SESEMAT MUKONO REGION

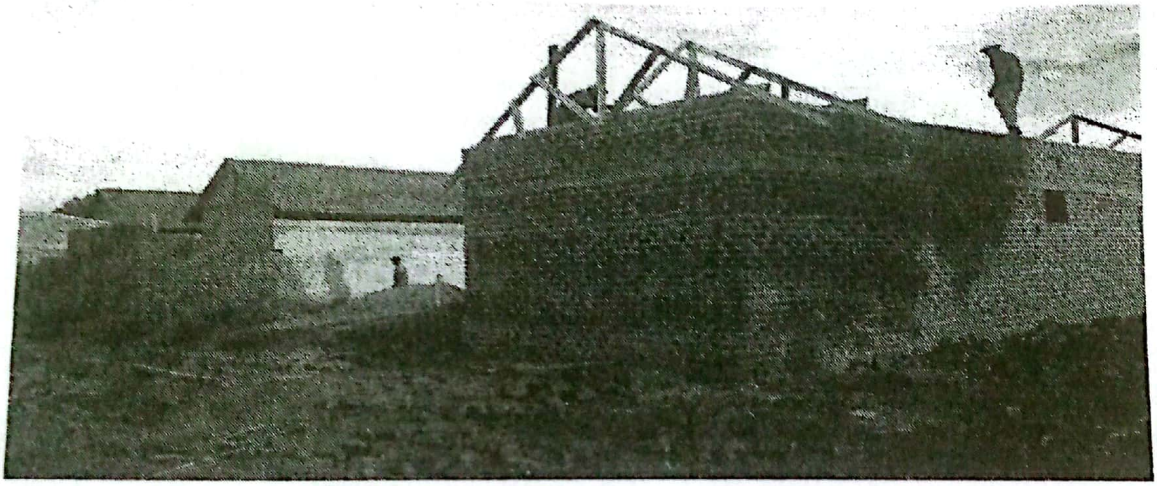
UGANDA LOWER SECONDARY CURRICULUM CERTIFICATE OF EDUCATION

COMPETENCE BASED CURRICULUM

CHEMISTRY PROPOSED MARKING GUIDE

SENIOR THREE

1. John wants to build a permanent house, but lacks adequate information about the proper materials to use during the construction of his house. As a student of chemistry, give a written advice to John on the suitable materials he can use to construct his house.



To build a permanent house, John will require the following building materials.

Material	Properties	Application
1. Iron sheet	High tensile strength; Not breakable; Not porous to water; Good malleability; Good ductility;	For roofing the house For making gutters For constructing concrete poles For making windows For making doors
2. Clay Tiles	Low tensile strength; Easily breakable; Not porous; Durable; Not malleable; Not ductile;	For roofing the house For laying the floor For making walls

3. Glass	Strong Resistant to fire Enough lighting in the house Little material required Not porous Easily breakable Low tensile strength	For fixing on the windows For fixing on the doors Act as mirrors in bathrooms and wash tabs
4. Concrete blocks / Burnt clay/ bricks	Very strong and hard Cannot be attacked by fire Easy to construct with Moderately durable Not easily breakable Not porous	For building the walls For building the foundation For making poles For laying the floor
5. Plastics e.g water proof Kavera	Water proof Resistant to acids and bases They are light Poor conductor of heat and electricity Durable/ Non-biodegradable	Making water pipes, light fitting eg sockets, plugs and bulb holders Laying on the foundation Laying on timber before roofing Nail caps for roofing
6. Wood	It is cheap Readily available Easily replaced Poor conductor of heat Hard and strong Water proof	For roofing the house For making windows and window frames For making doors and door frames For making the ceiling Act as ladders for standing on while building the walls and roofing For holding concrete while making floor and verandah
7. Soil/Sand	Readily available Cheap	For laying bricks on the wall For laying the foundation For making the ceiling For making the floor
8. Iron bar	High tensile strength; Not breakable; Not porous to water; Good malleability; Good ductility;	For making the beam For laying foundation For making concrete poles For reinforcing the walls For making windows For making doors For making the burglar proofs

Plastics are included as a damp ~~water~~ proof course
Cement
Gravel, Stones
Nails.

9. Concrete	Low tensile strength; Not easily breakable; Not porous; Moderately durable; Not malleable; Not ductile;	For Laying the floor For making the verandah For making the poles or pillars For laying the foundations For making the beams
10. Paint	Adhesive Waterproof Attractive colour/ appearance Resistant to changes in temperature	For smoothening the walls For beatifying the house Prevent corrosion of metallic surfaces especially windows, doors, iron sheets
11. Water	Universal solvent	For mixing concrete For dissolving paint For moisturing concrete during setting For washing building tools

Plastic (dump ~~tank~~)

ASSESSMENT GRID

Output	Basis of evaluation	Relevancy	Accuracy	Coherence	Excellence
	Suitable building materials for a permanent house	(6-Above) building materials	(6-Above) building materials, each property corresponds correctly to the use.	(6-Above) building materials, each property corresponds correctly to the use.	
		(3-5) building materials	(3-5) points correctly stated building materials, each property corresponds correctly to the use.	(3-5) building materials, each property corresponds correctly to the use.	
		(0-2) building materials	(0-2) building materials, each property corresponds correctly to the use.	(0-2 building materials, each property corresponds correctly to the use.	
	Total=10	**/3**	**/3**	**/3**	**/1**

2. Lillian was passing near a mango tree on her way home from school when she saw a ripe mango. She picked some stones and threw them at the mango, unfortunately the stone hit the swum of bees and suddenly she was attacked by bees that stung her severely. She sustained a lot of pain and swellings around her body. As a chemistry student explain the causes of the pains and the swellings and suggest ways of reducing the pain and the swellings.

Causes of pain of bee stings

1. Bee stings release methanoic/formic acid into the skin, which cause intense pain and irritation. To relieve the pain and irritation alkaline substances are applied to neutralize the methanoic acid injected into the skin.
2. The swelling is due to allergic reaction occurring when the immune system is over-sensitized/ elicited to the bee venom and produces antibodies to it. The histamine and other substances are released into the blood stream causing blood vessels to dilate and tissues to swell.

The following can be done to reverse the effects of the bees stings;

1. Fresh onion has compounds that can breakdown the proteins in the bee venom
2. Apply ice cube on the sting site to reduce pain and swelling, after washing the site properly to remove any remaining bee venom
3. Apply essential oils like lavender oil, rosemary oil, tea tree oil that contains anti-septics, anti-bacteria, anti-fungal properties that relieve the pain or the swelling
4. Apply aloe vera extract, that contains anti-inflammatory and anti-bacterial properties to reduce swelling and prevent further infection
5. Apply honey that contain anti-inflammatory compounds that reduce swelling. Honey also contains anti-bacteria agents that prevent infection and speeds up healing
6. Apply baking soda powder that is alkaline to neutralize the acidic bee sting, hence relieving the pain
7. Apply toothpaste, that is alkaline unto the site of the sting to neutralize the acidic bee sting, hence relieving the pain
8. Apply crushed potato leaves or banana peeling extract, that contain alkaline substances/agents that can neutralize the acidic bee venom, hence relieving pain
9. In case of severe allergic reactions due to bee stings refer the causality to the nearby hospital for further assistance

ASSESSMENT GRID

Output	Basis of evaluation	Relevancy	Accuracy	Coherence	Excellence
	Causes and Ways of reducing the pain and the	(8-11) points	(8-11) points correctly stated	(8-11) points logically arranged	Student relates the suggestions to the

	swellings	(5-7) points	(5-7) points correctly stated	(5-7) points logically arranged	neutralization reaction
		(0-4) points	(0-4) points correctly stated	(0-4) points logically arranged	
	Total=10	**/3**	**/3**	**/3**	**/1**

3. Your chemistry teacher has provided your class with turnings or powders of the following elements Magnesium, Copper and Iron. Write an investigation using a scientific method that you can carryout to place the elements in order of reactivity.

Aim: To arrange the given elements in order of their reactivity.

Hypothesis: The more reactive the metal, the more vigorous the reaction will be.

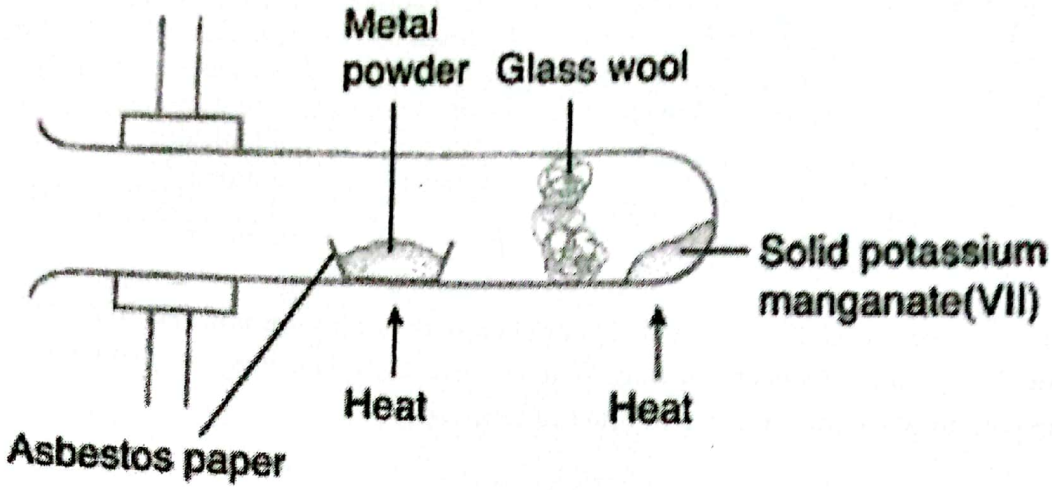
Materials: Powdered Magnesium, Iron filings, Copper turnings and Potassium manganate (VII) crystals

Apparatus: Boiling tubes, Glass wool, Spatula, Retort stand with clamp, Bunsen burner,

Procedure-1

1. One spatula of Potassium manganate (VII) crystals is placed in the boiling tube, and then some glass wool is placed in the boiling tube so as to separate the potassium manganate (VII) from the hot metal.
2. One spatula of the powdered magnesium is placed on a piece of asbestos paper, which is then placed in the boiling tube.
3. The boiling tube is then clamped in a horizontal position as shown below.

Set up



4. The magnesium powder is then heated first to glow red-hot before heating the potassium manganate crystals strongly.
5. The intensity of the reaction that took place is observed and noted.
6. The color of the product immediately after the reaction after it has cooled is also noted.
7. The experiment is then repeated with other metals

Table of results

Metal	Observation(s)	Conclusion
Magnesium	Burns very rapidly in oxygen giving off bright light. White powder when hot and remains white even when cold.	Magnesium is a very reactive metal. Magnesium oxide is formed.
Iron	Iron burns fairly rapidly with a very bright glow. The product is reddish brown when hot and even on cooling.	Iron is a reactive metal although not as reactive as zinc. Iron(III) oxide is the product.
Copper	Glows a little and very slowly. The product is black, whether hot or cold.	Copper is a less reactive metal. The product is copper(II) oxide

Conclusion

Additional information:

Potassium manganate (VII) functions as a source of oxygen when it decomposes on heating.

The metals used are powdered to speed up the rate of reaction.

Different metals react with a different degree of intensity with oxygen; the more reactive the metal, the more vigorous it reacts with oxygen hence the brighter the flame/glow.

The metals can then be arranged in order of decreasing reactivity as;

Magnesium → iron → copper

OR

Aim: To arrange the given elements in order of their reactivity.

Hypothesis: The more reactive the metal, the more vigorous the reaction will be.

Materials: Powdered Magnesium, Iron filings, Copper turnings, Magnesium oxide, Iron (III) oxide, Copper (II) oxide

Apparatus: Boiling tubes/ crucible, Spatula, Tripod stand and wire mesh, Bunsen burner,

Procedure

1. Transfer one spatula endful of Magnesium powder in a crucible
2. Add one spatula endful of Iron (III) oxide to the same crucible
3. Mix the two powders together using a spatula
4. Heat the mixture strongly and note your observation.
5. Repeat procedures (1-4) using a mixture of Iron fillings and Magnesium oxide
6. Identify from your observations which of the two elements is more reactive than the other.
7. Repeat procedures (1-6) using the following pairs of materials

(i) Magnesium powder and copper (II) oxide, then copper and Magnesium oxide

(ii) Iron fillings and copper (II) oxide, then copper powder and iron (II) oxide

Set up

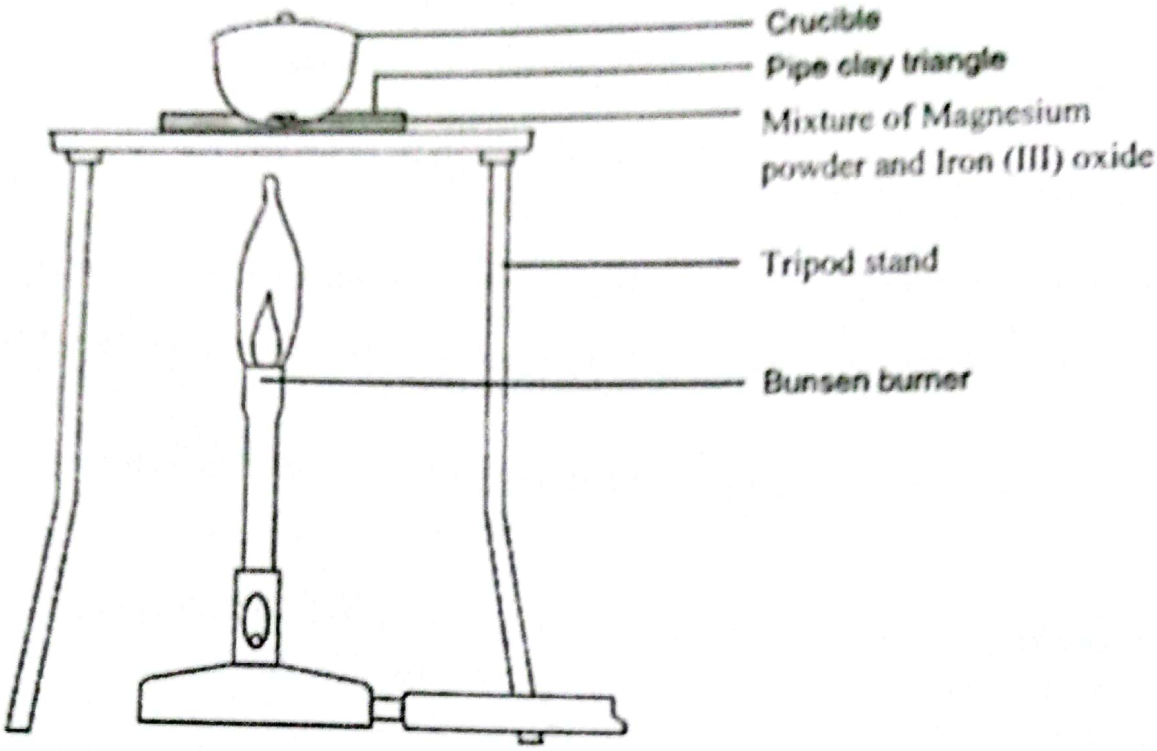


Table of Results

PAIR	OBSERVATION	CONCLUSION
Magnesium powder and Iron (III) oxide	Mixture glows red hot, forming white ash	Magnesium is more reactive than Iron
Magnesium oxide and Iron	No observable change	Iron is less reactive than Magnesium
Magnesium powder and Copper (II) oxide	Mixture glows red hot, the black powder turned to white ash, and a brown solid	Magnesium is more reactive than Copper
Copper and Magnesium oxide	No observable change	Copper is less reactive than Magnesium
Iron and Copper (II) oxide	Mixture glows red hot, the black powder turned to brown	Iron is more reactive than copper
Iron (III) oxide and Copper	No observable change	Copper is less reactive than Iron

Conclusion

The metals used are powdered to speed up the rate of reaction.

The most reactive metal displaces the less reactive metal from its metal oxide. The reaction is so vigorous when the most reactive metal is displacing a less reactive metal from its oxide, that is

far lower than it in the reactivity series. The less reactive metal can not displace the more reactive metal from its oxide, hence no reaction takes place.

The metals can then be arranged in order of decreasing reactivity as;

Magnesium → iron → copper

OR

Aim: To arrange the given elements in order of their reactivity.

Hypothesis: The more reactive the metal, the more vigorous the reaction will be.

Materials: Magnesium turnings/ribbon, Iron filings, Copper turnings, and dilute hydrochloric acid/ dilute sulphuric acid, water

Apparatus: Round bottomed flask, Thistle funnel, Delivery tubes, Retort stand with clamp, Gas jar, Water trough, Bunsen burner,

Procedure

1. Put Magnesium ribbon in a round bottomed flask
2. Add dilute hydrochloric acid into the flask using a thistle funnel
3. Observe what takes place in the round bottomed flask and the rate at which the gas jar is being filled with hydrogen.
4. Repeat the procedure 1-3, using Iron and Copper
5. Record your observations in the table below

Set up

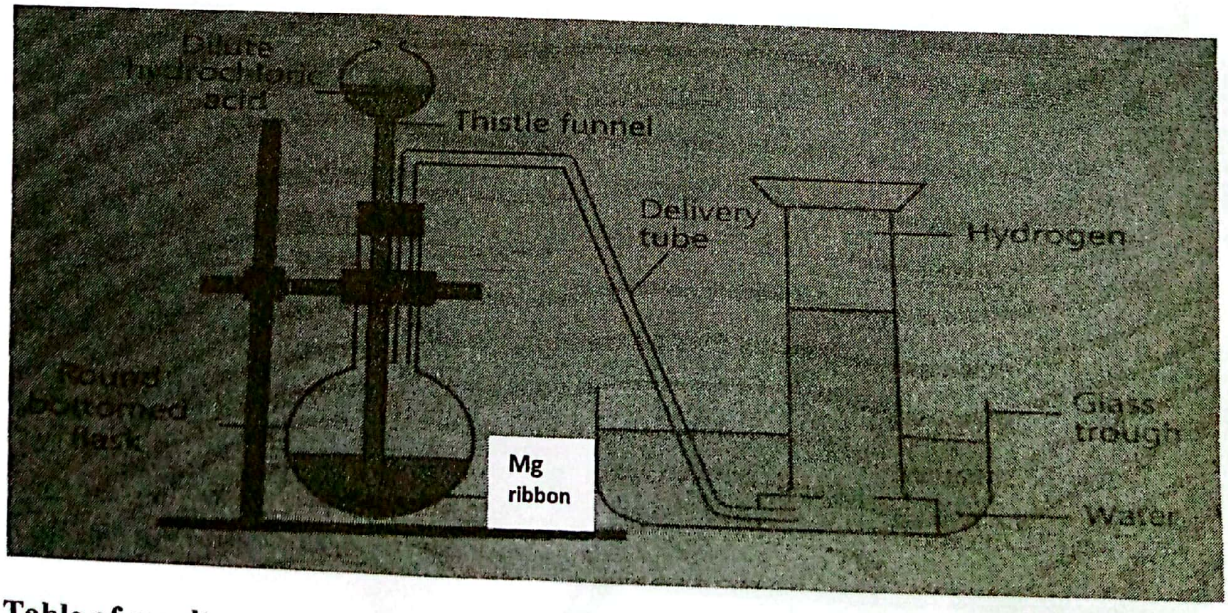


Table of results

Metal	Observation	Conclusion
Magnesium	The grey solid reacted vigorously forming a colourless solution	Magnesium is a very reactive metal
Iron	The grey solid reacted moderately forming a pale green solution	Iron is relatively reactive metal
Copper	No observable change	Copper is a less reactive metal

Conclusion

Different metals react with a different degree of intensity with dilute hydrochloric acid or dilute sulphuric acid; the more reactive the metal, the more vigorous it reacts with the acid

The metals can then be arranged in order of decreasing reactivity as;

Magnesium → iron → copper

OR

Aim: To arrange the given elements in order of their reactivity.

Hypothesis: The more reactive the metal, the more vigorous the reaction will be.

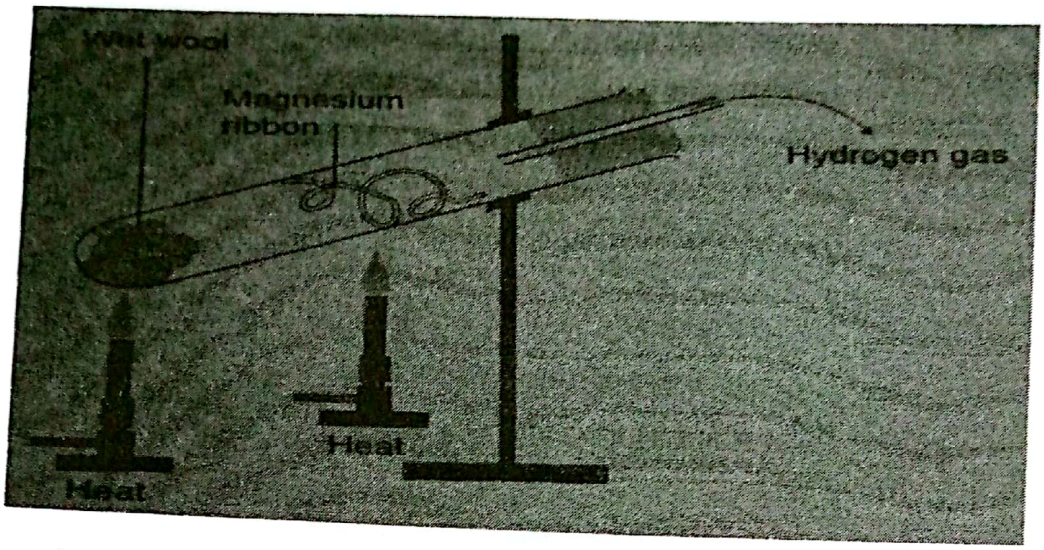
Materials: Magnesium ribbon, Iron plate, Copper foil, sand paper

Apparatus: Boiling tubes, Wet glass wool, Spatula, Retort stand with clamp, Bunsen burner, Cork with a glass tube

Procedure

1. Soak glass wool in water and insert it at the bottom of the boiling tube
2. Clean a piece of magnesium ribbon using a sand paper
3. Insert it in the middle of the boiling tube
4. Stopper the boiling tube with a cork containing glass tubing
5. Clamp the boiling tube as shown below

Set up



6. Heat the magnesium ribbon strongly and then heat the wet glass wool gently
7. Estimate the time for the mixture to glow red hot and carefully record your observations
8. Repeat the procedures 1-7, using Iron and Copper in place of Magnesium

Table of results

Metal	Observation	Conclusion
Magnesium	The grey solid reacts vigorously with steam, forming white ash	Magnesium is a very reactive metal
Iron	The grey solid reacts moderately with steam, forming a black solid	Iron is a relatively reactive metal
Copper	No observable change	Copper is a less reactive metal

Conclusion

Some metals react with a different degree of intensity with steam; the more reactive the metal, the more vigorous it reacts with steam.

The metals can then be arranged in order of decreasing reactivity as;

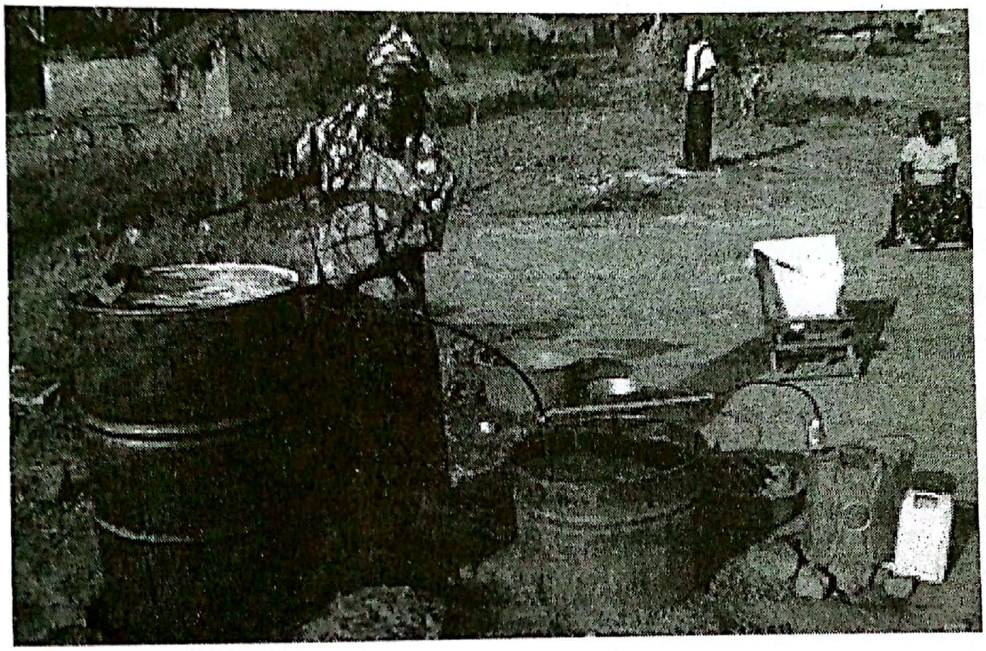
Magnesium → iron → copper

ASSESSMENT GRID

Output	Basis of evaluation	Relevancy	Accuracy	Coherence	Excellence
	Scientific investigation on reactivity	(9-13) steps	(9-13) steps correctly stated	(9-13) steps logically arranged	Student supports the reactions with
		(5-8) steps	(5-8) steps	(5-8) steps logically	

	series of metals	(0-4) steps	correctly stated (0-4) steps correctly stated	arranged (0-4) steps logically arranged	correct equations
	Total=10	/3	/3	/3	/1

4. A farmer in Kamwenge village has a large piece of land on which he planted bananas and millet for commercial purpose. He realized that a lot of bananas were ripening at the same time and therefore rotted before sell, which has led to a lot of losses. Please advise the farmer on how he can utilize the ripe bananas and the millet to produce a useful product. Indicate the positive and negative effects of the product.



Expected Response

1. The product that can be produced from ripe bananas and millet is ethanol

Local method of preparing ethanol

2. Ripe bananas are peeled, put in a container and squeezed well using spear grass to extract most of the juice.
3. Clean cotton cloth is used to filter out a clear juice
4. Flour of the germinated millet seeds is added to the filtrate
5. When bubbles begin forming, the mixture is stirred at regular intervals until no more bubbles are formed.
6. The millet flour added contains two enzymes, that is maltase which catalyses the hydrolysis of maltose into glucose.

$$\text{Maltose} + \text{Water} \xrightarrow{\text{Maltase}} \text{Glucose}$$

7. Another enzyme, zymase, which catalyses hydrolysis and fermentation of glucose to ethanol and carbon dioxide.

$$\text{Glucose} \xrightarrow{\text{Zymase}} \text{Ethanol} + \text{Carbon dioxide}$$

8. The resulting solution contains about 11% ethanol. To obtain a high percentage of ethanol, it is redistilled, where ethanol is collected as a distillate.
9. Cooling or condensation of ethanol vapour is effected using plenty of cold water.

Positive effects of ethanol

- ✓ Manufacture of perfumes
- ✓ Used in thermometers as a thermometric liquid
- ✓ Solvent while preparing lab reagents like phenolphthalein
- ✓ Anti-septic/ Disinfectant when cleaning wounds
- ✓ Used as a fuel when burnt
- ✓ Used to prepare hard drinks like beers or wines
- ✓ Used as a preservative
- ✓ Food processing
- ✓ Medicinal uses

Negative effects of ethanol

- ✓ Accelerated poverty
- ✓ Insanity
- ✓ Sexual immorality
- ✓ Family violence and break ups
- ✓ Road accidents
- ✓ Increased school dropouts
- ✓ Blindness
- ✓ Death

ASSESSMENT GRID

Output	Basis of evaluation	Relevancy	Accuracy	Coherence	Excellence
	Local method of producing ethanol	(11-Above) points, including 3 positive effects and 3 negative effects	(11-Above) points, including 3 positive effects and 3 negative effects correctly stated	(11-Above) points, including 3 positive effects and 3 negative effects logically arranged	
		(6-10) points, including 2 positive effects	(6-10) points, including 2 positive effects	(6-10) points, including 2 positive effects and 2	

		and 2 negative effects	and 2 negative effects correctly stated	negative effects logically arranged	
		(0-5) points, including 1 positive effects and 1 negative effects	(0-5) points, including 1 positive effects and 1 negative effects correctly stated	(0-5) points, including 1 positive effects and 1 negative effects logically arranged	
	Total=10	**/3**	**/3**	**/3**	**/1**