

MERU SCHOOL

443/2 -AGRICULTURE FORM THREE HOLIDAY ASSIGNMENT

DECEMBER 2025

SECTION A (30 MARKS)

1. List **two** appropriate hand tools needed to finish off the handle of a fork jembe.(1mark)

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2. (a) List **two** breeds of goats kept for hair production. (1 mark)

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- b) State **two** characteristics of the York shire pig. (1 mark)

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3. Identify the cause of the following nutritional disorders in livestock;

- i. Bovine ketosis (½ mark)

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- ii. Osteomalacia (½ mark)

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4. State **three** factors that may determine the effectiveness of an acaricide. (1½ marks)

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5. State **three** factors that influence the amount of concentrates fed to a lactating cow.

(1½mark)

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6. (a) Define the following terms as used in livestock breeding:

(i). Inbreeding.

(½ mark)

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(ii). Outcrossing.

(½ mark)

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(b). State two desirable characteristics to be considered when selecting a heifer for milk production.

(1 mark)

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7. (a). Give **two** methods of controlling piglet Anaemia.

(1 mark)

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(b). Give **two** reasons why sows may have a tendency of feeding on piglets immediately after farrowing.

(1 mark)

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8. State **two** properties of concrete that make it more suitable in construction of farm structures.

(1 mark)

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9. State **two** features of a good pig house. (1 mark)

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10. (a) Give two causes of scouring in calves. (1 mark)

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(b) State three signs of Anthrax infection disease observed in the carcass of cattle. (1½mark)

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11.(a). Give **two** conditions that reduce the quality of eggs for hatching. (1 mark)

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(b). Mention two characteristics of a poor layer that a farmer should look for in each of the following parts of a hen during culling.

(i). Comb (½ mark)

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(ii). Abdomen. (½ mark)

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12.Give **two** ways in which farmers market beef cattle in Kenya. (1 mark)

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13.State the role of the following hormones during milk let down and secretion.

(i). Oxytocin. (1 mark).

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(ii). Adrenaline. (1 mark)

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14. Give **four** maintenance practices carried out on the water-cooling system of a tractor.

(2 marks)

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15. Distinguish between each of the following practises as used in livestock production:

(a). Crutching and ringing in sheep management. (1 mark)

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(b). Cropping and harvesting in fish management. (1 mark)

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16.State **three** ways in which infectious disease can be spread from one animal to another.

(1½mark)

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17.State **four** factors considered when formulating a livestock ration. (2 marks)

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18.State **two** characteristics of a good vaccine. (1 mark)

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19. State **two** reasons why calves should be housed in individual calf pens. (1 mark)

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SECTION B (20 MARKS)

Answer ALL questions in this section in the spaces provided

20. Study the diagram of a cow shown below and answer the questions that follow;



- a) Identify the livestock equipment marked E. (1 mark)

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- b) State the use of equipment you have identified in (a) above. (1 mark)

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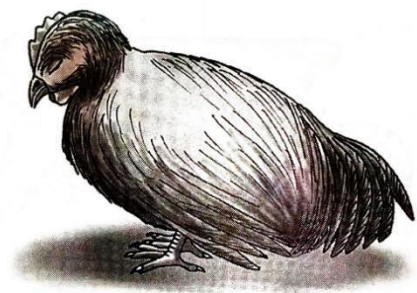
- c) While naming the appropriate tool used, state any two types of identification marks applied on the animal shown. (2 marks)

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21. The diagram below shows a chicken suffering from certain disease.



- a) Identify the disease. (1 mark)

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- b) Outline two symptoms of the disease you have identified in (a) above. (1 mark)

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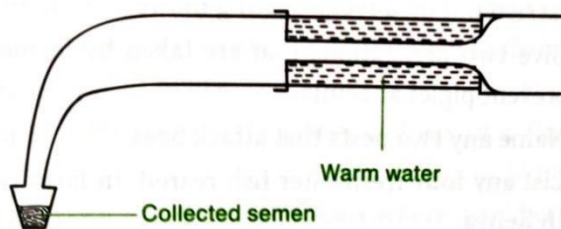
c) State two control measures of the above disease. (1 mark)

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d) Outline four symptoms of the disease you have identified in a) above. (2 marks)

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22. The diagram below shows a livestock production equipment. Study it and answer the questions that follow



a) Identify the equipment. (1 mark)

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b) What is the importance of warm water in the equipment? (1 mark)

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c) Describe the procedure followed when using the equipment in collecting semen.

(3 marks)

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23. a) A school farm has a deep litter poultry house measuring 9 m X 3.5 m. if the space allocated per bird is 0.27 m². How many birds can the school keep? (2 marks)

b) State two reasons for clipping the upper beak in poultry management. (1 mark)

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c) Name four livestock production tools which are complimentary in their use. (2 marks)

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d) Name any two materials which can be used as beddings in the deep litter system of poultry rearing. (1 mark)

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SECTION C (40 MARKS)

Answer any two questions from this section in the spaces provided

24. a) State five reasons for feeding livestock. (5 marks)

b) Describe the factors a farmer should consider when selecting a gilt for breeding. (8 marks)

c) Outline routine management practices that should be carried out on a lactating ewe.(7 marks)

25. a) Outline routine maintenance practices that should be carried out in deep litter system.

(6 marks)

b) State six practices that would ensure clean milk production. (6 marks)

c) Compare the use of an ox-drawn mouldboard plough with that of a tractor drawn plough

(8 marks)

26. a) Describe the importance of farm mechanization. (6 marks)

b) Describe East Coast Fever under the following sub headings

i. Causal organism (1 marks)

ii. Signs of infection (5 marks)

iii. Control measures (3 marks)

c) Outline five causes of stress in poultry. (5 marks)

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MERU SCHOOL
FORM 3 ART AND DESIGN HOLIDAY ASSIGNMENT
NOVEMBER/ DECEMBER 2025

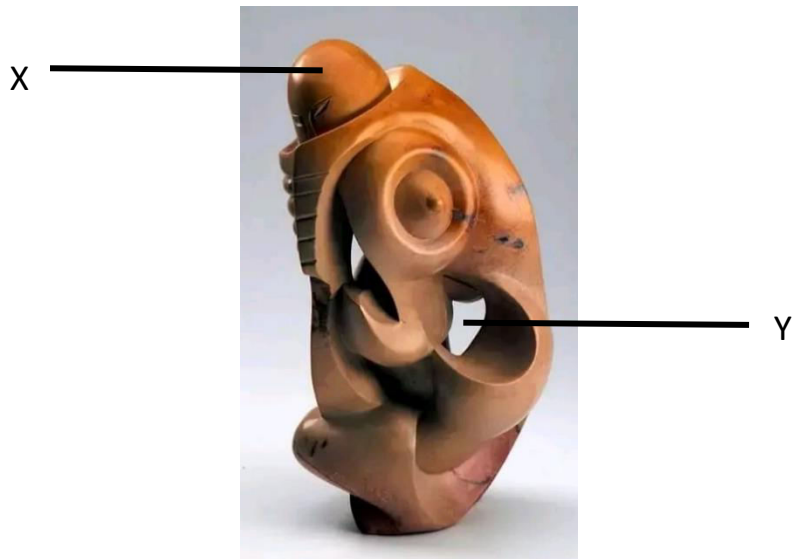
A. THEORY

SECTION A

Answer ALL questions in the spaces provided after each question

1.

- a. The illustration presented below is of a sculpture in the round. Study it and answer the question that follow



- Name the elements labelled X and Y (2 marks)
- b. Distinguish between **press mould** and **slip mould** (2 marks)
- c. Describe 2 roles of an armature when used in modelling technique (2 marks)
- d. Distinguish between **a template** and **a stencil** (2 marks)
- e. Why should **registration** be carried out in pattern making (2 marks)
- f. Explain the meaning of the word **Grouting** as used in mosaic technique (2 marks)
- g. Why is it advisable to properly **knead** clay before you use it in making pottery pieces (2 marks)
- h. Distinguish between **product design** and **communication design** (2 marks)
- i. Explain the meaning of the word **silhouette** as used in graphic design (2 marks)

- j. Give two main causes of thermal shock in pottery (2 marks)

2.

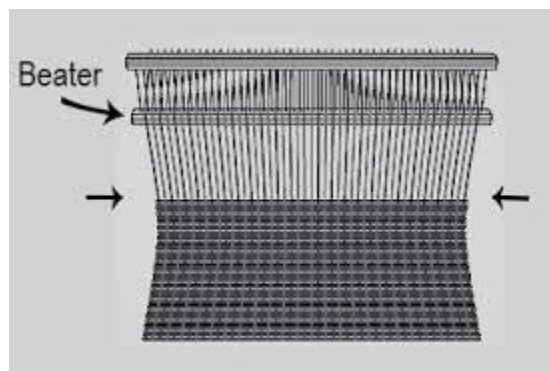
- a. Describe Atmospheric perspective. (1 mark)
- b. Explain how Biology is related to Art and Design. (1 mark)
- c. Describe “Landscaping” as a career related to Art and Design. (1 mark)
- d. Give **two** tertiary triad colour combinations on the colour wheel. (2 marks)
- e. Study the picture below and use it to answer the questions below.



Explain the use of lines in the picture above.

(1 mark)

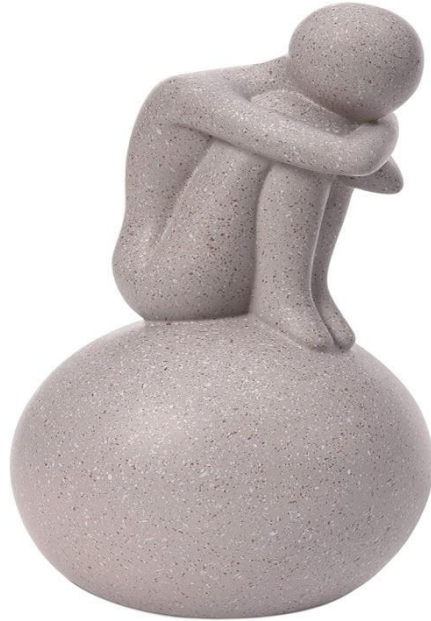
- f. Study the illustration below;



Identify the weaving defect above and explain how you would correct it in weaving process. (2 marks)

- g. Explain the main importance of contrast in a composition. (1 mark)

- h. Explain “anatomy of letter forms” as used in graphic design. (1 mark)
- i. Describe an “easel” and explain its use in Art and Design activities. (2 marks)
- j. Describe the Mezzotint printing technique. (1 mark)
- k. Study the sculpture shown below;



- Identify the type of sculpture shown above. (1 mark)
- l. Describe the nature of the planes used in the sculpture above. (2 marks)
- m. Explain the cause of shimmering effect in a mosaic art work. (1 mark)
- n. Distinguish between the terms “textile and fabric”. (2 marks)
- o. Explain the term “refractoriness” as used in pottery. (1 mark)

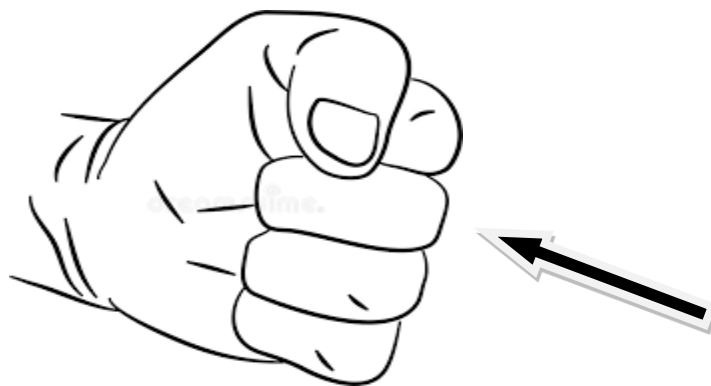
SECTION B

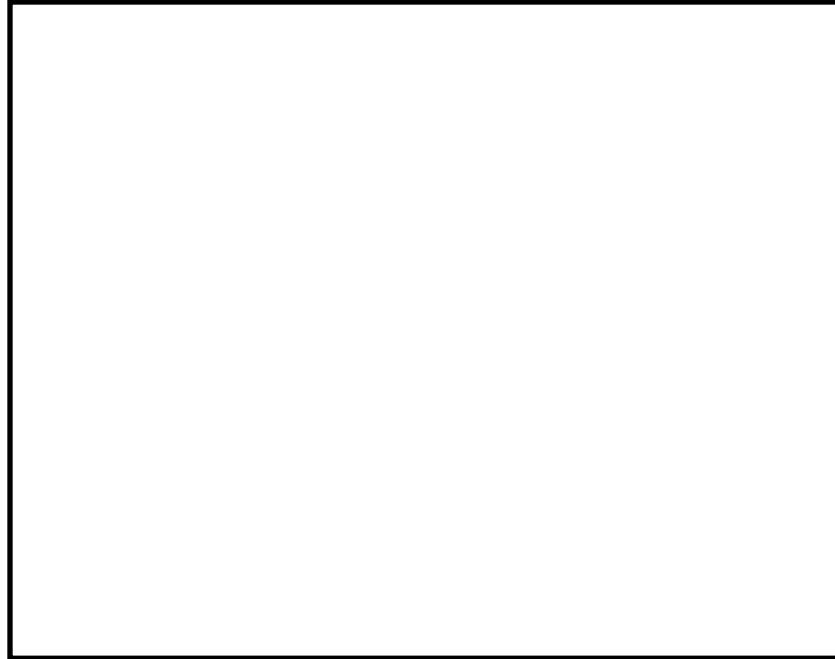
Answer ALL questions in the spaces provided after each question

- 3.
 - a. Highlight 2 reasons for wedging clay (2 marks)
 - b. Name one technique used to knead clay (1 mark)
- 4. The illustration below represents a technique in art. Study it.



- a) Identify the technique (1 mark)
 - b) Briefly describe the main steps involved in coming up with the work (4 marks)
5. Highlight five characteristics that are unique to mosaic technique (5 marks)
 6. Identify and describe the 3 properties of clay (6 marks)
 7. With regard to the moisture present in a body of clay, briefly describe the following concepts in pottery;
 - a. Greenware (2 marks)
 - b. Leatherhard (2 marks)
 - c. Bonedry (2 marks)
 8.
 - a) What is foreshortening as used in drawing? (1 mark)
 - b) In the space provided, draw the clenched fist below, viewed from the direction of the arrow. (4 marks)





9. Outline the procedure of window mounting.

(5 marks)

10. Study the pottery form below.



a) Identify the pottery decorative technique used.

(1 mark)

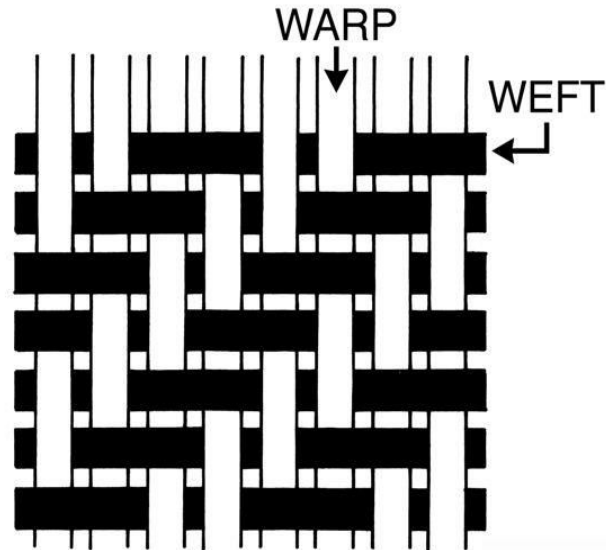
b) Describe the technique in 4 (a) above.

(4 marks)

11. Highlight the steps of making textile collage.

(5 marks)

12. Study the weaving technique shown below.



- (a) Identify the weave structure above. (1 mark)
- (b) Give the structure reading of the above weave structure from left. (3 marks)
- (c) Define the term **shed** as used in weaving? (1 mark)

SECTION C

*Answer **ANY ONE** question from this section in the space provided after question 9*

13.
 - a. Give 2 advantages of wood as a material for making sculptures (2 marks)
 - b. Describe the process of carving a sculpture in the round using wood (12 marks)
 - c. Recommend one appropriate finish applicable to the work (1 mark)
14.
 - a. Name the three approaches used in drawing (3 marks)
 - b. Illustrate the process of drawing using grid lines (12 marks)
15.
 - a. Describe the following techniques applied in pottery making
 - i. Slip trailing (2 marks)
 - ii. Excising (2 marks)
 - b. Outline the process of making a flower vase using slab technique with incised decorations (11 marks)

16. Study the composition below.



Analyse the use of the following principles in the composition above.

- | | | |
|------|------------|-----------|
| i) | Proportion | (3 marks) |
| ii) | Dominance | (2 marks) |
| iii) | Balance | (3 marks) |
| iv) | Rhythm | (3 marks) |
| v) | Contrast | (3 marks) |

17. Identify and describe **three** types of traffic control signs giving **one** example for each, its shape and colour. (15 marks)

- 18.
- a) Explain the use of the following tools in mosaic work. (5 marks)
- i. Nippers

- ii. Trowel
- iii. Sealer can
- iv. Tweezers
- v. Spatula

- b) Describe **two** methods of mounting tesserae on the support in process of making mosaic art work. (4 marks)
- c) Outline the procedure of making a glass mosaic. (6 marks)

B. PRACTICALS

- 1. Guided by the theme sports, generate 5 stick figures in the space provided below (5 marks)
- 2. In the space provided below come up with a sketch of a human figure portrait in $\frac{3}{4}$ view (5 marks)
- 3. Working with the Head units, come up with a sketch detailing the proportions in the human figure (5 marks)
- 4. Study, draw and shade the hand with the index finger stretched out while the thumb is comfortably resting on the middle figure (10 marks)
- 5.
 - a. Working with nature as a source of inspiration, design a motif to be used to design curtains for a beauty shop. The motif should be within an area measuring 5cm and 5cm
 - b. Use the motif to come up with a halfdrop repeat pattern on paper in an area measuring 35cm by 40cm

C. PROJECTS:

Portraits (human figure drawing)

- 1. A baby
- 2. The elderly
- 3. Prominent person in Africa
- 4. Self portrait

MERU SCHOOL

HOLIDAY ASSIGNMENT NOVEMBER/DECEMBER 2025

BIOLOGY FORM THREE

TOPICAL QUESTIONS

1. Describe how gaseous exchange takes place in terrestrial plants.
2. State three ways the alveoli of human lungs are suited to its function.
3.
 - a) Describe the mechanism of gaseous exchange in a bony fish.
 - b) Describe the Photosynthetic Theory of opening and closing the stomata.
 - c) Give the ways in which the gill of a bony fish is adapted to its function.
4.
 - a) Discuss gaseous exchange in the alveolus.
 - b) Describe the process of inhalation and exhalation in mammals.
5.
 - a) Explain why diffusion alone is adequate for gaseous exchange in Protozoans.
6.
 - a) State two ways in which floating leaves of aquatic plants are adapted to gaseous exchange.
 - b) Name structures for gaseous exchange in aquatic plants.
7. Give the scientific name of the organism that causes:
 - i) Tuberculosis
 - ii) Whooping cough

TRANSPORT IN PLANTS & ANIMALS QUESTIONS

1. State three adaptations of the xylem tissues.
2. State the function of the following structures in plants:
 - a) Endodermis of root
 - b) Companion cell in Plant
 - c) Cortex of a stem
3.
 - a) Name any two types of lignification patterns in xylem vessels.
 - b) List two stomatal responses that reduce rate of Transpiration.

4. Discuss the following:

- a) Environmental factors affecting rate of Transpiration.
- b) Structural factors affecting rate of Transpiration.

5. The table below shows results of blood cell counts per mm^3 of blood from a sample of people living in different altitudes.

Red blood cells $\times 10^4$	4.8	5.3	6.7	7.6	8.47	9.82
White blood cells $\times 10^4$	0.45	0.45	0.45	0.45	0.45	0.45
Altitude (Metres)	750	1,500	2,250	3,000	4,500	4,500

PHYSIOLOGY AND TRANSPORT QUESTIONS

1. Explain the effect of increased physical activity on the following organ systems:

- a) Heart
- b) Lungs
- c) Kidneys
- d) Skin

2. Describe how human blood is adapted to its functions.

3. The table below shows the volume of gases contained in 100 cm^3 of a blood sample taken at two points in the mammalian circulatory system.

Gas	Blood entering lungs (cm^3)	Blood leaving lungs (cm^3)
Oxygen	8.65	20.25
Nitrogen	0.75	0.75
Carbon (IV) oxide	55.60	31.65

a) Account for the difference in the gaseous composition of:

- I) Blood entering the lungs
- II) Blood leaving the lungs

b) Name the blood vessel through which blood enters the lungs.

c) Explain why most athletes prefer training from high altitude areas.

4. Explain the role of the liver in blood sugar regulation.

5. What is the fate of excess amino acids in the human body?

6. Give reasons for each of the following statements:

a) Constant body temperature is maintained in the body.

b) Low blood sugar is harmful to the body.

7. Name the three processes that take place in the liver to bring about differences in composition of blood in the hepatic vein and hepatic portal vein.

8. State three adaptations of the Proximal Convolute Tubule to its function.

9. Explain how animals are adapted to cold climate.

10.

a) State two functions of the kidney.

b) Name two diseases that affect kidney.

c) Name two substances that are not found in urine but are in ultrafiltrate.

11. Describe how the mammalian skin regulates body temperature.

12. Discuss the role of the kidney.

13

a) Name the products of glycolysis

b) What is the role of the cristae in a mitochondria?

c) Which is the most common substrate in human beings?

a) State two regions within a cell where the 1st and 2nd phase of aerobic respiration takes place in a cell.

b) Give uses of energy released during respiration.

14. Distinguish between gaseous exchange and respiration.

15. Give a reason why it is difficult to calculate Respiratory Quotient (R.Q.) in plants.

16. Give two reasons why fats are not considered the best substrate in respiration even if they give the highest energy value.

17. State two structural modifications of the kidney of desert animals like kangaroo .

18. Explain what is meant by oxygen debt.

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C.R.E FORM THREE

ANSWER ALL QUESTIONS

1. Outline the changing attitude towards Birth and naming in society today.
2. Give seven reasons why children are important in Traditional African Communities.
3. Identify reasons why pregnancy before marriage is rare in Traditional African Communities.
4. Give reasons why it is difficult to have reforms in Kenya today.
5. Outline reasons why Nehemiah condemned mixed marriages.
6. From the call of Nehemiah, identify seven qualities of God (Jeremiah 1). Give six ways in which the church prepares its members for the day of the Lord.
7. Give six ways in which the church prepares its members for the day of the Lord.
8. Outline the social injustices condemned by prophet Amos in Israel.
9. Explain categories of prophets in the Old Testament.
10. Give six factors that promote the spread of cults today.
11. Explain how David promoted the worship of God in Israel.
12. Give the roles of Samuel as a Judge in Israelites settled in Canaan.
13. Give reasons why Christians curse against Female Genital Mutilation in Kenya today.
14. Explain four differences between the Jewish and African Traditional Community concerning circumcision.
15. Describe the incident when Abraham was willing to sacrifice his son Isaac as contained in Genesis 22:1-14.
16. Give six steps taken by God to restore the broken relationship between Him and man.
17. State the effects of sin in Genesis 3-11.
18. Outline the activities performed by God in the first account of Creation.
19. Explain the teaching of Peter concerning the people of God.
20. Explain how Peter's life was transformed on the day of Pentecost.
21. Explain six ways in which the gifts of the Holy Spirit are abused in the church today.

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CHEMISTRY FORM THREE

- **READ AND MAKE NOTES ON THE FOLLOWING TOPICS:**

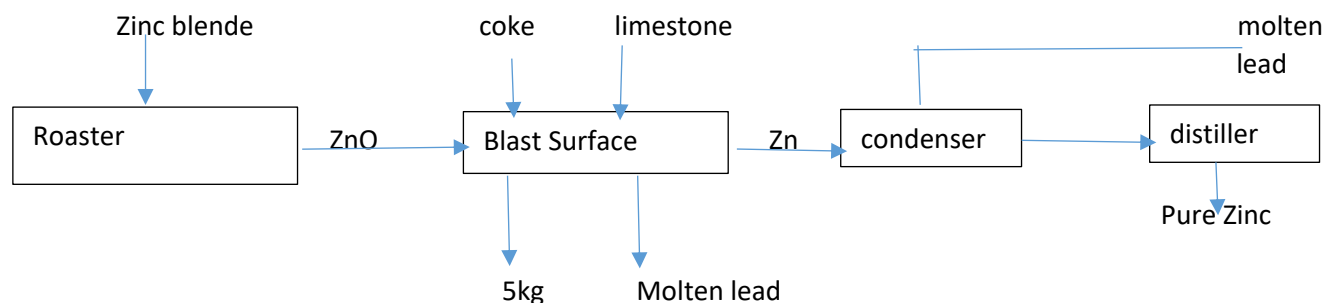
- 1) **METALS**

- 2) **RADIOACTIVITY**

- 3) **ACIDS & BASES AND SALTS**

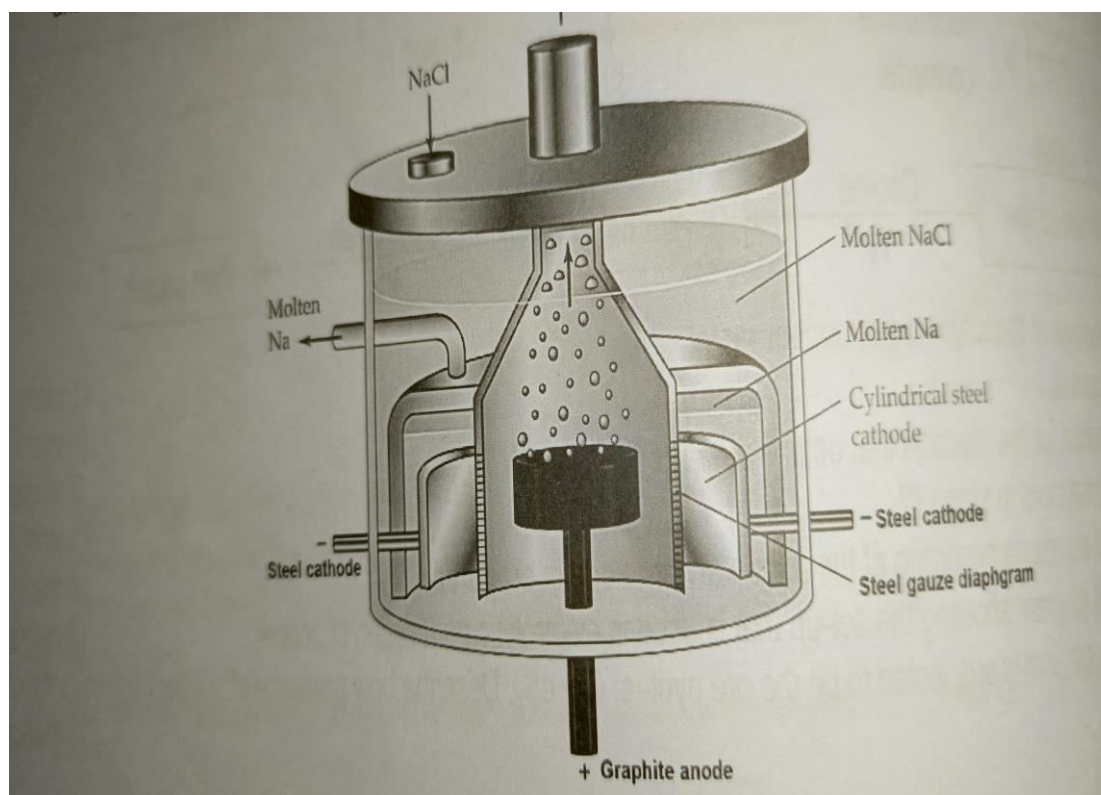
- **ANSWER ALL THE FOLLOWING QUESTIONS**

1. When zinc hydroxide dissolves in excess ammonia solution it forms a complex ion. Write the formula of its complex ion and its name. (1mk)
b) Write the equation for the formation of tetrahydroxolead (II) ion. (2mks)
2. a) Zinc occurs mainly as zinc blende. Name one other one from which zinc can be extracted. (1mk)
b) The flow chart below shows the various stages in the extraction of zinc metal;



- i) Write an equation for the reaction which occurs in the roasting chamber. (1mk)
 - ii) Describe the process that occurs in the blast furnace. (3mks)
 - iii) Explain why molten lead is added to the condenser. (1mk)
 - iv) State two uses of zinc. (2mks)
 - v) Give one reason why the extraction of zinc causes pollution to the environment. (1mk)
3. Aqueous hydrogen chloride reacts with potassium Manganate (VII) to produce chlorine gas, while a solution of hydrogen chloride in methylbenzene has no effect on potassium manganate (VII). Explain this observation. (3mks)

4. The diagram below shows the method used to extract sodium metal by electrolysis at molten sodium chloride. Study it and answer the questions that follow.



- Write the equation for the reaction taking place at the graphite anode. (1mk)
 - In this process, the anode is surrounded by diaphragm. What is the purpose of the diaphragm? (1mk)
 - Name an industry that can be built next to a sodium extraction plant. (1mk)
 - Why is the anode made of graphite in this case instead of steel which is a better conductor of electricity? (1mk)
 - Give a reason why large quantities of electricity is required for this process. (1mk)
 - Explain why aqueous sodium chloride is not suitable as an electrolyte for the manufacture of sodium in the Down's Process (1mk)
 - Sodium metal with air to form two oxides. Give the formulae of two oxides. (1mk)
 - What property of sodium makes it possible to be separated from the electrolyte? (1mk)
5. The table below shows solubility of salt Y at different temperatures;

Temperature (°C)	0	20	40	60	80	100
Solubility (g/100g water)	10	40	74	112	160	122

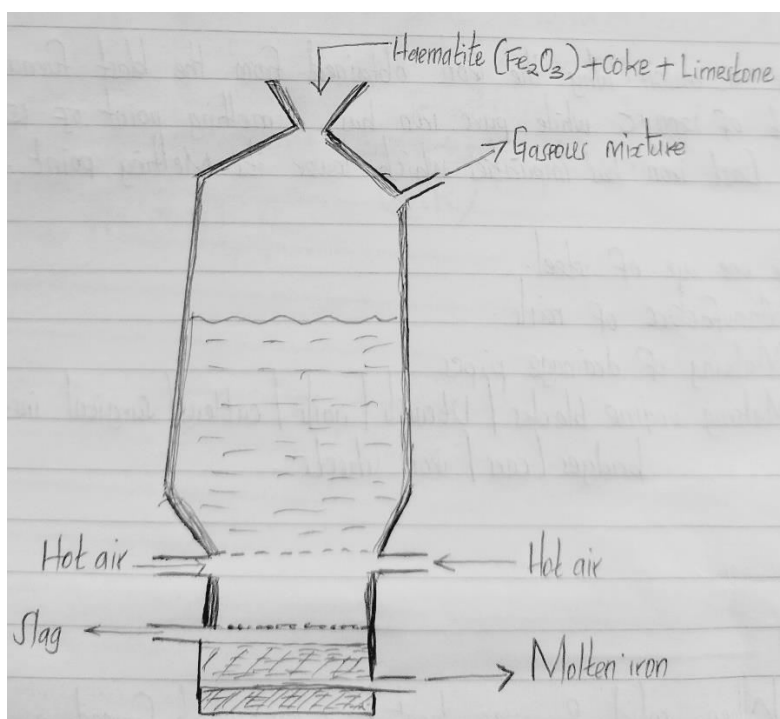
- Draw a graph of solubility against temperature. (3mks)
- From the graph determine:
 - Solubility of salt X at 35°C. (1mk)
 - The temperature at which the solubility of salt Y is 80g/100g H₂O. (1mk)
- A saturated solution of salt Y was cooled from 90°C to 35°C. Find the mass of crystals formed. (1mk)

6. Study the information in the table below answer the questions that follow;

Salt	Solubility (g/100g water)	
	At 40°C	At 60°C
CuSO ₄	28	38
PB(NO ₃) ₃	70	98

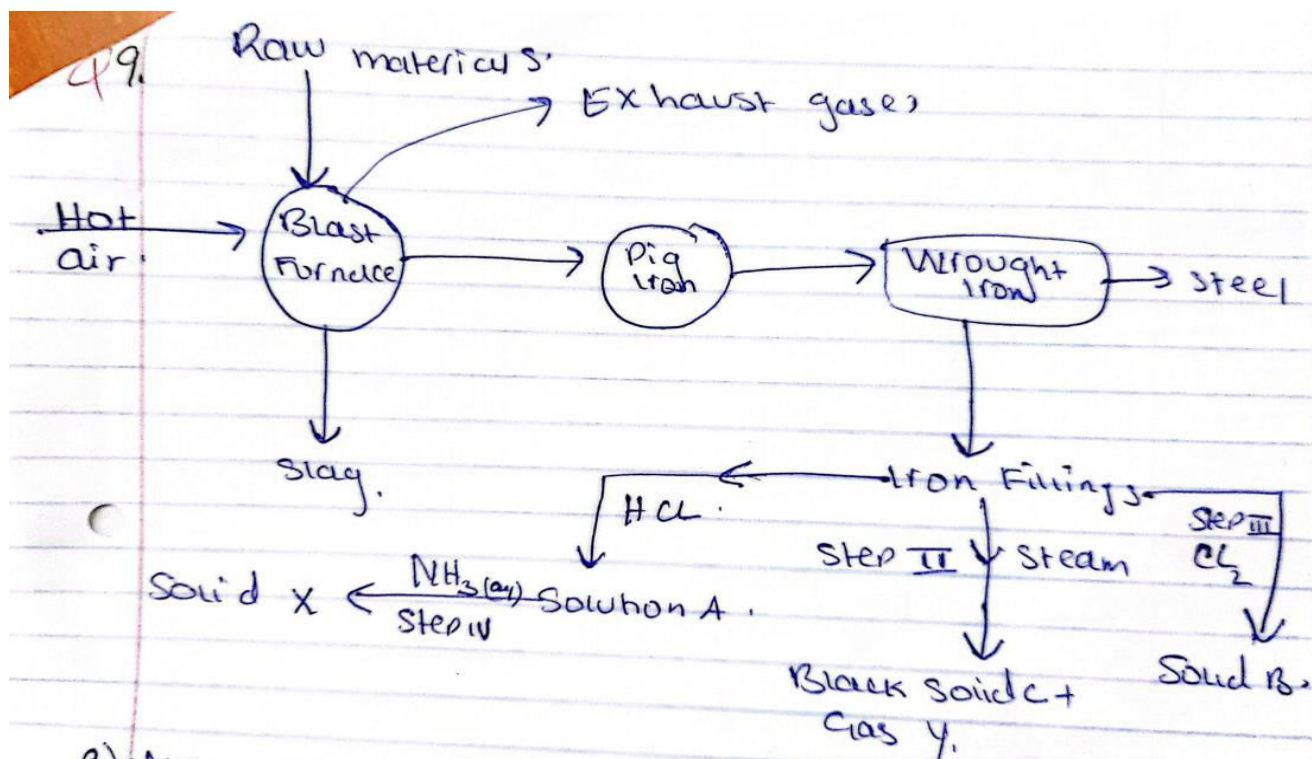
A mixture containing 36g of CuSO₄ and 78g of PB(NO₃)₂ in 100g of water at 60°C was cooled to 40°C;

- Which salt crystallized out. Give a reason. (2mks)
 - Calculate the mass of salt that crystallized out. (1mk)
 - State one cause of temporary hardness of water. (1mk)
 - A sample of river water is suspected to contain zinc and sulphate ions. Describe how the presence of zinc ions in acid sulphate can be established. (3mks)
7. The extraction of iron from its ores takes place in the blast furnace. Study it and answer the questions that follow:



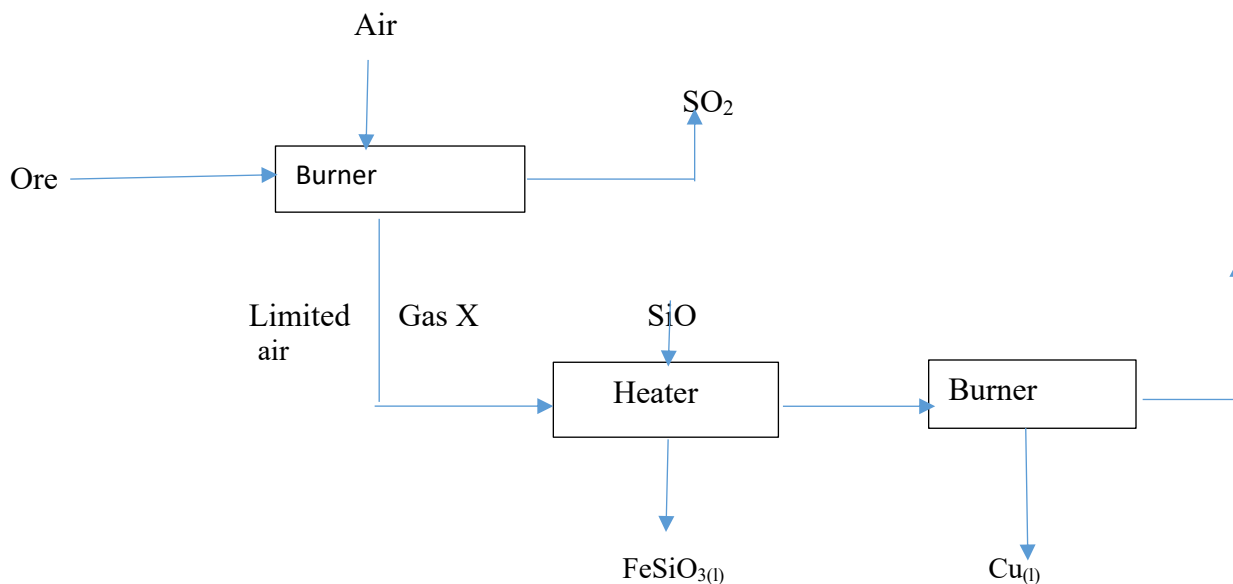
- Name:
 - One substance in slag. (1mk)
 - Another iron ore. (1mk)
 - one gas that is recycled. (1mk)
 - Describe the process which lead to the formation of iron in the blast furnace. (2mks)
8. a) Define the term Amphoteric oxide giving an example. (2mks)
- Write a formula of a complex ion formed when sodium hydroxide is added to Aluminium salt solution. (1mk)

9.



- Name the raw materials fed into the blast furnace. (2mks)
- Name three exhaust gases emitted from the blast furnace. (3mks)
- Name substances A, B, C. (3mks)

10. The flow chart below represents the steps followed when extracting copper from one of its ores. Study it and answer the questions that follow:



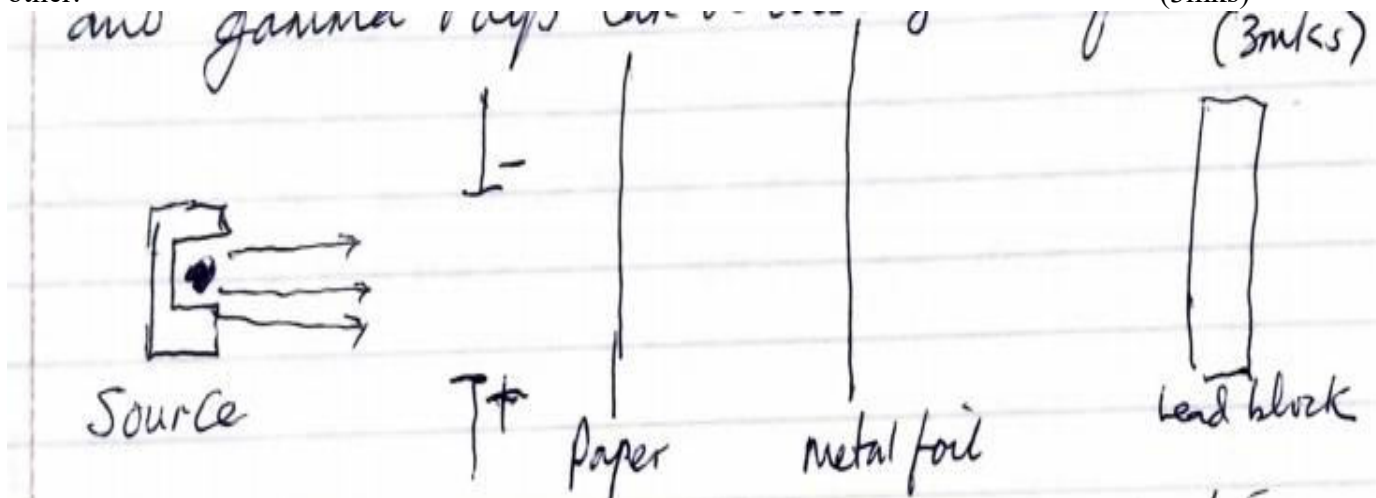
- Name the chief ore of copper. (1mk)
- Write equation for the reaction that occurs in the heater. (1mk)
- What is the purpose of the silicon (IV) oxide in this process? (1mk)

- iv) Write equations for the reactions that produces copper in burner II. (2mks)
- v) Name gas X. (1mk)
- vi) State two uses of copper. (2mks)
- vii) A green rocky material is suspected to be the ore malachite, $\text{CuCO}_3 \cdot \text{Cu(OH)}_2$. Describe with the use of appropriate equations how could establish the presence of copper in the ore. (3mks)
11. a) Give the definitions of the following. (3mks)
- Radioactivity.
 - Radioisotopes
 - Half life

- b) Give two differences between chemical and Nuclear reaction. (4mks)

Chemical reactions	Nuclear reactions

- c) 400g of a sample of iodine -131 undergoes true half-lives. Calculate the amount left after the third half-life. (2mks)
- d) Complete the diagram to show how Alpha, Beta and gamma rays can be distinguished from each other. (3mks)



- e) Outline three general properties of radiations. (3mks)
12. a) The table below gives the percentage of a radioactive isotope of Bismuth that remains after decaying at different times.
- | | | | | | | | |
|-----------------------|-----|----|----|----|----|----|-----|
| Time (min) | 0 | 6 | 12 | 22 | 38 | 62 | 100 |
| Percentage of Bismuth | 100 | 81 | 65 | 46 | 29 | 12 | 3 |
- On a graph, plot the percentage of Bismuth remaining against time. (3mks)
 - Using the graph to determine the original mass of the Bismuth isotope given that the mass that remained after 70 minutes was 0.16g. (2mks)
- b) Radioactive carbon – 14 decays emitting B-particle to form N – 14. Write a nuclear equation for the reaction. (1mk)
- c) A radioactive substance weighing MKg took 1900 years for the original mass to reduce to 15kg. Given that the half-life of the radioactive substance is 380 years. Determine the original mass of the radioactive substance. (2mks)

13. Calculate the values of X and Y in the following nuclear equation. (2mks)

14. a) Radioactivity has several applications. State one applications of radioactivity in:

- i) Medicine.
- ii) Agriculture
- iii) Nuclear power station
- iv) Tracers

(2mks)

b) State two ways to control pollution effects of radio activity.

(2mks)

Q.15 You are provided with:

Form 4

- ✓ A dibasic acid, labeled solution P
- ✓ Solution R containing 51.2g per litre of potassium carbonate

You are required to determine the concentration of solution P in moles per litre.

Procedure

Using a pipette and pipette filler, place 50cm^3 of solution P into a 250ml volumetric flask. Add distilled water into the flask to make it 250cm^3 of solution. Label this solution as Q. Fill the burette with solution Q. Pipette 25.0cm^3 of solution R into a conical flask and add 2 – 3 drops of methyl orange indicator and titrate with solution Q. The results obtained were recorded as shown in the table below.

Experiment	I	II	III
Final burette reading (cm^3)	-	25.0	32.9
Initial burette reading (cm^3)	0.0	0.0	-
Volume of solution Q used (cm^3)	25.1		24.9

a) Complete the table by filling in the missing values.

(1mk)

b) Calculate the average volume of solution Q used.

(1mk)

c) Calculate

i) The concentration of potassium carbonate, solution R, in moles per litre.
(K = 39.0, O = 16.0, C = 12.0)

(1mk)

ii) The moles of potassium carbonate which reacted.

(1mk)

iii) The moles of dibasic acid in solution Q.

(1mk)

d) Determine

i) The concentration in moles per litre of the dibasic acid in solution Q. (1mk)

ii) The molarity of the original dibasic acid solution P.

(1mk)

Q6 Solid A was placed in a boiling tube, 10cm^3 of distilled water was added. The mixture was shaken thoroughly. Use the information provided and fill the blank spaces

Observations	Inference
Solid dissolves to form a colourless solution	

The product obtained above was divided into five portions of 2cm^3 .

a) 3 drops of lead (II) nitrate was added to the 1st portion

Observations	Inference
White precipitate	

b) To the 2nd portion, 4 drops of dilute nitric (V) acid was added

Observations	Inference
	SO_3^{2-} , Cl^- present

c) To the 3rd portion, 4 drops of barium nitrate solution was added.

Observations	Inference
	Cl^- present

- d) To the 4th portion, aqueous NaOH was added drop wise until in excess

Observations	Inference
White precipitate soluble in excess	

- e) To the 5th portion, aqueous ammonia was added drop wise until in excess

Observations	Inference
White precipitate soluble in excess	

Q. 17. You are provided with solid B is **unsaturated alkanol**. Use the instructions provided and fill the observations and inferences in the spaces provided.

- a) Solid B was placed in a metallic spatula and ignited using a Bunsen burner flame.

Observations	Inferences
(1mk)	(1mk)

- b) Solid B was placed in a boiling tube and 10 cm³ of distilled water was added. The mixture was shaken thoroughly. The product was divided into two portions

- i) To the 1st portion, 3 drops of acidified potassium manganate (VII) was added.

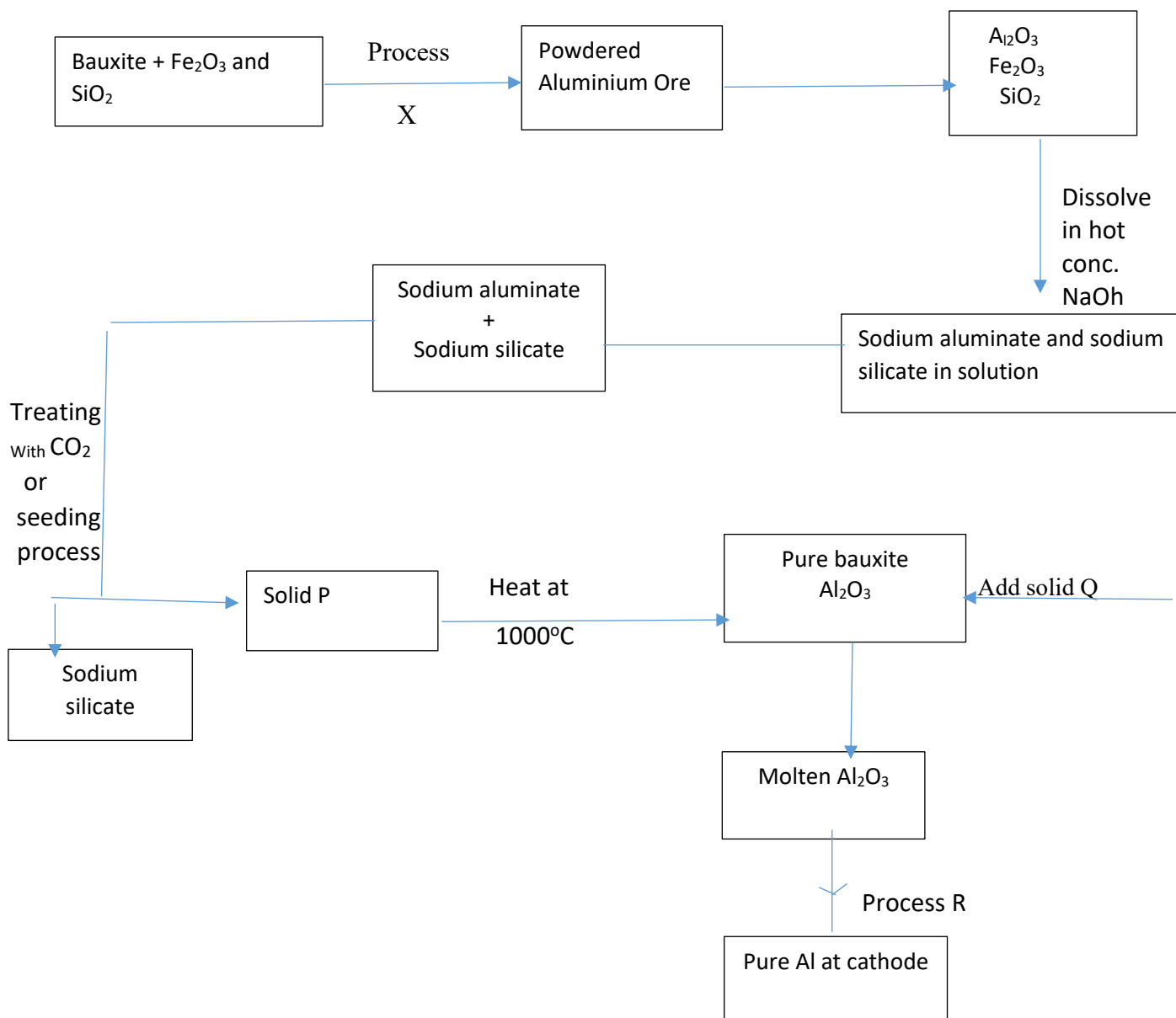
Observations	Inferences
(1mk)	(1mk)

- ii) To the 2nd portion, 2 drops of acidified potassium dichromate VI was added.

Observation	Inferences
(1mk)	(1mk)

18. Two ores of Aluminium are bauxite, $\text{Al}_2\text{O}_3 \cdot \text{H}_2\text{O}$ and china clay $\text{Al}_2\text{SiO}_5 \cdot \text{H}_2\text{O}$. Suggest two reasons why bauxite is usually preferred to china clay for extraction of Aluminium. (2mks)

b) Aluminium metal is extracted from its ore according to the scheme shown below. Study the solvent and and answer the questions that follow:



- i) Name (3mks)
 - I) Residue Y
 - II) Process X
 - III) Process Z
- ii) State two functions of concentrated $\text{NaOH}_{(\text{aq})}$. (1mk)
- iii) Name solid Q and state its function. (2mks)
- iv) Process R is used in the extraction of Aluminium metal. (1mk)
 - I Name process R.

II State the property of Aluminium that make it necessary to use process R as the method of extraction. (1mk)

19. Study the equation below and answer the questions that follow:



Giving reasons identify;

i) An acid in the forward reaction.

(1mk)

ii) A base in the backward reaction.

(1mk)

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MERU SCHOOL
HOLIDAY ASSIGNMENT NOVEMBER/DECEMBER 2025
ENGLISH FORM THREE

A. CREATIVE COMPOSITION

1. Write a composition that includes the following words: friends, police, court, jail.
2. Write a composition to illustrate the saying “When the deal is too good, think twice.”
3. Write a story that ends with the words: “... and that is how I learned never to trust a stranger again.”
4. Write a composition on the topic: “Hard work pays.”
5. Social media has done more harm than good.” Write an essay giving your opinion.

B. THE SAMARITAN BY JOHN LARA

1. Citizens have a role of voting in men and women of honour. When they elect selfish leaders, they end up suffering themselves. Write an essay in support of this claim basing your illustrations on John Lara's The Samaritan.
2. Immoral people try to hide their misdeeds but when the truth comes out, they face the consequences of their actions. Making reference to John Lara's The Samaritan, write an essay to support this statement.
3. Selfish leaders create many problems that affect citizens. Making reference to John Lara's The Samaritan, write an essay to support this statement.
4. Change can be initiated through the effort of ordinary citizens. Closely referring to Nicole in The Samaritan by John Lara, write an essay to support this statement.
5. “Corrupt leaders will use all means to escape liability instead of working for the progress of their societies.” Using The Samaritan write an essay to support the statement.

C. A SILENT SONG AND OTHER STORIES (edited by GODWIN SIUNDU)

1. Lack of sound judgment results to regrets. Making reference to A man of awesome power, justify this claim Lack of good sense results in misguided decisions which may torment us eternally.
2. Lack of courtesy between the police and civilians leads to lethal conflicts. Justify the validity of this statement using illustrations from Meja Mwangi's Incident in the park. (20 marks).
3. "Ninema is an epitome of a good businessperson that deserves to be emulated. " Validate the given statement, making reference to the story "Ninema" by Vrenika Pather. (20 marks)

4. Suffering is an indicator of loose familial relations, certify this assertion using A Silent Song by Leonard Kibera.

5. Citing illustrations from Eric Ng'omaryo's story Ivory Bangles, write an essay showing how anyone who defies custom is bound to suffer.

6. Children suffer when their parents mistreat them. Write an essay to support this statement basing your illustrations on The Sins of the Fathers.

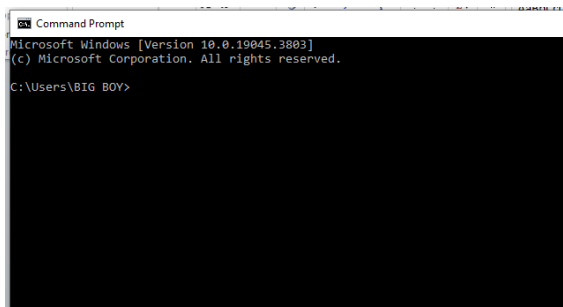
FORM 3 COMPUTER STUDIES
2025 DECEMBER HOLIDAY
ASSIGNMENT

1. State the meaning of each of the following terms used in computers (2 marks)
2. List four peripheral devices that may get powered from computer ports State three requirements that a computer system must have in order to be used for video conferencing (3MARKS)
3. Explain each of the following terms used in computer display unit (2 marks)
4. A company purchased computer software. State three reasons why the company should be provided with the software documentation during he purchase (3 marks)
5. State three reasons why computers in operations require reliable power supply (3 marks)
6. State two uses of computer simulation in education 2 marks
7. State two database objects that may be used to modify a record in a databases (2 marks)
8. Differentiate between menu driven interface and graphical user interface in respect to operating systems (2 marks)
9. State three difference between impact printer and non-impact printer (3 marks)
10. Explain a circumstance that may lead to the use of crop tool in a word processing document (2 marks)
11. State three benefits of a distributed operating system (3 MARKS)
 - a) The emergence of COVID-19 pandemic led to many organisation in Kenya to embrace teleworking approach. State the meaning of term teleworking? (1 mark)
 - b) State two advantages of using templates when creating documents in word processing
12. Explain a circumstance that may lead to the occurrence of each of the following errors during data processing
13. A) State two common features of the fourth generation programming languages (2 marks)
 - a) A student was advised to design a program before coding. State four reasons for this advice (4 marks)
 - b) In a computer game, a player is required to guess a winning number. If the number guessed is 10, the player is declared a winner and the game ends. If the number guessed is not 10, the player is notified to try again. When the number of trials exceeds 4, the player is notified and the game terminated. Draw a flowchart to represent the algorithm of this game (9 marks)

A web company offering e-learning services intends to hire a web administrator. Explain two roles the personnel is expected in the company (4 mark)

b.) Mundani cooperative society receives supplies of cereals from farmers. The data for the supplies made is accumulated for processing payments every end of month.

- i) Identify the data processing mode suitable for computing farmers payments (1 mark)
- ii) Explain two advantages of the data processing mode identified in (i) (4 marks)
- iii) Figure 1 shows a screenshot of a user interface of a computer. Study it to answer the questions that follows.



- i) State the category of an operating system exhibited by this type of user interface (1 Mark)

This type of operating system has become unpopular amongst computer users. State three reasons for this trend. (3 marks)

18 a) Explain the meaning of each of the following terms as used in system development

@ 2 marks

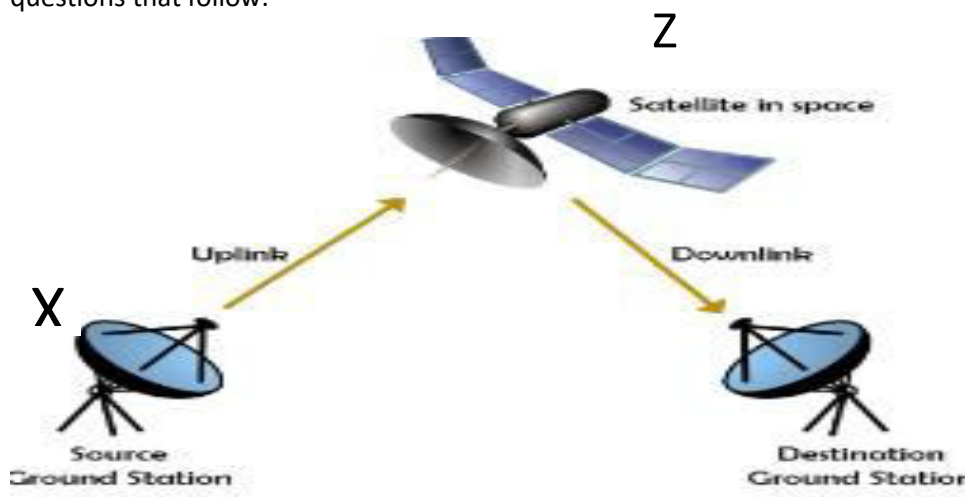
- i) Integration testing
- ii) Stress testing
- iii) Usability testing

b) State three activities carried out in each of the following phases of system development

@ 3 marks

- i) Analysis
- ii) Design

19. a) Figure 2 shows the transmission of data in a computer network. Study it to answer the questions that follow:



- i) Identify the components labelled **W,Y,X and Z** (2 marks)
- ii) Explain two reasons why a school in a remote location may adopt this technology for its internet connectivity (4 marks)
- c) Convert the decimal number **70.25**₁₀ to binary number system equivalent (4 marks)
- iii) Using two complement evaluate **1010 - 11101**₂ (5 Marks)

20 a) State the meaning of each of the following terms used in spreadsheets

- i. Cell
- ii. chart

(ii) State two differences between a function and a formula as used in spreadsheets (2 marks)

b) State four activities performed on the internet that may lead to degradation in our society

c) Mawingo intends to replace a processor in his home computer. State two functions he should consider before the replacement (2 marks)

Explain two reasons why the online system may be preferred by the agency (4 marks)

MERU SCHOOL
FORM 3 BUSINESS STUDIES
DECEMBER HOLIDAY ASSIGNMENT 2025

1. Explain five ways of protecting and controlling an office property.
2. Explain factors that limit the growth of a country's national income.
3. Explain reasons why Wakulima Manufacturers would want to have their own warehouse despite many public warehouses operating near their area of operation.
4. Explain ways in which Mr. Muthuri would benefit by being a member of Mwalimu National Deposit Taking Sacco.
5. Explain five factors that influences the choice of a means of transport.
6. Explain reasons why firms are widely adapting use of Tiktok for product promotion.
7. Explain reasons why fire is an insurable risk.
8. Explain reasons why many organisations are adapting landscape office layout over enclosed office layout.
9. Describe channels that Odhiambo who grows flowers in Naivasha can use to distribute his flowers to the United Arab Emirate.
10. Describe various types of unemployment.
11. Discuss challenges faced when calculating national income using output approach.
12. Discuss key features that distinguishes Public Limited Company from Private Limited Company.
13. Explain five reasons why Fuliza is increasingly becoming popular in Kenya.
14. Using a well labelled diagram, explain the effects of a shift of supply curve to the right on equilibrium price and quantity.
15. Explain ways in which insurance promoted business stability.
16. Explain ways in which technology has influenced insurance industry today.
17. Discuss advantages and disadvantages of advertising as a method of product promotion.
18. Outline differences between money order and postal order as a means of payment.
19. Explain ways in which a good filing system can facilitate efficient operation in an office.
20. Explain differences between departmental stores and chain stores.
21. Explain methods used in determining the price of a commodity in the market.
22. Explain reasons why small businesses continue to operate in the Kenyan market despite stiff competition from well-established large-scale business outlets.
23. Explain five negative effects of production activities on the environment.
24. Explain current trends in communication.
25. Explain five documents required by the registrar of companies before a company is registered.
26. Explain errors that are not revealed by a trial balance.
27. Record the above information in the relevant ledger accounts and balance them off on 7th March 20-2

Mtema possessed the following assets and liabilities on 1st July 20-2

	Sh.
Cash at bank	50,000
Debtors	20,000
Creditors	40,000
Furniture	30,000
Stock	25,000

Determine the amount of capital in the business on that date.

The following transactions took place during the first week of July, 20-2:

- | | | |
|------|---|---|
| July | 2 | Purchased stock worth sh.18,000 on credit |
| | 3 | Sold some furniture at cost for shs.4,000 and payment received by cheque. |
| | 4 | Received shs.9,000 cash from debtors |
| | 5 | Paid shs.12,000 to creditors by cheque |
| | 6 | Deposited shs.6,000 into the business bank account from the cash till |
| | 6 | Paid for advertising Sh.1,500 in cash |

Required:

Record the above information in the relevant ledger accounts, balance them off and extract a trial balance as at 7th July 20-2

28. The following were assets and liabilities of Nithi Stores on 1st October 20-3

	Sh.
Cash at bank	80,000
Cash in hand	15,000
Creditor Juma	24,000
Bank loan	70,000
Motor vehicle	210,000
Stock	45,000
Debtor Mangu	26,000

Determine Nithi Stores capital on 1st October 20-3

The following transactions took place during the first week of October 20-3:

- | | | |
|------|---|--|
| Oct. | 1 | Received Shs.3,500 in cash from Mangu |
| | 2 | Paid part of loan Shs.27,000 by cheque |
| | 3 | Paid creditor Juma Shs.9,000 in cash |
| | 4 | Nithi Stores converted private furniture valued at Shs.14,000 into business asset. |
| | 5 | Withdrew Shs.13,000 from bank for business use. |
| | 6 | Purchased stationery Shs.1,500 in cash. |
| | 7 | Purchased stock of goods worth Shs.18,500 from Juma on credit. |

Enter the above information in the relevant ledger accounts, balance them off as at 7th October 20-3 and prepare a trial balance as at that date.

29. Prepare a three-column cash book from the following information for the month of May 20-4.

- | | | |
|-----|----|---|
| May | 1 | Balances b/d: cash Shs.50,000, Bank Shs.180,000 |
| | 1 | Cash sales Shs.3,000 |
| | 2 | Paid the following creditors by cheque: N. Mwangi Shs.1,500, J. Mwaniki Shs.16,000, N. Mugo Shs.1,200 after deducting 10% cash discount in each case. |
| | 3 | Received cheques from the following debtors after deducting 5% discount in each case. E. Githinji Shs.24,000, D. Nyamu Shs.9,000, E. Mutua Shs.1,400. |
| | 5 | Paid for repairs in cash Shs.16,000 |
| | 10 | Paid Juma in cash Shs.9,500 |
| | 15 | Banked Shs.6,000 from the cash till |

- 15 Received cash from P. Kavuniki Shs.13,500 in full settlement of his account of Shs.15,000
- 16 Cash sales directly banked Shs.26,400
- 20 Cash purchases Shs.8,920

30. On 1st December 20-1, Njeru Traders had cash in hand Shs.15,000 and at bank Shs.45,000. The following transactions took place during the month:

- Dec.
- 1 Cash purchases Shs.900
 - 2 Paid for motor expenses Shs.2,000 in cash
 - 5 Received cash Shs.5,000 from Kibisu
 - 8 Cash sales Shs.1,000
 - 10 Atsiaya settled her account of Shs.1,500 by cheque after deducting 5% cash discount
 - 15 Paid for consultancy services in cash Shs.2,000
 - 18 Drew Shs.5,500 from the bank for personal use
 - 20 Paid for general expenses Shs.500 in cash
 - 23 Paid for salaries and wages by cheque Shs.2,000
 - 24 Paid the following creditors by cheque and in each case deducted 2% cash discount: F. Kisarago Shs.1,000, V. Nasimiyu Shs.1,500, D. Alima Shs.3,000
 - 25 Settled Kadogo's account of Shs.2,500 by cheque after deducting 5% cash discount.
 - 28 Received the following cheques from debtors after they had deducted cash discount of 2% in each case: G. Munene Shs.9,800, G. Akato Shs.2,940, W. Kangwana Shs.1,372
 - 29 Received the following amounts in cash from debtors having deducted cash discount of 2% in each case; Minao Shs.1,960, L. Koyo Shs.4,900, E. Odhiambo Shs.5,880.
 - 31 Transferred Shs.1,000 from cash till to the bank

Required:

Prepare a three-column cash book.

31. The following transactions took place in the business of Napunyi Stores during the month of August 20-2

- Aug.
- 1 Credit purchases: Mzee Shs.25,000, Mutomo Shs.30,000, Kailalshi Shs.40,000
 - 4 Credit sales: Bundi Shs.16,000 and Mambo Shs.20,000
 - 6 Credit purchases: Maisha Shs.10,000, Mutomo Shs.35,000 and Kandoka Shs.50,000
 - 8 Credit Sales: Kaimba Shs.60,000, Bundi Shs.26,000 and Kirima Shs.45,000
 - 13 Goods returned by Napunyi to: Mzee Shs.4,000, Maisha Shs.1,500 and Kandoka Shs.3,000
 - 18 Credit purchases from Ndoma Shs.70,000
 - 22 Goods returned to Napunyi by Bundi Shs.1,000 and Mambo Shs.2,400
 - 26 Credit sales to Bundi Shs.54,000
 - 31 Goods returned to Napunyi by: Kaimba Shs.1,200, Kirima Shs.2,000 and Bundi Shs.4,000

Record the above information in the correct books of original entry and thereafter post them to the relevant ledger accounts.

32. The following trial balance was extracted from the books of Kathuni Traders on 20th April 20-6

	Dr Sh	Cr Sh
Sales		427,000
Purchases	345,000	
Returns	17,000	20,000
Land and buildings	640,000	
Carriage in	12,000	
Carriage out	8,000	
Commissions		32,000
Stock 1 st May 20-5	54,000	
Loan from Biashara Bank		250,000
Discounts	16,000	29,000
Insurance	21,000	
Salaries	18,000	
Drawings	37,000	
Motor vehicles	400,000	
Furniture	70,000	
National Bank loan		360,000
Debtors/creditors	82,000	95,000
Bank		67,000
General expenses	15,000	
Cash in hand	35,000	
Capital		490,000
	<u>1,770,000</u>	<u>1,770,000</u>

Stock on 31st April 20-6 was valued at shs.75,000

Prepare:

- Trading, profit and loss account for the period ended 30th April 20-6
 - Balance sheet showing:
 - Fixed assets
 - Current assets
 - Long-term liabilities
 - Current liabilities
33. The trial balance given below was extracted from the books of Mwachofi as at 31st December 20-9

	Dr Sh	Cr Sh
Stock 1/1/20-9	30,000	
Purchases/sales	275,000	390,000
Returns	10,000	6,000
Discounts	5,000	7,000
Insurance	20,000	
Advertising	4,000	
Carriage inwards	15,000	
Carriage outwards	8,000	
Premises	45,000	
Machinery	18,000	

Loan from Ukweli Bank		210,000
Debtors	47,000	
Drawings	25,000	
Cash at bank	250,000	
Commissions		36,000
Creditors		52,000
Salaries	19,000	
Cash in hand	40,000	
Rates	12,000	
Capital		<u>689,000</u>
	<u>1,390,000</u>	<u>1,390,000</u>

Stock on 31st December 20-9 was Sh.50,000

Prepare a trading, profit and loss account for the period ended 31st December 20-9 and a balance sheet as at that date.

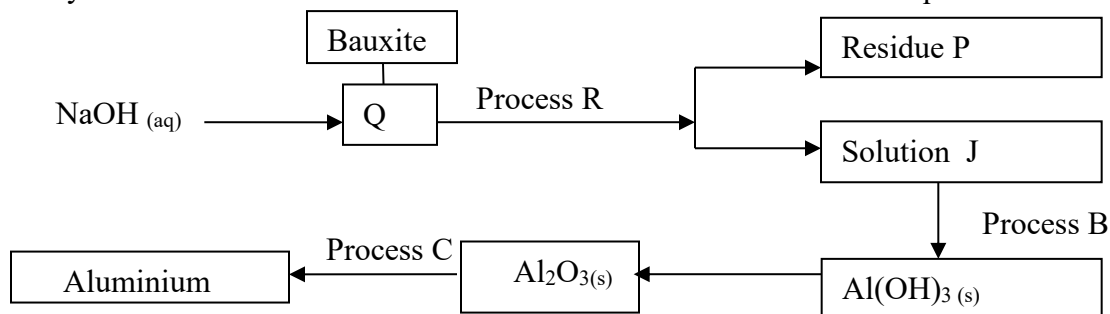
Make notes on the following topics.

- (i) Money and banking
- (ii) Public finance

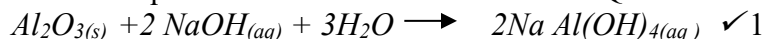
Kenya Certificate of Secondary Education
REVISION ON METALS FORM 4
INSTRUCTIONS TO STUDENTS:
TOPIC: METALS

I. ALUMINIUM

1. (a) Study the flow chart of extraction of aluminium below and answer the questions that follow.



- (i) Write the equation for the reaction in chamber Q. (1 mark)



- (ii) Name residue P. (1 mark)

Iron (III) hydroxide ✓1

- (iii) Name processes R and C. (2marks)

R: Filtration ✓1

C: Electrolysis ✓1

- (iv) In process C, a current of 88.0A was passed through molten aluminium oxide for 8 hours. Determine the mass of aluminium produced. (3marks)

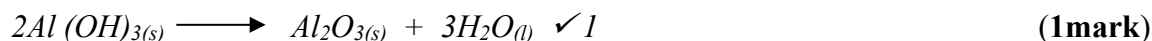
(1 Faraday = 96 500 coulombs and Al = 27)

$$\begin{aligned}
 Q &= It \\
 &= 88 \times 8 \times 60 \times 60 \\
 &= 2534400 \text{ C} \quad \checkmark \frac{1}{2} \text{ mk} \\
 Al^{3+} (l) + 3e^{-} &\longrightarrow Al(s) \quad \checkmark 1 \\
 27g \text{ Al} &\longrightarrow 3 \times 96500 \text{ C} \quad \checkmark \frac{1}{2} \\
 X &\longleftarrow 2\,534\,400 \text{ C} \\
 X &= \frac{27 \times 2534400}{3 \times 96500} \quad \checkmark \frac{1}{2} \\
 &= 236.3689 \text{ g} \quad \checkmark \frac{1}{2}
 \end{aligned}$$

- (v) State **two** ways by which process B is accomplished. (2marks)

- By adding a seed / seeding ✓1
- By bubbling CO₂ into the NaAl(OH)₄ ✓1

- (vi) Write an equation for the conversion of aluminium hydroxide into aluminium oxide.



(b) Explain the following observations:

(i) Aluminium utensils should not be cleaned with strongly alkaline washing liquids. (1mark)

Strongly alkaline solutions / liquids dissolve the protective layer of aluminium oxide ✓1

(ii) Aluminium alloys are commonly used in aeroplane construction.

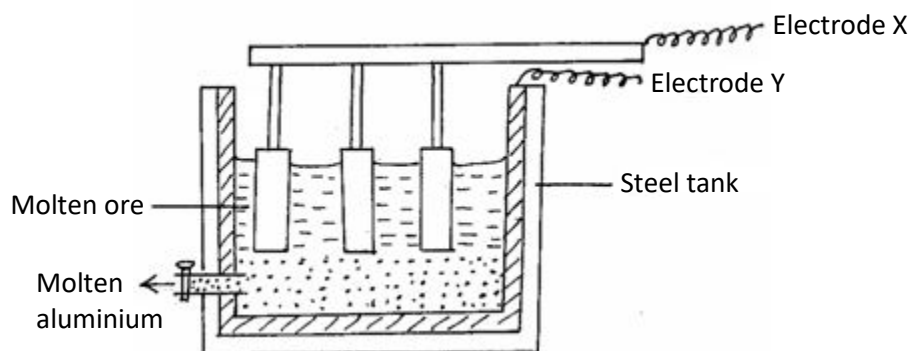
(1mark)

- Low density ✓1

- Less reactive / inert (Any one)

- More resistant to corrosion

2. Aluminium is extracted using the electrolytic cell represented by the diagram below.



(a) Why is aluminium extracted by electrolytic method?

(1mark)

Aluminium is very reactive metal ✓ hence extracted by electrolysis.

(b) Name the electrodes labeled

(2marks)

X – Anode ✓½mk

Y – Cathode ✓½mk

(c) The chief ore from which aluminium is extracted is bauxite.

(i) Name **two** main impurities present in bauxite.

(2marks)

Iron (II) oxide ✓1mk

Silicon (IV) oxide ✓1mk

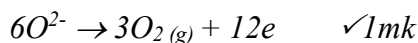
(ii) Aluminium oxide is the main component in Bauxite with a melting point of 2015°C but electrolysis of molten aluminium oxide is carried out at 800°C. Explain how this is achieved.

(2marks)

Cryolite is added. ✓1mk This lower the temperature from 2015°C to 800°C. ✓1mk

(d) Write the equations for the reaction taking place at the anode.

(1mark)



(e) One of the electrodes is replaced periodically. Which one and why?

(2marks)

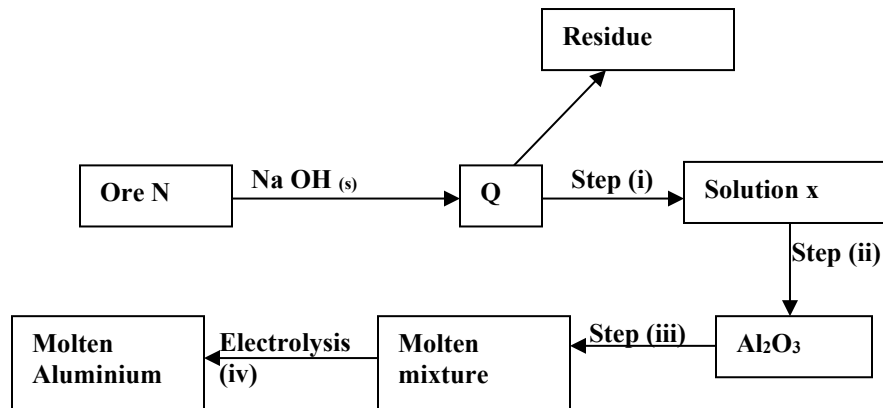
The anode. ✓ The oxygen liberated at the anode reacts with carbon anode to ✓ form carbon (IV) oxide hence its corroded.

- (f) Duralumin (an alloy of copper, aluminium and magnesium) is preferred to pure aluminium in the construction of aeroplane bodies. Give **one** property of duralumin that is considered. (1mark)

- Stronger than pure aluminium.
- Harder than pure aluminium.
- Has higher tensile strength than aluminium.
- Not easily corroded compared to aluminium.
- More durable.

(Any 1mk)

3. Study the flow chart below and answer the questions that follow.



- (a) Name one Ore of N. (1mark)

Bauxite

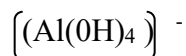
- (b) Explain why the ore is first dissolved in excess sodium hydroxide solution (1mark)

To purify the ore

- (c) Name the major compound present in the residue. (1mark)

Iron (III) hydroxide

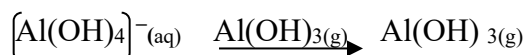
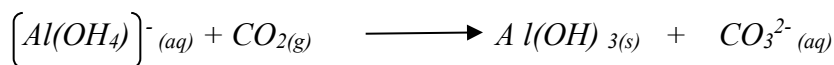
- (d) Give the formula of the aluminium compound present in solution X (1mark)



- (e) Explain how to obtain aluminium hydroxide from solution X (1mark)

- Pump Carbon (IV) oxide CO_2 through the solution to precipitate aluminum hydroxide as a precipitate
- seeding (Put one crystal of aluminum hydroxide into the solution)

- (f) (i) Write an equation of the reaction that takes place in (e) above (1mark)



(ii) What is the role of cryolite (Na_3AlF_6) in the extraction of Aluminium: (1mark)

- To lower the melting of aluminum oxide from 2050°C to 800°C . ✓ (1mk)
- To increase the conductivity of the electrolyte

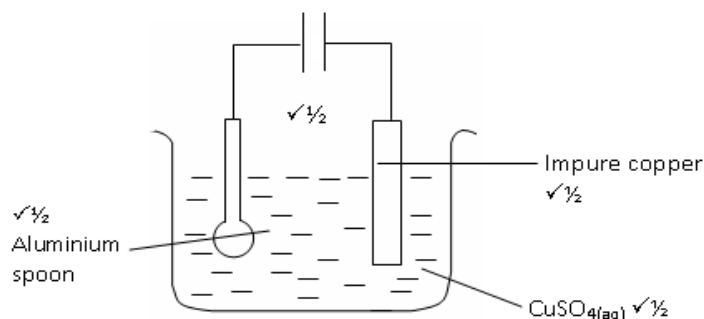
(iii) Explain why Na^+ and F^- ions are not discharged during electrolysis in step (iv) (1mark)

They are higher in the electrochemical series than Al^{3+} while F^- is

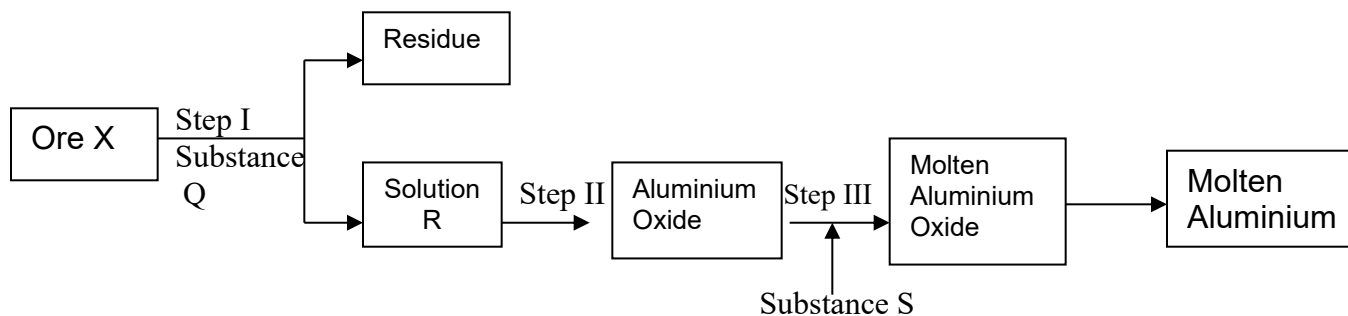
(iv) Aluminium is a good conductor of electricity. State **two** uses of aluminium based on that property. (2marks)

- to make cooking pans
- To make electric cables

(g) Draw a diagram to show how an aluminium spoon can be electroplated with copper. (2marks)



4. The process of extraction of Aluminium is summarized as below:



(a) (i) Write the formula of the main Ore X which is used in extraction of aluminium.

(1mark)

$\text{Al}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$ ✓ 1 // $\text{Al}_2\text{O}_3 \cdot \text{H}_2\text{O}$

(ii) Name:

(a) The main residue formed after filtration in step I.

(1mark)

Iron (iii) Oxide ✓ 1

(b) Substance Q.

(1mark)

Concentrated Sodium ✓ 1 Hydroxide // (NaOH)

(iii) How is the sodium Aluminate in Solution R separated from the impurity silicon (IV) oxide?

(2marks)

By bubbling carbon (iv) oxide gas through the filtrate to precipitate Aluminum hydroxide which is then filtered off. ✓½

(iv) What is the purpose of addition of substance S in step III.

(2marks)

To lower M.p of Al_2O_3 from $2015^{\circ}C$ ✓1 to $800^{\circ}C$; which is economical ✓1 during electrolysis // to avoid Aluminium from vaporizing if electrolysis is carried out at $2015^{\circ}C$.

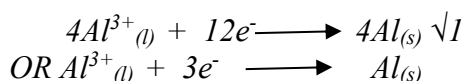
(b) (i) Explain why the Anode in extraction of Aluminium is replaced periodically.

(2marks)

Because the carbon anode is attacked ✓1 by oxygen liberated at high temperature hence the anode gradually burns ✓1 away.

(ii) Write an equation for the formation of Aluminium at the cathode.

(1mark)



(c) (i) Explain why Duralum an alloy of Aluminium is used in construction of aircraft parts and car window frames.

(1mark)

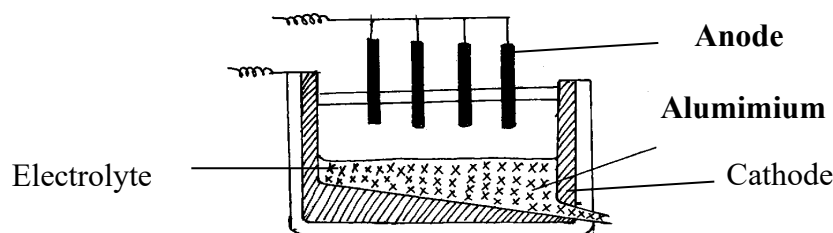
It is light, ✓1 hard, strong and resistant to corrosion

(ii) Apart from the application of Aluminium above, state two other uses.

(2marks)

- Making cooking vessels. ✓1
- Making overhead cables. ✓1
- As a reducing agent in thermite process. (any 2x1 = 2mks)

5. The extraction of aluminium from its ore takes place in two stages, purification stage and electrolysis stage. The diagram below shows the set up for the electrolysis stage.



(a) (i) Name the ore from which aluminium is extracted.

(1mark)

Bauxite

(ii) Name the impurity which is removed at the purification stage.

(1mark)

- Iron
- Silicon

(b) (i) Label on the diagram each of the following:-

Anode

(1mark)

Cathode

(1mark)

Region containing electrolyte.

(1mark)

- (ii) The melting point of aluminium oxide is 2054°C, but electrolysis is carried out between 800°C - 900°C.

I. Why is electrolysis not carried out at 2054°C. (1mark)

- High temperature is expensive to attain and maintain OR
- Al_2O_3 is a very poor conductor of electricity at very high temperature.

II. What is done to lower the temperature? (1mark)

Adding cryolite (impurity) to molten aluminium oxide

(iii) Give two properties that makes aluminium be collected as shown in the diagram. (2marks)

- Denser than the electrolyte
- Insoluble in the electrolyte

(c) State two properties of aluminium that makes it possible to be used in making overhead electric cables. (2marks)

- Low density ✓ 1
- good conductor of electricity
- Less reactive / inert (Any one)
- More resistant to corrosion

(d) A typical electrolysis cell uses a current of 40,000 amperes. Calculate the mass in kg of aluminium produced in one hour. (3marks)

$$IF = 96500c, Al = 27$$



$$Q = It$$

$$Q = (40,000 \times 60 \times 60) C = 144000000C$$

$$3F \text{ ----- } 27g \text{ Al}$$

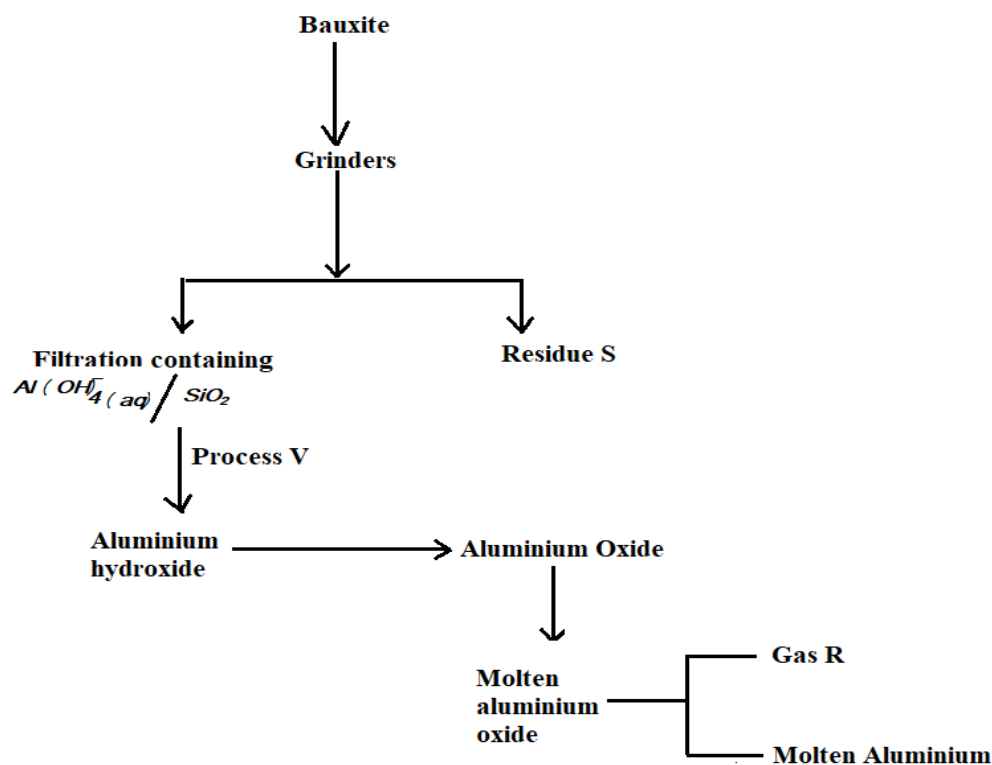
$$(3 \times 96500) c \text{ ----- } 27g \text{ Al.}$$

$$144000000c?$$

$$= \left(\frac{144000000 \times 27}{3 \times 96500} \right) g = \frac{144000000 \times 27}{289500}$$

$$= 13430g \approx 13.43kg \text{ Al}$$

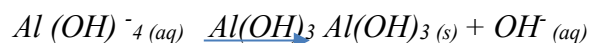
6. The following flow chart is an illustration of the extraction of aluminum from its ores



i) Give the formula of bauxite (1mk)
✓ $Al_2O_3 \cdot 2H_2O$

ii.) Name the two impurities in bauxite
✓ Iron (III) oxide
✓ Silicon (iv) oxide

iii.) Write the chemical equation for the reaction taking place during process cost – effective (1mk)



OR



(iv) The melting point of aluminum oxide is quite high. Explain what is done to make the process (1mk)

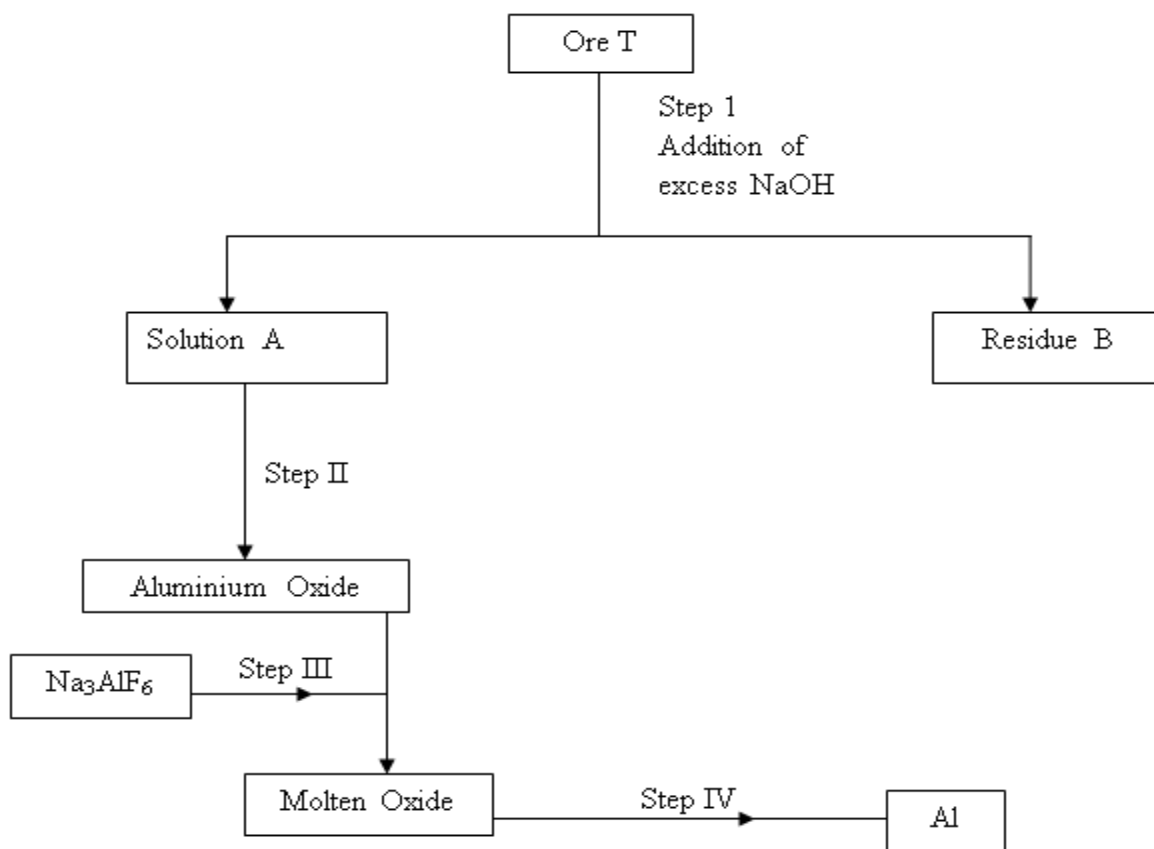
✓ Adding cryolite (Na_3AlF_6) which lowers the melting point of aluminium, oxide from 2015 to 800° C

(v) Name residue S
Residue S – Iron (III) Oxide
Gas R – Oxygen

(vi) Write down the half equations for the reaction at the
I, Anode : $6O^{2-}(l) \longrightarrow 3O_2(g) + 12e^-$
II, Cathode : $4Al^{3+}(l) + 12e^- \longrightarrow 4Al(s)$

- (vii) In the electrolysis stage the graphite electrode used at the anode is periodically replaced anode at regular intervals (1mk)
 ✓ *The oxygen evolved at the anode reacts carbon electrode to form carbon (iv) oxide. This corrodes the carbon anode hence the need to replace from time to time*
- (viii) Give two properties that makes aluminum and alloys suitable for making aircraft bodies (2mks)
 ✓ *Lighter*
 ✓ *Stronger*
 ✓ *More resistant to corrosion*
 ✓ *Higher tensile strength*

7. The following diagram represents the extraction process of a metal. Study it and answer the questions that follow.



- a)
- (i) Name ore T (1mark)
Bauxite 1mk / hydrated aluminium (III) oxide

- (ii) Why was ore T dissolved in excess sodium hydroxide? (1mark)

Dissolve Al_2O_3 which is amphoteric for purification / to remove impurities. 1mk

b)

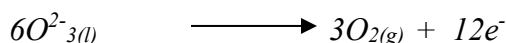
- (i) Explain why sodium ions and fluoride ions are not discharged in step (iv) (1mark)

Due to low concentration they are not preferentially discharged./require high voltage/power to be discharged

- (ii) Write the ionic equation for reactions in step (IV) at

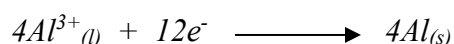
I). Anode

(½ mark)



II). Cathode

(½ mark)



- (iii) Explain the reasons why graphite anode should be replaced from time to time. (2marks)

Oxygen gas produced at the anode reacts with carbon anode (graphite) therefore anode wears away thus should be replaced

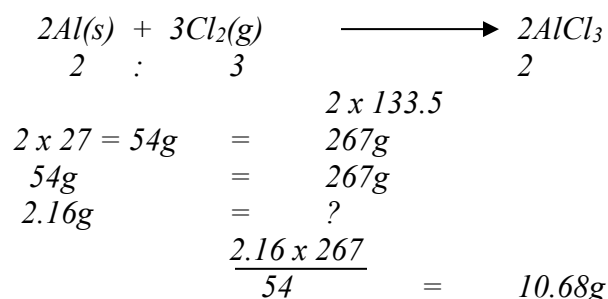
- c) State the role of cryolite (Na_3AlF_6) in the extraction of aluminium (1mark)

To lower the melting point of Al_2O_3 from 2050 to 800°C

- d) When 2.16g of aluminum foil were heated in a stream of chlorine gas the mass of the product formed was 6.94g. Calculate

- (i) Maximum mass of the product formed if chlorine was in excess. (2marks)

(Al = 27, Cl = 35.5)



- (ii) Percentage yield of the product formed (1mark)

$$\% \text{ yield} = \frac{6.94}{10.68} \times 100 = 64.94\%$$

8. (a) A part from Bauxite, state any other two ores of aluminium. (1 mark)

Mica ✓½

Corundum ✓½

- (b) Name the method that is used to extract aluminium from Bauxite. (1mark)

Electrolysis ✓1

- (c) (i) Name two major impurities in Bauxite. (1 mark)

Silicon (IV) oxide ✓½

Iron (III) oxide ✓½

(ii) Explain how the impurities are removed. (2 marks)

- *Grind the ore ✓½ and mix with sodium hydroxide ✓½*
- *Aluminium oxide reacts with NaOH to give a soluble aluminate*
- *Impurities are filtered ✓½ off and aluminium hydroxide is added to the ✓½ filtrate to precipitate out $Al(OH)_3$*

(d) Cryolite is used in the extraction of aluminium from Bauxite. State its function. (1 mark)
To lower the melting point of aluminium oxide hence to save on the amount of heat needed to melt it. ✓1

(e) Aluminium is a reactive metal yet utensils made of aluminium do not corrode easily. Explain this observation. (2 marks)

Due to formation of unreactive layer ✓1 of Al_2O_3 which coats the surface preventing further reaction ✓1

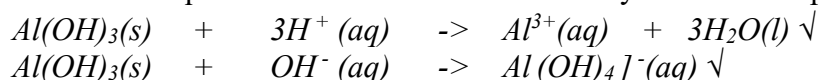
(f) Explain the economic and environmental benefits of recycling aluminium (from scrap metal) over extraction of aluminium from Bauxite. (2 marks)

- *High energy demand ✓1 is reduced.*
- *Less pollutant from gases emitted into the atmosphere ✓1.*

(g) State other two uses of aluminium other than making utensils and relate them to the property. (2 marks)

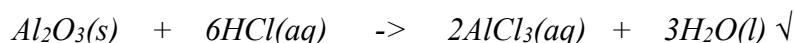
- *For making overhead cables, because it is light and is a good conductor of electricity.*
- *An alloy of aluminum and magnesium is used in making parts of aeroplanes, railway trucks, trains, buses, tankers, furniture and cars because of its low density. Aluminium can easily be stretched due to its low tensile strength; therefore, its alloys such as duralumin are used as they are light, hard and strong. Duralumin is used in the construction of aircraft and car window frames.*

(h) Write two ionic equations to show that aluminium hydroxide is amphoteric (2mk)



9. Aluminium oxide reacts with both acids and bases.

(a) Write an equation for the reaction between aluminium oxide and hydrochloric acid.(1mk)



(b) Using the equation in (a)above ,calculate the number of moles of hydrochloric acid that would react completely with 153.0g of aluminium oxide.(Al= 27.0; O=16.0) (2mk)

Mole ratio $Al_2O_3 : HCl = 1:6$ ✓½

Molar mass = $Al_2O_3(s) = 102g$ ✓½

Moles $Al_2O_3(s) = \frac{153.0g}{102g} = 1.5moles$ ✓½

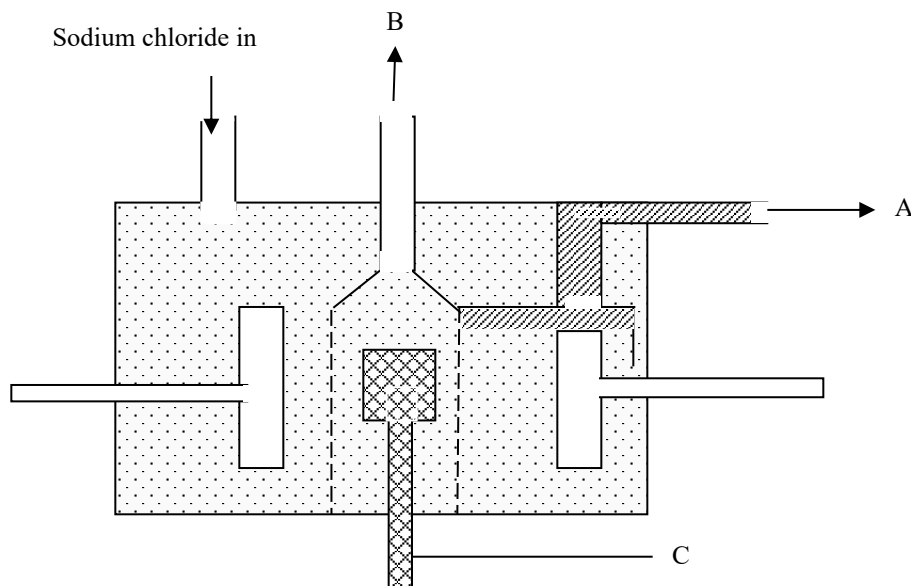
Moles HCl = $1.5moles \times 6 = 9.0 moles$ ✓½

II. SODIUM

1. (a) Sodium metal is extracted by the down's process made of iron shell and bricks. Give a reason why the walls have to be iron and bricks. (1mark)

To withstand too much heating to melt the ore and maintain it in molten state.

- (b) The diagram below is a Down's cell.



Label the parts A, B, and C.

(3marks)

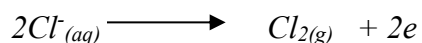
A- liquid sodium *Note reject sodium alone*

B-Cl₂ gas

C- Carbon anode

- (c) (i) Write the equation of the reaction at the Anode

(1mark)



- (ii) During this process calcium chloride was added

State **two** functions of the substance

(2marks)

- To lower NaCl melting point

- To save on electricity

- (iii) What property of sodium makes it possible for it to be collected as in the diagram

(1mark)

- Low density

- (d) (i) State and explain one environmental effect that may arise from the extraction of sodium (2marks)

- Pollution; Cl₂ is poisonous

- (ii) Give two industrial uses of sodium

(2 marks)

- makes alloy with K used as a coolant

- Makes NaCN for gold extraction

- (e) Starting with sodium metal, describe how a sample of crystals of sodium hydrogen carbonate may be prepared. (3mks)

Add a small piece of sodium to excess water✓.
Bubble excess carbon(IV)oxide to the solution✓.
Heat the solution tho concentrate✓½.
Allow crystals to form✓½.
Wash with distilled water
Dry between filter papers.

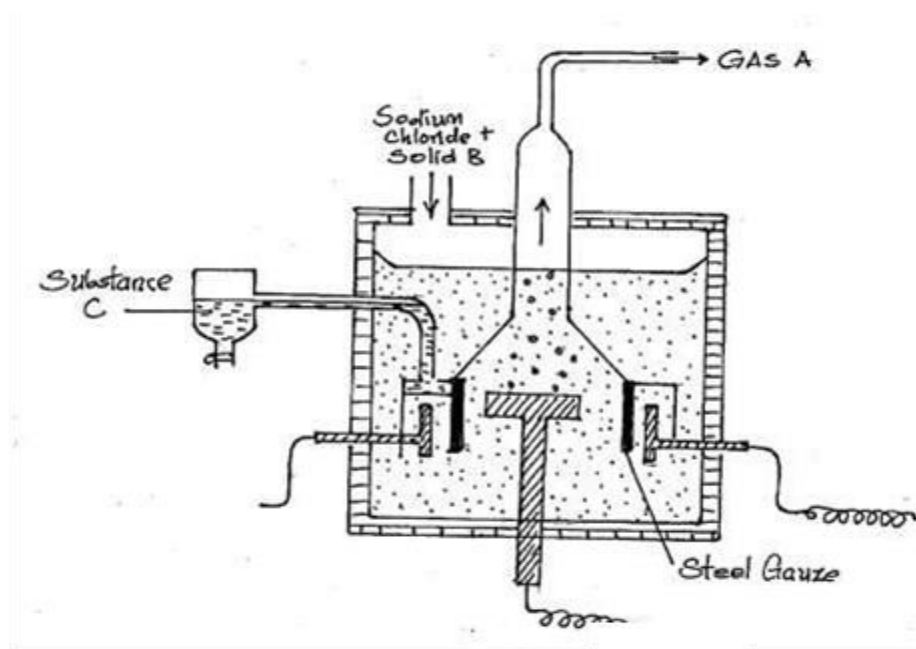
- (f) i) When brine is electrolyzed using inert electrodes, chlorine gas is liberated at the anode instead of oxygen. Explain this observation. (2mks)

Cl⁻ in brine are highly concentrated ✓ causing overvoltage thus discharged as chlorine gas by blocking OH⁻ ✓ that should be discharged to produce Oxygen gas .

- ii) Name the product formed at the cathode. (1 mk)

Hydrogen gas ✓

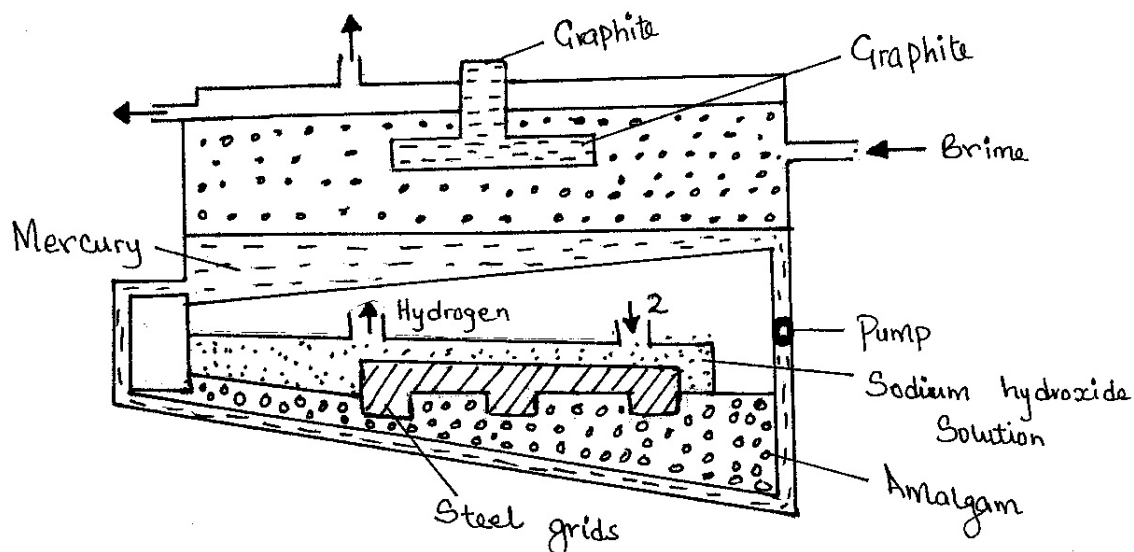
2. The diagram below represents a down cell used in extraction of sodium metal. Use it to answer the questions that follow.



- a) What material is the cathode made of? (1mk)
Steel
- b) Molten sodium chloride other than brine is preferred in the process. Explain. (1mk)
H⁺ (aq) would be preferentially discharged instead of Na⁺ because hydrogen is lower than sodium in the electrochemical series.
- c) State the role of steel diaphragm. (1mk)
To prevent /separate sodium and chlorine gas recombining

- d) Identify substances (3mks)
A – chlorine
B- calcium chloride
C- molten sodium metal
- e) Identify the impurity present in the sodium collected from the process. (1mk)
Calcium metal
- f) How is the impurity separated from the required metal? (1mk)
Calcium being denser ($\frac{1}{2}$) than sodium is allowed to settle down while sodium with lower density ($\frac{1}{2}$) and molten at given temperature floats on calcium and its tapped out at the cathode.
- g) State the function of solid B. (1mk)
 CaCl_2 is added as an impurity to lower the melting point of sodium chloride.
- h) With a reason state how sodium metal is stored. (2mks)
Under paraffin – reacts with air – and water vapour / moisture.

3. The diagram below represents a mercury cell that can be used in the industrial manufacture of sodium hydroxide. Study it and answer the questions that follow:-



- (a) Brine usually contains soluble calcium and magnesium salts. Explain how sodium carbonate is used to purify brine. (2marks)
Adding sodium carbonate solution to brine.
Calcium and magnesium salts are precipitated as calcium carbonate and magnesium carbonate which are then filtered off.
- (b) Name:
 (i) Raw material introduced at 2. (1mark)
Distilled water / Water $\frac{1}{2}$

- (ii) Another substance that can be used in the cell instead of graphite. (1mark)

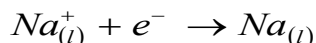
Platinum/ Titanium ✓½

- (c) Identify the by-product that comes out at I. (1mark)

Chlorine ✓¹

- (d) Write an equation for the reaction:-

- (i) That occurred at the anode. (1mark)



- (ii) In which sodium hydroxide was produced. (1mark)



- (e) Give **two** reasons why mercury is recycled. (2marks)

Mercury is expensive. /To reduce the running costs ✓¹

It is poisonous

- (f) Give one use of sodium hydroxide (1mark)

Manufacture of soaps and detergents ✓

//Manufacture of bleaching agents✓

//Extraction of aluminium from its ores✓

- (g) A current of 100 amperes was passed through the cell for five (5) hours

- (i) Write the equation for the reaction that occurred at the mercury cathode (1mark)



- (ii) Calculate the mass of sodium hydroxide that was produced (2marks)

$$(Na = 23.0, O = 16.0, H = 1.0, 1 Faraday = 96500 Coulombs \checkmark)$$

$$\text{Molar mass NaOH} = 40g$$

$$Q=It \Rightarrow 100 \times 5 \times 60 \times 60 = 1,800,000 \text{Coulombs}$$

$$\frac{96500C}{1,800,000Coulombs} \rightarrow \frac{40g NaOH}{1,800,000C} \times 40 \checkmark^{1/2} = \frac{746.1136 g \checkmark^{1/2}}{96500C}$$

4. State the observations that would be made in the following tests to distinguish between metals

- (i) Sodium and copper by burning small pieces of each in air (2mk)

- Sodium burns with a yellow flame. Copper burns with a green/blue flame✓
- Sodium burns to form white/yellow solid. Copper burns to form a black solid. ✓

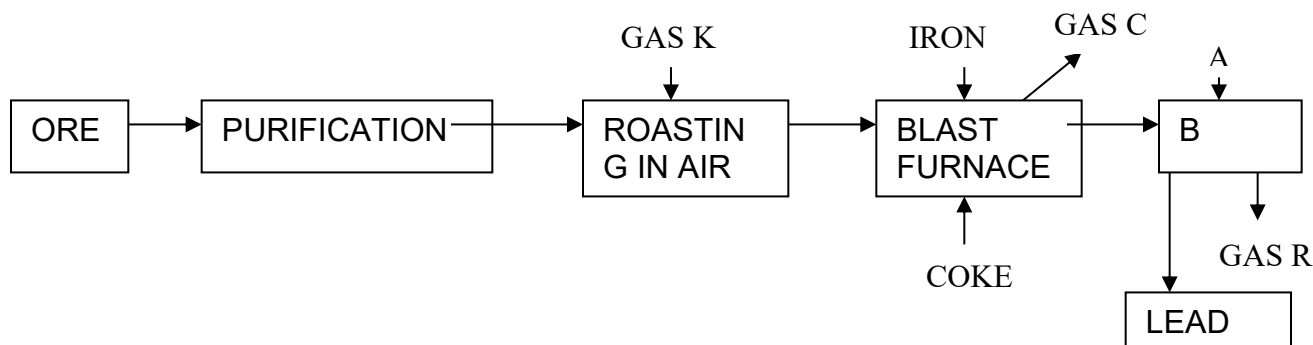
- (ii) Sodium and Magnesium by placing small pieces of each in cold water which contains two drops of phenolphthalein. (2mk)

- Sodium darts/floats on the surface of water while Magnesium sinks. ✓

- With sodium the solution turn pink immediately. With Magnesium the solution turns gradually/slowly. ✓
- With sodium there is rapid effervescence. With magnesium there is slow effervescence. ✓

III. LEAD

1. The industrial extraction of lead metal from its ore is as illustrated in the flow chart below:



(a) Identify the chief ore used to extract lead metal. (1mark)

galena // (PbS) ✓¹

(b) What happens at purifications stage? (1mark)

Concentration of the ore by froth flotation. ✓¹

(c) Write an equation for the reaction that takes place when the ore is roasted in air. (1mark)



(d) Identify substances: (5marks)

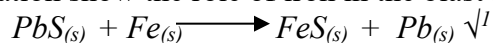
S - Iron (ii) Sulphate ✓¹

A - Sulphur (iv) oxide ✓¹

C - Carbon (ii) Oxide ✓¹

R - Carbon (iv) Oxide ✓¹

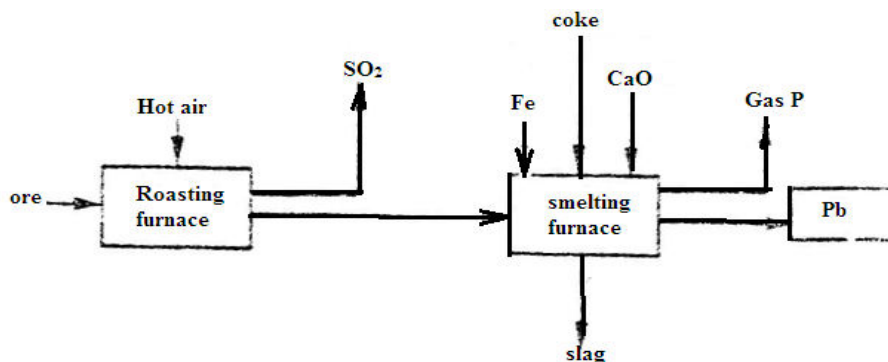
(e) Using an equation show the role of iron in the blast furnace. (1mark)



(f) Tetraethyl lead is an anti-knock additive that is added to petrol. This petrol additive is however being phased out. Give a reason to this. (1mark)

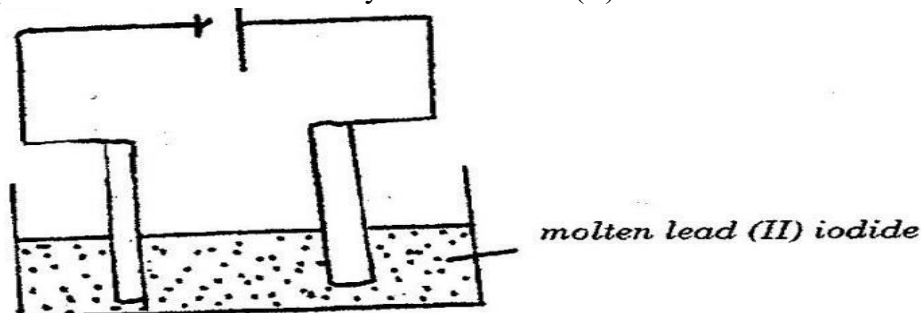
Lead released to the atmosphere is poisonous. ✓¹

2. The flow chart below illustrate the industrial extraction of lead metal. Study it and answer the questions that follow.



- (a) (i) Name the ore that is commonly used in this process (1mark)
 • *Galena*✓
- (ii) Explain what takes place in the roasting furnace (1mark)
 • *Some of the sulphide is converted into oxide*✓.
 • *Some Lead(II)sulphide is converted into Lead(II)oxide.* ✓.
- (iii) Identify gas P (1mark)
 • *Carbon(II)oxide*✓/*CO*✓.
 • *Carbon(IV)oxide*✓/*CO₂* ✓.
- (iv) Write the equation for the main reaction that takes place in the smelting furnace. (1mark)
 • *PbO(s) + C(s) -> Pb(s) + CO(g)* ✓
- (v) What is the purpose of adding iron in the smelting furnace? (1mark)
 • *To reduce any unreacted lead (II) sulphide to lead*✓.
- (vi) Give two environmental hazards likely to be associated with extraction of Lead. (1mark)
 • *Lead and lead compounds are poisonous/toxic/carcinogenic*✓.
 • *Produces sulphur (IV)oxide that dissolve in water/rain causing acidic rain*✓.
 • *Produces carbon (IV)oxide that dissolve in water/rain causing acidic rain*✓.
 • *Produces carbon (II)oxide that is highly toxic/poisonous*✓.
- (b) Explain why hard water flowing in lead pipes may be safer for drinking than soft water flowing in the same pipes. (1mark)
 • *Hard water contains Ca²⁺ and Mg²⁺*✓
 • *The ions form protective layer of insoluble CaCO₃^{1/2}/ MgCO₃ on the lead.*
 • *Soft water does not form these protective deposits*✓^{1/2}.
- (c) State one use of lead other than the making of lead pipes. (1mark)
 • *Making solder alloy*✓
 • *Making lead accumulators/battery*✓
 • *Making gun burettes.* ✓
 • *Making ball bearings*✓

3) The set – up below was used to electrolyse molten lead (II) iodide.



- i) State the observation that was made at the anode during the electrolysis.
Give a reason for your answer. (2mk)
- Purple vapour fumes produced*
Ions are oxidized to iodine gas
- ii) A current of 0.5 A was passed for two hours. Calculate the mass of lead that was deposited (Pb = 207 ; 1F = 96,500C) (3mks)

$$Q = It \Rightarrow 0.5 \text{ A} \times 2 \times 60 \times 60 \text{ s} = 3600 \text{ C}$$

$$\text{Pb}^{2+} (\text{l}) + 2\text{e}^{-} \rightarrow \text{Pb} (\text{s})$$

Method 1

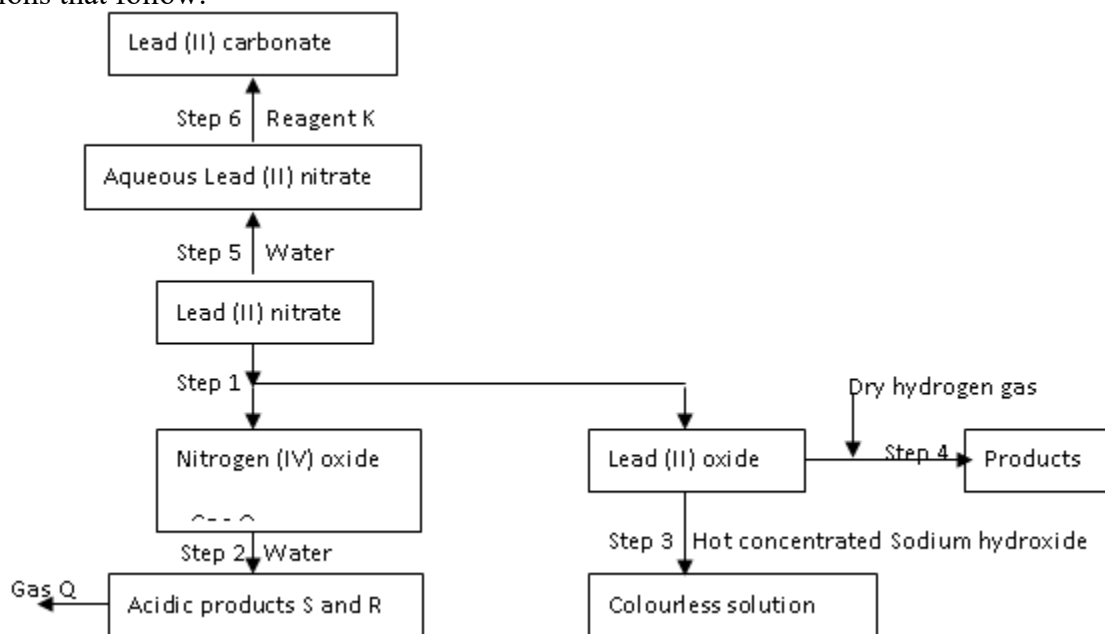
$$\frac{2 \times 96,500 \text{ C}}{3600 \text{ C}} \rightarrow \frac{207 \text{ g}}{\frac{3600 \text{ C} \times 207}{2 \times 96,500 \text{ C}}} = 3.8611 \text{ g}$$

Method 2

$$\text{Number of Faradays / moles} = \frac{3600 \text{ C}}{2 \times 96500} = 0.0186 \text{ F}$$

$$\text{Mass of Pb} = 0.0186 \times 207 = 3.8502 \text{ g}$$

4. The flow chart below shows some reactions starting with lead (II) nitrate. Study it and answer the questions that follow.



- a) State the condition necessary in step 1. (1mk)
- Heat/heating*
- b) Identify: (3mk)
- (i) Reagent K
- Sodium carbonate(Na₂CO₃)/*
 - Potassium carbonate(K₂CO₃)/*
 - ammonium carbonate((NH₄)₂CO₃)*
- (ii) Gas Q
- Oxygen/ O₂*

(iii) Acidic products S and R

- Nitric(V) acid HNO_3
- Nitric(III) acid HNO_2

c) Write:

(i) The formula of the complex ion formed in step 3.

(1mk)

- $[\text{Pb}(\text{OH})_4]^{2-}$

(ii) The equation of the reaction in step 4

(1 mk)

- $\text{PbO}(\text{s}) + \text{H}_2(\text{g}) \rightarrow \text{Pb}(\text{s}) + \text{H}_2\text{O}(\text{l})$

d) The use of materials made of lead in roofing and in water pipes is being discouraged. State two reasons why these materials have been used in the past.

(2mks)

- They are cheap
- They are corrosion resistant

e) One reason why their use is being discouraged

(1mk)

- Lead and lead salts are carcinogenic

f) The reaction between lead(II) nitrate(V) and concentrated sulphuric acid starts but stops immediately. Explain

(2mks)

- Reaction produces insoluble Lead(II) sulphate which coats/cover unreacted surface of lead(II) nitrate(V) preventing further reaction

IV. COPPER

2. The extraction of copper from copper pyrites is done in three main stages before pure copper is obtained.

(i) The concentration of the ore to remove impurities.

(ii) Roasting of the ore and reduction.

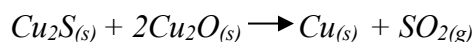
(iii) Purification of blister copper.

(a) Name the methods used to purify the ore.

(1 mark)

Froth floatation

(b) One of the equations in stage (ii) to form blister copper is



I. Name the reducing agent.

(1 mark)

Copper(I) sulphide

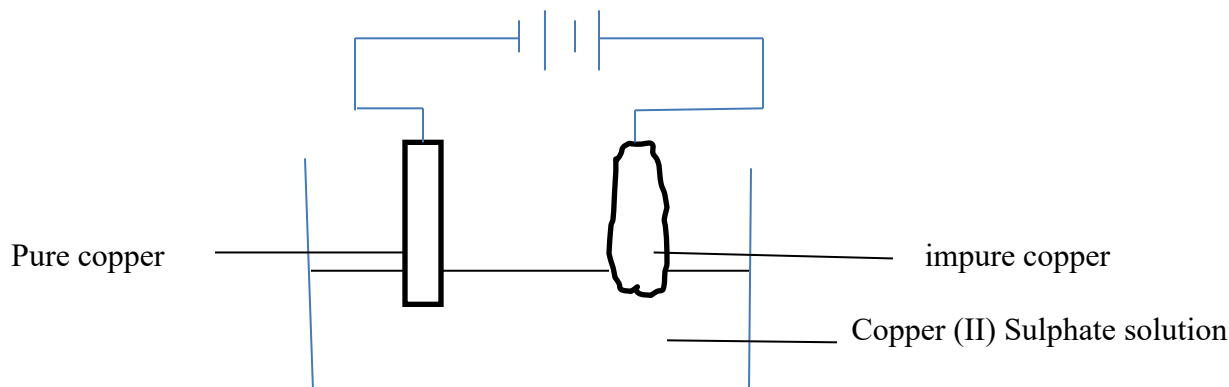
II. Explain why this type of Copper is called "blister copper".

(1 mark)

Forms blister like surface due to escaping SO_2

(c) One of the uses of copper is to make electrical conductors and it must be 99.99% pure.

I. Draw a diagram to illustrate how blister copper is purified. (2 marks)



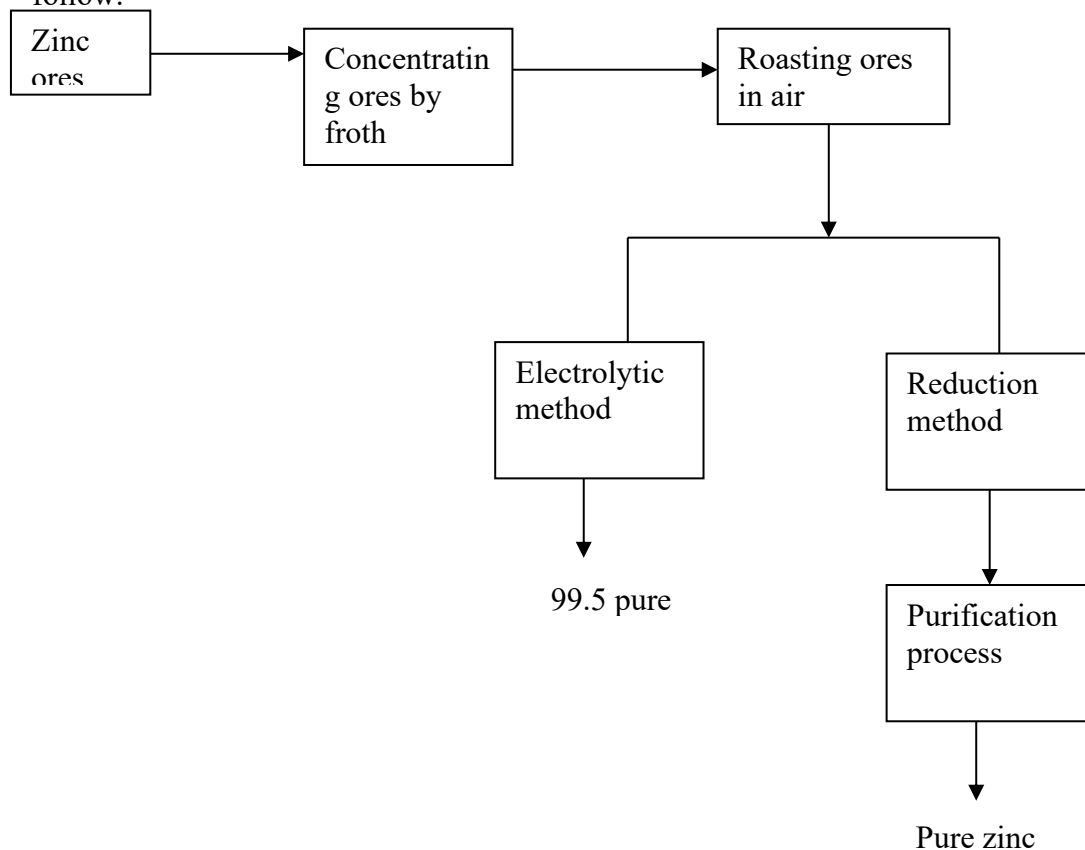
II. State one other uses of copper.

(1 mark)

Making coins / alloys

ZINC

1. Study the following reaction scheme for extraction of zinc metal and then answer the questions that follow.



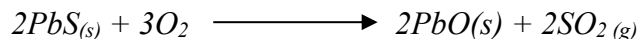
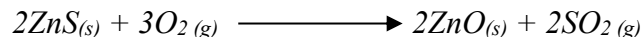
(i) Name the **two** ore from which zinc can be extracted.

(2marks)

Zinc carbonate ✓1

Zinc blende ✓1

(ii) Write the equation for the reaction that takes place when zinc ores are roasted in air. (1marks)



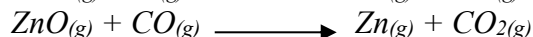
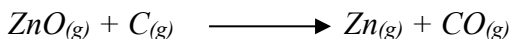
(b) Explain the effects of the by-products of the roasting process of zinc ores on the environment. (2marks)

The $\text{SO}_{2(g)}$ gas produced ready combines with oxygen in air to form sulphur (vi) oxide gas ($\text{SO}_{3(g)}$). The sulphur(vi)oxide gas is very soluble in water and hence dissolves in rain water and falls as acid rain. The rain destroys aquatic life, iron sheets and stones. The gases are poisonous, if inhaled, causes respiratory problems.

(c) (i) Name the reducing agents used in the furnace during extraction process of zinc by reduction method. (1marks)

Carbon(Coke) ✓½mk
Carbon monoxide ✓½mk

(ii) Write the equations for the reduction processes to obtain zinc. (1marks)

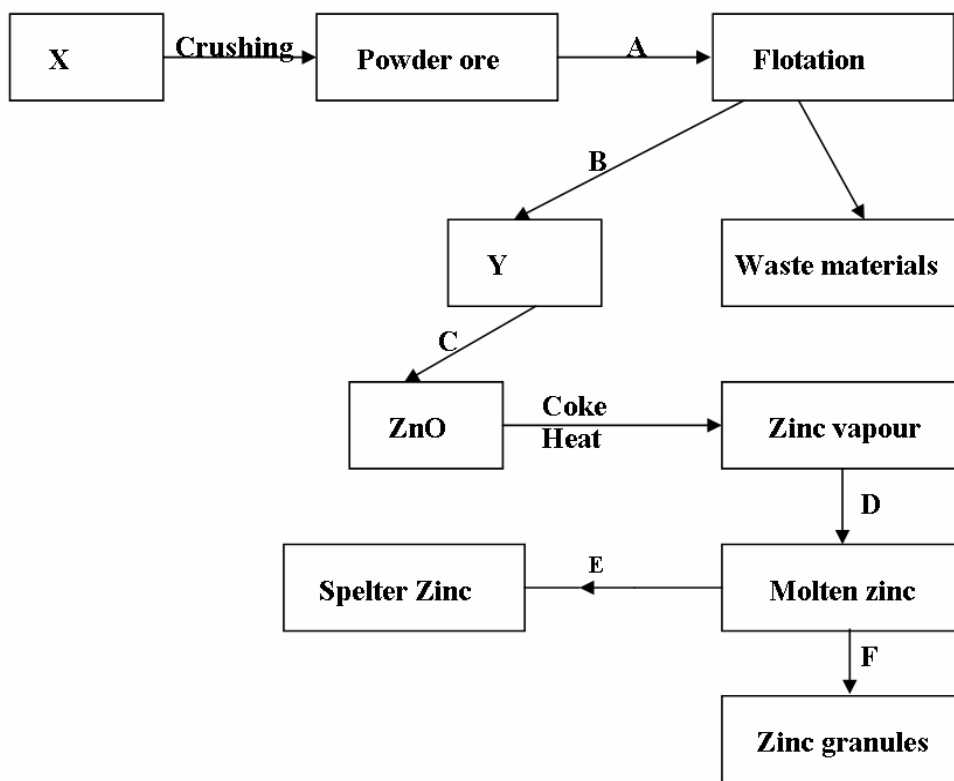


(d) Name the electrolyte used in the electrolyte method and explain how it is acquired. (2marks)

Electrolyte is zinc sulphate ($\text{ZnSO}_4(aq)$). it is obtained from the reaction between zinc oxide and sulphuric acid.

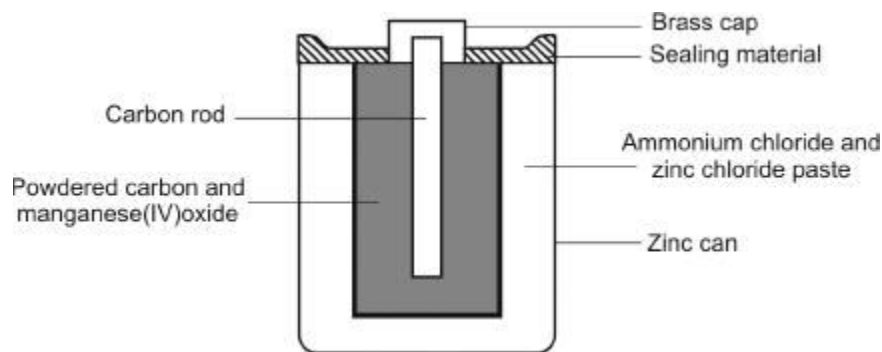


2) The flow chart represents extraction of zinc. Study it and answer the questions that follow.



- (a) Give the names of: (2mks)
- X- Zinc blende ✓1
 - Y – Zinc sulphate ✓
- (b) The process represented by A involves making of slurry and frothing. Name the substances used for:
- Making slurry Water ✓1 (1mk)
 - Frothing Vegetable oil ✓1 (1mk)
- (c)(i) Explain how process B is used to obtain Y. (2mks)
- After adding frothing agents and blowing air through the mixture ✓1 ore particles collect on the surface and are obtained through decantation and then filtration ✓1*
- (ii) Explain why its easy to separate Y from the waste material. (1mk)
- Waste material settles at the bottom of the reaction vessel while Y floats on the surface of the mixture ✓1*
- (d) Write the equation for the reaction which changes X to zinc oxide. (1mk)
- $$2\text{ZnS}_{(s)} + 3\text{O}_{2(g)} \longrightarrow 2\text{ZnO}_{(s)} + 2\text{SO}_{2(g)} \quad \checkmark 1$$
- (e) Name the processes represented by: (3mks)
- D: Cooling of zinc vapour ✓1*
E: Casting of molten zinc into block ✓1
F: Addition of water to molten zinc ✓1

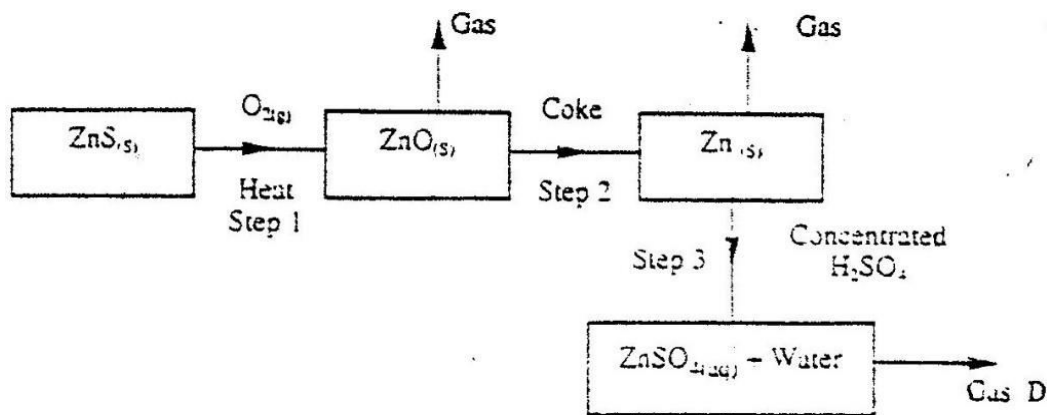
3) Use the cross-section of the dry cell below to answer the questions that follow



- On the diagram, show with a (+) sign the positive terminal (1mk)
- Write the equation for the reaction in which electrons are produced (1mk)

$$\text{Zn(s)} \rightarrow \text{Zn}^{2+}(\text{aq}) + 2\text{e}^-$$
- The zinc can is lined with ammonium chloride and zinc chloride paste. Explain why the mixture should not be solid state. (1mk)
The cell does not produce any current because the ions are fused and not mobile.
- Give one advantage and one disadvantage of dry cells. (2mks)
Advantage:
Portable, cheap, convenient to use.
Disadvantage:
Not rechargeable, Cause environmental pollution, cannot produce continuous supply of electricity

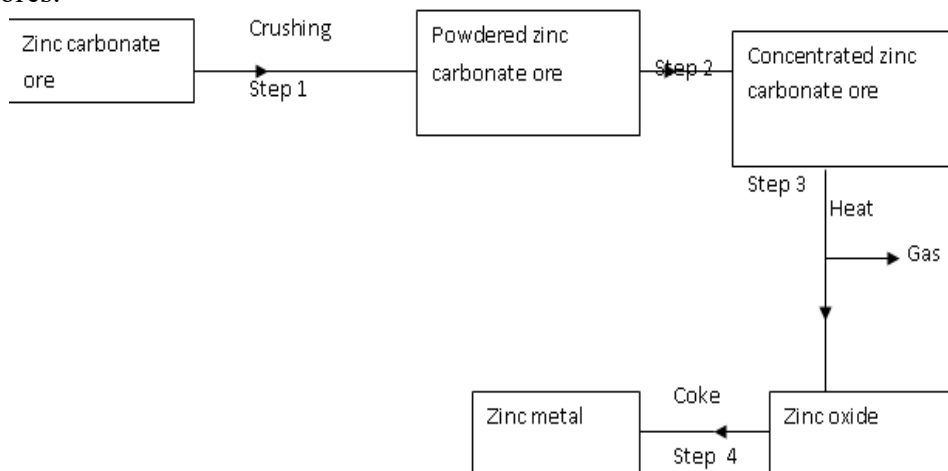
4. Study the flow chart below and answer the questions that follow.



- State the condition necessary for the reaction in step 2 to occur (1mk)
Heat/Heating
- Name: (1mk)
 - Gas D (1mk)
sulphur(IV)oxide
 - One use of zinc (1mk)

Galvanization of iron.✓
Making brass alloy with copper.✓
As negative electrode in dry cells/battery ✓

5. The flow chart below shows steps used in the extraction of zinc from one of its ores.

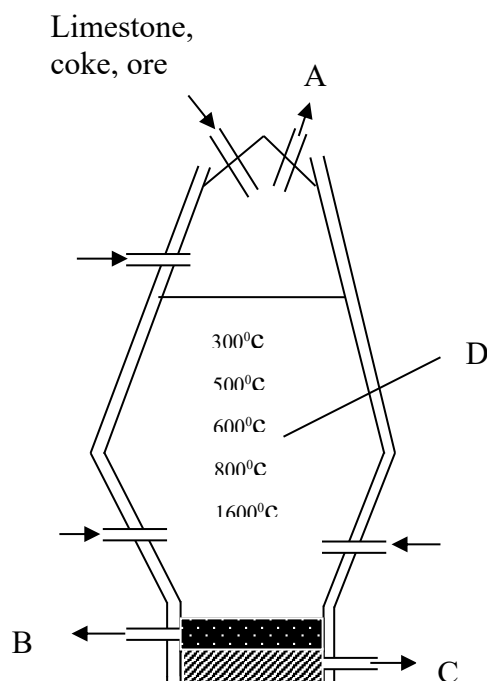


- Name the process that is used in step 2 to concentrate the ore. (1mark)
Froth flotation✓
- Write an equation for the reaction which takes place in step 3. (1 mark)

$$\text{ZnCO}_3(s) \longrightarrow \text{ZnO}(s) + \text{CO}_2(g)$$
- Name one use of zinc other than galvanizing. (1mark)
As negative terminal and casing in dry/Laclanche cells✓.
Making brass alloy with copper(Cu/Zn) ✓

V. IRON

2. Iron is obtained using the blast furnace below.



(a) Name one ore of iron..... Magnetic, hematite, $FeCO_3$ (1mark)

(b) Name what comes out through points (3marks)

A – waste gases

B – slag

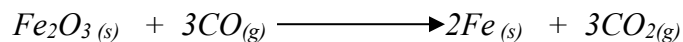
C- molten iron

(c) Limestone is one of the raw materials in extraction of iron. State its **two** functions. (2marks)

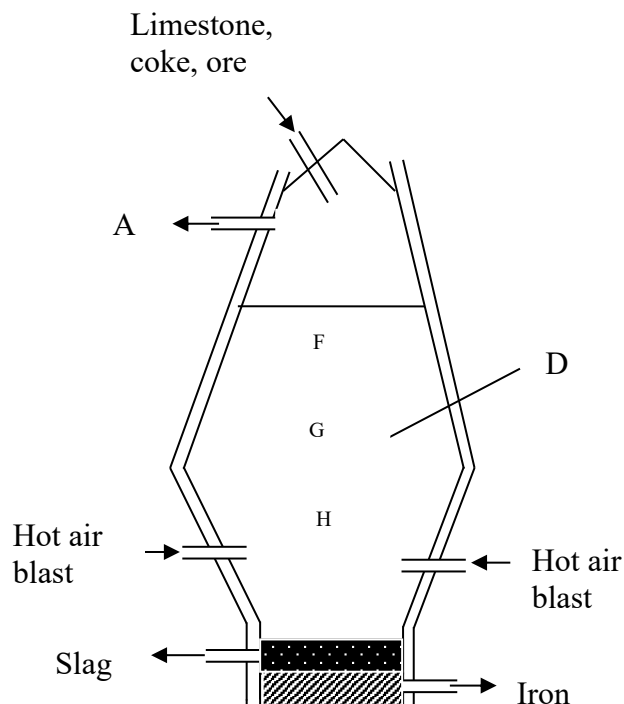
Produce CO_2

To remove impurities from ore.

(d) Write an equation for the reaction taking place at point D (1mark)



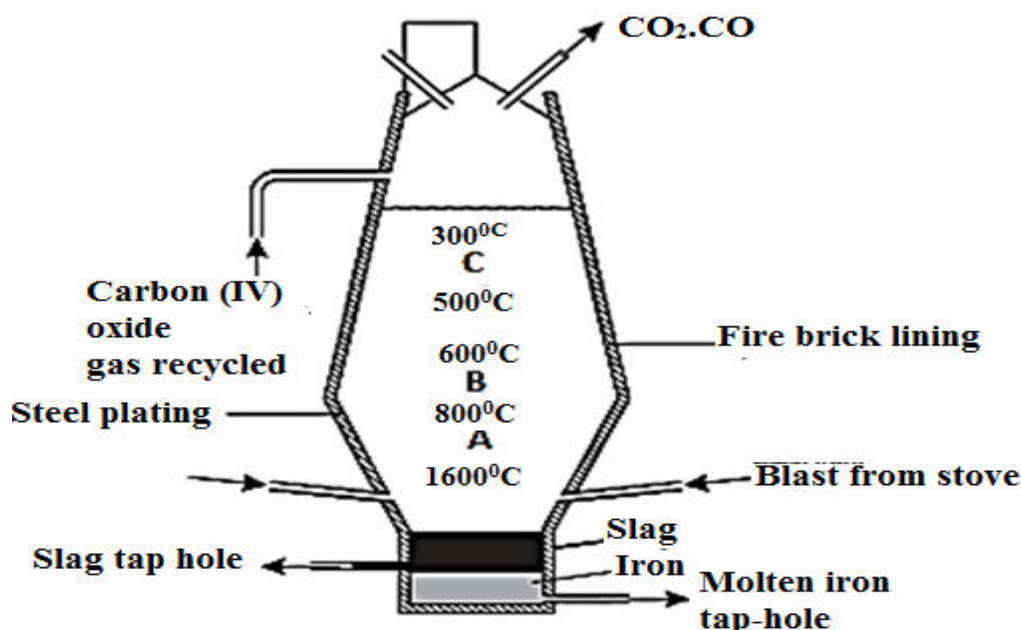
3. The blast furnace used in extraction of iron is as shown below.



- (a) Name the constituents of A. (2marks)
Carbon (IV) oxide and carbon(II) oxide
- (b) At which point F, G and H would you expect the highest temperature? (1mark)
Point H
- (c) State the role of the hot air blasts in this process. (1mark)
To burn coke and keep temperature of the lower furnace hot
- (d) It is possible to separate iron from the slag. Explain. (1mark)
Slag is denser than molten iron
- (e) Write an equation for the reaction that takes place to produce iron. (1mark)

$$\text{Fe}_2\text{O}_{3(s)} + 3\text{CO}_{(g)} \longrightarrow 2\text{Fe}_{(l)} + 3\text{CO}_{2(g)}$$
- (f) Iron obtained from the furnace must be given further treatment before it can be used in building bridges. Explain. (2marks)
It is brittle hence treated to make it tough and resistant to rust
- (g) What is meant by galvanized iron? (1mark)
Iron coated with zinc metal
- (h) Why is it necessary to galvanize iron? (1mark)
To prevent rusting
- (i) State one environmental hazard associated with extraction of iron. (1mark)
Burning coke produce CO_2 which is green house hence cause global warming

13. Extraction of iron involves two main processes, smelting and refining. Below is the blast furnace which is used to smelt iron from its ore.



- (a)(i) The chief ore is Hematite. Name one other ore used in extraction iron. (1mk)

Magnetite/ Siderite

- ii) Name the reducing agent in the process. (1mk)

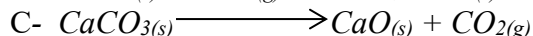
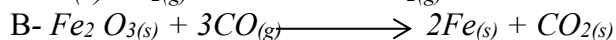
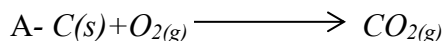
Carbon (II) oxide

- ii) What is the role of the hot air blast in the process. (1mk)

React with coke/charcoal / carbon to form carbon (IV) Oxide

Rise the temperature at the bottom of the furnace to about 200K (1650C)

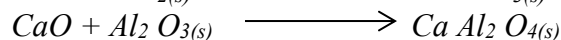
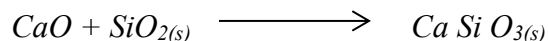
- (b) Write equations for the reaction that took place of the region marked A, B and C. (3mks)



- (c) What is the purpose of limestone in the extraction process. (1mk)

Decompose to quick lime (calcium oxide) which react to remove impurities and produce more carbon (IV) oxide gas.

- (d) Write equations to show how impurities are removed from the ore. (2mks)

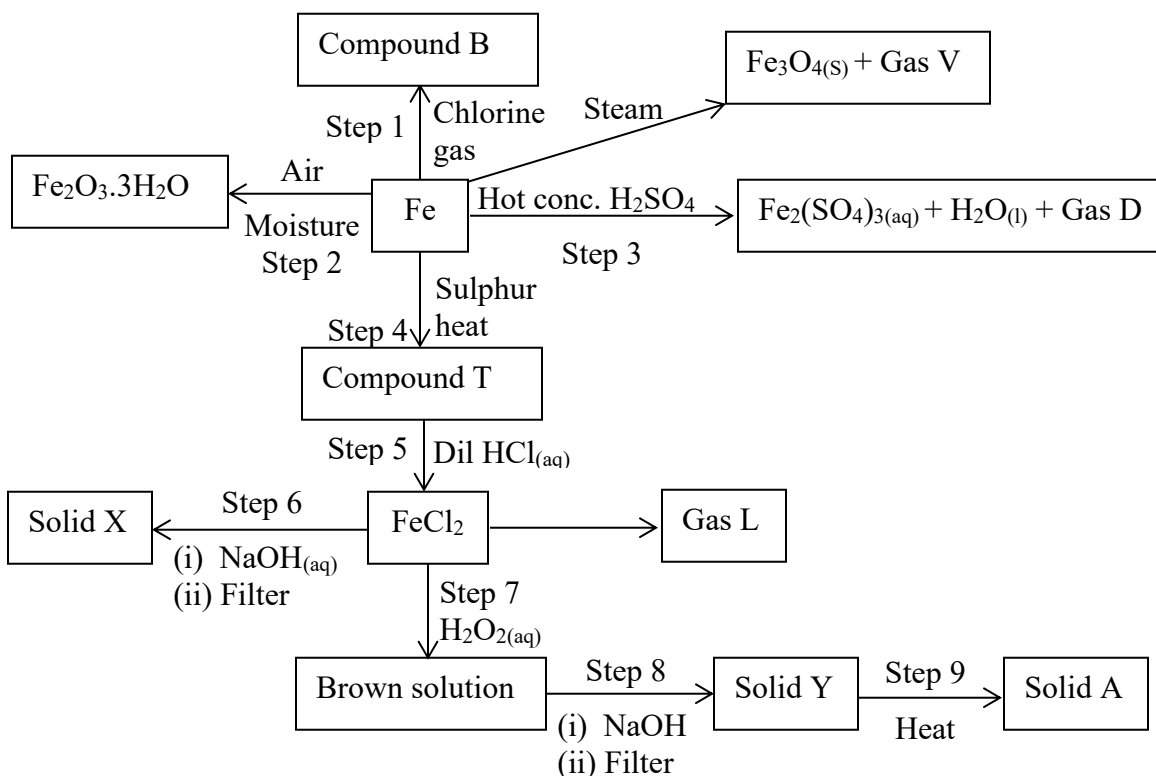


- (e) State one environmental effect of the process. (1mk)

Carbon (IV) Oxide gas causes global warming if allowed to escape.

Carbon (IV) Oxide is highly poisonous/ toxic that can kill.

4. Study the flow chart below starting from iron metal and answer the questions that follow.



(a) Identify gases D, L and V (1½ marks)

- D – Sulphur (IV) oxide // SO_2 ½✓
- L – Hydrogen sulphide // H_2S ½✓
- V – Hydrogen // H_2 ½✓

(b) Identify the following substances. (2½ marks)

- Compound B – Iron (III) chloride // $FeCl_3$ ½✓
- Compound T – Iron (II) sulphide // FeS ½✓
- Solid A – Iron (III) oxide // Fe_2O_3 ½✓
- Solid Y- Iron (III)hydroxide // $Fe(OH)_3$ ½✓
- Solid X- Iron (II)hydroxide // $Fe(OH)_2$ ½✓

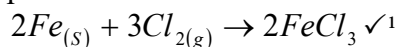
(c) What name is given to the reaction in Step 2? (1 mark)

Rusting ½✓

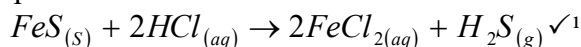
(d) State the colour of solid X. (1 mark)

Green ✓¹

(c) Write balanced equations for the reactions that occurred in Step 1 (1 mark)



Step 5 (1 mark)

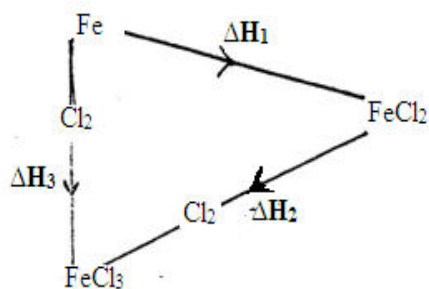


(f) What property of hydrogen peroxide (H_2O_2) is indicated in Step 7?

(1 mark)

An oxidizing agent ✓

(g) Study the energy cycle diagram below and answer the questions that follow



(i) What does ΔH_1 represent?

(1 mark)

ΔH_f of FeCl_2 ✓ // Heat of formation of iron(II)chloride

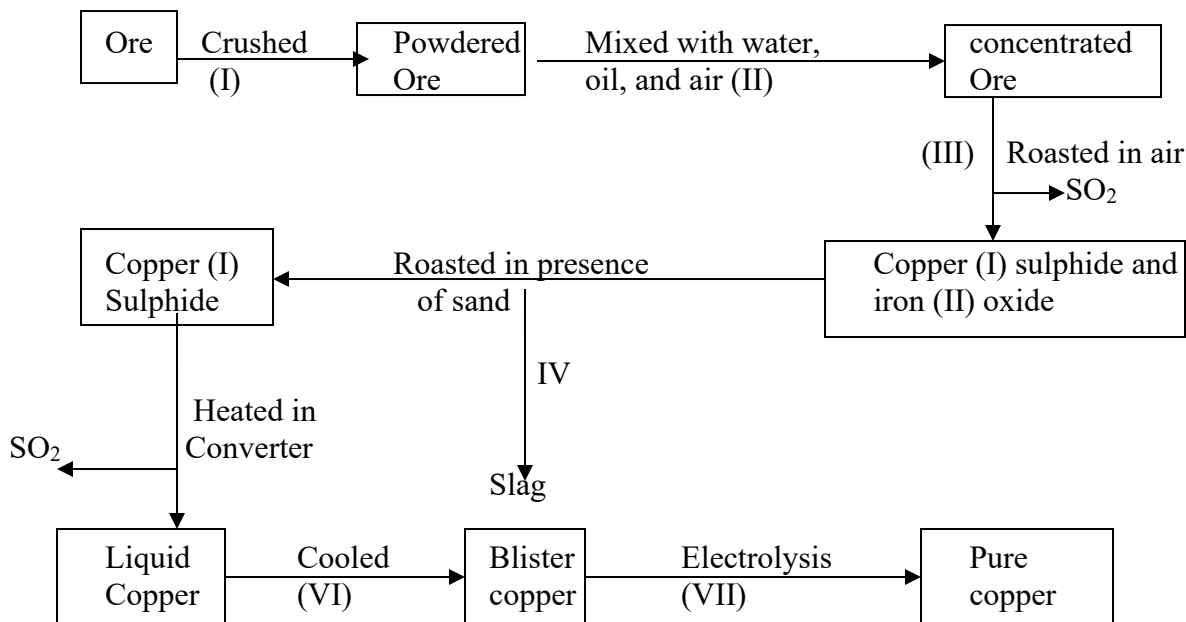
(ii) Show the relationship between ΔH_1 , ΔH_2 and ΔH_3

(1 mark)

$$\begin{aligned}\Delta H_1 &= \Delta H_3 - \Delta H_2 \checkmark \\ // \Delta H_2 &= \Delta H_3 - \Delta H_1 \checkmark \\ // \Delta H_3 &= \Delta H_1 + \Delta H_2 \checkmark\end{aligned}$$

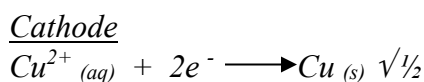
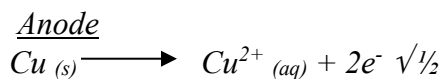
EXTRACTION OF COPPER

1. The diagram below is a flow chart for the extraction of copper. Study it and answer the questions that follow.



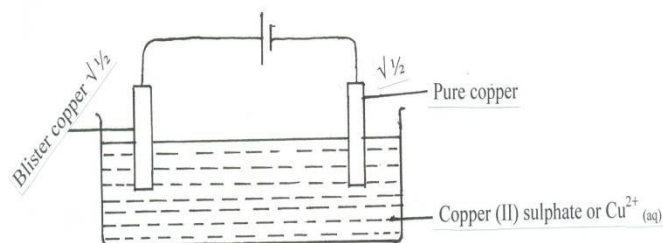
- (a) Write the formula of the major ore of copper metal. (1mark)
 $CuFeS_2$ ✓
- (b) Name process (II) (1mark)
Froth floatation ✓
- (c) Give an equation for the reaction that occurs in stage (III). (1mark)

$$2CuFeS_{(s)} + 4O_{2(g)} \longrightarrow Cu_2S_{(s)} + 2FeO_{(s)} + 3SO_{2(g)}$$
 ✓
- (d) Explain what happens in stage (IV). (2marks)
Silica / SiO_2 ✓ is added which reacts with iron (II) oxide to form iron (II) ✓ silicate which forms part of slag.
- (e) Write half cell equations for the reactions occurring at the anode and cathode in stage (VII). (1mark)



(f) Draw a simple diagram showing the set-up that is used in electrolytic purification of copper.

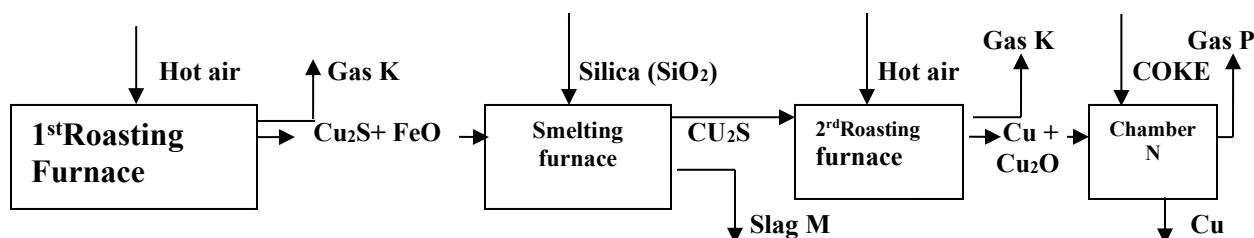
(2marks)



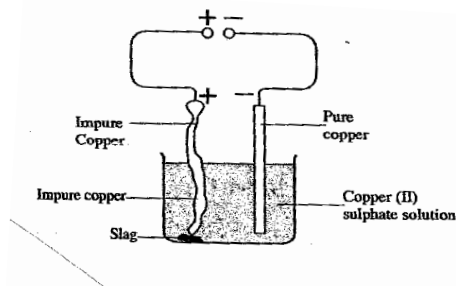
(g) A green rocky material is suspected to be malachite, $\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$. Describe how the presence of copper can be ascertained. (3marks)

- Add HNO_3 to the ore ✓ 1/2
- Filter and place small portion of the filtrate into a test tube. ✓ 1
- Add $\text{NH}_4\text{OH}_{(\text{aq})}$ until in excess – Deep blue solution ✓ 1/2 confirms presence of Cu^{2+} ions

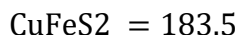
2. (a) The flow chart below outlines some of the processes involved during extraction of copper from copper pyrites. Study it and answer the questions that follow.



- (a) i) Name gas K. (1 mk)
Sulphur (IV) Oxide
 - ii) Write an equation for the reaction that takes place in the 1st roasting furnace. (1 mk)
$$2\text{CuFeS}_{2(s)} + 3\text{O}_{2(g)} \longrightarrow \text{Cu}_2\text{S}_{(s)} + 2\text{FeO}_{(s)} + 3\text{SO}_{2(g)}$$
 - iii) Write the formula of the cation present in the slag M. (1 mk)
 Fe^{2+}
 - iv) Identify gas P. (1 mk)
Carbon (IV) Oxide
 - v) What name is given to the reaction that takes place in chamber N? Give a reason for the answer. (2 mks)
Redox reaction- because Cu_2O is reduced to Cu while the carbon is oxidised to carbon (IV) Oxide
- (b) The copper obtained from chamber N is not pure. Draw a labeled diagram to show the set up you would use to refine the copper by electrolysis. (3 mks)



- (c) Given that the mass of copper obtained from the above extraction was 210kg, determine the percentage purity of the ore (copper pyrites) if 810kg of it was fed to the 1st roasting furnace. (Cu = 63.5, Fe = 56, S = 32.0) (2 mks)



$$183.5 = 63.5$$

$$810 = ?$$

$$\frac{810 \times 63.5}{183.5} = 280.2997 \quad \frac{210}{280.2997} = 74.92 \%$$

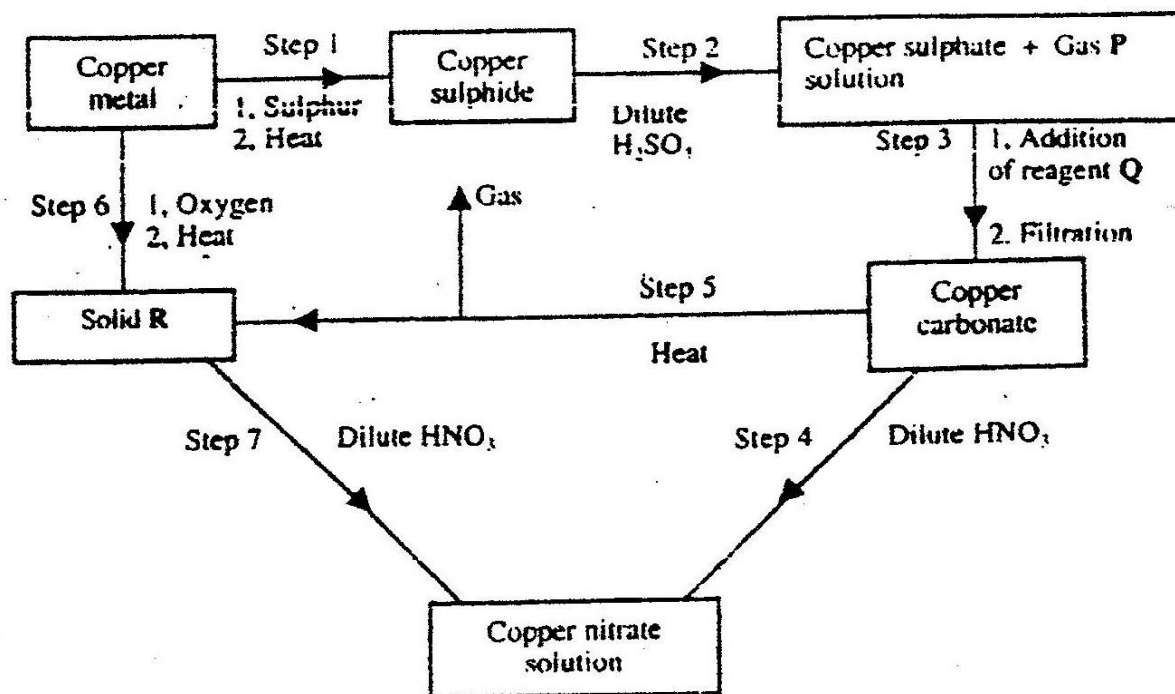
- (d) Give 2 effects that this process could have on the environment. (2 mks)

- Acid rain due to production of sulphur (IV) Oxide which leads to corrosion of iron sheets
- leads to land degradation

3. (a) Name one ore from which copper metal is extracted (1 mk)

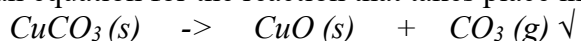
- Malachite/CuCO₃//Copper pyrites/CuFeS₂✓

- (b) The chart below shows a sequence of reactions starting with copper. Study it and answer the questions that follow



- (c) Identify
- Gas P (1 mk)
 - Hydrogen sulphide✓//H₂S
 - Reagent Q (1 mk)
 - Sodium carbonate✓/ Na₂CO₃ //Potassium carbonate/ K₂CO₃
 - Solid R (1 mk)
 - Copper(II)oxide✓//CuO

- (d) Write an equation for the reaction that takes place in step 5 (1mk)



- (e) State the observations made in steps 4 and 7 (2 mk)

(i) Step 4

- Effervescence✓
- Blue solution✓formed

(ii) Step 7

- Black solid dissolves to form a blue solution✓

(1mk)

(f) Bronze is an alloy of copper and another metal

(i) Name the other metal

Tin✓/Sn

(1mk)

(ii) Give one use of Bronze

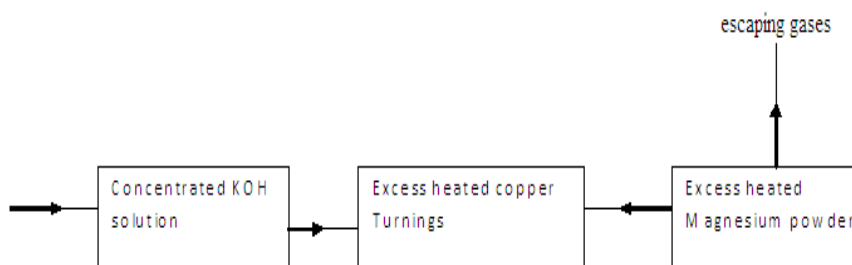
(1mk)

- Making ornaments✓/medals✓/jewels✓/clock springs✓/rim of car wheel✓/Making coins✓.

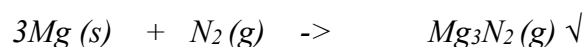
(g) Some sodium chloride was found to be contaminated with copper (II) oxide. Describe how a sample of sodium chloride can be separated from the mixture. (3 mks)

- Add water to the mixture✓.
- Sodium chloride dissolves✓ $\frac{1}{2}$,copper(II)oxide does not✓ $\frac{1}{2}$
- Filter✓ $\frac{1}{2}$
- Heat the filtrate✓ $\frac{1}{2}$ to concentrate/dryness
- Allow crystals to form
- Wash with distilled water.
- Dry between filter papers

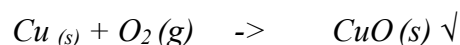
(h) Air was passed through several reagents as shown in the flow chart below



(i) Write an equation for the reaction, which takes place in chamber with magnesium powder. (1mk)



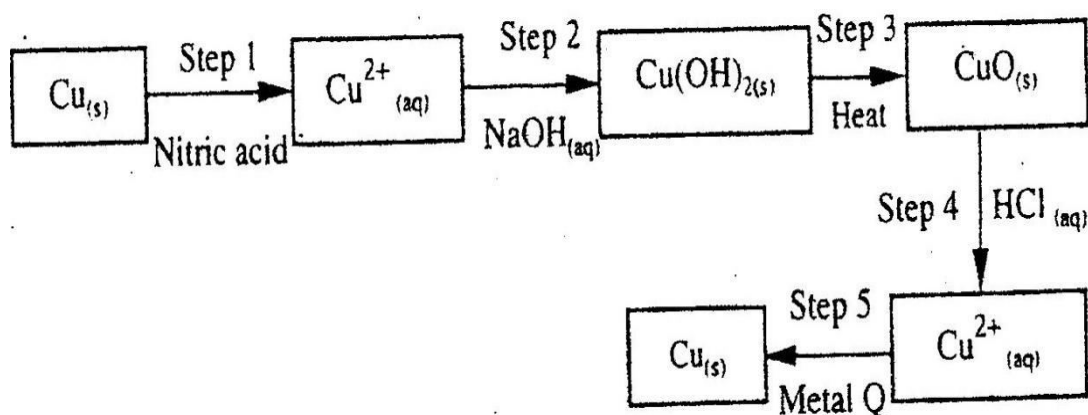
(ii) Write an equation for the reaction, which takes place in chamber with copper turnings. (1mk)



(iii) Name one gas, which escapes from the chamber containing magnesium powder. Give a reason for your answer. (2mks)

Argon✓,Neon,Helium

4. The flow chart below shows a sequence of chemical reactions starting with copper. Study it and answer the questions that follow.



- (a) In step 1, excess 3M nitric acid was added to 0.5g of copper powder
- (i) State two observations which were made when the reactions was in progress (2mks)
- Effervescence✓
 - Brown gas produced✓
 - Blue solution formed✓
- (ii) Explain why dilute hydrochloric acid cannot be used in step 1 (1mk)
- Dilute hydrochloric acid is not an oxidizing agent✓
- (iii) I Write the equation for the reaction that took place in step 1 (1mk)
- $\text{Cu(s)} + 4\text{HNO}_3(\text{aq}) \longrightarrow \text{Cu(NO}_3)_2(\text{aq}) + 2\text{NO}_2(\text{g}) + 2\text{H}_2\text{O(l)}$
- II Calculate the volume of 3M nitric that was needed to react completely with 0.5g of copper powder. (Cu = 63.5) (3 mk)
- $$\text{Moles Cu} = \frac{0.5\text{g}}{63.5} \times \frac{1}{2} = 0.0079\text{moles} \times \frac{1}{2}$$
- $$\text{Moles HNO}_3(\text{aq}) = 0.0079 \times 4 \times \frac{1}{2} = 0.0316\text{moles} \times \frac{1}{2}$$
- $$\text{Volume HNO}_3 = \frac{0.0316\text{moles} \times 1000\text{cm}^3}{3\text{M}} \times \frac{1}{2} = 10.5333\text{cm}^3 \times \frac{1}{2}$$
- (b) Give the names of the types of reactions that took place in steps 4 and 5 (2 mk)
- Step 4
- Neutralization ✓
- Step 5
- Displacement
- (c) Apart from the good conductivity of electricity, state two other properties that make it possible for copper to be extensively used in the electrical industry. (2mks)
- Its ductile✓
- Resistant to corrosion by element of air ✓.

5. a) On heating a pale green solid K, carbon(IV)oxide gas and a black solid M were formed. On reacting K with dilute hydrochloric acid, carbon(IV)oxide gas and a green solution S were formed. When excess aqueous ammonia was added to solution S ,a deep blue solution was formed.

(i)Identify the cation in solid K (1mk)

Cu²⁺✓

(ii)Identify the two anions in solution S (2mk)

CO₃²⁻✓, Cl⁻✓

(b)Name two ores from which copper is extracted (1mk)

Copper pyrites✓

Malachite✓

(c) During extraction of copper metal,the ore is subjected to froth flotation. Give a reason why this process is Necessary (1mk)

To remove impurities/to concentrate the ore✓

(d) Name four alloys of copper and state its use (4mk)

Alloys of copper	Uses of the alloy
<i>Brass✓½ Copper and Zinc</i>	<i>Making screws and bulb caps✓½</i>
<i>Bronze✓½ Copper and Tin</i>	<i>Making clock springs, electrical contacts and copper coins✓½</i>
<i>Duralumin✓½ Aluminium, Copper and Magnesium</i>	<i>Making aircraft, utensils, windows frames because of its light weight and corrosion resistant. ✓½</i>
<i>German silver✓½ Copper, Zinc and Nickel</i>	<i>Making coins ✓½</i>

---End---

MERU SCHOOL GEOGRAPHY

DECEMBER L HOLIDAY ASSIGNMENT

FORM THREE

A. Read and write notes on the following form 4 topics

- 1) Land rehabilitation and reclamation
- 2) Fishing
- 3) wildlife and tourism
- 4) transport and communication

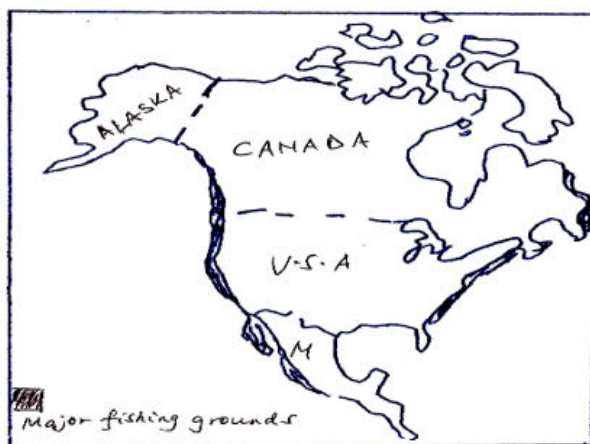
B. Answer the following questions

Land rehabilitation and reclamation

1. (a) Differentiate between land reclamation and land rehabilitation. (2mks)
(b) (i) List **three** was in which tsetse fly menace has been controlled in the Lambwe Valley. (3mks)
(ii) Name **two** areas in Kenya where swamps have been reclaimed. (2mks)
(iii) State **four** factors which influenced the establishment of Perkerra Irrigation Scheme. (4mks)
(c) You intend to carry out a field study on Budalangi Flood control.
(i) Name **two** methods that have been used to control flooding in Budalangi. (2mks)
(ii) Give **three** reasons why flood control in Budalangi is important. (3mks)
(iii) List **three** activities that you would undertake prior to the study. (3mks)
(iv) Explain **three** methods that you would use to present your findings after the study. (6mks)
2. a) i) Define land reclamation. (2mks)
ii) Give two methods that are used to drain swamps in Kenya. (2mks)
iii) Name the method of irrigation used in Mwea Tebere. (1mk)
b) Explain how the following factors influenced establishment of Mwea Tebere irrigation scheme.
- Topography (2mks)
- Soil (2mks)
- Government policy

Fishing

1. Use the map of North America below to answer questions (a) and (b)



- a) Name
(i) The fishing ground shaded (1 mark)

- (ii) The ocean current marked (b) (1 mark)
 - b) Explain **four** physical conditions necessary for fishing in the fishing ground shaded. (8 marks)
 - c) Describe trawling method of fishing (6 marks)
 - d) i) Explain **three** ways in which overfishing can be controlled in Lake Naivasha (6 marks)
 - ii) State **three** significance of fish farming (3 marks)
2. a. i) Name two countries found in the north West pacific fishing ground. (2mks)
- ii) Explain four physical factors that favour fishing in the above fishing ground. (8mks)
- b) Describe the following methods of fishing:
- i) drifting (4mks)
 - ii) purse seine (4mks)
- c) Compare fishing in Kenya and Japan under the following sub-headings:
- i) fishing ground (2mks)
 - ii) climate (2mks)
- d) State 3 significance of fishing to the economy of Kenya. (3mks)

wildlife and tourism

1. (a) (i) Differentiate between Ecotourism and Domestic Tourism (2mks)
- (ii) Give four reasons why the government of Kenya should promote eco-tourism (4mks)
- (b) Explain how the following factors influence the distribution of wildlife in East Africa
- (i) Human factors (2mks)
 - (ii) Vegetation cover (2mks)
- (c) (i) Name three game sanctuaries in Kenya (3mks)
- (ii) Explain two problems experienced in wildlife conservation in Kenya (4mks)
- (d) (i) State four reasons why there is a decline in the number of tourist visiting Kenya in the year 2007/2008 (4mks)
- (ii) Give Four reasons why Switzerland has become a popular tourist destination than in Kenya (4mks)
2. (a) (i) What is domestic tourism? (2mks)
- (ii) Explain four factors which hinder the development of domestic tourism in Kenya. (8mks)
- (b) (i) State three reasons why domestic tourism should be encouraged in Kenya. (5mks)
- (ii) Give two effects of forests fires on wildlife in Kenya. (2mks)
- (b) (i) Explain three factors which have made Switzerland a major tourist destination in Europe. (6mks)
- (ii) Other than establishing national parks, explain two measures being taken by the government of Kenya to conserve wildlife. (4mks)

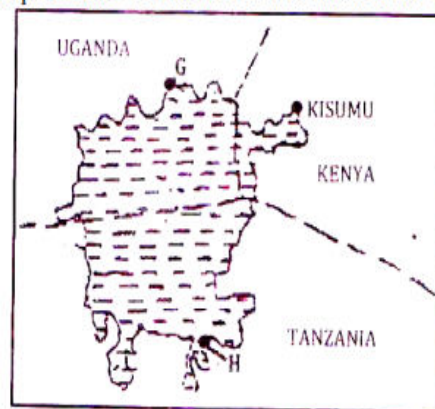
Transport and communication

1. (a) (i) Differentiate transport and communication. (2mks)
- (ii) State three reasons why road network is more widespread than railway network in East Africa. (3mks)
- (b) (i) Outline three benefits derived from the construction of Nairobi-Thika super highway. (3mks)
- (ii) Draw a sketch map of the Great Lakes and St. Lawrence Seaway. On it mark and name the following:-
- Lakes Michigan and Ontario. (2mks)
 - Ports Duluth and Chicago. (2mks)
- (c) Explain how the following factors hinder transport and communication in Africa. (4mks)
- Terrain.
 - Shortage of skilled labour.
- (c) Explain four benefits of transport in the economic development of Africa. (8mks)

2.a)i)Distinguish between transport and communication.

2mks

ii) Use the sketch map of Lake Victoria below to answer the question that follow.



a) Name the Lake ports marked G and H.

2mks

b) i)State three advantages of using water transport .

3mks

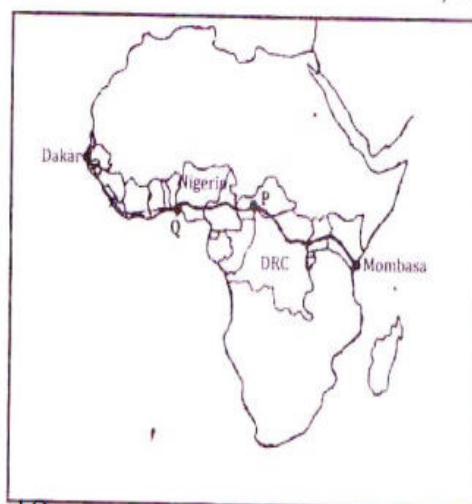
ii) Explain three problems facing river transport in Africa

6mks

iii) State two reasons why flowers from Kenya are transported by air.

2mks

c) Study the map of Africa below and use it to answer question (i) (ii)



i) Name the towns marked P and Q .

2mks

ii) Name two export goods from Kenya that are transported along the highway.

2mks

d) Explain three benefits of the Trans-African highway to the economies of Africa countries.

6mks

MERU SCHOOL

HOLIDAY ASSIGNMENT NOVEMBER/DECEMBER 2025

HISTORY FORM THREE

ANSWER ALL QUESTIONS

NB: The opener exam will cover the following three topics:

- a) World Wars
- b) International Relations
- c) Co-operation in Africa

Read these three topics and make notes.

QUESTIONS

1. What were the causes of World War I?

Austro-Hungarian Empire's control over Serbs and other Slavic people.

2. Describe the incident that sparked off World War I.

3. Discuss the factors that made the central powers lose to the Allies.

Western Front—a long war that Germany could not win against the superior Allied resources.

4. How did World War I affect Europe?

loss), which fostered long-term resentment and contributed to the rise of Nazism.

Formation of the League of Nations: An attempt was made to create an international body to prevent future wars.

International Relations: The League of Nations

5. Outline the main organs of the League of Nations.

6. Explain the achievements and failures of the League of Nations.

7. Why did the League of Nations fail in its aim of preserving international peace?

8. Identify the causes of World War II.

9. Give reasons why members of the Allied forces defeated the Axis powers during World War II.

10. Discuss the results of World War II.

11. Give reasons why the United Nations Organization was formed in 1945.

12. Name the organs of the UNO and give the function of each.

The Commonwealth and Non-Aligned Movement

14. List the objectives of the Commonwealth movement.

15. Describe the characteristics of the Commonwealth of Nations.

16. What are the benefits of the Commonwealth to its members?

17. Identify the problems that have been experienced by the Non-Aligned Movement in its operations.

18. What role has the Non-Aligned Movement played since its formation?

19. (a) Mention five weapons of Cold War.

19. (b) Explain the causes of the Cold War.
20. Describe the course of the Cold War in Europe, Asia, Africa and Cuba.
21. Discuss measures taken by the Superpowers to ease tension between them.
22. Explain the effects of the Cold War.
23. Define the term Pan-Africanism.
24. Name three African Americans who promoted Pan-Africanism.
25. Discuss five grievances advanced by the Pan-Africanists against the European powers.
26. What were the challenges encountered by the Pan-African Movement between 1945 and 1963?
27. Outline the objectives of the Organization of African Unity (OAU).
28. What were the achievements of the OAU?
29. Outline the challenges encountered by the OAU.
30. Give the objectives of the East African Community. (1967 – 1977)
31. Explain the achievements of and the challenges facing the East African Community (1967–1977).
32. (a) State the objectives of the Economic Community of West African States (ECOWAS).
b) List ten member states of ECOWAS.
33. Discuss the achievements of the Economic Community of West African States since 1975.
34. What challenges has the ECOWAS encountered since its formation?
35. What are the objectives of the Common Market for Eastern and Southern Africa?
36. Discuss the challenges facing the common market for Eastern and Southern Africa.
37. Outline the achievements of the Common Market for Eastern and Southern Africa.

MERU SCHOOL

HOLIDAY ASSIGNMENT NOVEMBER/DECEMBER 2025

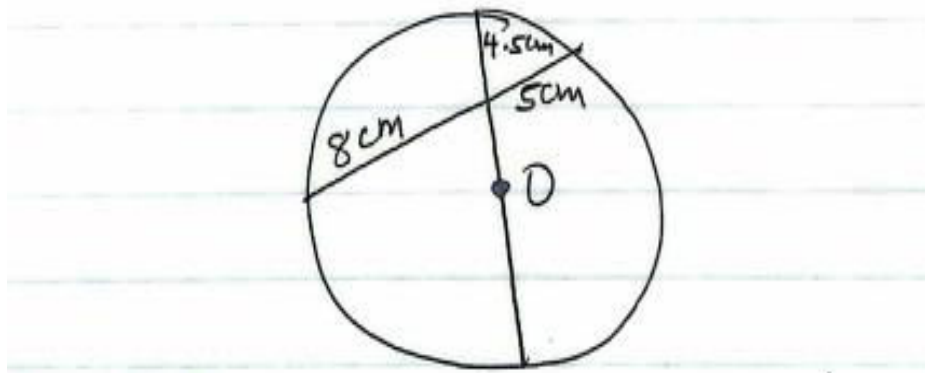
MATHEMATICS FORM THREE

ANSWER ALL QUESTIONS

1. Simplify $\left(x + \frac{1}{y}\right)^2 - \left(x - \frac{1}{y}\right)^2$. (3mks)
2. Simplify completely;
 $\frac{2x^2 - 98}{3x^2 - 16x - 35} \div \frac{x + 7}{3x + 5}$ (3mks)
3. Expand and simplify the expression; $(2x^2 - 3y^3)^2 + 12x^2y^3$. (3mks)
4. If $x = -2/5$ is one root of the equation $6 + 11x - px^2 = 0$, find the value of p and the other root. (4mks)
5. A student was given an assignment to expand $(x - y)^2$. While in hurry he expanded it as $x^2 - y^2$. Given that $x=5$ and $y=3$, find the percentage error in the students expansion. (4mks)
6. The percentage error in calculating the volume of a cylinder is 21%. Find the percentage error in calculating the radius if the height and π are exact. (4mks)
7. Round off 45.985 correct to 3 sf and calculate the percentage error due to rounding off. (4mks)
8. Given that $\tan 75^\circ = 2 + \sqrt{3}$, find without using tables or calculator $\tan 15^\circ$ in the form $p + q\sqrt{m}$, where p , q and m are integers. (3mks)
9. Given that $\sin\theta = \frac{\sqrt{3}}{2}$, find without using tables or calculator $\cos(90 - \theta)$. (3mks)
10. Simplify $(1 + \sqrt{7})(1 - \sqrt{7})$ hence evaluate $\frac{1}{1 - \sqrt{7}}$ leaving your answer in the form $a + b\sqrt{7}$. (3mks)
11. Express $\frac{3}{5 - \sqrt{2}}$ in the form $a + b\sqrt{c}$ where a , b and c are rational numbers. (3mks)
12. Simplify $\frac{\sqrt{5} + 3}{\sqrt{5} - 2}$. Give the answer in the form $a + b\sqrt{c}$ where a , b and c are integers. (3mks)
13. Given that $2 \log x^2 + \log \sqrt{x} = k \log x$, find the value of k . (3mks)
14. Simplify without using tables:
 $\log_3 49 \times \log_7 27$.
15. Find the value of x in: (3mks)
 $\log(2x - 1) - \log(8x + 1) + \log 3 = 0$.
16. Calculate the exact value of compound interest earned on sh.20,000 for $1 \frac{1}{2}$ years at the rate of 12% p.a. compounded half yearly. (3mks)
17. A man invested sh.24000 in an account which pays 15% interest per annum compounded quarterly. Find the amount in the account after $1 \frac{3}{4}$ years. (3mks)
18. The hire purchase price of a TV consists of sh.4600 deposit and 8 equal monthly instalments of sh.840. Given that the carrying charge is sh.2800, find the cash price. (3mks)

19. Calculate the radius of the circle below given that O is the centre.

(3mks)



20. Two parallel chords of lengths 9.6cm and 6cm are drawn in a circle of radius 5.4cm. find the distance between the two chords. (3mks)

21. Make n the subject of the formula: (3mks)

$$S = \frac{a(1 - r^n)}{1 - r}$$

22. Make q the subject of the formula. (3mks)

$$X = (mq^2 + nq)^{1/2}$$

23. Make n the subject of the formula: (3mks)

$$\frac{p}{q} = \frac{m^2}{\sqrt[3]{1-n^2}}$$

24. P varies partly as the square of V and partly as the cube of V. When $v = 2$, $P = -20$ and when $v = 3$, $P = 135$. Find the relationship between p and v. (3mks)

25. A variable Z varies directly as the square of x and inversely as the square root of y. Find the percentage change in z if x is increased by 20% and y decreased by 19%. (4mks)

26. Find the values of x given that the matrix is a singular matrix. (3mks)

$$\begin{bmatrix} x+7 & 4 \\ -3 & -x \end{bmatrix}$$

27. The third and fifth terms of an arithmetic progression are 7 and -7 respectively;

i) Determine the first and the common difference. (2mks)

ii) The sum of the first 14 terms. (2mks)

28. Given that $\mathbf{p} = 2\mathbf{i} - \mathbf{j} + 3\mathbf{k}$ and $\mathbf{q} = \mathbf{i} - \mathbf{j} + 2\mathbf{k}$. Determine $|2\mathbf{p} - 2\mathbf{q}|$ correct to 2 d.p. (4mks)

29. Given that P(12, -6, 9) and Q(3, 18, -12). A is the point which divides PQ in the ratio 2:1. Find the co-ordinates of A hence express PA in terms of $\mathbf{i}$, $\mathbf{j}$ and $\mathbf{k}$. (3mks)

30. The position vectors of A and B are $\mathbf{a}$ and $\mathbf{b}$ respectively. If $\mathbf{a} = 2\mathbf{i} + 3\mathbf{k}$ and $\mathbf{b} = 4\mathbf{i} + 2\mathbf{j} + \mathbf{k}$. Find $|\mathbf{A} \cdot \mathbf{B}|$ (4mks)

31. The points A, B and C lie on a straight line. Given that $\mathbf{a} = 2\mathbf{i} + 3\mathbf{j} + 9\mathbf{k}$ and $\mathbf{c} = 5\mathbf{i} - 3\mathbf{j} + 4\mathbf{k}$ respectively and B divides AC internally in the ratio 2:1, find the position vector of B. (3mks)

32. a) Expand $\left(5 + \frac{x}{2}\right)^6$ up to the fourth term. (2mks)

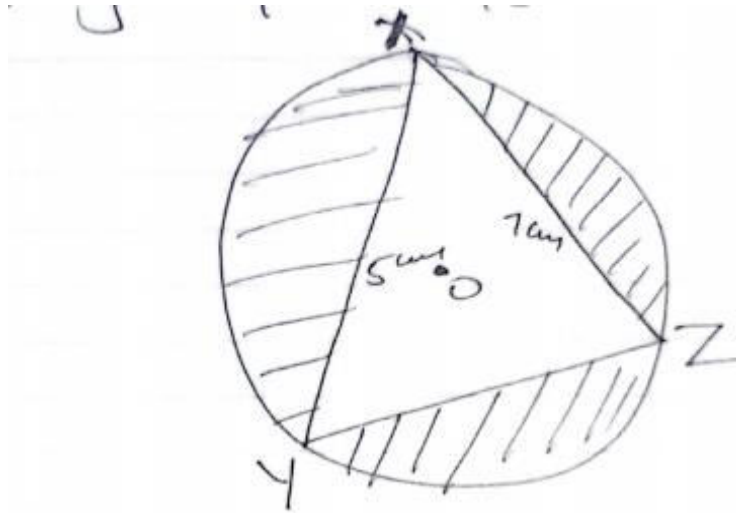
b) Use your expansion to estimate the value of $\left(\frac{11}{2}\right)^6$ correct to 1 d.p. (2mks)

33. a) Expand $(x - 0.2)^5$ in ascending powers of x.

b) Use your expansion up to the fourth term to estimate $(0.98)^5$.

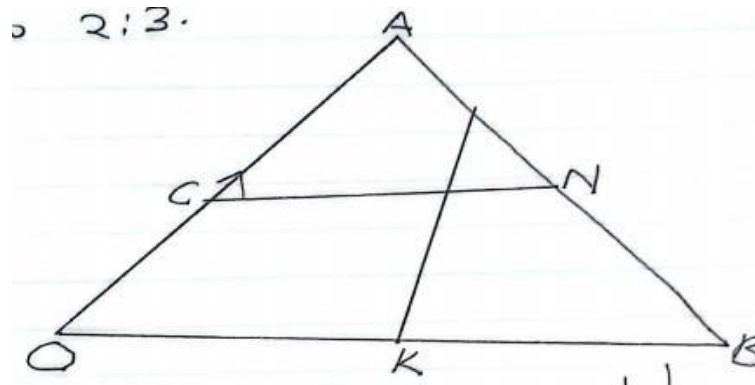
34. A box contains 5 red marbles and 3 white marbles and 3 white marbles. Two marbles are removed from the box one at a time without replacements. Find the probability of picking two red marbles. (3mks)
35. A square of side 8cm is inscribed in a circle. Find the probability that a point picked at random will fall inside the circle but not inside the square. (3mks)
36. The probability of a team winning a game is $\frac{1}{4}$. If it wins, the probability of winning the following game increases by 10%. If it loses, the probability of winning the next game increases by 20%. Determine the probability that the team wins in the second round. (3mks)
37. A trader mixed grade A rice costing sh.150 per kg with grade B rice costing sh.120 per kilogram in the ratio 5:1 in order to make blend X. In what ratio should grade B rice be mixed with blend x to make blend y costing ksh.135 per kg. (4mks)
38. A circle centre C(2,-1) passes through the point P(-6,5). Find the equation of the circle in the form $x^2 + y^2 + ax + by + c = 0$. (2mks)
39. Three consecutive terms of a A.P are $x+2$, $x - 2$ and $x - 5$. Find:
- The value of x . (3mks)
 - The common ratio. (1mk)
 - Given that $x+2$ is the 3rd term of the G.P, find:
 - The first term giving your answer as a fraction. (3mks)
 - The sum of the first six terms correct to 2 d.p. (3mks)
40. The 1st, the 5th and 6th terms of an A.P are first three terms of a G.P. if the first term of AP is 328, find;
- The common difference of the A.P. (3mks)
 - The common ratio of the G.P. (2mks)
 - The 10th term of the G.P. (2mks)
 - The sum of the first 10 terms of the G.P. (3mks)
41. a) Find the inverse of the matrix: (2mks)
- $$A = \begin{bmatrix} 5 & 3 \\ 2 & 7 \end{bmatrix}.$$
- b) Hence determine the point of intersection of the lines; (2mks)
- $$5x + 3y = 21 \text{ and } 2x + 7y = 20.$$
- c) Two other lines intersect at (5,4) and form a parallelogram with lines in (a) above. Find the equation of the new lines. (4mks)
42. Two plots A and B are available for sale. The original price of plot A is sh.300,000 and it appreciates every year at a rate of 15%. The price of B depreciates at a rate of 10% every half-year due to landslides as a result of heavy rains;
- Find the price of plot A after 4 years. (3mks)
 - If after the 4 years, the price of plot B is twice the price of plot A. find the original price of plot B. (3mks)
 - Find to the nearest half-year when the price of B would be two-fifth of its original price. (4mks)

43. The figure below shows circumscribed circle centre O. Chords XY and YZ measure 5cm, and 7cm respectively. Angle YXZ = 48°.



Calculate:

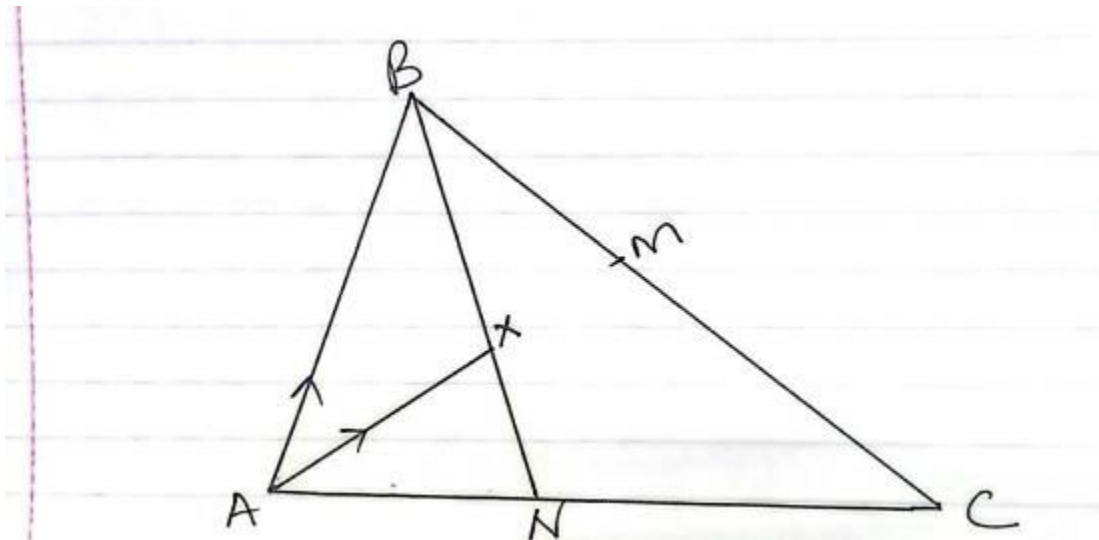
- The length of chord YZ. (3mks)
 - The radius of the circle (2mks)
 - The area of triangle XYZ. (2mks)
 - The area of the shaded region. (3mks)
44. A pavement is of length $(x-1)$ m and width $(x-8)$ m. the area of the pavement is 4.56m^2 ;
- Write a quadratic equation for area of the pavement in the form $ax^2 + bx + c = 0$ where a, b and c are constants. (3mks)
 - Using completing the square method, find the length and the width of the pavement. (4mks)
 - The pavement is covered with rectangular tiles measuring 0.4m by 0.3m, determine the number of tiles used to cover the pavement completely. (3mks)
45. The length of a room is 3m shorter than three times the width. The height of the room is a quarter of its length. The area of the floor is 60m^2 ;
- Calculate the dimensions of the room. (5mks)
 - The floor of the room was tiled leaving a border of width ym all round. If the area of the border was 1.69m^2 , find:-
 - The width of the border. (4mka)
 - The dimensions of the floor area covered by the tiles. (1mka)
46. In the figure below OA = a and OB = b. K and N are mid-points of OB and AB respectively. Point C divides OA in the ratio 2:4 while D divides AB in the ratio 2:3



- a) Express in terms of $\mathbf{a}$ and $\mathbf{b}$;
- $\mathbf{CN}$ (1mk)
 - $\mathbf{KD}$ (2mks)
- b) If the $\mathbf{OX} = \mathbf{OC} + p\mathbf{CN}$ and also $\mathbf{OX} = \mathbf{OK} + q\mathbf{KD}$ where p and q are scalars. Find the values of p and q . (5mks)
- c) Find the ratio in which X divides KD . (2mks)

47. In the figure below $\mathbf{AB} = 3\mathbf{b}$ and $\mathbf{AC} = 2\mathbf{c}$, $\mathbf{BX} = \frac{4}{13}\mathbf{c} - \frac{30}{13}\mathbf{b}$. Point M divides BC in the ratio

2:3. Lines BX has been produced to meet AC at point N .



- a) Find the following vectors in terms of $\mathbf{b}$ and $\mathbf{c}$;
- $\mathbf{AX}$ (2mks)
 - $\mathbf{AM}$ (2mks)
- b) i) Show that points A , X and M are collinear. (3mks)
- ii) Find the ratio in which X divides AM . (1mk)
- c) Given that $\mathbf{BX} : \mathbf{XN} = 10:3$, find the ratio in which N divides AC . (2mks)
48. A contractor applied for two contracts;
 A – Building a school chapel and B – building a dorm.
 The probability of getting contract A is 0.8 while that of getting contract B depends on whether or not contract A is obtained. It is 0.6 if A is obtained otherwise its only 0.3;
- a) Represent the above information on a probability tree diagram. (2mks)
- b) Use your tree diagram to find the probability of getting;
- Both contracts. (2mks)
 - Only one contract (2mks)
 - None of the contract. (2mks)
 - At least one contract. (2mks)
49. Two bags A and B contains identical balls except for one colour. Bag A contains 3 green and 4 white balls while bag B contains 4 green and 2 white balls;
- a) If a ball is drawn at random from each bag, find the probability both balls are of the same colour. (4mks)
- b) If the two balls are drawn at random from each bag one ball at a time without replacement, find the probability that; -
- The two balls drawn from bag A or bag B are green. (3mks)
 - All the four balls drawn are green. (3mks)

- 50.** Pipes A and B can fill a tank in 20 hours and $7\frac{1}{2}$ hour respectively. A third pipe C empties the tank in 10 hours. The tank is initially empty. Pipe A and B are both opened at 8.00 a.m. for $2\frac{1}{2}$ hours;
- a) Find the fraction of the water in the tank after the $2\frac{1}{2}$ hours. (3mks)
 - b) After the $2\frac{1}{2}$ hours pipe C is opened and the three pipes run for 6 hours. What fraction of the tank is empty at the end of the 6 hours? (3mks)
 - c) Pipe A is closed after the 6 hours but pipe B and C continue to run. Find the time the tank would be fully filled up. (4mks)

MTIHANI WA UFUNGUZI

KIDATO CHA NNE 2026

A. MAPAMBAZUKO YA MCHWEO NA HADITHI NYINGINE

1. (a) “Mume wangu, ninapoandika waraka huu, naomba uelewe kuwa wanao wawili wanazidi kuumia. Labda unadhani unayoyafanya ni siri ila usilolijua ni kwamba kila ufanyalo nalifahamu.”
 - (a) Fafanua muktadha wa dondoo hili(al. 4)
 - (b) Tambua umuhimu wa mandhari katika dondoo hili katika kujenga maudhui (al. 5)
 - (c) Eleza sifa nne za mzungumzaji (al. 4)
 - (d) Eleza toni katika dondoo hili (al.2)
- (b) Jadili maudhui ya ukiukaji wa haki za watoto katika hadithi ya Mapambazuko ya Machweo (Ala. 5)

B. NGUU ZA JADI

1. “Mimi ni mwanamume. Ninaweza kuoa wakati wowote na idadi yoyote ya wanawake. Shida iko wapi? Mwanamke akishaolewa, basi yake yamekwisha hapo. Azae na kuitumikia jamaa yake bila kuulizauliza maswali.”
 - (a) Weka dondoo hili katika muktadha wake. (Al. 4)
 - (b) Fafanua sifa sita za msemaji wa maneno haya (Al. 6)
 - (c) Eleza maudhui yoyote manne yanayojitokeza katika dondoo hili (Al. 4)
 - (d) Maudhui ya usaliti yamejadiliwa kwa kina katika Riwaya nzima. Thibitisha (Al. 6)

AU

2. Matatizo ya Afrika ni tokeo la uongozi mbaya. Thibitisha kwa kurejelea riwaya ya Nguu za Jadi (Al. 20)

BEMBEA YA MAISHA

1. Anwani ya Bembea ya Maisha inaafiki tamthilia hii. Jadili (Al. 20)

AU

2. Kwa kurejelea mifano mbalimbali thibitisha namna ndoa katika tamthilia ya Bembea ya Maisha zimemulika uhalisia wa jamii za kifaraka. (Al. 20)

C. FASIHI SIMULIZI

1. Soma utungo ufuatao kisha ujibu maswali yanayofuata.

Ewe Mainga wa Ndumi

Siwe uloambia akina mama

Siku tulopiga foleni

Chakula cha msaada kupata

Turudishe vifaranga kwenye miji

Wageuke vijusi tena

Njaa isiwaangamize?

Siwe ulopita

Matusi ukitema

Chumvi na sukarikuturushia ja samadi?

Uhitaji wetu ukatutuma

Kuokota vihela uloturushia

Ukatununua,kura ukapata?

Sasa miaka mitano imetimia

Waja tulaghai tena

Mainga wa Ndumi huna lolote safari hii

Ubunge umekudondoka ukitazama

Maswali

- (a) Huu ni wimbo wa aina gani? (alama 2)
- (b) Taja shughuli mojambo ya kijamii na kiuchumi ambazo huendelezwa katika jamii ya utungo huu. (Al. 2)
- (c) Wewe ni mwasilishaji wa kipera hiki jukwani, eleza mambo sita ambayo utazingatia katika uwasilishaji wako. (alama 6)
- (d) Jadili jinsi jamii ya kisasa inavyojaribu kuendeleza fasihi simulizi. (alama 5)
- (e) Maandishi ni mojawepo ya vifaa vya kukusanya na kuhifadhi fasihi simulizi. Tathmini udhaifu wa kutumia kifaa hiki. (alama 5)

E. USHAIRI

1. Soma shairi lifuatalo kisha ujibu maswali.

KAMA SODOMA!

Miji yetu kwa yakini, kidogo kama Sodoma!
Haihitaji makini, kwa mwenye macho mazima
Utaona walakini, mradi ukitizama
Wanazini hadharani, wana kwa watu wazima
Yafanana na Sodoma, miji yetu kwa yakini.

Miji yetu kwa yakini, kidogo kama Sodoma!
Wanazini hadharani, wana kwa watu wazima

Wanatafuna maini, vijana na kina mama
Hawana haya nyusoni, wameharamisha wema
Yafanana na Sodoma, miji yetu kwa yakini.

Miji yetu kwa yakini, kidogo kama Sodoma!
Hawana haya nyusoni, wameharamisha wema
Baba na binti ndani, wanacheza lelemama
Marijali wa mbioni, kujipagaza umama
Yafanana na Sodoma, miji yetu kwa yakini.

Miji yetu kwa yakini, kidogo kama Sodoma!
Marijali wa mbioni, kujipagaza umama
Wameikataa dini, toka tumboni mwa mama
Wadai Wataliani, watajirisha mapema
Yafanana na sodoma, mji yetu kwa yakini.

Miji yetu kwa yakini, kidogo kama Sodoma!
Wadai ufirauni, watajirisha mapema
Hivyo mambo ya kigeni, yametunukiwa dhima
Uwaonapo fuoni, nusu uchi wa mnyama
Yafanana na Sodoma, miji yetu kwa yakini.

Miji yetu kwa yakini, kidogo kama Sodoma!
Uwaonapo fuoni, nusu uchi wa mnyama
Watu hawana imani, umezidi uhasama
Na viongozi wa dini, kuabudu darahima
Yafanana na Sodoma, miji yetu kwa yakini.

Miji yetu kwa yakini, kidogo kama sodoma!
Na viongozi wa dini, kuabudu darahima
Wamekeuka yamini, kati yao na Rahima
Wamemuasi Manani, na kusahau kiyama
Yafanana na sodoma, miji yetu kwa yakini.

Miji yetu kwa yakini, kidogo kama Sodoma!
Wamemuasi manani, na kusahau kiyama
Ya Illahi tuauni, tuwe watu maamuma
Tukue katika dini, siku zetu za uzima
Yafanana na Sodoma, miji yetu kwa yakini.

Maswali

- a. Bainisha bahari ya shairi hili ukijikita katika ruwaza zifuatazo (alama3)
 - i. Mishororo
 - ii. Maneno
 - iii. Vina
- b. Eleza muundo wa shairi hili (alama4)
- c. Bainisha mbinu zifuatazo za kimtindo katika shairi hili (alama3)
 - i. Tashbihi
 - ii. Taswira
 - iii. Tasfida
- d. Eleza toni ya shairi hili (alama1)
- e. Bainisha nafsi nenewa katika shairi hili (alama1)\
- f. Fafanua dhamira ya mtunzi wa shairi hili (alama2)
- g. Andika ubeti watatu kwa lugha tutumbi (alama4)
- h. Fafanua maana ya maneno haya kama yalivyotumiwa na mshairi (alama2)

- i. Manani
- ii. Marijali

MERU SCHOOL
DECEMBER HOLIDAY ASSIGNMENT 2025
FORM THREE PHYSICS

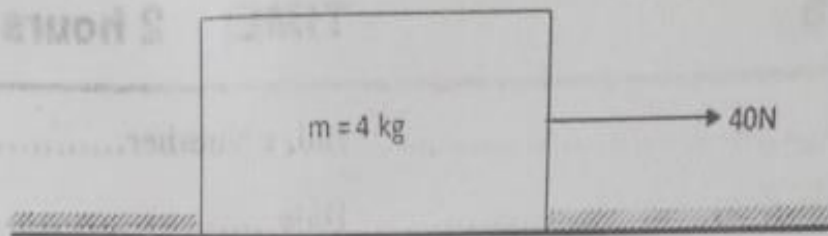
SECTION A (25 MARKS)

Attempt all the questions in the spaces provided.

1. Define a free fall.

(1 mark)

2. The figure 1 below shows a force of 40N acting on a body of mass 4kg. The coefficient of friction between the surfaces is 0.05.



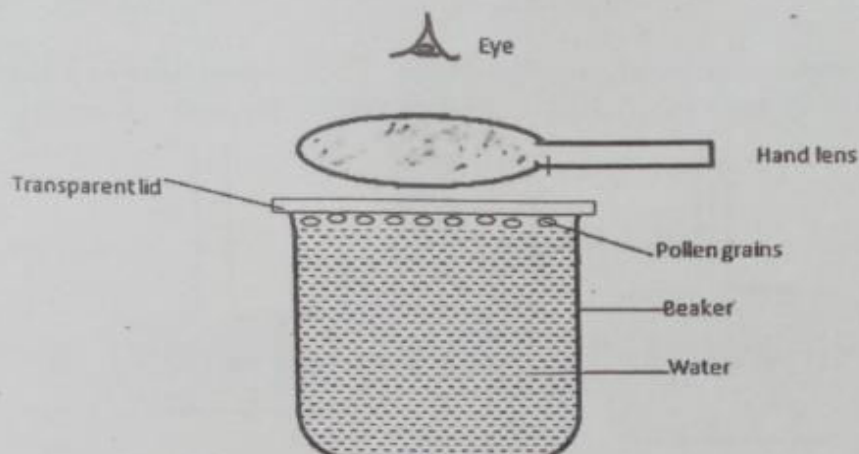
Determine the acceleration of the body.

(3 marks)

3. A uniform bar is pivoted at a point 30cm from one end. A force of 12N at the end of the shorter side keeps the bar in equilibrium. If the length of the bar is 1 metre, determine the weight w , of the bar.

(2marks)

4. A student observed some pollen grains on the surface of water in a beaker with the help of hand lens as shown in the figure below



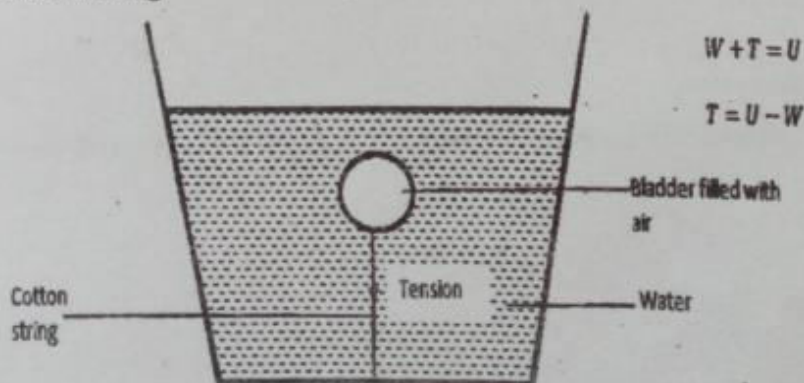
a. State the observation made. (1 mark)

b. Explain the observation in (a) above. (1 mark)

5. An immersion heater consumes a voltage of 240V and a current of 10A. If it is used to heat 5kg of water at

20°C, find the final temperature of water after 7 minutes. (Take the specific heat capacity of water = 4200 J/kg/k) (3marks)

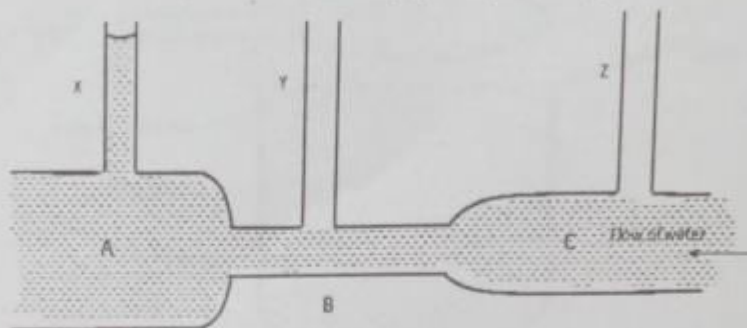
6. The figure below shows a rubber bladder filled with air, fixed at the bottom of a water container, and held with a cotton string.



State and explain the observation made when water is heated gently for a few minutes.

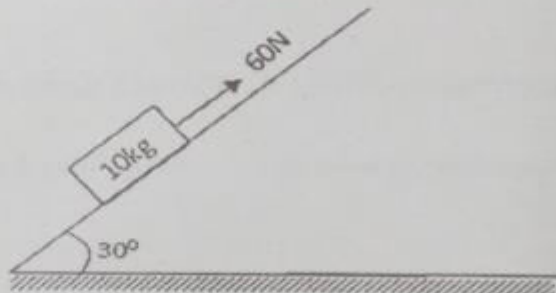
(2 marks)

7. The figure below shows a pipe of varying cross-section. Three vertical tubes X, Y and Z of same diameter are fixed to the section A, B and C of the pipe respectively as shown below.



- Given that the water flows in the direction shown by the arrow, indicate on the diagram the relative levels of water in Y and Z. (1 mark)

8. A smooth wooden plane is inclined at an angle of 30° to the horizontal as shown in Figure 5 below. An object of mass 10 kg is pulled steadily up the plane by a force of 60 N .



Determine;

- a. The velocity ratio of the inclined plane.

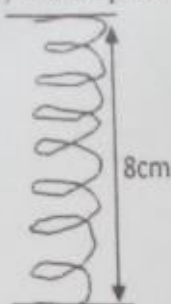
(2 marks)

- b. Efficiency of the system.

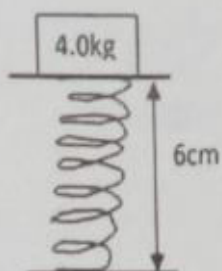
(2 marks)

9. The figure below shows a spiral spring when not compressed and when compressed by a mass of 4.0kg.

a) Uncompressed spring

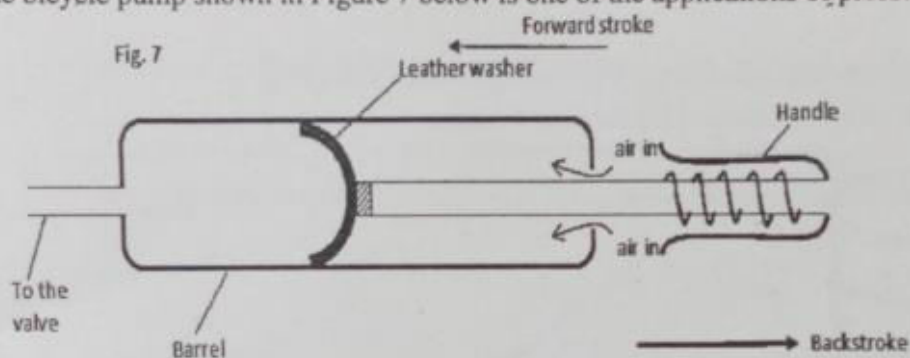


b) Compressed spring



Determine the elastic potential energy stored by the compressed spring in (b). (3marks)

10. The bicycle pump shown in Figure 7 below is one of the applications of pressure in gases.



Explain how the leather washer functions during;

a. Backstroke

(1mark)

b. forward stroke

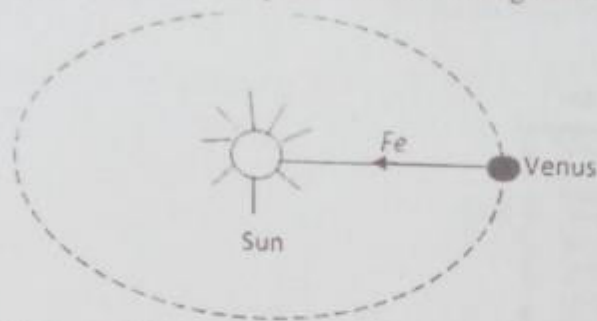
(1 mark)

11. Explain how greenhouse effect increases the average temperate of the earth. (2marks)

SECTION B (55 MARKS)

Answer all the questions in this section in the spaces provided

12. a. The figure below shows a planet Venus orbiting the sun in a circular orbit at constant speed.



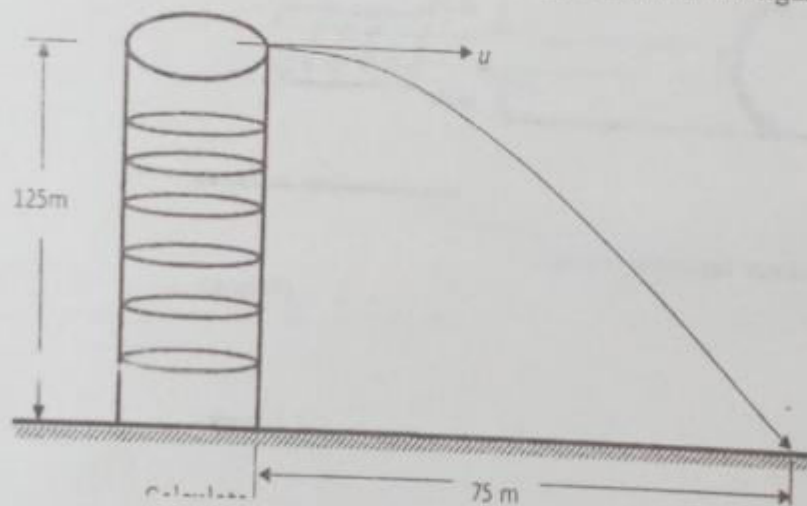
- i. State what provides the centripetal force.

(1 mark)

- ii. Define angular velocity

(1 mark)

A stone is thrown with a horizontal velocity u from the top of a building of height 125m so as to hit a Target on the ground 75m from the base of the building as shown in the figure below.



Calculate:

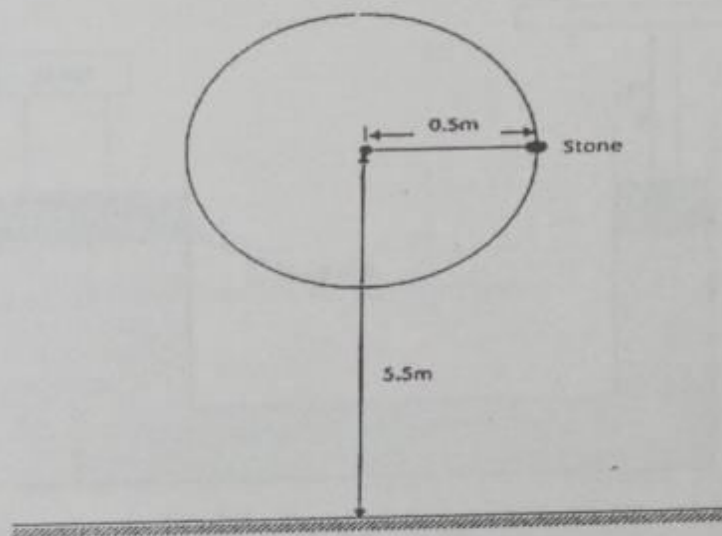
- i. the time taken for the stone to hit the target.

(2 marks)

ii. the horizontal velocity, u , of the stone.

(2 marks)

- c. A stone of mass 0.5 kg is attached to a string of length 0.5 m that will break if the tension exceeds 20 N . The stone is whirled in a vertical plane, the axis of rotation being above the ground, as shown in the figure below.



- d. The angular velocity is gradually increased until the string breaks.

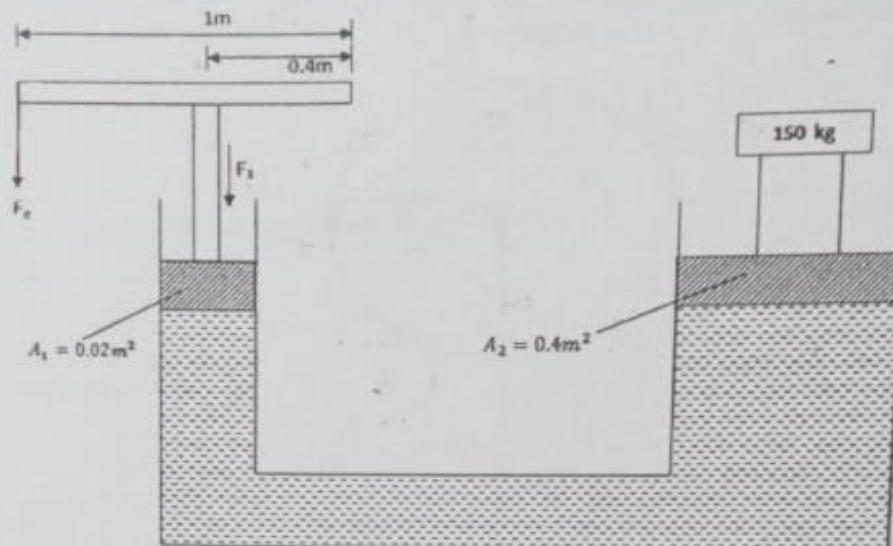
i. In what position is the string most likely to break? (1 mark)

ii. At what angular velocity, ω will the string break? (3 marks)

13. a. Define the term atmospheric pressure.

(1 mark)

b. The figure below shows a hydraulic lift supporting a load of 150kg. Its cross-sectional areas A_1 and A_2 are 0.02m^2 and 0.4m^2 respectively.



The length of the effort arm is 1m and the length of the plunger from the pivot is 0.4m. Determine:

i. The pressure exerted by 150kg mass.

(1mark)

ii. The pressure exerted by F on the smaller piston.

(1mark)

iii. The force F_1 .

(2marks)

iv. The applied force, F_e .

(2 marks)

v The mechanical advantage,

(2 marks)

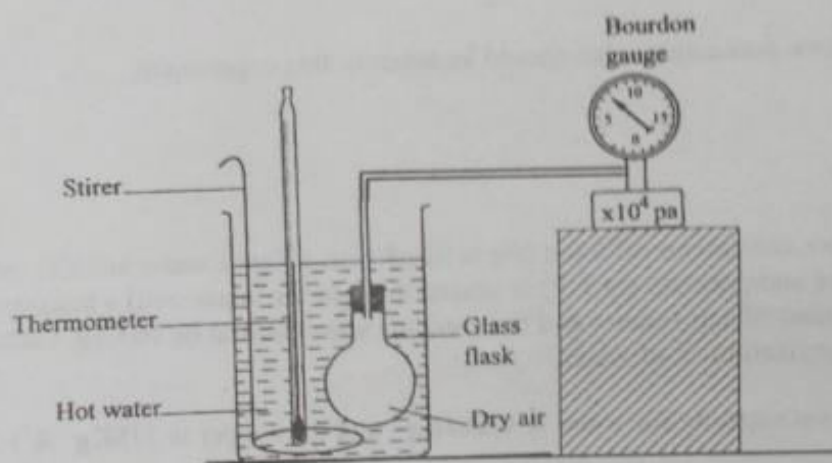
14a) Define Pressure Law

(1 mark)

b) State **one** basic assumption of the kinetic theory of gases.

(1 mark)

c) The figure below shows a set up that may be used to verify Pressure law.



i) State the measurements that may be taken in the experiment.

(2marks)

ii) Explain how the measurement in (i) above may be used to verify Pressure law.

(3marks)

iii) A car tyre is at an air pressure of 4.0×10^5 Pa. at a temperature of 27°C . While it is running, the temperature rises to 75°C . What is the new pressure in the tyre? (Assume the tyre does not expand)
(3 marks)

15 (a) (i) Describe the experiment to determine the specific heat capacity c , of a block of aluminium with two holes drilled in it, to accommodate a thermometer and an electric immersion heater.
(3marks)

(ii) State two precautions that should be taken in this experiment.
(2 marks)

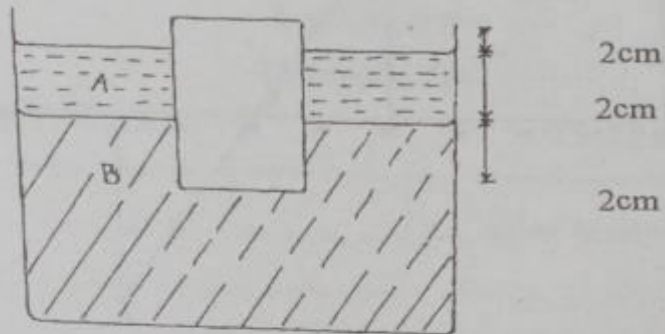
(b) A copper calorimeter of mass 60g is filled with 100g of water at 25°C . Steam at a normal temperature and pressure (N.T.P) is passed through the water until a temperature 45°C is attained. The final mass of calorimeter and the contents was found to be 163.5g. Calculate the specific latent heat of vaporization 'l' of water.
(5marks)

(Specific heat capacity for water is 4200J Kg^{-1} and for copper is $378\text{J Kg}^{-1}\text{K}^{-1}$)

16(a) State the law of floatation

(1mark)

(b) The figure below shows a uniform block of uniform cross-sectional area of 6.0cm^2 floating on two liquids A and B. The lengths of the block in each liquid are shown. Given that the density of liquid A is 800kg/m^3 and that of liquid B is 1000kg/m^3 determine the:



(i) Weight of liquid A displaced

(2marks)

(ii) Weight of liquid B displaced

(2marks)

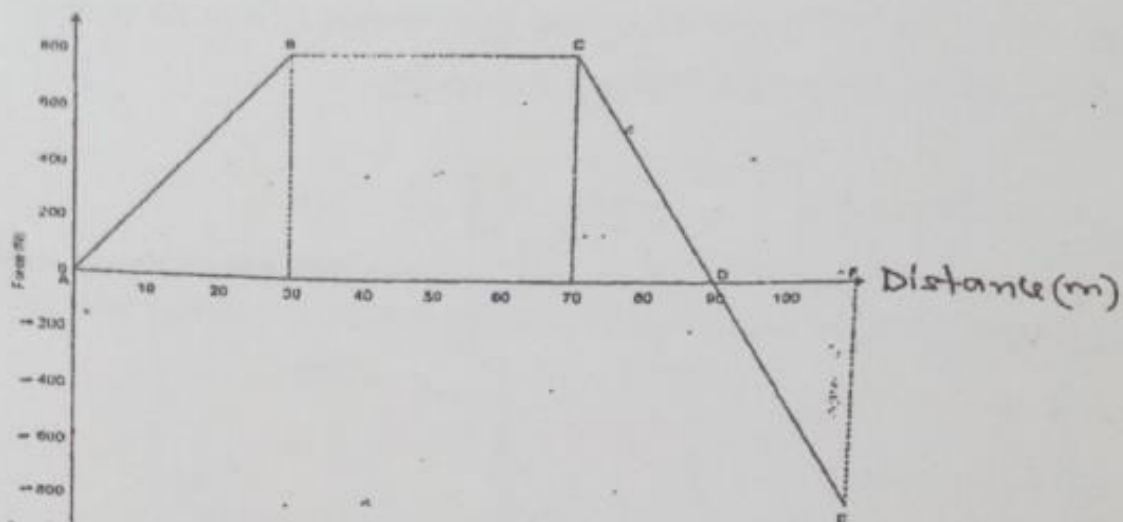
(iii) Density of block

(4marks)

17(a) Define the term work

(1 mark)

(b) The figure shows a force-distance graph for a car towed on a horizontal ground



(i) Calculate the total work done

(3 marks)

ii. If the velocity just before reaching point C is 0.6 m/s , calculate the power developed by the agent providing the force at this point.

(3 marks)

SECTION A (25 MARKS).

1. A body in a uniform circular motion experiences acceleration despite moving at a constant speed. Explain. (1mk)

2. Figure 1 below shows a uniform bar of length 100 cm pivoted near one end. The bar is kept in equilibrium by a spring balance shown.

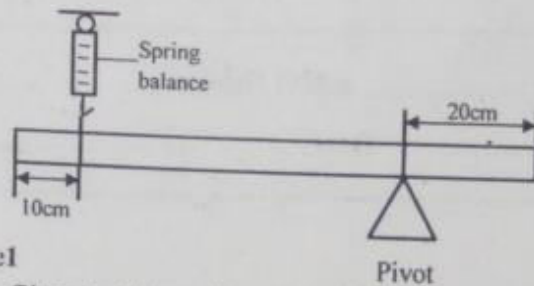


Figure1

Given that the weight of the bar is 1.4N, determine the reading of the spring balance. (3mks)

3. Figure2 below shows two capillary tubes of different sizes dipped in water.

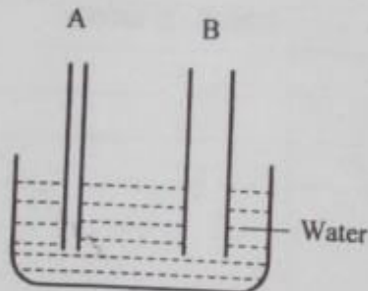


Figure2

- (a) Mark on the diagram the level of water in the capillary tubes. (1 mk)

(b) Explain the difference in the levels of water in the two tubes. (1 mk)

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4. Figure 3 below shows a system of gears.



Figure3

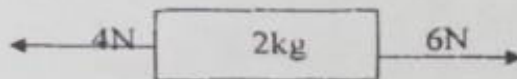
Find the velocity ratio of the following gear wheels. (2mks)

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5. Two forces act on a trolley as shown below.



Find the acceleration of the trolley. (2mks)

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6. State one reason why mercury is preferred as a barometric liquid and not water. (1mk)

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7. Figure 4 below shows water placed in a measuring cylinder calibrated in cm^3

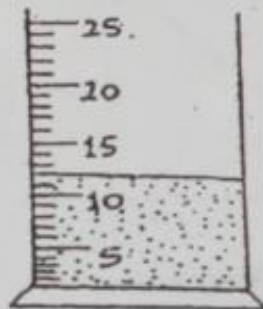
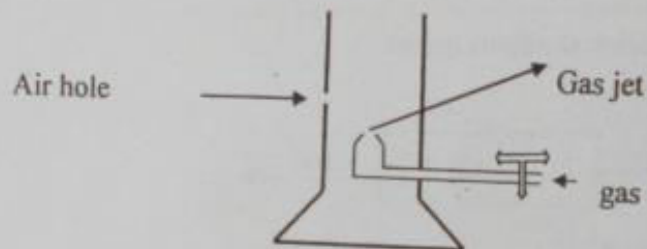


Figure4

An object of mass 30g and density 2.5g/cm^3 is lowered gently in the water. By first determining the volume of the object, Indicate on the diagram the new level. (3 mks)

8. A particle starts from rest and accelerates uniformly in a straight line. After 4 seconds it is 20m from the starting point. Determine the acceleration of the particle. (3 marks)

9. Figure 5 below shows a Bunsen burner.



Explain how air is drawn into the burner when the gas tap is open. (2mks)

10. Figure 6 below shows the variation of force with extension for a certain spring.

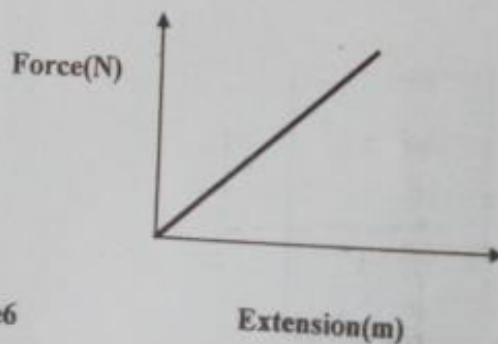


Figure 6

On the same axis, **sketch** the variation of force with extension for another similar spring whose length is double the first spring (1mk)

11. State one effect of expansion in gases. (1mk)

12.(a) State the mode of heat transfer by which heat from the sun reaches the Earth's surface. (1 mk)

(b) Explain your answer in(a) above. (1mk)

13. Figure 7 below shows part of a micrometer screw gauge.

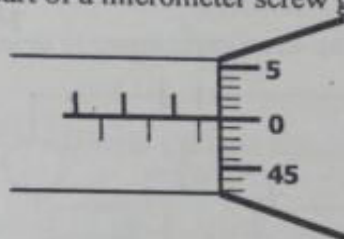


Figure7

(i) State the pitch of the micrometers crew gauge (2mks)

SECTIONB(55MARKS).

Answer all Questions in this section.

14(a). (i) Define the term "Specific Latent heat of fusion" of a substance. (1mk)

(ii) 25g of ice was added to 300g of water at 35°C in a beaker of negligible heat capacity. When

(I) Calculate the heat lost by the water.

(2 mks)

(I) Calculate the heat lost by the water.

(I) Write an expression in terms of L_f (Specific Latent heat of fusion of ice) for the heat gained by ice to melt and for its temperature to rise to 20°C . (3 mks)

(3 mks)

(II) Calculate the Specific Latent heat of fusion of ice, L_f .

(3mks)

(b). Figure 8 below shows a set up in an experiment to determine specific heat capacity of water.

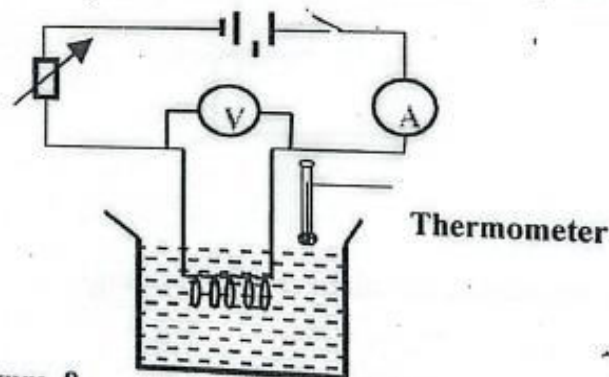


Figure 8

The data below was obtained from the experiment

- Voltage V across the heater = $24V$
- Current I in the circuit = $1.5A$
- Time (t) heating = 5 Minutes
- Mass m of water = $600g$
- Change in temperature $\Delta T = 4^{\circ}C$

(i) State two improvements that would be made in the set up to obtain accurate results. (2 mks)

(ii) Use the above results to determine the specific heat capacity of water. (3mks)

15.(a) Figure 9 below shows a pulley system being used to raise a load.

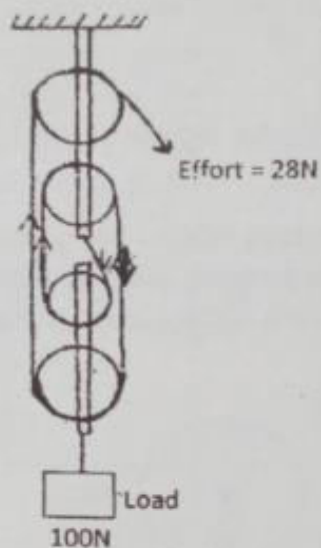


Figure 9

If the effort applied is 28N and the load lifted is 100N, determine the efficiency of the system. (3mks)

(b) Figure 10 below shows a simple pendulum. The pendulum bob whose mass is 80g oscillates between points A and C, through its rest position B. A and C are both 80cm higher than B.

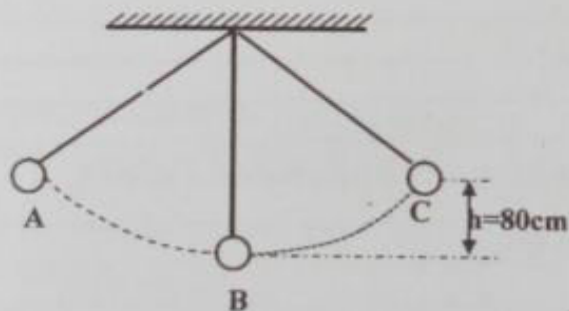


Figure 10

(i) State the form of energy possessed by the pendulum bob at:

Point A-

Point B-

(2mks)

(ii) Determine the velocity of the bob at point B. (Take acceleration due to gravity $g=10\text{m/s}^2$) (4mks)

16. Figure 11 below shows a body of mass 50g, which is rotated in a vertical circle of radius 0.4m. The speed of the body is gradually increased until the string breaks. The string breaks when the mass is at its lowest position A and at a speed of 30m/s. Point A is 5m above the ground.

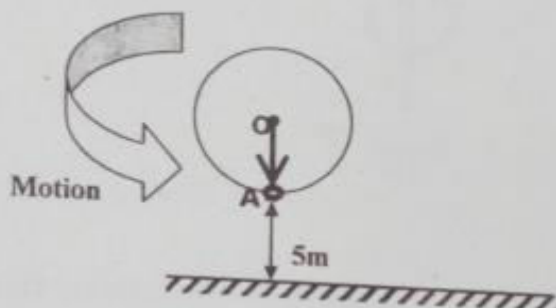


Figure 11

a) Show on the diagram (with an arrow) the initial direction and the path of the body from the time the string breaks until it strikes the ground. (2mks)

b) Calculate;

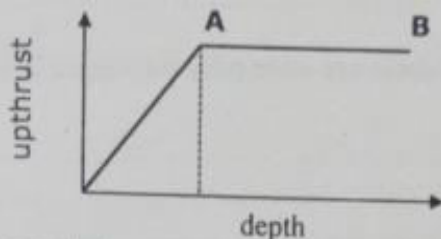
(i) The tension in the string when the body is at the top-most point. (2 mks)

(ii) The tension in the string when the body is at point A. (2MKS)

(iii) the time the body takes to reach the ground after breaking off. (Take $g=10\text{m/s}^2$) (2mks)

(iv) The horizontal distance the body travels before it strikes the ground. (2mks)

17. (a) A glass block is suspended from a spring balance and held inside a beaker without touching the beak below shows a graph of variation of upthrust con the block with depth of water in the beaker.



Explain the nature of the graph at:

Region OA:

(1mk)

Region AB:

(1 mk)

(b) A body weighs 2.0N when freely suspended in air and 1.36N when fully submerged in a liquid of density 800kg/m^3 . Taking $g=10\text{N/Kg}$, determine:

(i) The up thrust experienced by the body in the liquid.

(1 mk)

(ii) The volume of the body.

(3 mks)

(iii) the density of the body

(3 mks)

(iv) The up thrust the body will experience when fully submerged in a liquid of density $1,200 \text{ kg/m}^3$.

(2 mks)

18. Figure 13 below shows a set up that a student used to investigate the pressure law.

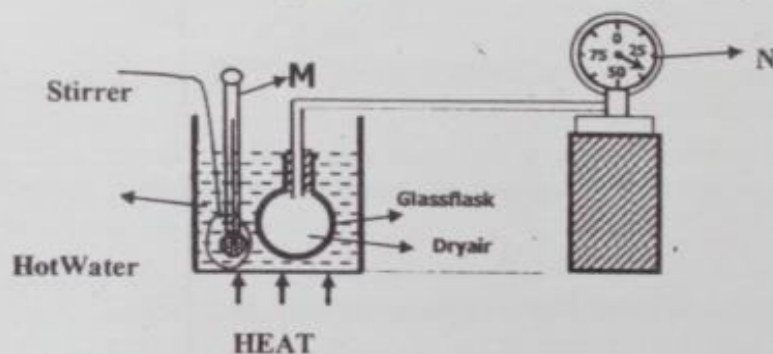


Figure 13

(a) Name the parts

(2 mks)

M

N

b) What are the functions of

(2 mks)

(i) The stirrer

(ii) Part N.

(c) State the measurements that should be taken in the experiment

(2mks)

(d) Explain how the measurement in (c) above may be used to verify Pressure law

(4mks)

(e) Name one limitation of the gas laws.

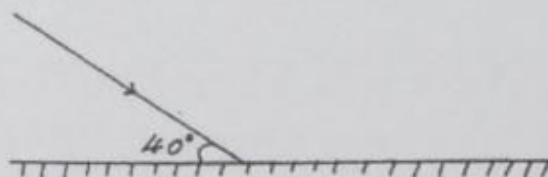
(1mk)

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SECTION : A (25MARKS)

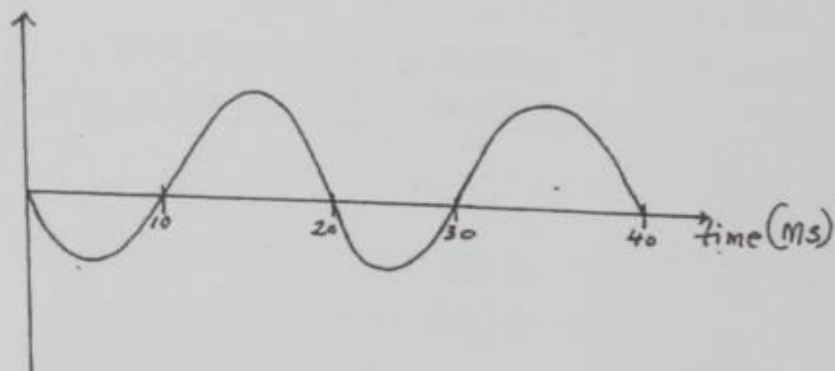
1. Name a branch of physics that deals with the study of the behavior of particles constituting the nucleus of an atom. (1mk)

2. A ray of light makes an angle of 40° with a plane mirror as shown below. The mirror is then rotated through an angle of 15° in a clockwise directions.

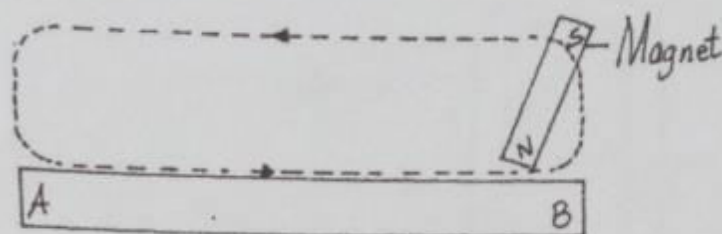


Determine the angle between the incident ray and the new reflected ray. (2mks)

3. The figure below shows a displacement time graph of a wave. Determine the frequency of the wave. (3mks)



The figure below shows one method of making a magnet.



Name the polarity formed at:

(1mk)

i) A

ii) B

5. The table below shows some electromagnetic waves complete the table appropriately. (2mks)

Type of Radiation	Detector	Uses
Radio waves		Communication
	Phototransistor or blackened thermometer	Warmth sensor

6. The refractive indices of water and glass are $\frac{4}{3}$ and $\frac{3}{2}$ respectively. Determine the refractive index of glass with respect to water for a ray of light moving from water to glass. (3mks)

7. A highly negatively charged rod is gradually brought close to the cap of a positively charged electroscope. The leaf is observed to collapse initially then it diverges. Explain why the leaf initially collapses. (1mk)

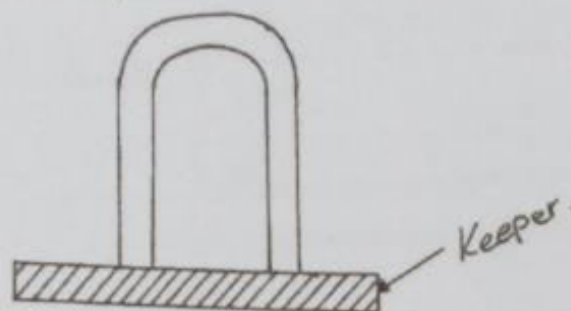
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The figure below shows a U- shaped magnet stored with a keeper.



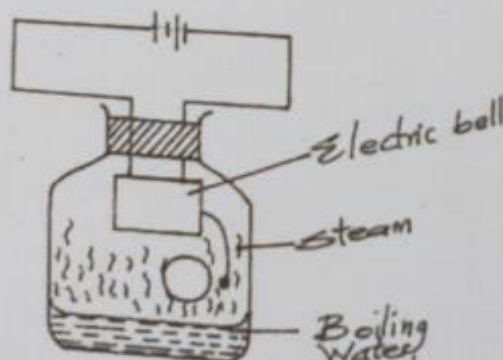
Explain the advantage of storing the magnet as shown above.

(2mks)

9. Define the term "accommodation" as applied to the human eye.

(1mk)

10. The figure below shows a set up by a student



- i) State what happens to the sound from the bell as the bottle and its contents are cooled to 0°C .

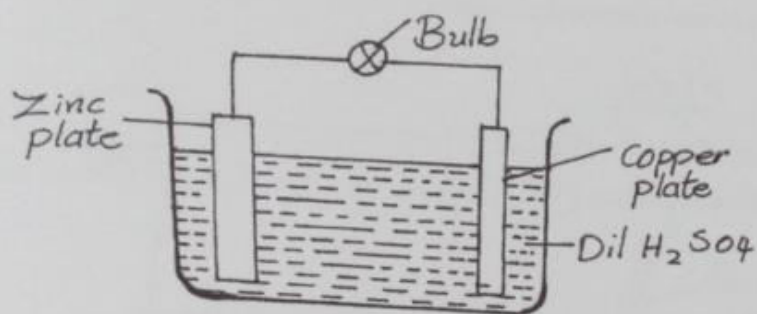
(1mk)

- ii) Explain the observations stated in (i) above.

(1mk)

11.

The figure below shows a set-up for a simple cell.



Explain why the bulb goes off after only a short time.

• (2mks)

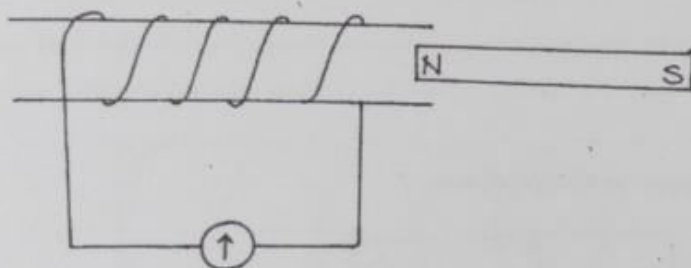
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12. The figure below shows the ends of a solenoid connected to a galvanometer as shown below.



State and explain what is observed when the magnet is pushed into the solenoid.

(2mks)

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13. An electric bulb with a filament of resistance $480\ \Omega$ is connected to a 240V mains supply.

Determine the energy dissipated in 2 minutes.

(3mks)

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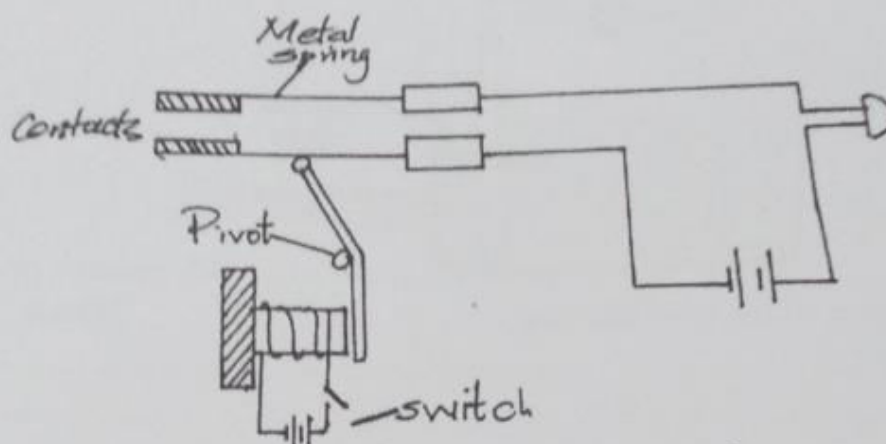
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SECTION B (55 MARKS)

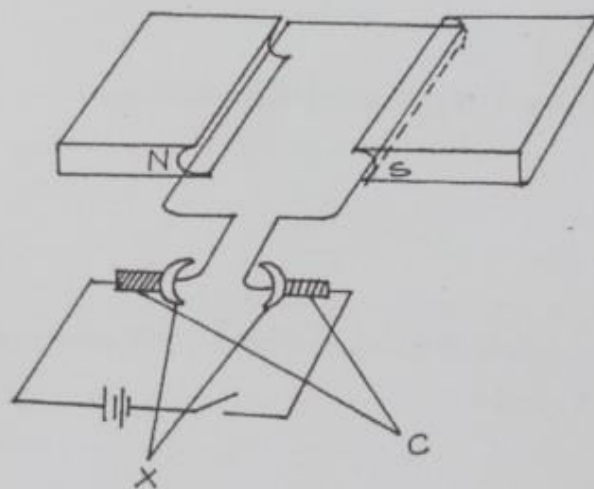
14. a) The figure below shows an electromagnetic relay.



Explain what happens when the switch is closed.

(3mks)

- b) The diagram below shows an electric device



- i) Name the electrical device.

(1mk)

- ii) Name the parts labeled.

(2 mks)

- X
 II.C

iii) Explain how the electrical device works.

(3mks)

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iv) State two ways of increasing the speed of rotation of the electrical device. (2mks)

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15. a) State the difference between transverse and longitudinal waves. (2mks)

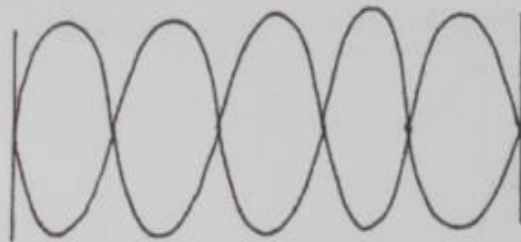
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b) The figure below shows a stationary wave formed when string of length 3.0m is stretched between two supports and plucked.



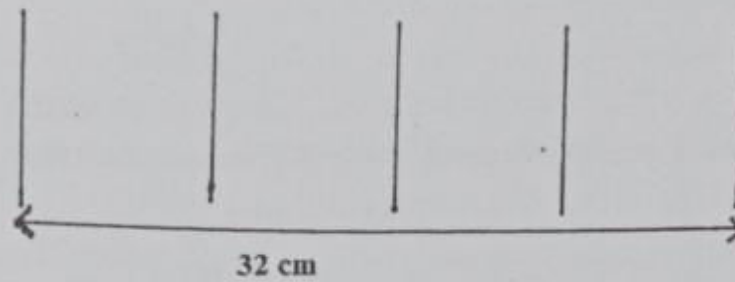
i) State how this wave is formed. (1mk)

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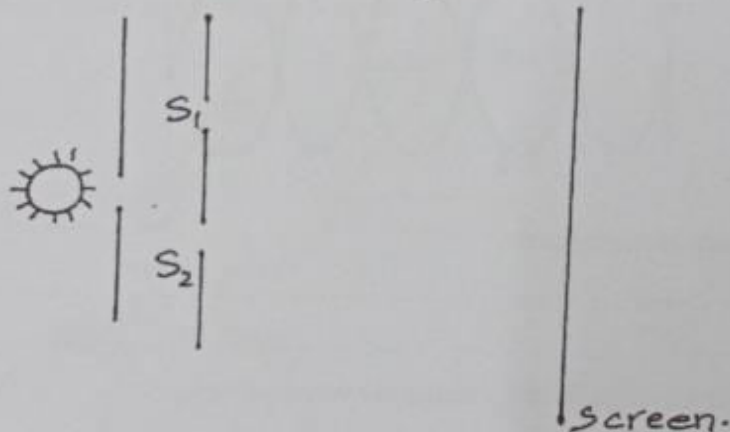
ii) Determine the wavelength of the stationary wave above. (2mks)

- c) The figure below is a sketch of ripples caused by a vibrator in a ripple tank whose frequency is 50Hz .



Using the above information, determine the speed of the wave in SI units. • (3mks)

- d) In an experiment to investigate interference of light waves, a double slit was placed in front of a monochromatic source of light as shown below.



- i) State and explain what is observed on the screen. (2mks)

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- ii) State what would happen if the slit separation S_1S_2 is reduced. (1mk)

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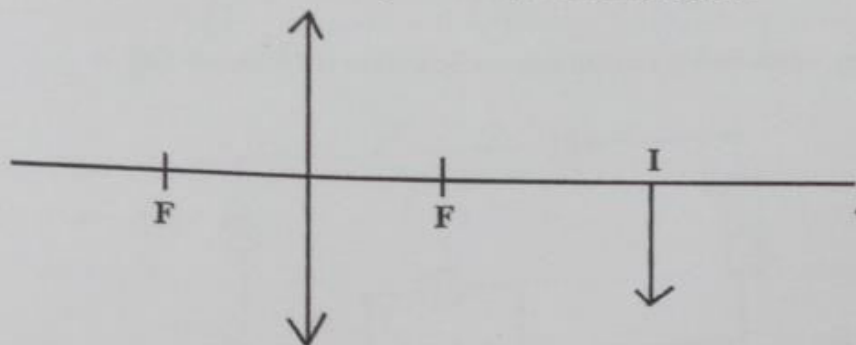
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16.

- a) Define the term principal focus as used in a concave lens.

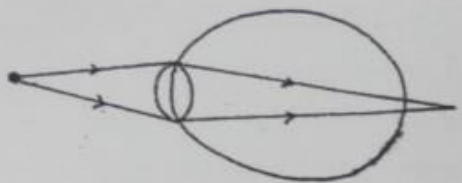
(1mk)

- b) The figure below shows a real image formed by a converging lens.



On the same diagram, construct a ray diagram to locate the position of the object. (3mks)

- c) The figure below shows how a near objects, O is focused in a defective eye.



- i) Name the eye defect.

(1mk)

- ii) How does the observer view an object near them.

(1mk)

- iii) Sketch on the same diagram how a distant object is focused by the eye. (2mks)

- d) An object placed 12cm from a convex lens forms an upright image 36cm from the lens.

Calculate the focal length of the lens.

(3mks)

7. a) State the condition necessary for a conductor to obey Ohm's Law. (1mk)

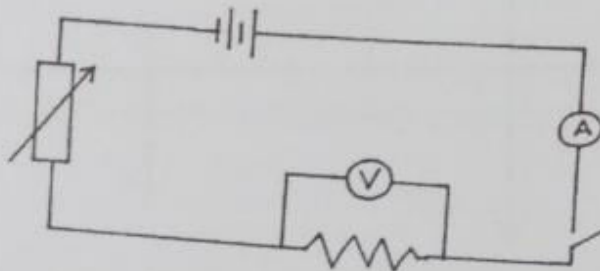
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- b) The figure below shows a circuit that can be used to verify Ohm's Law.



- Explain briefly how the set-up can be used to verify Ohm's Law. (4mks)

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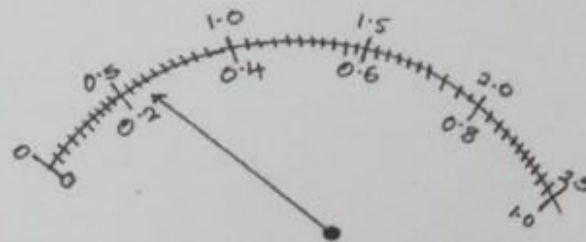
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- c) Two resistors R_1 and R_2 are connected in series to a 10V battery and a current of 0.5A flows through the circuit, when R_1 only is connected a current 0.8A flows . Calculate the value of R_2 (3mks)

- d) The figure below shows the scale of an ammeter used to measure current through a conductor.



State the reading from the meter when the student is using.

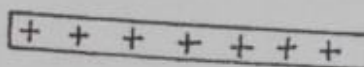
i) 0-2.5A scale

(1mk)

ii) 0-1.0A scale

(1mk)

18. a) Sketch the electric field pattern due to the arrangement of the charges shown below. (1mk)



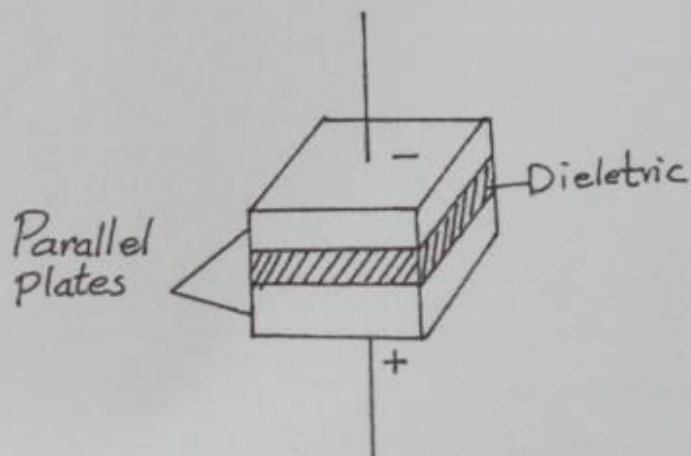
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- b) The diagram below shows a parallel plate capacitor with a dielectric material in between the plates.



State how each of the following quantities are affected when the dielectric material is pulled out of the parallel plates.

i) the p.d across the plates.

(1mk)

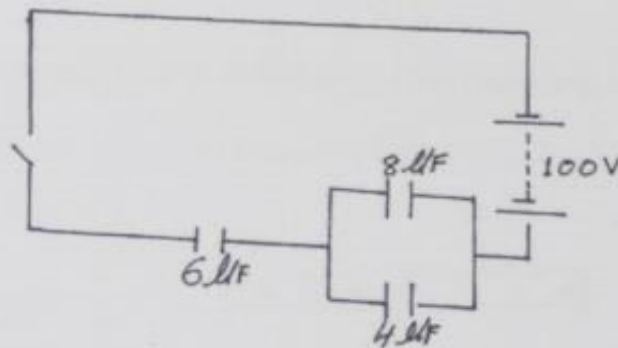
ii) the charge on the plates.

(1mk)

iii) the capacitance of the system.

(1mk)

c) The figure below shows a system of capacitors connected to a 100V supply.



Calculate :

i) the effective capacitance.

(3mks)

ii) charge stored by the $6\mu F$ capacitor.

(2mks)

iii) potential across the $4\mu F$ capacitor.

(3mks)

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