HILLCREST HIGH SCHOOL

NATURAL SCIENCE EXAM

GRADE 9 **NOVEMBER 2019**

TIME : 2 HRS **TOTAL : 120**

INSTRUCTIONS

1. This question paper consists of 13 pages and 4 sections:
   SECTION A and B: EARTH SCIENCE (60)
   SECTION C and D: PHYSICAL SCIENCE (60)
2. Non-programmable calculators may be used
3. Number the answers correctly according to the numbering system used in this question paper
4. A formula sheet is provided below for your use
5. Give brief motivations, discussions, et cetera where required
6. Calculations must be rounded off to two decimal places where appropriate
7. RULE OFF after each question and leave a line between each answer

FORMULA SHEET

$R = \frac{V}{I}$ $Rs = r_1 + r_2 + r_3$ ..... $\frac{1}{Rp} = \frac{1}{r_1} + \frac{1}{r_2} + \frac{1}{r_3}$ .....

$W = mg$ $g_E = 9,8\ m.s^{-2}$

EARTH SCIENCE

SECTION A:

QUESTION 1: MULTIPLE CHOICE [10 X 1 = 10]

Four options are provided as possible answers to the following questions.
Each question has only one correct answer. Write only the letter **(A-D)** next to the question number **(1.1 – 1.10)** in the answer book.

1.1 The element that is most abundant in the Earth's crust is
- A. silicon
- B. nitrogen
- C. carbon
- D. oxygen

1.2 The atmosphere has four layers, namely the ……
- A. lithosphere, hydrosphere, atmosphere, biosphere
- B. mesosphere, thermosphere, stratosphere, troposphere
- C. water vapour, carbon dioxide, oxygen, nitrogen
- D. thermosphere, mesosphere, biosphere and hydrosphere

1.3 An igneous rock that forms from magma by cooling very rapidly on the surface of the Earth is called
- A. granite
- B. basalt
- C. pumice stone
- D. sandstone

1.4 The lithosphere is made up of the
- A. crust and upper mantle
- B. mantle only
- C. crust only
- D. outer core and the mantle

1.5 _____ is a manual technique used to sort gold from sediments.
- A. Shaft mining
- B. Panning
- C. Surface mining
- D. Sorting

1.6 Ore is removed from the crust of the Earth by the process of:
- A. mining
- B. sorting
- C. sieving
- D. extracting

1.7 The type of rock most likely to contain fossils is
- A. igneous
- B. marble
- C. sedimentary
- D. metamorphic

1.8 Most meteorites burn up in this layer of the atmosphere.

A. Troposphere
B. Mesosphere
C. Stratosphere
D. Thermosphere

1.9 Stars are born inside huge clouds of gas and dust called

A. Nebulae
B. Constellations
C. Comets
D. Galaxies

1.10 The sun is a…

A. supernova
B. red giant
C. white dwarf
D. yellow dwarf star

QUESTION 2: TERMINOLOGY [5]

Write down only the correct scientific term / words for the following descriptions:

2.1 What a 'red giant' becomes once its fuel runs out.

2.2 A type of igneous rock that forms as magma cools deep inside the Earth.

2.3 The process during which rocks are broken up naturally into smaller particles.

2.4 A mixture of different metals that produces a new metal with superior qualities.

2.5 Water in any form that falls to the Earth's as part of the water cycle.

TOTAL SECTION A: [15]

SECTION B:

QUESTION 3 [3]

Complete the following sentences. Supply **ONLY** the missing word.

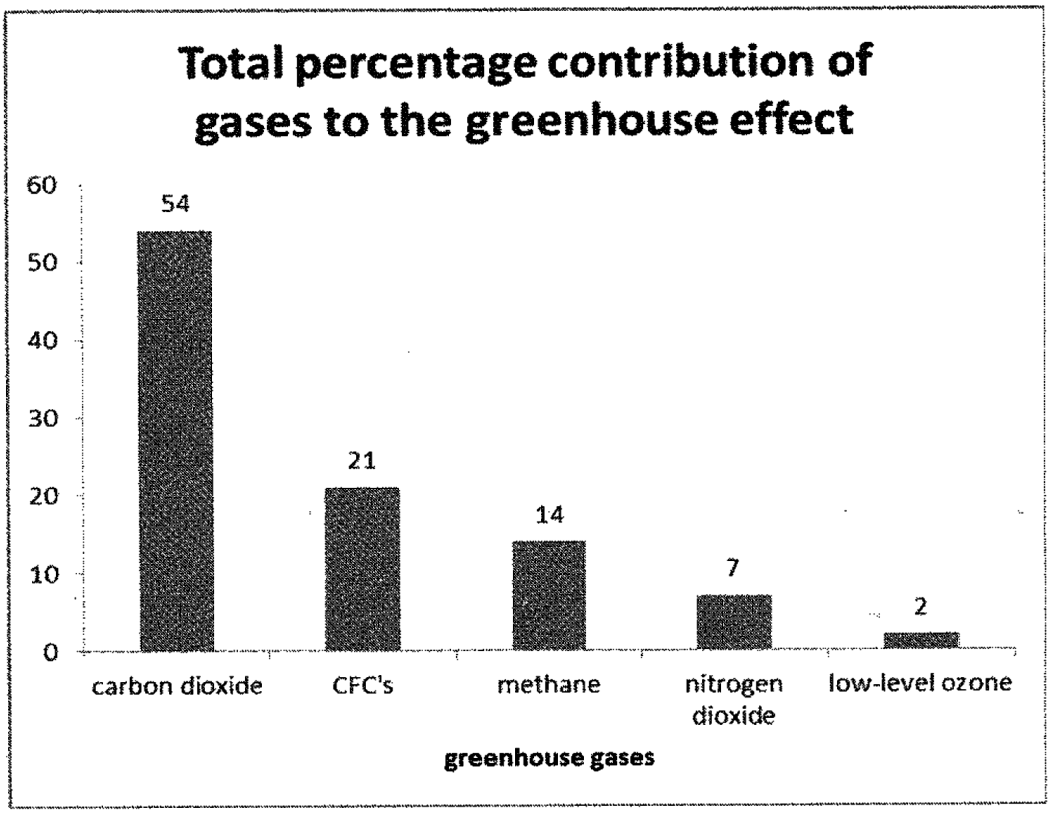
"*As magma from the mantle rises through the crust, it cools to form* ***(3.1)*** _____ *rock. It also pushes through the crust, heating existing rock and causing chemical changes thereby turning it into* ***(3.2)*** _____ *rock. All rocks that become eroded by the elements will be deposited in layers known as* ***(3.3)*** _____ *rock."*

QUESTION 4 [7]

Burning coal releases greenhouse gases into the atmosphere. These greenhouse gases cause global warming.

The following bar graph displays information about an investigation between the sources and amounts of greenhouse gases on Earth.

Refer to the following bar graph and answer the questions that follow.



4.1 A greenhouse gas (not in the graph) is water vapour. Calculate the percentage contribution of water vapour to the greenhouse effect from the data provided. Show all working. (2)

4.2 Identify the gas produced by:

4.2.1 the excessive use of fertilizer (1)

4.2.2 farming of livestock (1)

4.2.3 the cellular respiration of animals and plants. (1)

4.3 Discuss ONE negative effect that global warming has on the biosphere. (Do not exceed more than 4 lines in your answer.) (2)

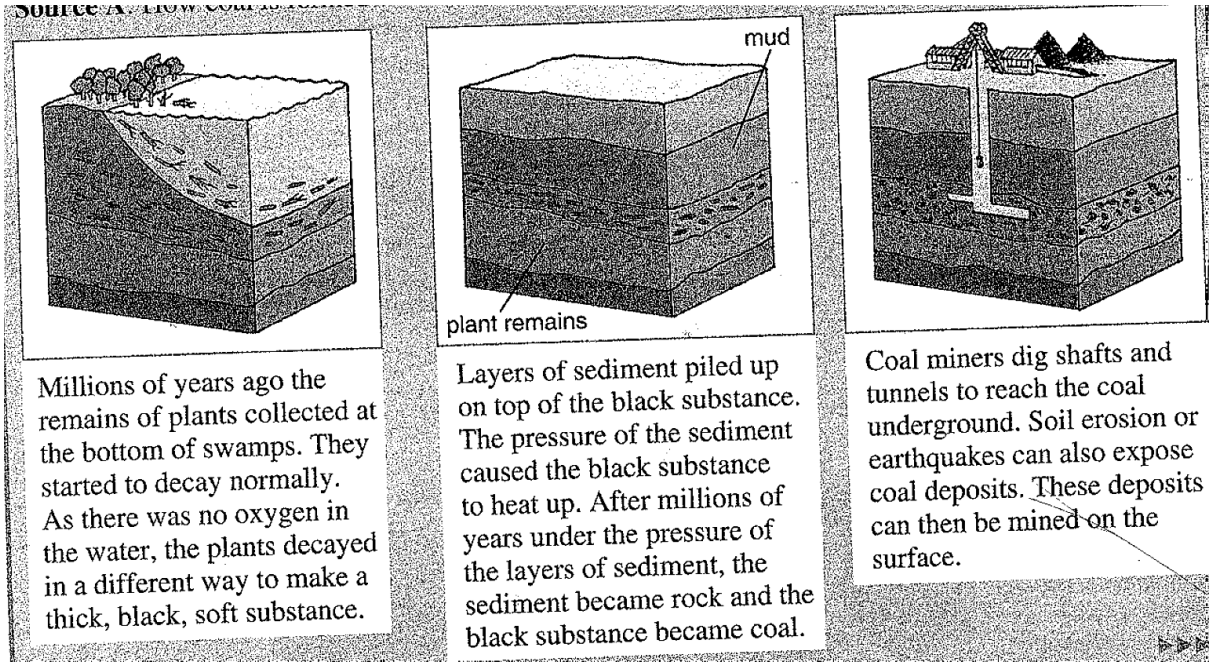
_____

QUESTION 5 [10]

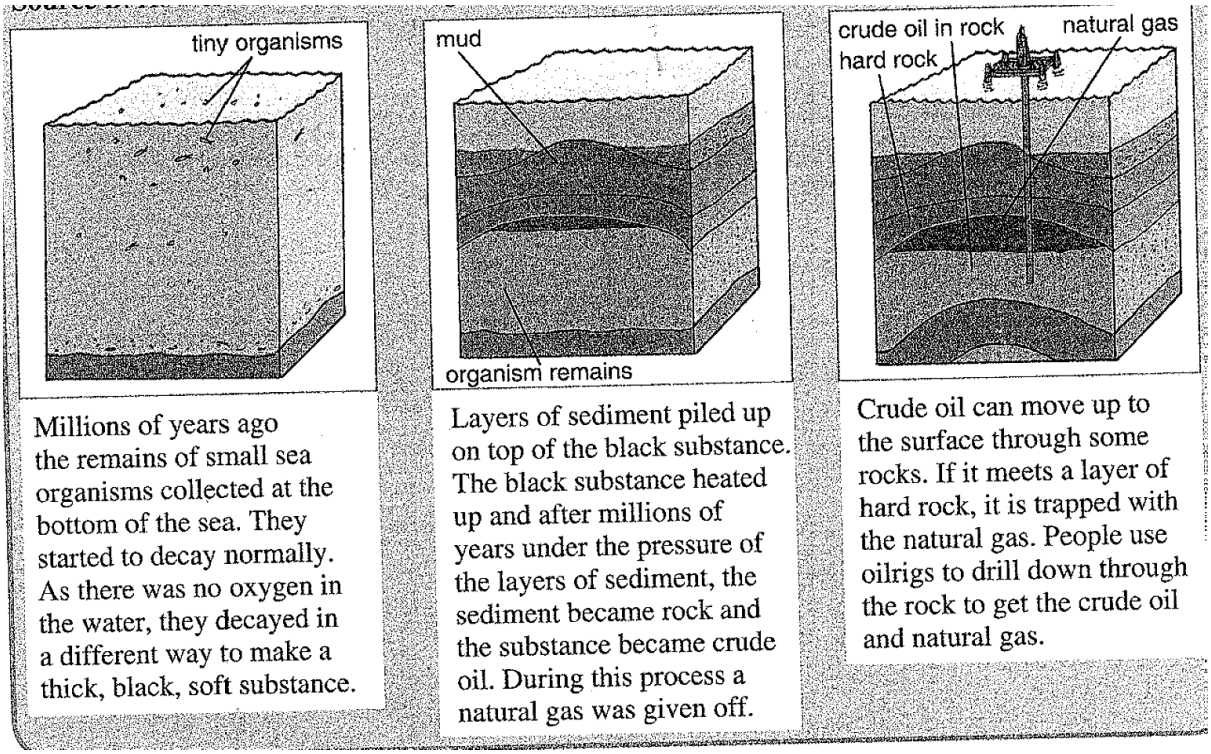
The diagrams below show how fossil fuels such as coal, crude oil and natural gas are formed.

Refer to the sources A and B and answer the questions that follow.

SOURCE A: HOW COAL IS FORMED



SOURCE B: HOW CRUDE OIL AND NATURAL GAS ARE FORMED



ANSWER IN FULL SENTENCES.

5.1 Why are coal, oil and natural gas referred to as fossil fuels? (2)

5.2 Are fossil fuels renewable or non-renewable resources? Explain your answer. (2)

5.3 How is the formation of coal and crude oil the same? (2)

5.4 How is the formation of coal different from the formation of crude oil? (2)

5.5 Describe two ways (not more than 4 lines) in which people in your community make use of any of these fossil fuels. (2)

QUESTION 6 [6]

Some igneous rocks have small crystals and some have large crystals.

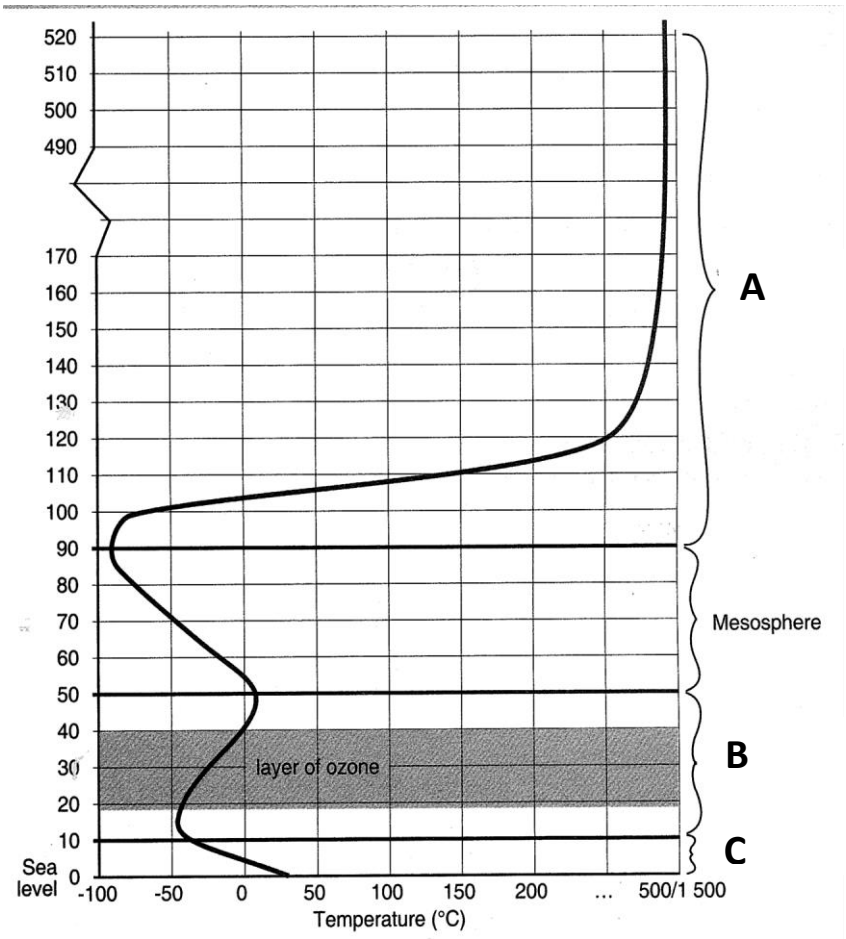
6.1 Give an example of an igneous rock with large crystals. (1)

6.2 Briefly explain how the rock in question **6.1** forms. (3)

6.3 Explain briefly how sedimentary shale becomes slate. (2)

QUESTION 7 [13]

Refer to the graph and answer the questions that follow.



A graph showing temperature changes in the atmosphere

7.1 Suggest a suitable label for the y-axis. (1)

7.2 Name the dependent variable. (1)

7.3 Supply a label for the layers marked

7.3.1 **A** (1)

7.3.2 **B** (1)

7.3.3 **C** (1)

7.4.1 What is the approximate temperature range for the mesosphere? Show all your working. (3)

7.4.2 Explain why the temperature in the stratosphere increases so dramatically. (2)

7.5 The current temperature in Durban is 32^{O}C. Estimate the temperature in Pinetown, which is approximately 500m above sea level. Show your working. (**Hint**: temperature changes by 1^{o}C for every 100m change in altitude.) (3)

QUESTION 8 [6]

Read the following paragraph on stars. Select the correct answer from the choice in the brackets. Write down only the question number and the answer.

Do NOT re-write the paragraph.

For most of its life, a star converts the gas **(8.1 helium / hydrogen)** into **(8.2 helium / hydrogen)** during a process known as nuclear **(8.3 fission / fusion).** Stars that look red are **(8.4 cooler / hotter)** and **(8.5 younger / older)** than stars that appear blue. As stars age and run out of fuel, all nuclear reactions will cease and they will eventually contract to form **(8.6 red giants / white dwarfs)**.

TOTAL SECTION B: [45]
TOTAL SECTION A & B: [60]

PHYSICAL SCIENCE

SECTION C: START THIS SECTION ON A NEW PAGE

QUESTION 9: MULTIPLE CHOICE [10 X 1 = 10]

Four options are provided as possible answers to the following questions.
Each question has only one correct answer. Write only the letter **(A-D)** next to the question number **(9.1 – 9.10)** in the answer book.

9.1 Which of the following is an example of a contact force?
- A. Frictional force
- B. Gravitational force
- C. Electrostatic force
- D. Magnetic force

9.2 An object that loses electrons becomes…
- A. positively charged
- B. neutral
- C. negatively charged
- D. lighter in mass

9.3 What is the symbol of the unit in which force is measured?
- A. kg
- B. N
- C. $m.s^{-2}$
- D. $N.m^{-1}$

9.4 Field forces are also called…
- A. gravitational forces
- B. non-contact forces
- C. friction forces
- D. contact forces

9.5 Where would your weight be the smallest?
- A. On the Earth's surface.
- B. Under water.
- C. On the Moon.
- D. It would be the same everywhere.

9.6 The electrical component that controls the flow of electric current is called a…
- A. conductor
- B. diode
- C. ammeter
- D. transformer

9.7 The type of electric circuit in which the voltage is divided across the resistance is…

A. parallel
B. series
C. neither
D. both

9.8 The energy conversion that takes place in a coal-fired power station is…

A. gravitational to electrical
B. electrical to mechanical
C. chemical to mechanical
D. mechanical to electrical

9.9 An electrical cord has three insulated wires inside it. Which statement is correct?

A. the brown wire is live and the blue wire is neutral
B. the green/yellow wire is neutral and the brown wire is live
C. the blue wire is live and the green/yellow wire is neutral
D. the brown wire is live and the blue wire is earth

9.10 If all the conductors are made of copper wire, which one of the following would have the greatest resistance?

A. Long, thin, hot
B. Short, thin, cool
C. Long, hot, thick
D. Short, cool, thick

QUESTION 10 : MATCHING COLUMNS [5]

Match the statements in column A with the correct words in column B.
Write only the correct letter next to the number in your answer book e.g. (**10.1 = A)**

COLUMN A		**COLUMN B**	
10.1	A force that can cause a moving object to slow down	A	coal
10.2	Subatomic particles transferred during a lightning strike	B	turbines
10.3	Mirrors used in the sun-heated steam process of electricity generation	C	friction
10.4	A renewable source of energy	D	fission
10.5	The process by which nuclear power is produced	E	neutrons
		F	tension
		G	sea waves
		H	electrons
		I	heliostats
		J	fusion

QUESTION 11: TERMINOLOGY [5]

Complete the following sentences by choosing the correct answer. Write only the correct answer next to the number in your answer book, e.g. **11.1 cell**.

11.1 The instrument used to measure potential difference is a **(cell / ammeter / potentiometer / voltmeter).**

11.2 If the number of resistors in series is increased, the current will **(increase / decrease / remain constant).**

11.3 As the number of cells, connected in series, in a circuit increases, the voltage will **(increase / decrease / remain constant).**

11.4 An ammeter is always connected in **(series / parallel).**

11.5 A battery will last longer if the cells are connected in **(series / parallel).**

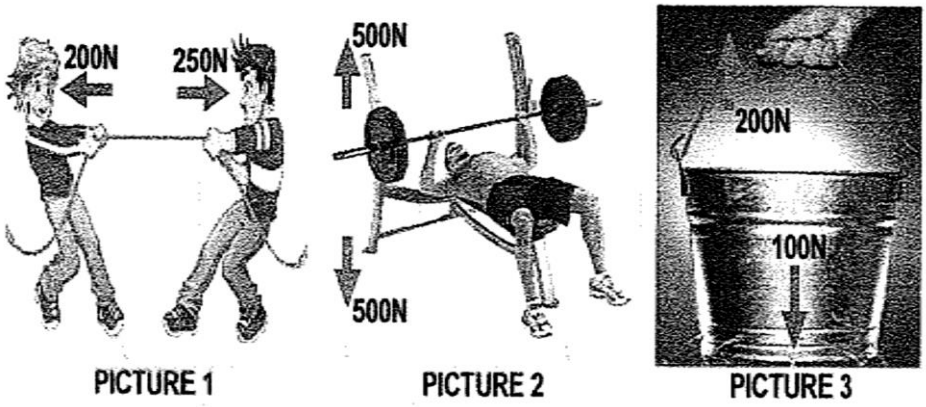
TOTAL SECTION C : [20]

SECTION D

QUESTION 12 [8]

12.1 Define the term *force*. (1)

12.2 Use the pictures below to answer the following questions:



PICTURE 1 PICTURE 2 PICTURE 3

12.2.1 Which picture shows balanced forces? (1)

12.2.2 Name the type of contact force observed in **Picture 1**. (1)

12.2.3 What is the magnitude of the resultant / net force in **Picture 1**? Show your working. (2)

12.2.4 Calculate the mass of the bucket shown in **Picture 3** that has a weight of 100N. (3)

QUESTION 13 [11]

13.1 Consider the instrument below:

13.1.1 Name this instrument. (1)

13.1.2 What is this instrument used to measure? (1)

13.1.3 What would the reading on this instrument be if a pencil case with a mass of 500 g was hooked onto it? Show all your workings. (4)

13.2 Four people struggle to push a car on a sandy road. They each exert a force of **200 N** and push the car in the direction of North as shown in the picture below:

A frictional force exists between the road and the wheels which makes it difficult for the men to move the car and they only manage to create a resultant pushing force of **500 N**.

13.2.1 In which direction does the frictional force act? (1)

13.2.2 Calculate the size of the pushing force that these men apply to the car. (2)

13.2.3 Calculate the size of the frictional force acting on the wheels of the car. (2)

QUESTION 14 [5]

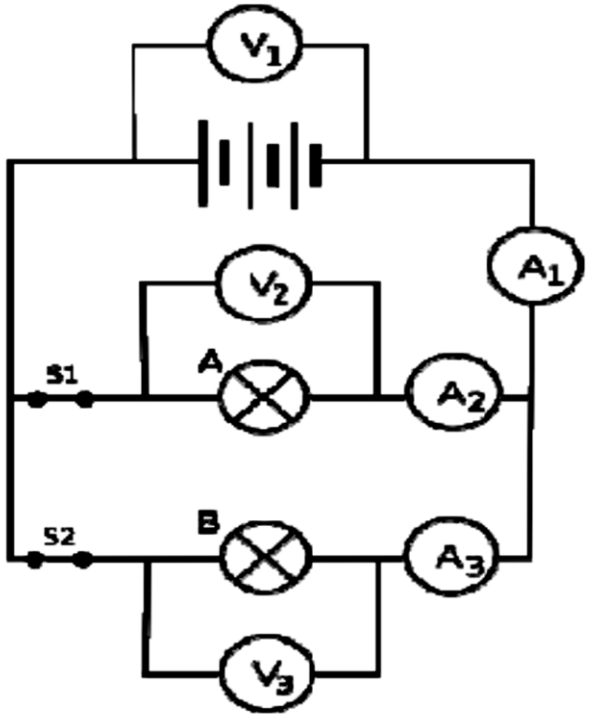
The following appliances are used in a household:

- 5 light bulbs of 100 W each for 10 hours
- an iron of 1 kW for 3 hours
- a kettle of 2 000 W for 30 minutes

Calculate the cost of the electricity used above if the price of electricity is priced at R1,71 per kWh. Show all your workings.

QUESTION 15 [9]

Study the circuit diagram below. **All bulbs are identical**.



$V_1 = 12\ V$

$A_1 = 6\ A$

$A_2 = 3\ A$

Calculate:

15.1 V_2 (1)

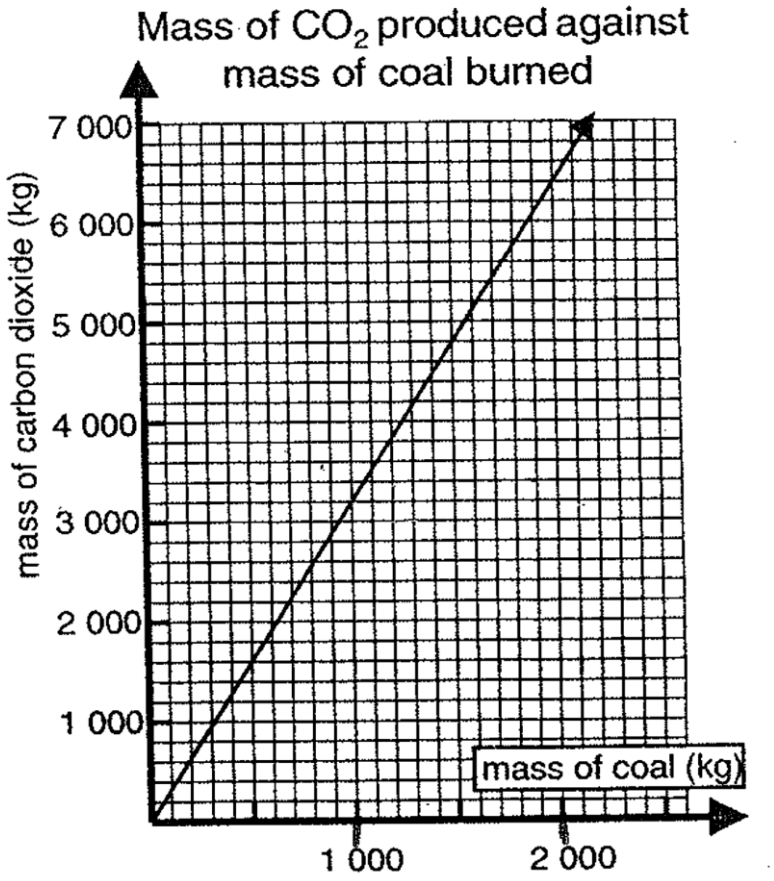
15.2 A_3 (2)

15.3 Resistance of Bulb B (3)

15.4 Total resistance for the parallel circuit (3)

QUESTION 16 [7]

We burn coal to make steam to generate electricity in power stations. Use the graph below to answer the questions that follow:



16.1 Name the dependent variable on this graph. (1)

16.2 What mass of coal is burned to produce 1 000 kg of carbon dioxide? (1)

16.3 Based on the information provided by the graph, predict the mass of carbon dioxide produced if 3 000 kg of coal is burned. Show your calculations. (3)

16.4 Name <u>TWO</u> ways, other than coal, in which electricity can be generated on a large scale. (2)

TOTAL SECTION D: [40]
TOTAL SECTION C & D: [60]
TOTAL: [120]