



education

Department of
Education
FREE STATE PROVINCE

GRADE 9

NATURAL SCIENCES

NOVEMBER 2024

MARKS: 100

TIME: 2 HOURS

INSTRUCTIONS

1. This paper consists of TWO sections and ELEVEN questions.
SECTION A: 20 marks (QUESTION 1 TO 3)
SECTION B: 80 marks (QUESTION 4 TO 11)
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. Write neatly and legibly.
6. SKIP A LINE between sub-questions e.g., 4.1.1 and 4.1.2.

This question paper consists of 14 pages.

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 Gravitational force is ...

- A a push.
- B a pull.
- C either a push or a pull.
- D neither a push nor a pull.

(1)

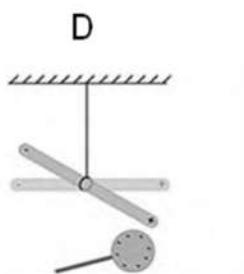
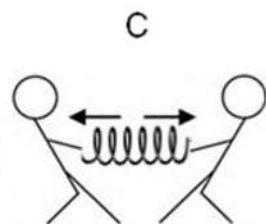
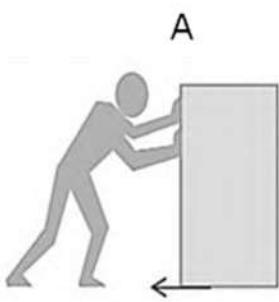
1.2 A stationery tin can is crushed by hitting it with a hammer. What is the EFFECT of the force exerted by the hammer on the tin can?



- A It changes the shape of the can.
- B It changes the speed of the can.
- C It causes the can to rotate.
- D It changes the direction in which the can moves.

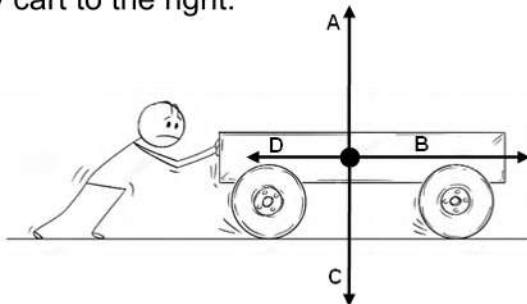
(1)

1.3 Which diagram illustrates electrostatic force?



(1)

1.4 A man pushes a heavy cart to the right.



What are the correct labels for forces B and D exerted on the cart?

	Label for force B	Label for force D
A	Normal force	Friction
B	Friction	Weight
C	Applied force	Normal force
D	Applied force	Friction

(1)

1.5 An electrical component which converts electrical energy into sound energy.

- A Resistor
- B Buzzer
- C Bulb
- D Cell

(1)

1.6 The function of a voltmeter in an electric circuit.

- A To provide energy for the current to flow.
- B To measure potential difference.
- C To measure the strength of the current.
- D To control the flow of current.

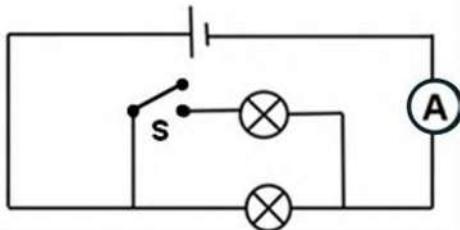
(1)

1.7 A parallel circuit ...

- A is a circuit in which the bulbs are connected side by side.
- B provides only one pathway for the current to flow through.
- C provides high resistance to avoid components from fusing.
- D divides the current between the resistors.

(1)

1.8 Two identical bulbs are connected in parallel in the circuit, shown below.



What will happen to the ammeter reading when switch S is closed?

- A The reading will not be affected.
- B The reading will increase (become higher).
- C The reading will decrease (become lower).
- D The reading will be 0 A.

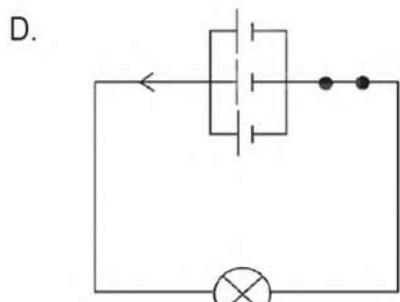
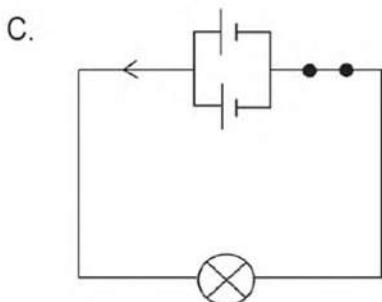
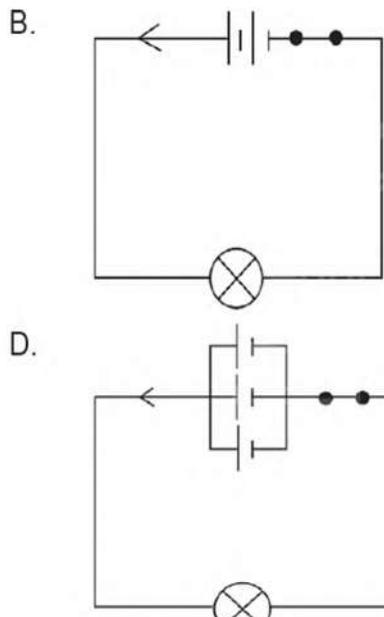
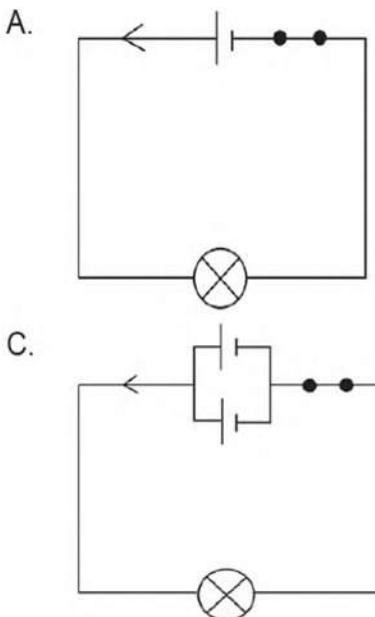
(1)

1.9 Which one of the following circuit components is a source of energy?

- A
- B
- C
- D

(1)

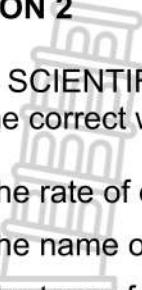
1.10 Identical light bulbs and cells are used in the following circuits. In which circuit does the light bulb glow the brightest?



(1)
[10]

QUESTION 2

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



- 2.1 The rate of electrical energy supply. (1)
- 2.2 The name of the nuclear power station near Cape Town. (1)
- 2.3 The type of electricity generated by falling water. (1)
- 2.4 The device used to step down or step up the voltage in a circuit. (1)
- 2.5 The green-and-yellow wire in a three-pin plug. (1)

[5]

QUESTION 3

Match the description in COLUMN A with a word in COLUMN B. Write only the LETTER (A – J) next to the question number (3.1 – 3.5) in your answer book.

COLUMN A		COLUMN B	
3.1	The layer of the atmosphere where weather occurs.	A	Crust
3.2	The layer of the earth which consists of magma (molten rock).	B	Troposphere
3.3	Molten (liquid) rock which comes out of a volcano.	C	Magma
3.4	Earth's interconnected web of life, including all living organisms and their environments.	D	Ecosystem
3.5	An example of igneous rock.	E	Mantle
		F	Stratosphere
		G	Lava
		H	Biosphere
		I	Sandstone
		J	Granite

[5]

TOTAL SECTION A: 20

SECTION B

QUESTION 4

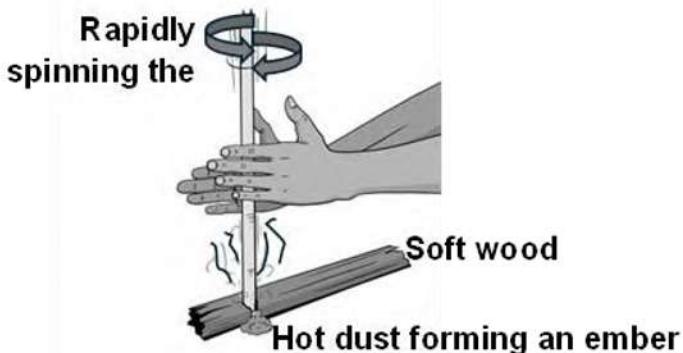
4.1 Consider the following forces:

Friction; Magnetic force; Tension; Electrostatic force

Which of these forces are contact forces?

(2)

4.2 Fire can be made by spinning a sharpened stick of wood in a socket (hole) in another piece of wood. Eventually, the wood dust heats up to form an ember which can be used to ignite a bundle of dry grass to start a fire.



4.2.1 Identify the force causing the wood dust to heat up. (1)

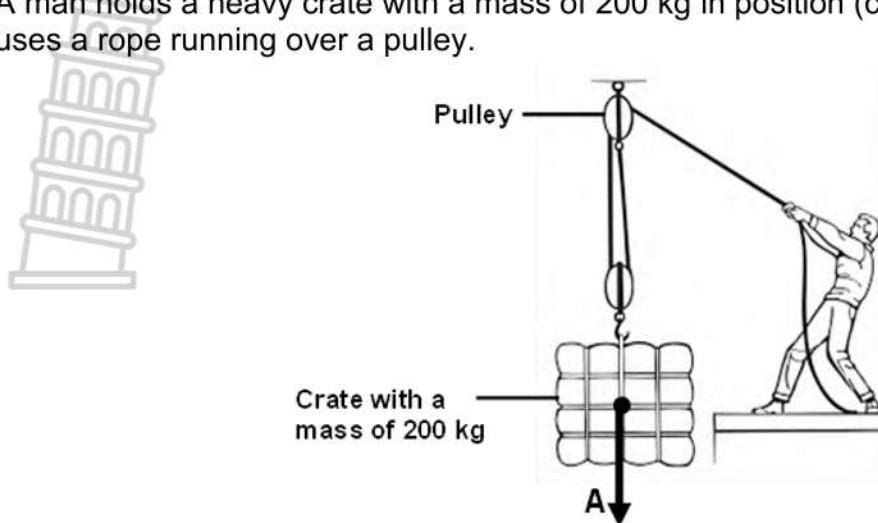
4.2.2 Explain why it is necessary for the stick to spin rapidly and to apply slight pressure on the wood for this fire-making method to be effective. (2)

4.3 Road signs, like the one in the diagram, warns drivers to drive carefully when the road is slippery after a shower of rain.



Explain why the car might start to skid (drift) across the wet road. (2)

4.4 A man holds a heavy crate with a mass of 200 kg in position (crate is not moving). He uses a rope running over a pulley.



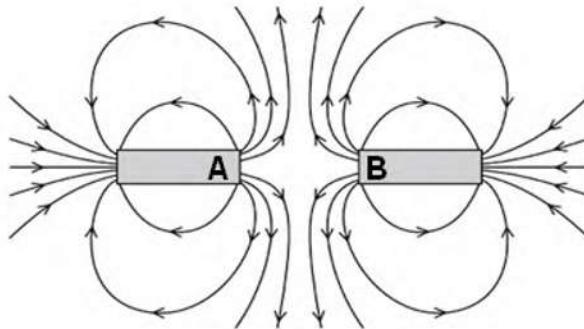
4.4.1 Calculate the weight of the crate.

Given: $w = mg$ and $g = 9.8 \text{ m}\cdot\text{s}^{-2}$ (2)

4.4.2 Label force A. (1)

4.4.3 What is the magnitude of the tension in the rope? (1)

4.5 Two bar magnets are placed close to each other and the following magnetic field pattern is observed.



4.5.1 Give a reason from the diagram why A and B are LIKE (similar) poles. (1)

4.5.2 Redraw the two bar magnets below and draw the field pattern between these two magnets. Opposite poles (UNLIKE poles) now face each other. (1)



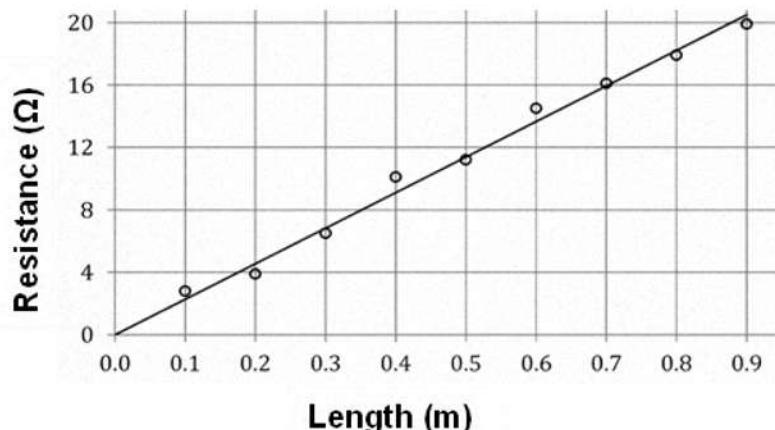
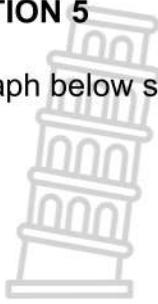
(2)

4.5.3 What will happen to the strength of the magnetic force between two magnets if they are moved closer together? (1)

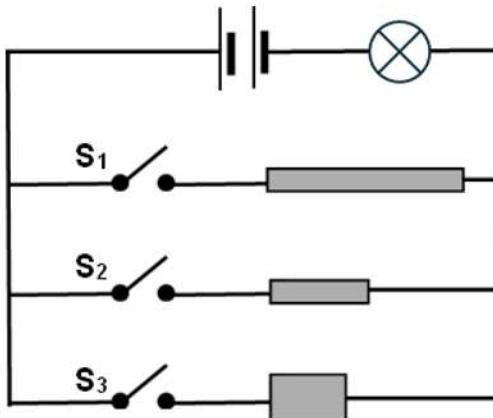
[15]

QUESTION 5

The graph below shows the relationship between the length of a resistor and its resistance.



- 5.1 Read from the graph, the length of a resistor with a resistance of $16\ \Omega$. (1)
- 5.2 Read from the graph, the resistance of a resistor with a length of 0,1 m. (1)
- 5.3 Use the graph to answer the following investigative question:
How does the length of a resistor affect its resistance? (2)
- 5.4 Except for length, name TWO other factors that affect the resistance of a resistor. (2)
- 5.5 Which ONE of the following switches, when closed, would make the bulb glow the BRIGHTTEST? The resistors are at the same temperature and made of the same material.



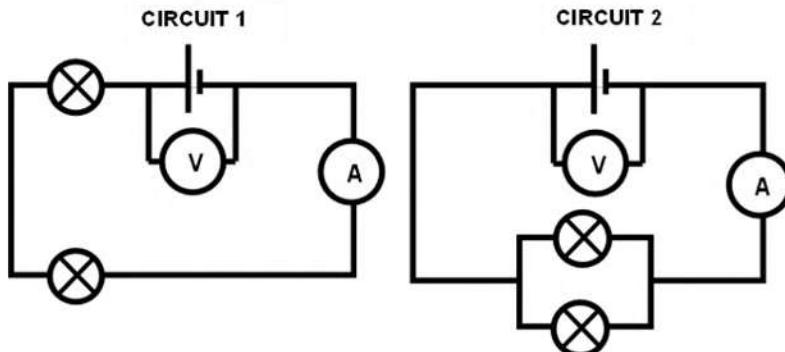
Choose between S_1 , S_2 or S_3 .

(1)

[7]

QUESTION 6

6.1 Study the circuit diagrams below and answer the questions that follow. All bulbs and cells are identical.



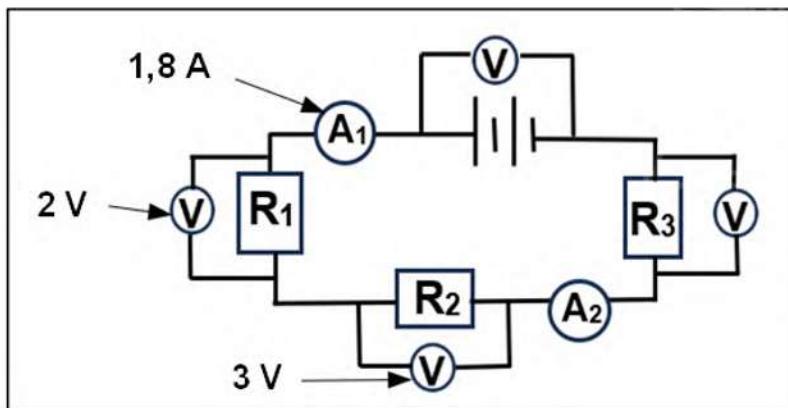
6.1.1 Give a reason why one can say that the bulbs in circuit 1 are NOT connected in parallel. (1)

6.1.2 Explain why the ammeter reading in circuit 1 is less than in circuit 2. (2)

6.1.3 If ONE bulb is added in parallel to CIRCUIT 2, what will be the effect on the:
(Choose between INCREASES, DECREASES or REMAINS THE SAME.)

- Voltmeter reading. (1)
- Total (overall) resistance of the circuit. (1)
- Ammeter reading. (1)
- The brightness of the bulbs. (1)

6.2 The circuit diagram below shows a battery consisting of two identical cells, three resistors (R_1 , R_2 and R_3) in series and two ammeters (A_1 and A_2). A voltmeter is connected across the battery, and across each of the three resistors. The reading on ammeter A_1 is 1,8 A. The potential difference across R_1 and R_2 are 2 V and 3 V respectively.



6.2.1 What is the reading on ammeter A_2 ? (1)

6.2.2 The reading on the voltmeter connected across the battery is 9 V.

- What is the potential difference that each of the cells can supply? (1)
- Calculate the reading on the voltmeter connected across R_3 . (2)

6.2.3 What will happen to the reading on A_2 in each of the following cases?
Only write INCREASES, DECREASES or REMAINS THE SAME.

- A third cell is added in series to the battery. (1)
- One of the resistors is replaced with a piece of thick copper wire. (1)
- A fourth resistor is connected in parallel, across R_2 . (1)

[14]

QUESTION 7

7.1 The diagram below shows an old-fashioned fridge and a modern energy-saving fridge.

Old-fashioned 800 W fridge



Modern 380 W energy-saving fridge



7.1 Convert 800 W to kW. (1)

7.2 Use the following formula:

$$\text{Cost} = \text{Power rating of the appliance} \times \text{Time used} \times \text{Unit price of electricity}$$

7.2.1 Calculate the cost to use the 800 W old-fashioned fridge for 8 hours if the unit price of electricity is R 4,00. (2)

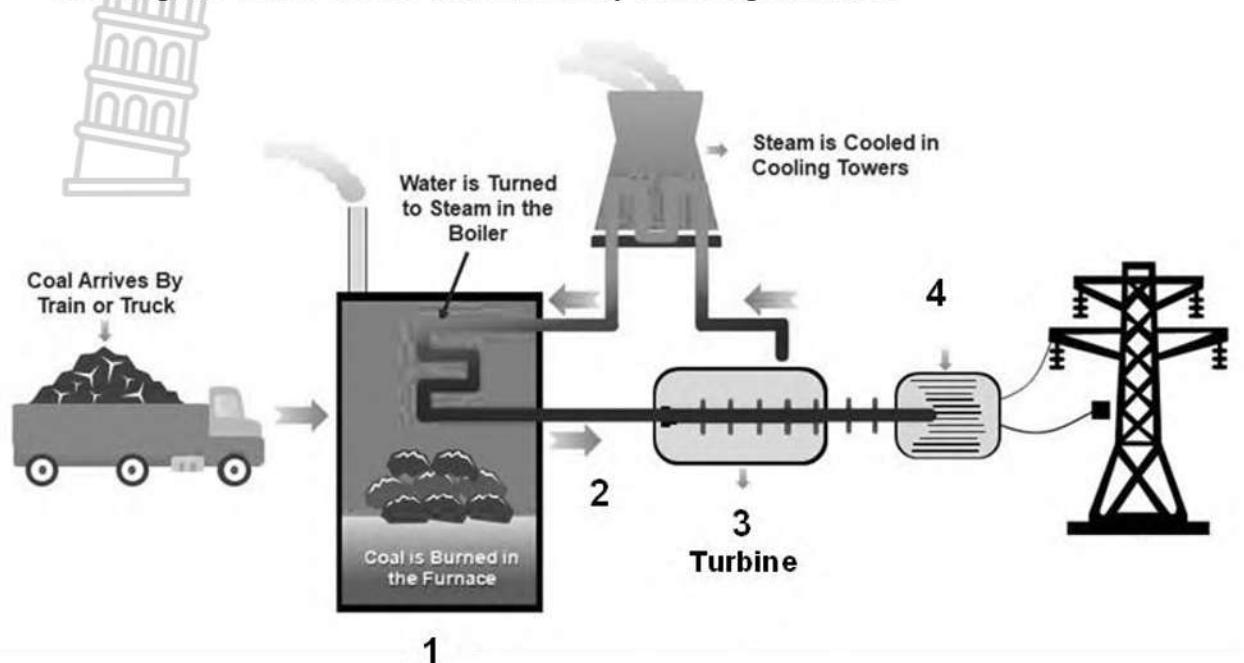
7.2.2 Calculate the cost to use the modern 380 W fridge for 8 hours if the unit price of electricity is R 4,00. (2)

7.3 Mention two advantages of using energy-saving devices. (2)

[7]

QUESTION 8

8.1 The diagram below shows how electricity can be generated.



8.1.1 Provide a suitable heading for the diagram. (1)

8.1.2 Which fuel is used to boil the water? (1)

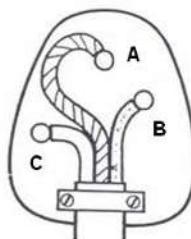
8.1.3 What is used to make the turbine rotate (turn)? (1)

8.1.4 Label part 4 in the diagram. (1)

8.1.5 Give a reason why this method of generating electricity is NOT sustainable. (1)

8.1.6 Suggest two alternative methods that can be used to generate electricity which is sustainable with very little impact on the environment. (2)

8.2 Study the diagram of the top view of a three-pin plug.



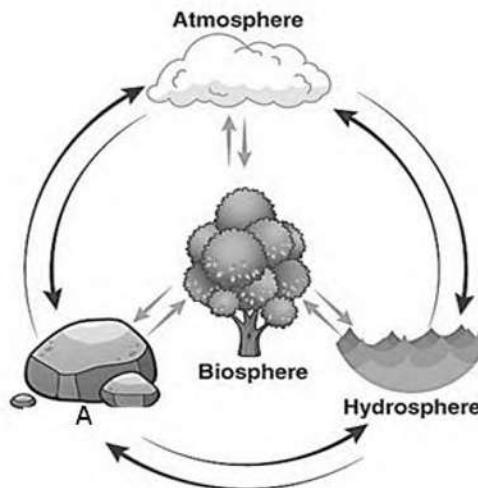
8.2.1 Give the COLOURS of wires A and B. (2)

8.2.2 What is the function of the earth wire in the 3-pin plug? (1)

[10]

QUESTION 9

9.1 Shown below are the four spheres of the Earth. Answer the questions that follow.



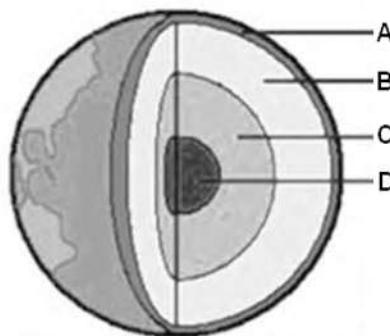
9.1.1 Name sphere A composed of soil, rock and various minerals. (1)

9.1.2 Give an example of how sphere A interacts with the biosphere. (1)

9.1.3 Identify the sphere from which plants get the water they need. (1)

9.1.4 Explain how the air in the atmosphere around the tree is involved in its life processes. (2)

9.2 The diagram below represents the structure of the Earth.



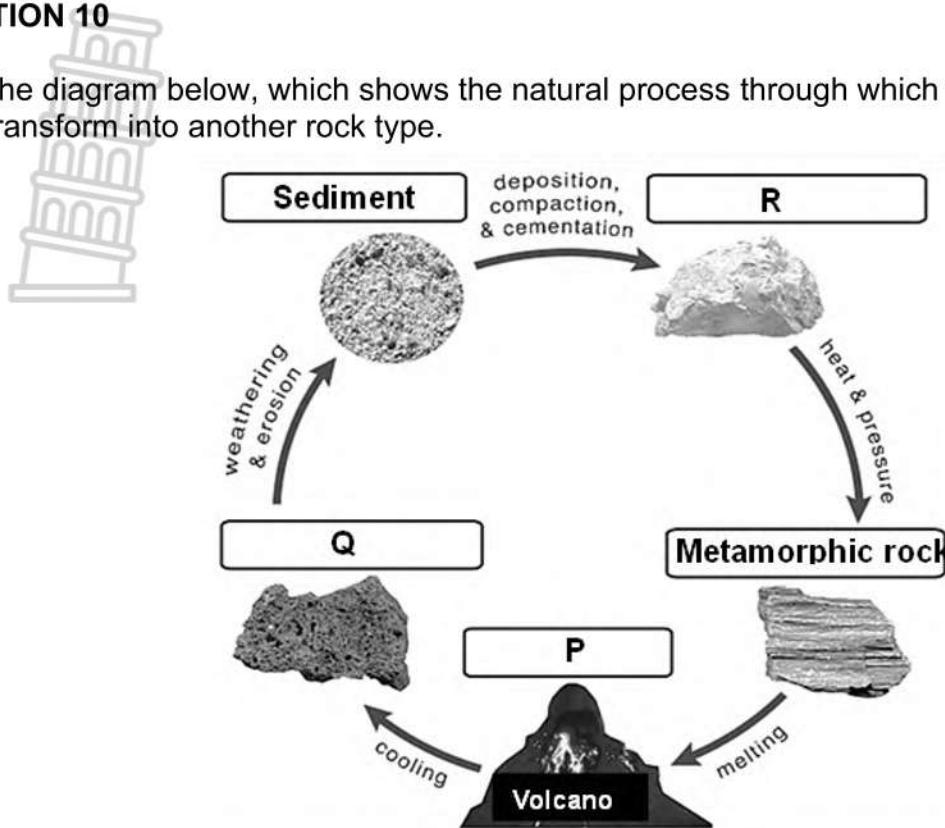
Give the LETTER (A, B, C or D) for each of the following layers of the Earth:

9.2.1 Inner core (1)
 9.2.2 Crust (1)
 9.2.3 The layer where magma is found. (1)

[8]

QUESTION 10

Study the diagram below, which shows the natural process through which the three main rock types transform into another rock type.



10.1 Provide this diagram with a suitable heading. (1)

10.2 Use the words in the WORD BOX to answer the following questions:

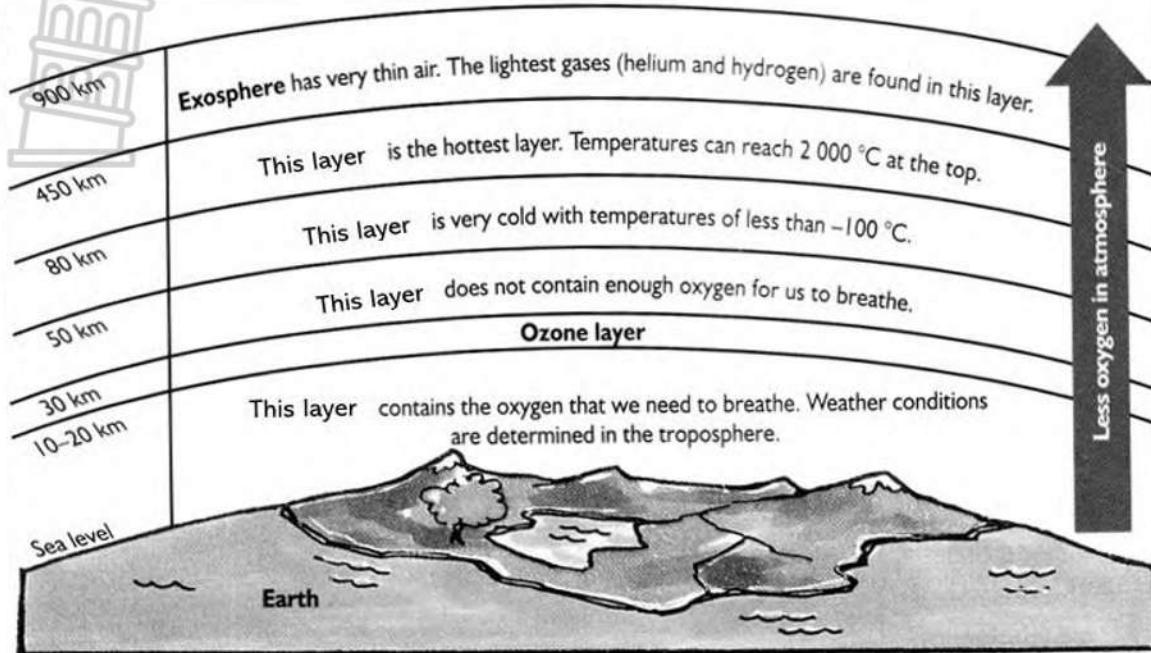
Metamorphic rock	Igneous rock	Magma	Marble
Sedimentary rock	Sandstone	Pumice stone	Limestone

- The molten rock (P) that pushes up into the volcano. (1)
- The type of rock that forms when molten rock (Q) from the volcano cools down. (1)
- The type of rock that forms when layers of sediments (R) are compressed. (1)
- An igneous rock which forms when magma cools down rapidly. (1)
- An example of a sedimentary rock. (1)
- An example of a metamorphic rock. (1)

10.3 Explain how rocks on the surface of the Earth are weathered to form smaller particles, like sand. (2)
[9]

QUESTION 11

Use the diagram of the layers of the atmosphere below to answer the questions.



11.1 Name each of the following layers:

- The layer that includes the ozone layer and extends to 50 km above the surface of the Earth. (1)
- The layer directly above the surface of the Earth where weather occurs. (1)
- The hottest layer which is up to 450 km above the surface of the Earth. (1)
- The layer with a temperature of -100° C. (1)

11.2 What is the function of the ozone layer? (1)

11.3 Mention TWO consequences for Earth if the ozone layer depletes or disappears. (2)

11.4 Greenland is losing about 300 gigatons of ice per year, causing the sea level to rise because of melting ice.

11.4.1 What is the primary cause of polar ice melting? (1)

11.4.2 Name TWO greenhouse gases contributing to the phenomenon mentioned in question 11.4.1. (2)
[10]

TOTAL SECTION B: 80
GRAND TOTAL: 100



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GRADE 9

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MEMORANDUM

MARKS: 100

This memorandum consists of 7 pages

SECTION A

QUESTION 1



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

QUESTION 2

2.1	(Electrical) power ✓	(1)
2.2	Koeberg ✓	(1)
2.3	Hydro✓(electricity)	(1)
2.4	Transformer ✓	(1)
2.5	Earth✓ (wire)	(1)
		[5]

QUESTION 3

3.1	B✓	(1)
3.2	E✓	(1)
3.3	G✓	(1)
3.4	H✓	(1)
3.5	J✓	(1)
		[5]

TOTAL SECTION A: 20

SECTION B**QUESTION 4**

4.1 Friction ✓
Tension ✓ (In any order) (2)

4.2.1 Friction✓ (1)

4.2.2 The pressure and rapid spinning of the stick increases the friction✓ and the production of heat. ✓ (2)

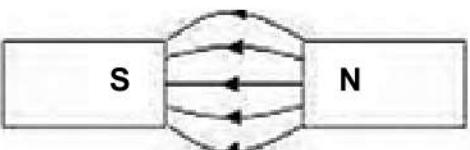
4.3 Due to the layer of water on the road, the friction✓ between the tires and the road decreases / is less,✓ which might cause the driver to lose control of the car. (2)

4.4.1 $w = mg$ (No mark on formula; formula was given)
 $= 200 \times 9,8$ ✓ (Correct substitution)
 $= 1960 \text{ N}$ ✓ (Answer, WITH the correct unit) (2)

4.4.2 Weight **OR** Gravitational force **OR** Force of gravity✓ (1)

4.4.3 1 960 N (Apply **positive marking** from 4.4.1)
OR
The same as the weight of the crate. ✓ (1)

4.5.1 The magnetic fields / field lines oppose each other.✓
(Accept: the magnetic fields / magnets repel each other.) (1)

4.5.2 

Marking criteria:

- ✓ Shape of the magnetic field.
- ✓ Direction indicated from N to S.

(2)

4.5.3 The magnetic force will increase / become stronger. ✓ (1)
[15]

QUESTION 5

5.1 0,7 m ✓

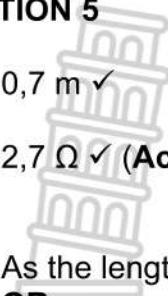
5.2 2,7 Ω ✓ (Accept any value from 2,5 Ω to 3 Ω)

5.3 As the length of the resistor increases, the resistance also increases.
OR
 As the resistor gets longer, the resistance becomes more.
OR
 Resistance increases with an increase in length.

Penalise with ONLY one mark if the measuring unit is incorrect or omitted.

(1)

(1)

**Marking criteria****Marks**

BOTH variables are mentioned: Length and Resistance ✓

The correct RELATIONSHIP between the variables is given. ✓

(2)

5.4 Thickness ✓
 Type of material / metal ✓
 Temperature ✓ (DO NOT ACCEPT LENGTH) (ANY TWO) (2)

5.5 S_3 ✓ (1)
[7]

QUESTION 6**NOTE:** In calculations, ALL steps must be shown.

Penalise only ONCE in Question 6 if a unit is incorrect or omitted.

6.1.1 There is only one pathway for the current to flow through. ✓
OR
 The circuit does not branch / current does not divide. ✓ (1)

6.1.2 In circuit 1, the two bulbs are connected in series. ✓
Overall resistance in circuit 1 is more ✓ than in circuit 2.
 Thus, overall current in circuit 1 is less than in circuit 2. (given in question) (2)

6.1.3 a) Remains the same ✓ (1)
 b) Decreases ✓ (1)
 c) Increases ✓ (1)
 d) Remains the same ✓ (1)

6.2.1 $1,8 \text{ A} \checkmark$ (1)

6.2.2 a) $9 \text{ V} \div 2 = 4,5 \text{ V} \checkmark$ (1)

b)
$$\begin{aligned} V_{R3} &= 9 - (2+3) \checkmark && \text{(Substitution)} \\ &= 9 - 5 \\ &= 4 \text{ V} \checkmark && \text{(Correct answer with a unit)} \end{aligned}$$
 (2)

6.2.3 a) Increases \checkmark (1)

b) Increases \checkmark (1)

c) Increases \checkmark (1)

[14]

QUESTION 7

NOTE: In calculations, ALL steps must be shown.

Penalise only ONCE in Question 7 if a unit is incorrect or omitted.

7.1 $800 \div 1\ 000 = 0,8 \text{ kW} \checkmark$ (Apply **positive marking** from 7.1 to 7.2.1) (1)

7.2.1
$$\begin{aligned} \text{Cost} &= \text{Power rating of the appliance} \times \text{Time used} \times \text{Unit price of electricity} \\ &= 0,8 \times 8 \times 4 \checkmark && \text{(Substitution)} \\ &= \text{R } 25,60 \checkmark && \text{(Answer with unit, rounded to two decimals)} \end{aligned}$$
 (2)

7.2.2
$$\begin{aligned} \text{Cost} &= \text{Power rating of the appliance} \times \text{Time used} \times \text{Unit price of electricity} \\ &= 0,38 \times 8 \times 4 \checkmark && \text{(If substitution is wrong; answer is wrong; 0/2)} \\ &= \text{R } 12,16 \checkmark && \text{(Answer with unit, rounded to two decimals)} \end{aligned}$$
 (2)

7.3 It saves money / is cheaper / costs less to use energy-saving devices. \checkmark
 Less electricity must be generated, therefore less fossil fuel is used. \checkmark
 Smaller negative impact on the environment / less greenhouse gases are emitted / less pollution. \checkmark
 Reduces the demand for electricity and can lead to less loadshedding. \checkmark

(ANY TWO) (2)
 [7]

QUESTION 8


8.1.1 Power station / Coal-fired power station✓ (1)

8.1.2 Coal✓ (1)

8.1.3 Steam✓ (1)

8.1.4 Generator✓ (1)

8.1.5 Coal is a fossil fuel and cannot be replaced / replenished. ✓ (1)

8.1.6 Solar energy✓
 Wind energy✓
 Hydro-energy✓
 Wave energy✓
 Biomass✓
 (Accept: Nuclear energy✓) (ANY TWO) (2)

8.2.1 A – Yellow and green✓
 B - Brown✓ (Accept: Red) (2)

8.2.2 The earth wire directs / leads excess charge/current into the ground. ✓
OR
 It prevents an electrical shock if the live wire touches the metal casing of the appliance. ✓ (1)

[10]

QUESTION 9

9.1.1 Lithosphere✓ (1)

9.1.2 The tree's roots are anchored by the soil and keeps it upright.✓
OR
 The tree absorbs minerals / nutrients from the soil (lithosphere). ✓ (1)

9.1.3 Hydrosphere✓ (1)

9.1.4 The leaves of the tree absorb carbon dioxide from the atmosphere for photosynthesis✓ and releases oxygen which supports the respiration of other organisms.✓ (2)

9.2.1 D✓
 9.2.2 A✓
 9.2.3 B✓ (Accept: C) (3)

[8]

**QUESTION 10**

10.1 Rock cycle✓ (1)

10.2 a) Magma✓ (DO NOT accept lava) (1)
 b) Igneous rock✓ (1)
 c) Sedimentary rock✓ (1)
 d) Pumice stone✓ (1)
 e) Sandstone OR Limestone✓ (1)
 f) Marble✓ (1)

10.3 Rocks are weathered/broken down by:
 Heat,✓ cold, ✓ wind, ✓ water, ✓ corrosion ✓ (ANY TWO) (2)
 [9]

QUESTION 11

11.1 a) Stratosphere ✓ (1)
 b) Troposphere ✓ (1)
 c) Thermosphere ✓ (1)
 d) Mesosphere✓ (1)

11.2 It protects the Earth against the ultraviolet / UV radiation from the Sun.✓ (1)

11.3 Cause skin cancer / cataracts ✓
 Affects human health / Weaken immune systems ✓
 Damage plants / Reduce crops / Disrupts photosynthesis ✓
 Disrupts life cycles / Decreases the sizes of populations or species ✓ (ANY TWO)(2)

11.4.1 Global warming ✓ (1)

11.4.2 Carbon dioxide / CO₂✓
 Water vapour / H₂O(g) ✓
 Methane / CH₄ ✓
 Nitrous oxide (N₂O) ✓
 (Accept: Carbon monoxide / CO) (ANY TWO) (2)
 [10]

TOTAL SECTION B: 80
GRAND TOTAL: 100