1 with the reading on ammeter A_2. Explain your answer. (2)

5.4.2 What will happen to the brightness of bulb Y when the switch is closed? Explain your answer. (2)

5.4.3 What will happen to the brightness of bulb X when the switch is closed? Explain your answer. (2)

[13]

QUESTION 6

An investigation was conducted with the aim to determine what influence the length of a conductor has on the current strength passing through the conductor.

A series circuit consisting of two cells, a switch, and an ammeter was set up.
Two crocodile clips were used to connect different lengths of the same type of conductor in the circuit. The current strength passing through five different lengths of this conductor was measured with an ammeter. See table of results.

Circuit diagram:

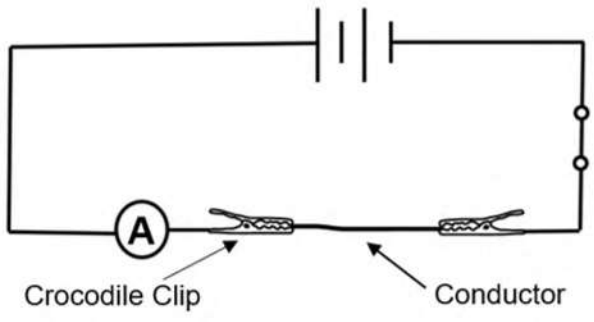


Table of results:

Length of conductor (mm)	Current strength (A)
30	2,3
60	1,2
90	0,8
120	0,6
150	0,5

6.1 Identify the independent variable in this investigation. (1)

6.2 Identify the dependent variable in this investigation. (1)

6.3 Use the graph paper (ANSWER SHEET) attached at the back of the question paper and draw a line graph of current strength versus length of conductor. Label both axes clearly and supply a heading for your graph. (5)

6.4 Use your graph and formulate a suitable conclusion for this investigation. (2)

6.5 Use your knowledge of the relationship that exists between the resistance of a conductor and the current strength that passes through a conductor and determine which length of the conductor used in this investigation has the largest RESISTANCE. (1)

6.6 Name one variable that had to be kept constant during the investigation. (1)
[11]

QUESTION 7

The following table shows the energy usage of different household appliances.

Household appliance	**Power rating (W)**
Oven	2500
Laptop	80
Television	600
Heater	2000
Geyser (Water heating appliance)	3000

7.1 Which appliance consumes the greatest amount of energy when switched on? (1)

7.2 Suggest TWO things that can be done to reduce the average daily energy consumption of a geyser. (2)

7.3 Convert the power rating of the **OVEN** to kW. (1)

7.4 The following formula can be used to calculate the cost of electricity when the power rating of an appliance is known.

Cost = Power rating (kW) x Time (h) x Unit price (R/kWh)

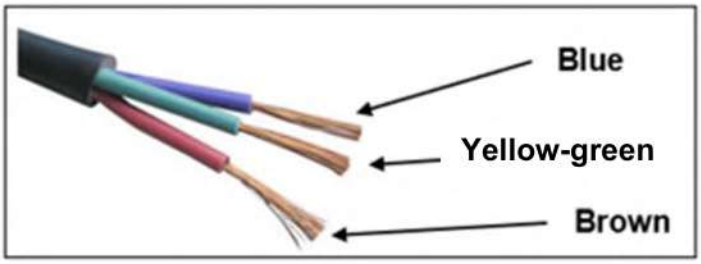
7.4.1 Use the formula and determine the cost of using the oven for a period of one month (30 days).

You can assume that the oven is used for an average of three (3) hours per day and that the price of electricity at your local municipality is R2,40 per unit. (3)

7.4.2 Calculate the cost SAVED per month if the oven is used for two (2) hours per day instead of three (3) hours per day. (3)
[10]

QUESTION 8

8.1 An electric kettle is connected to the 220 V mains supply by means of three different wires.



8.1.1 What is the blue wire called? (1)

8.1.2 Explain the function of the yellow-green wire. (1)

8.2 Koeberg Power Station is the only nuclear power station in South Africa.

The following steps are part of the process of generating electricity at a nuclear power station. Arrange the steps in the correct sequence.

TAKE NOTE: Only write the LETTERS in the correct sequence.

A	Steam turns the turbines.
B	Steam is produced through the heating of water.
C	Rotation of the turbines drive the generators.
D	Heat is released through nuclear fission.

(1)

8.3 Which ONE of the steps in question 8.2 is NOT present in the generation of electricity in a coal fired power station? Write only the LETTER of the answer. (1)

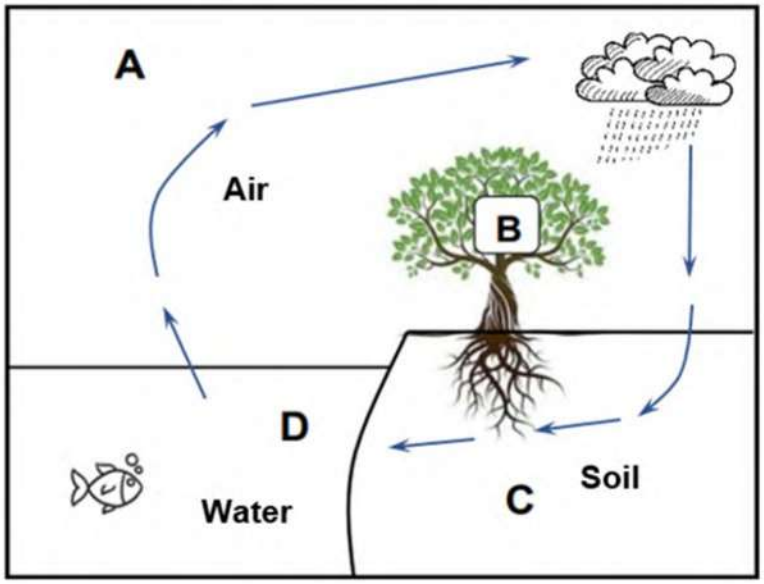
8.4 Give two advantages of generating electricity by using nuclear energy. (2)

8.5 In addition to coal and radioactive nuclear fuel, give two renewable sources of energy that can be used to generate electricity on a large scale. (2)

[8]

QUESTION 9

In the following diagram the letters A, B, C and D represent the four spheres of the earth:

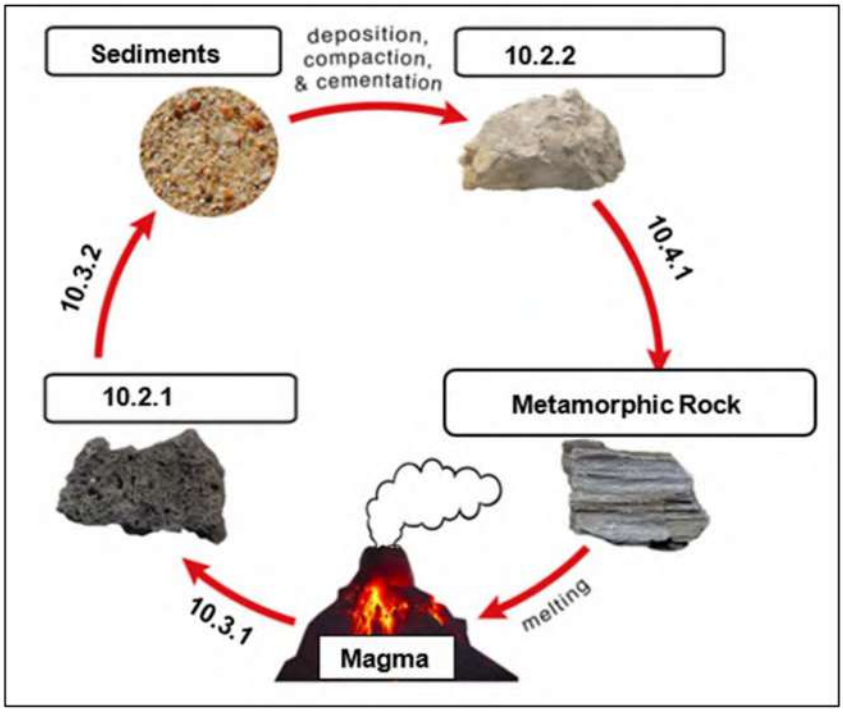


9.1 Name the spheres of the earth represented by letters A and C. (2)

9.2 Use the diagram and explain the interaction that exists between sphere B and sphere D. (2)
[4]

QUESTION 10

Consider the following diagram and answer the questions that follow.



10.1 What is the cycle shown in the diagram called? (1)

10.2 Identify the ROCK TYPES labelled 10.2.1 and 10.2.2.
(NOTE: Only write down the question number and rock type.) (2)

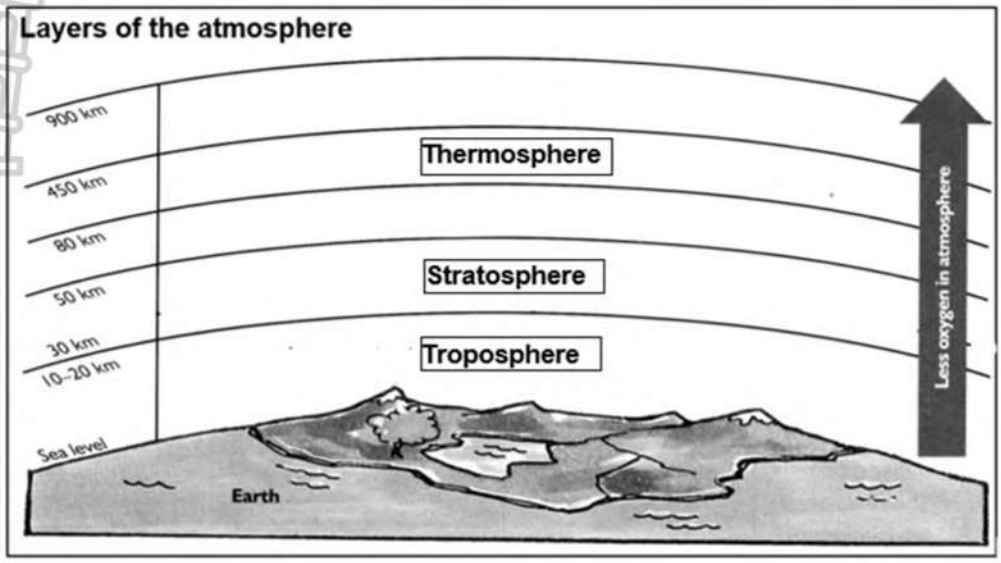
10.3 Identify the PROCESSES labelled 10.3.1 and 10.3.2.
(NOTE: Only write down the question number and process that takes place.)(2)

10.4 Give TWO extreme physical conditions that are needed for rock to undergo metamorphoses in the step labeled 10.4.1 of the cycle. (2)

10.5 Is granite an example of a sedimentary, metamorphic, or igneous rock? (1)

10.6 Briefly describe how granite is formed. (2)
[10]

QUESTION 11



The Earth's atmosphere the mixture of the gases that surrounds the planet. The Earth's atmosphere can be divided into five atmospheric layers or spheres, each with specific characteristics.

11.1 Write down ONLY THE NAME for each of the spheres described in the statements below:

11.1.1 The layer that can be found between the stratosphere and the thermosphere. (1)

11.1.2 The sphere that contains a layer of ozone gas (O_3). (1)

11.1.3 This layer has the greatest density of all the atmospheric layers. (1)

11.2 Give two examples of greenhouse gases. (2)

11.3 The destruction of vegetation by means of deforestation is responsible for the rapid increase in the rate of global warming. Explain this statement. (2)

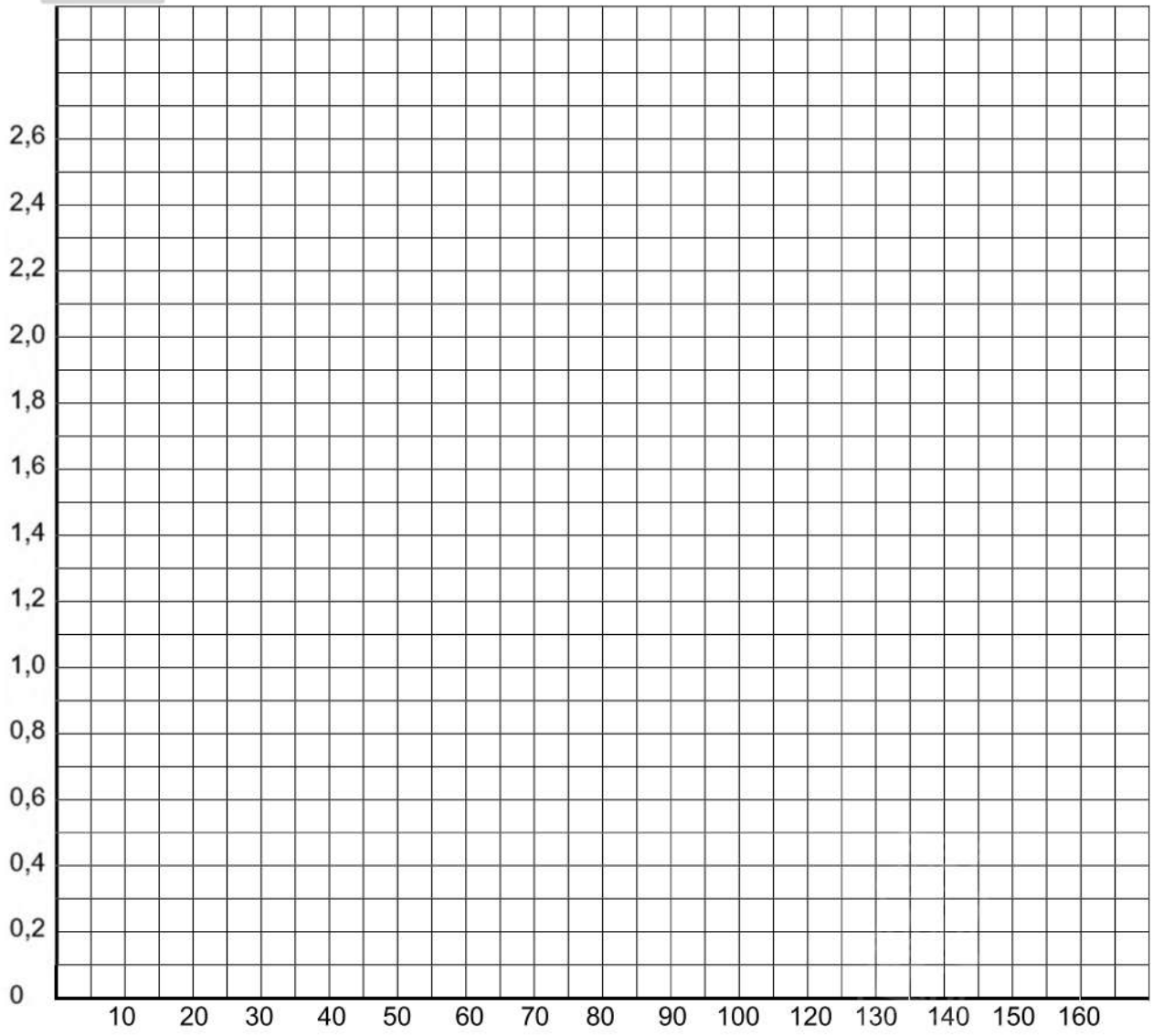
11.4 Global warming is a potential life-threatening problem on earth. Mention THREE (3) negative consequences of global warming on the environment (3)
[10]

TOTAL SECTION A: 20
TOTAL SECTION B: 80
GRAND TOTAL: 100

GRAPH PAPER

QUESTION 6.3 (5)

NAME OF LEARNER: _____



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GRADE 9

NATURAL SCIENCES

NOVEMBER 2022

MEMORANDUM

MARKS: 100

This memorandum consists of 9 pages

SECTION A

QUESTION 1

1.1	D ✓	(1)
1.2	D ✓	(1)
1.3	C ✓	(1)
1.4	D ✓	(1)
1.5	B ✓	(1)
1.6	A ✓	(1)
1.7	A ✓	(1)
1.8	B ✓	(1)
1.9	C ✓	(1)
1.10	D ✓	(1)
		[10]

QUESTION 2

2.1	Newton ✓ (Accept: N)	(1)
2.2	Nitrogen ✓ (Accept: N_2)	(1)
2.3	Troposphere ✓	(1)
2.4	Sedimentary rock ✓	(1)
2.5	Ozone✓	(1)
		[5]

QUESTION 3

3.1	G ✓	(1)
3.2	D ✓	(1)
3.3	I ✓	(1)
3.4	H ✓	(1)
3.5	A ✓	(1)
		[5]

TOTAL SECTION A: 20

SECTION B

QUESTION 4

4.1 A force can …

cause an object to move.
make objects to stop moving.
change the speed of objects (accelerate or decelerate).
change the direction of a moving object.
change the shape of an object.

Any TWO (2) for TWO (2) marks✓✓ (2)

4.2.1 Applied force OR Pushing force OR Force of man on the crate✓
Normal force✓ (Accept: Force of floor on crate)
Gravitational force or weight✓ (3)

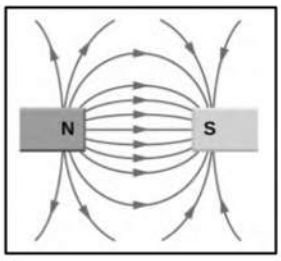
4.2.2 Gravitational force OR Gravity OR Weight of the crate ✓ (1)

4.3.1 Electrons✓ (1)

4.3.2 Friction between the scarf and balloon causes electrons to move from the scarf to the balloon.✓ An excess of electrons✓ (negative charges) on the balloon causes an overall negative charge on the balloon. (2)

4.3.3 The balloon and scarf are charged oppositely after rubbing✓ them together. Oppositely charged objects attract one another✓, therefore the balloon and scarf experience a force of attraction when brought closer together. (2)

4.4



Polarity: N-and S-pole ✓ indicated correctly on both magnets.

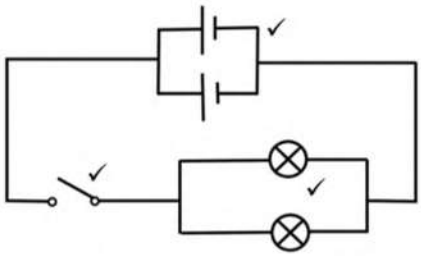
Field lines: The shape of magnetic field between the magnets ✓ (field lines touch surface of magnet and field lines do not cross).

Direction: Correct direction of magnetic field lines (from N to S).✓ (3)

[14]

QUESTION 5

5.1



(3)

5.2 Advantages:
If one bulb burns out (fuses), the remaining bulb(s) will still function.✓
The brightness of bulbs connected in parallel will not be influenced with each new bulb added in parallel. (Brightness remains the same.)✓ (2)

5.3 Electrical energy✓ is converted to light energy.✓ (2)

5.4.1 The reading on A_1 is equal to the reading on A_2.✓
A_1 and A_2 are both connected in series with the same total current passing through A_1 and A_2.✓ (2)

5.4.2 Bulb Y will stop glowing.✓ When the switch is closed, the current will no longer pass through bulb Y because the current will take the route of least resistance.✓
OR
Closing the switch will effectively create a short-circuit.✓ Bulb Y will therefore stop glowing.✓ (2)

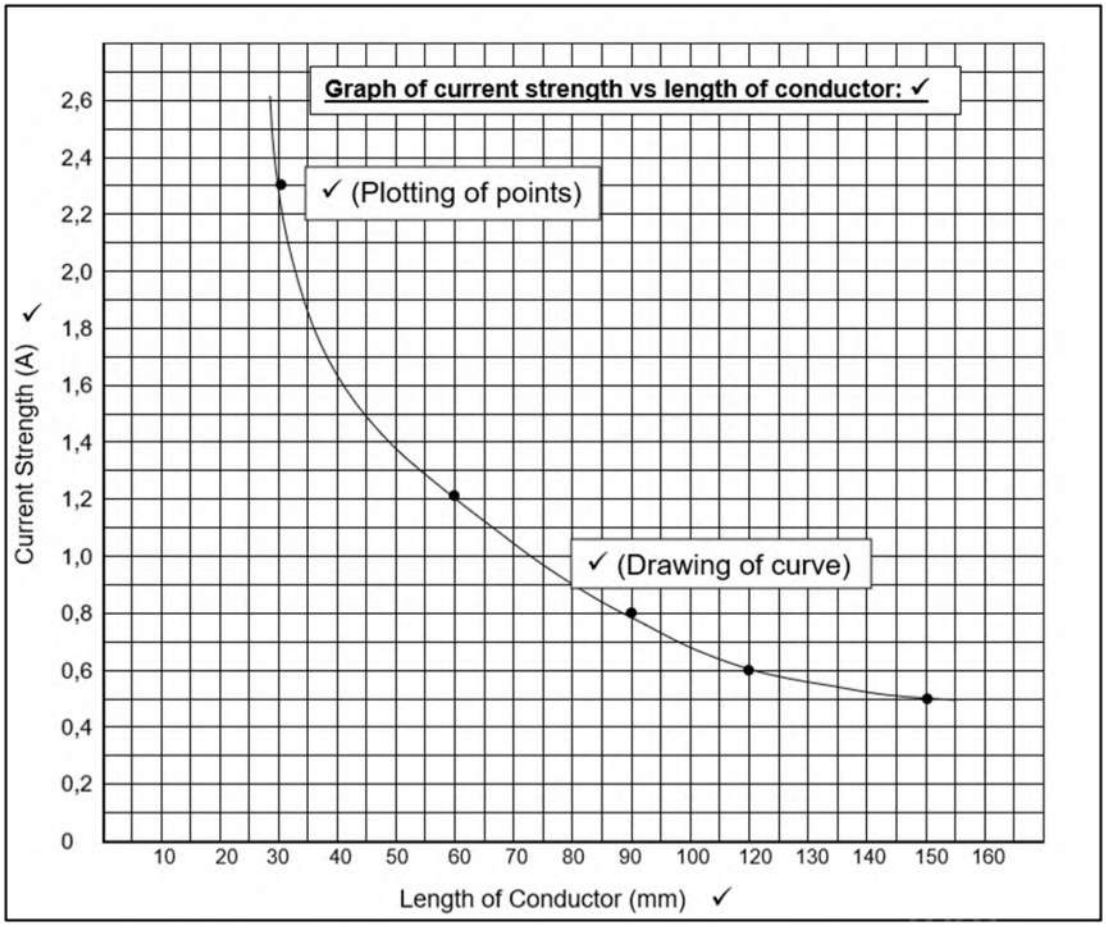
5.4.3 Bulb X will glow brighter. ✓
The total resistance of the circuit will decrease when the switch is closed.
Bulb X will therefore experience a higher total current✓ and glow brighter. (2)
[13]

QUESTION 6

6.1 Length of conductor✓ (1)

6.2 Current strength **OR** Current✓ (1)

6.3 Label and unit on x-axis✓
Label and unit on y-axis✓
Heading of graph; must contain both variables✓
Plotting of data✓
Drawing of line (Best fit curve)✓ (5)



6.4 The <u>longer the conductor</u>✓ the <u>smaller the current</u>✓ that passes through the conductor.
OR
The <u>shorter the conductor</u>✓ the <u>greater the current</u>✓ passing through the conductor. (2)

6.5 150 mm✓ length of conductor (1)

6.6 Temperature **OR** thickness **OR** type of conductor used.✓ (1)
(Any ONE for ONE mark) **[11]**

QUESTION 7

7.1. Geyser✓ (1)

7.2 Switch the geyser off when not in use.
Set the thermostat to a lower maximum temperature (e.g., turn the water temperature down from 65°C to 55°C).
Cover the geyser with insulation material (geyser blanket) which will insulate the geyser against excessive loss of heat, especially during wintertime.
(Any TWO for TWO marks. Alternative answers should be considered)✓✓ (2)

7.3 2500 W = 2,5 kW✓ (1)

7.4.1 **Time** = 30 x 3 = 90 hours ✓

Cost = Power rating x Time x Unit price

Cost = 2,5 x 90 x 2,40✓

Cost = R 540,00✓ (3)

7.4.2 Time = 30 x 2 = 60 hours

Cost = Power rating x Time x Unit price

Cost = 2,5 x 60 x 2,40✓

Cost = R 360,00✓

Saving = R 540,00 – R 360,00 = R 180,00 ✓ (3)

Alternative answers which can also be considered as correct:

Cost = R 540,00 – (2/3 x R 540,00) = R 180,00 (✓✓✓)

OR

Cost = 1/3 x R 540,00 = R 180,00 (✓✓✓)

[10]

QUESTION 8

8.1.1 Neutral wire✓ (1)

8.1.2 The yellow-green wire is used as a protective measure.✓
OR
The yellow-green wire is wired to the earth, making appliances shock proof in case of a short circuit.✓ (1)

8.2 D, B, A, C ✓ (1)

8.3 D✓(Heat is released through nuclear fission.) (1)

8.4 Nuclear energy is considered as clean energy with no harmful gasses released into the atmosphere during generation.
Generation of electricity by means of nuclear energy is cost effective and reliable.
A large supply of nuclear fuel is available which is promising for future energy supply.
Nuclear fuel has an enormous energy density, meaning that a relatively small amount of fuel is needed to generate a large amount of electricity.

(Any TWO for TWO marks. Alternative answers should be considered)✓✓ (2)

8.5 Solar energy; Hydro energy; Wind energy; Tidal energy; Geothermal energy Biomass energy
(Any TWO for TWO marks)✓✓ (2)
[8]

QUESTION 9

9.1 A = Atmosphere✓
C = Lithosphere✓ (2)

9.2 The hydrosphere (sphere D) provides water for the biosphere (sphere B) to function, grow, and live in: E.g.,

- Animals drink water
- Fish live / swim in water
- Water is needed for plants to grow

(Alternative correct answers should be considered)✓✓ (2)
[4]

QUESTION 10

10.1 Rock cycle✓ (1)

10.2.1 Igneous rock✓
10.2.2 Sedimentary rock✓ (2)

10.3.1 Cooling down AND/OR Solidification ✓
10.3.2 Weathering AND/OR Erosion ✓ (2)

10.4 High temperature✓
High pressure✓ (2)

10.5 Igneous rock✓ (1)

10.6 Granite is formed inside a volcano✓ (deep beneath the Earth's crust) when magma cools down and solidifies.✓ (2)
[10]

QUESTION 11

11.1.1 Mesosphere✓ (1)

11.1.2 Stratosphere✓ (1)

11.1.3 Troposphere✓ (1)

11.2 Carbon dioxide (CO_2)
Methane (CH_4)
Water vapour (H_2O)
Nitrous oxide (N_2O)
Ozone (O_3)

(Any TWO for TWO marks. Either the name or the chemical formula is acceptable)✓✓ (2)

11.3 Vegetation (green plants) convert carbon dioxide gas to oxygen gas during the process of photosynthesis. ✓ Less vegetation because of deforestation, means that the carbon dioxide gas levels in the atmosphere will increase more rapidly. Carbon dioxide gas is a heat trapping greenhouse gas responsible for the rapid increase in global warming.✓

OR

The burning down (combustion) of rain forests and other vegetation to open up land for development releases large volumes of carbon dioxide gas into the atmosphere. ✓ Carbon dioxide is a heat trapping greenhouse gas. This increase in carbon dioxide gas in the atmosphere, leads to an increase in the rate of global warming.✓ (2)

11.4 Climate change ✓
Rising sea levels✓
Destruction of agricultural land✓
Food shortage✓
Mass extinction✓ (**ANY THREE**)
(Alternative answers can also be considered – use discretion) (3)
[10]

TOTAL SECTION B: 80
GRAND TOTAL: 100