basic education
Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

Marks obtained	
Section A	
Section B	
Total	

NATIONAL ASSESSMENT
GENERAL EDUCATION CERTIFICATE (GEC)
2021

PILOT STUDY	**NATURAL SCIENCES: 60 Marks**
GRADE 9	Learner Name _____ School Name _____ EMIS Number ☐☐☐☐☐☐☐☐☐☐ Class Name _____ Gender (✓) Boy ☐ Girl ☐ Age ☐☐ Years
English	
	To be completed by Test Administrator
DATE OF COMPLETION	

This test consists of 31 pages, excluding the cover page.

Instructions to the learner

1. Read all the instructions and questions carefully.
2. The teacher will help you through the practice exercises before you start writing the test.
3. Circle the letter of the correct answer.
4. Question 2 demonstrates how to make a correction if you change your answer.
5. Answer all questions.
6. Do not use a calculator.
7. The duration of this test is 90 minutes.

Practice exercises

Circle the letter of the correct answer from number 1 to 2.

1. What is the SI unit for measuring weight?

A Kl

B Cm

(C) Kg

D Ml

You have answered correctly if you have circled the letter C.

2. What is the SI unit for measuring force?

A Ton

~~(B) Milligram~~

C kilogram

(D) Newton

If you made a mistake by circling B, draw a line through the letter B and the answer. Then circle the correct letter D.

What is the **main** language spoken at your home?

Tick **(✓)** next to the applicable language.

Afrikaans		Sesotho	
English		Setswana	
IsiNdebele		Siswati	
IsiXhosa		Tshivenda	
IsiZulu		Xitsonga	
Sepedi		Other	

The test starts on the next page.

Do not turn the page until you are told to do so.

SECTION A

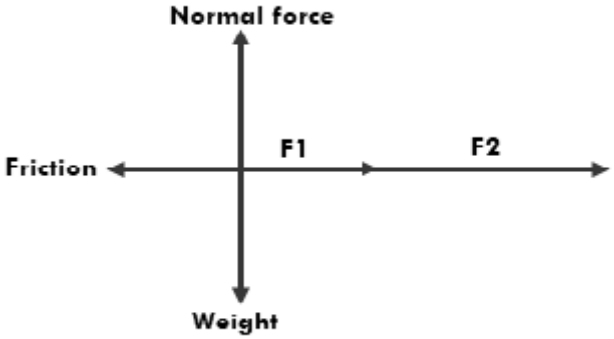
Circle the letter of the correct answer from question 1 – 48.

The picture shows sky divers who jumped out of the back of a plane and fell towards the Earth due to gravity. As they fall, they experience air resistance.

1. What type of force is air resistance?

   A gravitational force
   B magnetic force
   C applied force
   D frictional force (1)

Forces are classified into two types, namely, contact and non-contact forces.



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

2. Which of the following forces is a non-contact force?

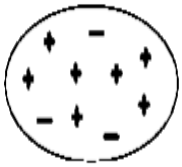
A Normal
B Friction
C F1 + F2
D Weight (1)

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

3. What is the relationship between mass and gravitational force?

A the smaller the mass of the object, the greater the gravitational force.
B the greater the mass of the object, the greater the gravitational force.
C the mass of the object is always lesser than the gravitational force.
D the mass of the object is always greater than the gravitational force. (1)

When materials are rubbed against each other, they are able to get an electrostatic charge and this is called static electricity. The sphere shows a distribution of charges in its nucleus.



4. Choose the best combination below that best describe the distribution of charges in the sphere.

	Overall charge	Why is it positive, negative or neutral?
A	Charge = 4 + (-4) = 0	It is neutral as there are equal numbers of positive and negative charges.
B	Charge = 3 + (-6) = -3	It is negatively charged as there are 3 more negative than positive charges.
C	Charge = 7 + (-3) = 4	It is positively charged as there are 4 more positive charges than negative charges.
D	Charge = 7 + (-4) = -3	It is negatively charged as there are 3 more negative than positive charges

(1)

Forces can have different effects on objects.

5. What is it that forces **cannot** do when applied on objects?

A change the shape of the object.
B change the motion of an object.
C change the direction of an object.
D change the mass of an object. (1)

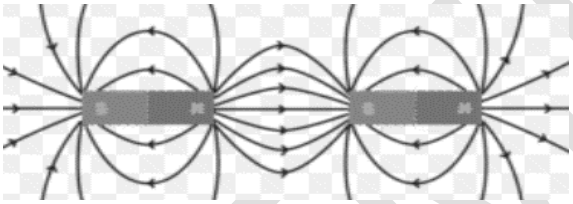
A boy is herding cattle in the field when the lightning and storm started. As he

approaches home the lightning and storm get stronger and he decides to hide under the tree until the storm is over.

6. What is the precautionary measure the boy should take when faced with such situation?

A He should run in the open field to get home so that he can be safe .
B He should stand next to the telephone lines to make a call home.
C He should look for a low-lying part away from trees and high objects.
D He should run and hide under pylons as electric pylons stop lightning.

A b brings the magnets closer to one another. He notices that the magnets pull his hands towards each other. This is because of the magnetic field that exists between the two magnets as shown by the arrows in the above diagram.



7. Which two arrows below best represent the direction of the magnetic field that exists between the two magnets?

A 
B 
C 
D 

(1)

The picture shows a puppet sitting on a chair with its feet not touching the ground.

.

8. Why is the chair not breaking when the force of the body and the feet of the puppet are exerted on the chair?

A Because the chair is stronger than the body of the puppet.
B Because the puppet has no weight that can break the chair.
C Because the puppet is not sitting properly on the chair.
D Because the chair exerts equal opposite force on the puppet. (1)

Erica was combing her hair and decided to put a rubbed balloon next to her hair. Her hair was attracted to the balloon.

9. How are the electrons transferred between the hair and the balloon?

A Electrons are transferred from the balloon to the hair and the hair becomes positively charged.
B Electrons move from the atoms and molecules in the hair to the balloon.
C The object has neither gained nor lost electrons, they both remained neutral.
D The object cannot be positively charged because electrons can't move. (1)

The diagram shows a complete electric cell system which generates electricity with different components.

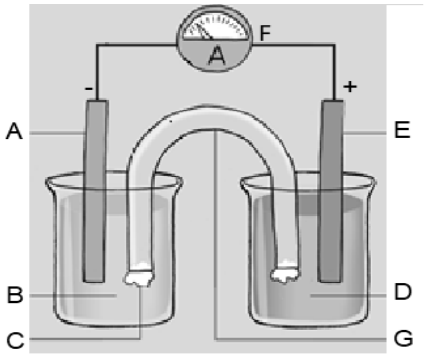


Diagram from Siyavula textbook showing a complete electrochemical cell.

10. Letters A, B, D and E represent the following components, respectively.

A Zinc electrode, zinc sulphate solution, copper sulphate solution and copper electrode.

B Copper sulphate solution, copper electrode, zinc sulphate solution and zinc electrode.

C Zinc electrode, zinc sulphate, copper electrode and salt bridge.

D Copper sulphate solution, zinc sulphate solution copper electrode and zinc electrode. (1)

A battery is two or more cells that are connected together. Batteries are categorized into primary and secondary.

11. What form of reaction does a primary battery use to produce energy?

A redox reactions

B oxidation reactions

C reduction reactions

D combination reactions (1)

12. What determines the conducting ability of a material?

A structure
B insulation
C resistivity
D ohm (1)

The relationship between potential difference, current and resistance can be represented by formula.

13. What is the formula to calculate voltage drop?

A V = IR
B V = I + R
C V = I – R
D V = I/ R (1)

Lerato is doing an investigation to determine which conductor has the least resistance. She connects the components of the circuit as shown.

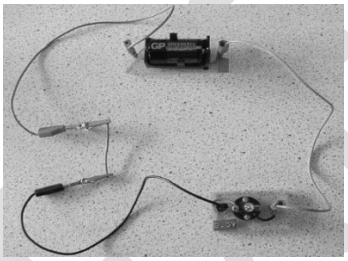


Diagram from Siyavula textbook.

14. In her conclusion, which conductor is she likely find that has the least resistance?

A Copper
B Silver
C Silicon
D Glass (1)

The resistance of a circuit can be calculated using the following formula:

$$Resistance = \frac{\text{Voltage}}{\text{Current}}$$

15. What is the SI unit to measure the resistance?

A joules
B ampere
C volts
D ohm (1)

16. What happens when a circuit contains one branch with very little or no resistance?

A Increase in resistance
B Short circuit
C Decrease in resistance
D Low current in the circuit (1)

There are three fundamental relationships concerning voltage, current and resistance in parallel circuits.

17. What is the effect of resistors connected in parallel in a circuit?

A The total resistance in a parallel circuit has no effect on the flow of electric charges in a circuit.
B The total resistance in a parallel circuit opposes the passage of electrons and increases resistance.
C The total resistance of a parallel circuit is always more than any of the individual resistance values.
D The total resistance of a parallel circuit is always less than any of the individual resistance values. (1)

18. Which of the following statements is corrected about the effect of the number of cells connected in series on current and potential difference?

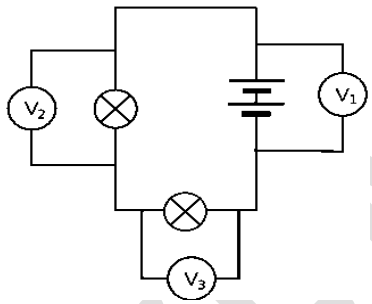
A Decreasing the number of cells connected in series will increase the current and potential difference in the circuit.

B Increasing the number of cells connected in series will decrease the current and potential difference in the circuit.

C Increasing the number of cells connected in series will increase the current and potential difference in the circuit.

D Decreasing the number of cells connected in series will increase the current and decreases potential difference in the circuit. (1)

Two cells with a potential difference of 12 V are connected in series. $V_1 = 12V$ and $V_2 = 8V$. If the voltmeter reading on $V_3 = 4V$ and the resistance 2 ohms.



19. What would be the current in the 2 ohm resistor?

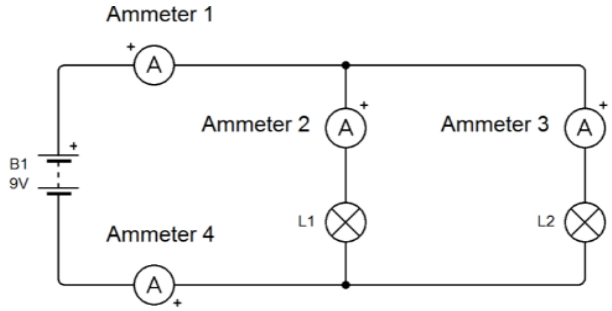
A 2 A

B 0.5 A

C 8 A

D 12 A (1)

The electric circuit with a 9V battery and two identical bulbs connected in parallel, L1 and L2. Ammeter 2 and 3 are connected to L1 and L2 respectively. Ammeter 1 and 4 are connected on the other side of the circuit.



20. Which statement is correct about the reading on ammeter 2 and 3?

A The reading on ammeter 2 and ammeter 3 add up to the reading on ammeter 1 or ammeter 4.

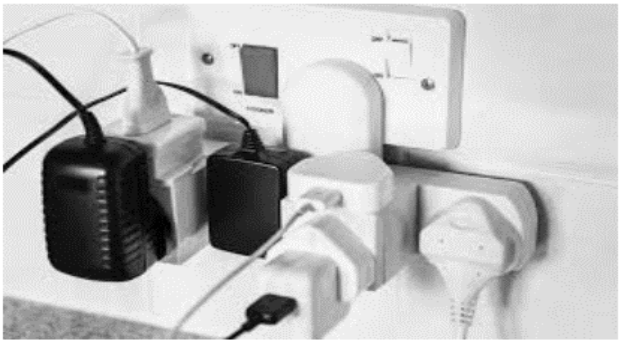
B The reading on ammeter 2 and ammeter 3 is equal to the zero because no current is flowing.

C The reading on ammeter 2 and ammeter 3 is equal to the reading on ammeter 4 only in the circuit.

D The reading on ammeter 2 and ammeter 3 is equal to the reading on ammeter 1 only in the circuit. (1)

The picture below shows a multiple-plug with several appliances plugged in, which

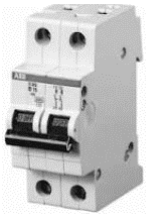
are overloading the socket.



21. Why do you think overloaded sockets like the one above are dangerous?

A The plug is not accessible when there are many items.
B The wire and other components might heat up and cause fire.
C The appliances look clumsy when put together in one place.
D The current flows through one wire and misses other wires. (1)

A circuit breaker is one of the most important safety devices in our homes. Without circuit breakers, electricity could be dangerous due to the risk of fires.



22. Which of the following statements is correct about circuit breakers?

A A circuit breaker is like a fuse as it also melts when there is excessive power in the circuit.
B A circuit breaker acts in the same way as a switch as it breaks the circuit if current surges.
C A circuit breaker consists of a switch that is connected to a battery to complete the circuit.
D A circuit breaker has a reset button that can only be used when there is fire in the circuit. (1)

Electric power in South Africa is mainly produced by turning a turbine which will

turn a generator.

23. What is the main source of electric power generator in South Africa?

A Oil
B natural gas
C Coal
D Uranium (1)

South Africa has one commercial nuclear power station, the Koeberg Power Station. Nuclear power uses nuclear fission, and nuclear (radioactive) decay. The element used in the nuclear power station is uranium.

24. What is the purpose of using uranium in the nuclear power station?

A it is unstable and undergoes radioactive decay at a slow rate.
B it is stable and undergoes radioactive decay at a fast rate.
C it is unstable and cannot be controlled in the nuclear reactor vessels.
D it is stable and is also the only available element in the planet. (1)

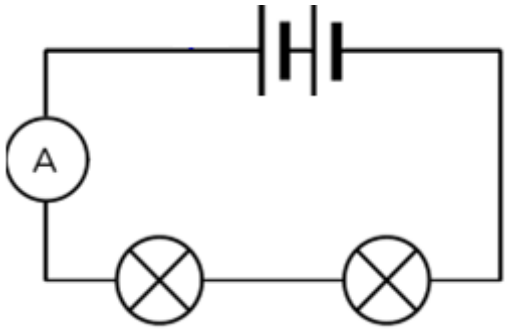
The national grid is a network of interacting parts that distributes electricity across the nation.

25. What is the correct order in which the energy is generated

A Power plant, transformer, high-voltage transmission, national grid lines, step down transformer.
B Power plant, transformer, national grid lines, high-voltage transmission, step down transformer.
C Power plant, step down transformer, transformer, high-voltage transmission, national grid lines.
D Power plant, national grid lines, high-voltage transmission, transformer, step down transformer. (1)

The diagram shows a circuit with two cells, an ammeter and two identical bulbs

connected in series.



26. If one bulb is removed from the circuit above, what will happen to current flow?

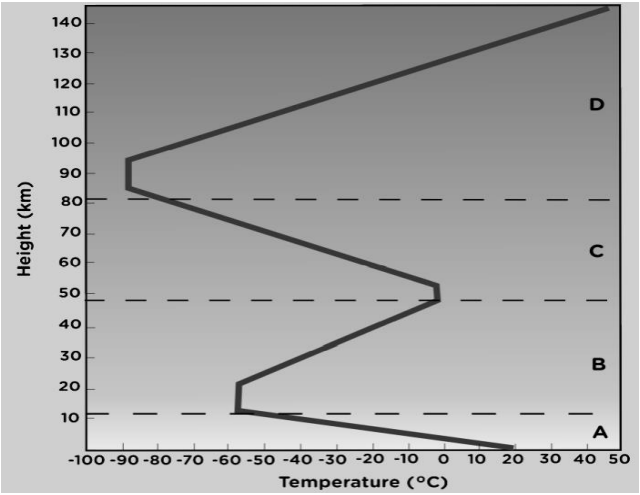
A There will be an increase in current through the remaining resistor.
B There will be a decrease in current through the remaining resistor.
C There will be no current flowing throughout the circuit.
D There is same amount of current flowing throughout the circuit. (1)

There are several alternatives of electric power generation in South Africa. The challenge with these alternatives is the importance of balancing the sustainability and environmental factors to declare them as best alternatives.

27. What represents a better alternative based on the above-mentioned factors?

A Wind power
B Hydroelectric power
C Solar energy power
D Nuclear power (1)

The graph shows the variation in temperature as you move further away from the earth.



Picture adapted from Siyavula textbook

28. What is the relationship between the temperature and the altitude?

A Temperature increases as you gain altitude in the stratosphere and the thermosphere.

B Temperature decreases as you gain altitude in the stratosphere and the thermosphere.

C Temperature increases as you gain altitude in the troposphere and mesosphere.

D Temperature remains the same as you gain altitude in the troposphere and mesosphere. (1)

29. Planet Earth is made up of four spheres, namely; Lithosphere, hydrosphere, biosphere and atmosphere. From the statements below, choose one statement that best describes the lithosphere.

A It contains all solid, liquid and gaseous water of the planet.

B It contains all the planet's living things and microorganisms.

C It contains all the air in the Earth's system and absorbs heat.

D It contains all the cold, hard solid land of the planet's crust. (1)

The structure of the Earth is divided into four major components

30. Which of the following represent four major components of the Earth?

A Mesosphere, atmosphere, hydrosphere and biosphere
B The crust, the mantle, the outer core and the inner core
C Geosphere, atmosphere, hydrosphere and biosphere
D The crust, the mantle, mesosphere and outer core (1)

31. Why do scientists have limited information about the mesosphere?

A The amount of mass in the mesosphere makes it difficult to penetrate the mesosphere.
B There is too much heat from surrounding layers hence mesosphere is not accessible.
C The force of attraction between the layers makes it difficult to penetrate mesosphere.
D The weather balloons and other aircrafts cannot fly high enough to reach mesosphere. (1)

Thermosphere is one of the layers of the atmosphere where most satellites orbit the earth in this layer.

32. Which statement best describes the thermosphere?

A Thermosphere is the form of oxygen found in the stratosphere which absorbs high levels of energy.
B Thermosphere is the second layer of the atmosphere from the earth's surface lying between 10 – 50 km.
C Thermosphere is the fourth and the thickest layer of the atmosphere lying from 80 – 700 km from the earth.
D Thermosphere is lowest layer of the atmosphere closest the surface of the Earth and extends to 10 km above. (1)

33. What are the three main gases that make up thermosphere?

A Atomic oxygen, atomic nitrogen and helium
B Carbon dioxide, water vapour and helium
C Hydrogen, carbon monoxide and argon
D Helium, atomic oxygen and nitrogen (1)

The greenhouse effect is described as a warming effect caused by the trapping of energy in the atmosphere by air pollutants such as high level of carbon dioxide and carbon monoxide. This results in Global warming which has severe effects on the climate.

34. What are the factors affecting global warming in our planet earth.?

A Weather patterns will change drastically.
B Food security will increase drastically.
C Northern hemisphere will be drier.
D Southern hemisphere will be wetter. (1)

35. In which layer is ozone found?

A Troposphere
B Stratosphere
C Mesosphere
D Thermosphere (1)

The first iron mining techniques used charcoal which was mixed with iron ore in a bloomery. However, the bloomery is replaced with blast furnace.

36. What is the best explanation of blast furnace?

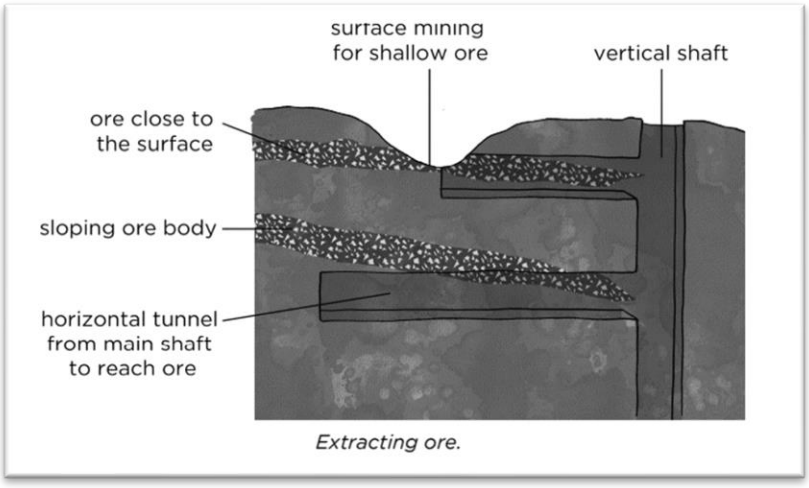
A Blast furnace is the process of drilling holes into the rock to put explosives such as dynamites.

B Blast furnace is the process of exposing coal seam by removing layers above the rock surface.

C Blast furnace is the huge oven where iron ore is burned with oxygen and coal to produce metal.

D Blast furnace is the replacement of overburden surface soil so that minerals can be extracted. (1)

The diagram shows the process of extracting ores from the mines



Extracting ore.

Source: Siyavula textbook

37. Which steps are in the correct order of extracting metals from ores?

A Exploration, drilling and blasting, crushing and milling, separation, refining and distribution

B Exploration, crushing and milling, separation, drilling and blasting, refining and distribution

C Exploration, refining and distribution, crushing and milling, separation, drilling and blasting

D Exploration, separation, crushing and milling, drilling and blasting, refining and distribution (1)

Lime is added to react with unwanted material such as sand.

38. What is the chemical name for lime

A Silicon dioxide

B Calcium carbonate

C Manganese

D Phosphate (1)

South Africa has a wealth of minerals. It is the world's largest producer of chromium, manganese, platinum, vanadium and other minerals. These minerals

can be mined in two different ways.

39. What are the two ways of mining in South Africa?

A Pit mining and shaft mining
B Physical and shaft mining
C Chemical and pit mining
D Pit mining and rock mining (1)

40. Explain the chemical process used for extraction of gold.

A Gold is first washed to make it into the high-grade gold and then sorted into sizes for fuel production process.
B Gold is crushed into appropriate size and used as fuel for electricity generation or the iron making process.
C Gold is dissolved in a solvent and it is then separated from the ore by washing and recovered by precipitation.
D Gold is dug out from the face of the mine and pillars of gold are left behind to support the roof of the mine. (1)

The mining rights in South Africa are owned by big companies like Lonmin, De Beers, Anglo and Exxaro.

41. Who should benefit in the mining of minerals in South Africa?

A Local communities from the mine surrounding areas.
B Foreign nationals mining in the closed mines.
C Big companies owning the mining rights only.
D Board members of the companies owning rights. (1)

Stars come in variety of masses and the mass determines how radiantly the star will shine and how it dies. All stars, irrespective of their size, follow the same 7 stage cycle.

42. What is the fourth stage of these 7 stages of the life cycle of the star?

A Main sequence
B Red giant
C T-Tauri Phase
D Protostar (1)

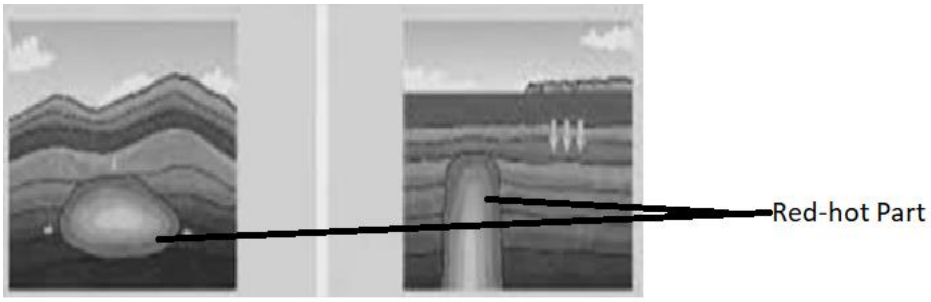
43. Why is Earth the only planet that is habitable in the Solar system?

A Earth is the closest planet to the sun and keeps us warm.
B Earth is exposed to solar radiation through its magnetic field.
C Earth is kept cooler by its insulating atmosphere to sustain life.
D Earth has the right chemical ingredients for life, including water. (1)

44. What are the three main types of rocks?

A Igneous rock, sedimentary rock, metamorphic rock
B Magma rock, sedimentary rock, metamorphic rock
C Weathering rock, clay particles, quartzite rock
D Marble rock, igneous rock, surface magma rock (1)

Look at the two pictures below and explain the process as depicted in the two pictures.



45. How is Metamorphic rock formed?

A The red-hot part in the above picture is the formation of the metamorphic rock.
B Metamorphic rock forms deep below the surface where there is high temperature.
C Wind, water and ice transport particles to the red-hot area to form metamorphic rock.
D Metamorphic rock forms as the sand particles are covered by sandstone in the red-hot area. (1)

One of the main components of the earth's independent physical systems is the atmosphere.

46. Which of the following statements best describes the atmosphere?

A Atmosphere is the layer of gasses surrounding a planet or other celestial bodies.
B Atmosphere is the invisible layer that forms part of the energy from the sun.
C Atmosphere is the form of oxygen found in the stratosphere at high altitude.
D Atmosphere is the amount of matter of an object found on earth's surface. (1)

47. Which of the following statements best describes stratosphere as the layer of the atmosphere?

A Stratosphere is the lowest layer of the atmosphere and lies just above 10 km from Earth's surface.

B Stratosphere is the second layer of the atmosphere and lies between 10 – 50 km from the Earth's surface.

C Stratosphere is the third layer of the atmosphere and lies between 50 – 80 km above the Earth's surface.

D Stratosphere is the fourth layer of the atmosphere and lies between 80 – 350 km above the Earth's surface. (1)

48. Describe the chemical process that is used to improve the quality of iron.

A By melting the metal and reacting the carbon with pure oxygen to form carbon dioxide gas.

B By removing oxygen from lead(II) oxide so that carbon and oxygen can be left in a metal.

C By heating the mixture and blowing air (oxygen) in through bellows to convert metal to iron.

D By adding lime to the blast furnace and heating up the temperature to 1200^0C for molten iron. (1)

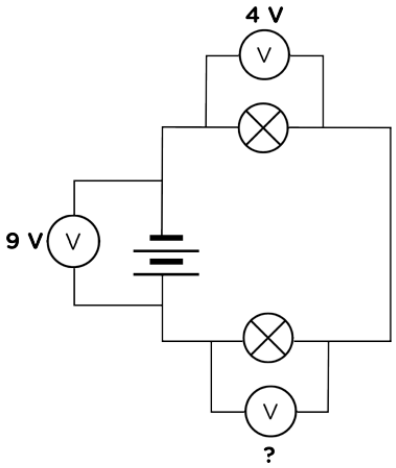
[48]

SECTION B

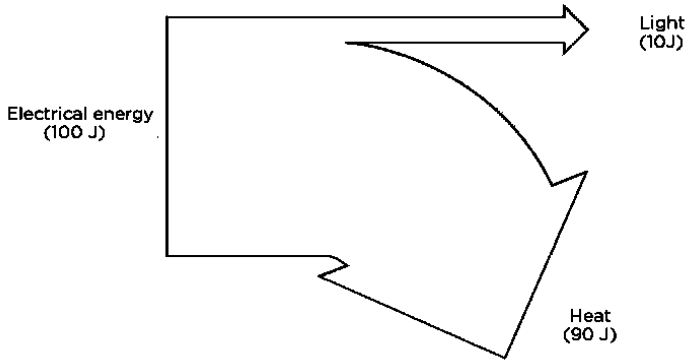
Answer all the questions to the best of your ability on the spaces provided.

When you hold an object in your hand and then let it go, the object will fall to the ground. The force that is attracting the object towards the centre of the earth is the force of gravity. Gravitational force also exists between the earth, moon and the sun.

1. What do you think could happen if there was no force of gravity acting between the objects and the earth's surface? (1)



2. In the above diagram, resistors are in series, if the potential difference across the battery is 9 V and the potential difference across one of the bulbs is 4 V, what would be the reading on the third voltmeter? (2)



3. The Sankey diagram for an incandescent light bulb is shown above.

a) Explain the energy transfers in the incandescent light bulb. (2)

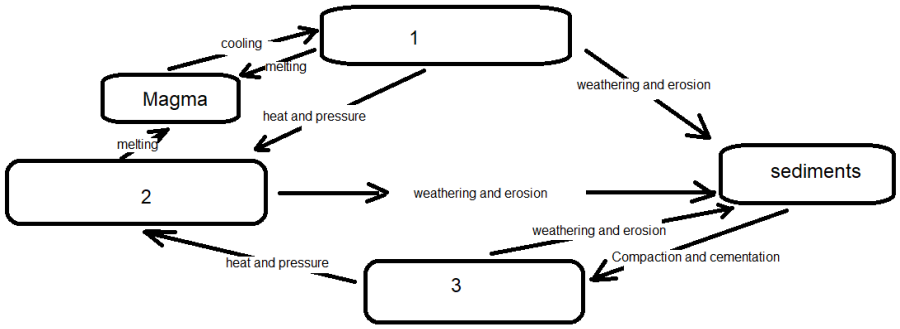
b) Explain why is the incandescent light bulb is inefficient as a light bulb? (1)

Views of the earth from space have already revealed many features about our planet and that it is made up of four spheres.

4. Which sphere includes all life on earth? (1)

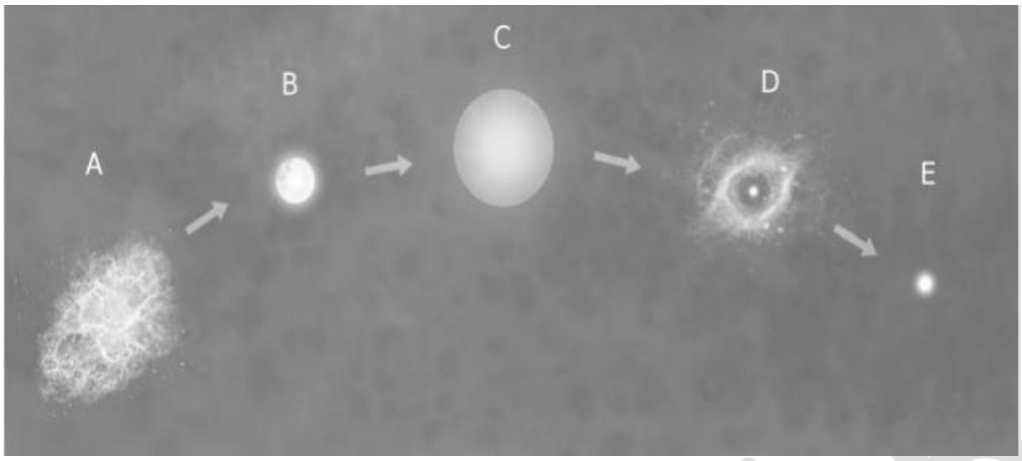
In South Africa electricity is sold to consumers as metered and prepaid. A metered electricity is when consumers pay monthly while prepaid electricity is when consumers buy a voucher for a particular quantity in advance.

5. What are the benefits of using a prepaid electricity to meter one? Mention only **one**. (1)



6. Complete the above diagram by writing the correct type of rock represented by numbers 1, 2 and 3. Use the space below. (3)

1.
2.
3.



The picture shows the stages of the birth of a star.

7. Briefly explain what happens during stage D. (1)

[12]

END OF TEST