**Candidate's Name: .....**

**Signature: …….....**

| Random No. | | | | | | Personal No. | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

**(*Do not write your School/ Centre Name or Number anywhere on this Booklet.*)**

**500/2**
**GENERAL SCIENCE**
**Paper 2**
**2024**
1½ hours

**UGANDA NATIONAL EXAMINATIONS BOARD**

**Uganda Certificate of Education**

GENERAL SCIENCE

**Paper 2**
Chemistry

1 hour 30 minutes

**INSTRUCTIONS TO CANDIDATES:**

*This paper consists of* **two** *sections*; **A** *and* **B**. *It has* **four** *examination items*.

*Section* **A** *has* **two** *compulsory items. Answers to these items are to be written in the spaces provided.*

*Section* **B** *has* **two** *items. Answer* **one** *item from this section. Answers to these items* **must** *be written in the answer booklets provided*.

*Any additional item answered will not be scored.*

*Answer* **three** *items in all.*



 **Turn Over**

## SECTION A

*Answer* **all** *items from this section.*

**Item 1.**

A girl was sent to a nearby shop to buy salt. It accidentally poured and got mixed with sand. She collected it and took it to her mother. Her mother simply poured water into the contents sieved off the sand using a piece of cloth. She kept the filtrate for future use.

**Task:**

As a general science chemistry student;

(a) Explain to the girl how it was possible for the mother to obtain pure salt.

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(b) Show the difference between the salt from the shop and the salt the girl took to her mother.

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(c) Give the importance of the filtrate at home.

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**Item 2.**

One morning the children found a panga left in the garden covered with a reddish-brown coat. The children asked their father to explain to them what had happened to the panga.

**Task:**
As a general science chemistry learner, write a message the father can deliver to the children. In your message include;

(a) how the brown coat occurred.

(b) how the brown coat affects the panga.

(c) How to avoid the brown coat in other similar tools.

## SECTION B

*Answer* **one** *item from this section.*

**Item 3.**

The government of Uganda is planning to set up another copper production plant in Kilembe – Kasese District. The science club members in your school would like to know how the process of production will be carried out, its environmental impact and uses of copper.

**Task:**

As a general science chemistry student write a presentation you will deliver to the science club members.

**Item 4**

An investor wants to setup a factory to produce iron from its natural source in Muko- Kabale District. However, the community around would like to know how the industrial process is done, its environmental impact and the uses of iron.

**Task:**

As a general science chemistry learner, write a presentation you will deliver to the community.





**END**

**500/2**
**GENERAL**
**SCIENCE**
**Paper 2**
**2024**

**UGANDA NATIONAL EXAMINATIONS BOARD**

**Uganda Certificate of Education**

GENERAL SCIENCE

**Paper 2**
Chemistry

***New Lower Secondary Curriculum***

# *SCORING GUIDE*

# 545/1 - CHEMISTRY DRAFT GUIDE / BASIS

## Item 1

<table>
<tr><th>S/N</th><th>Basis of Assessment</th><th>Assessment Criteria</th><th>Scoring</th></tr>
<tr><td></td><td>category of substance with reason and example</td><td>Sand and (common) salt together formed a mixture since the two are only physically combined or not chemically combined or not chemically combined. The mixture can be separated by filtration since sand is insoluble in water and salt is soluble in water. Other substances which can form a mixture separated by filtration are sand and sugar.<br><br>The salt from the shop is a compound and the one she took to her mother is a mixture.</td><td>03</td></tr>
<tr><td></td><td>Properties of substances</td><td>Salt from the shop differ from that she took to her mother in the following ways:
<table>
<tr><td>Salt from shop</td><td>Salt she took to her mother</td></tr>
<tr><td>Cannot be separated by physical means</td><td>Can be separated by physical means</td></tr>
<tr><td>Has properties quite different from those of the elements in it</td><td>Has properties which is the average of the substances in it e.g. colour, taste.</td></tr>
<tr><td>Has a fixed composition is formed with energy change</td><td>Has variable composition is formed with no energy change</td></tr>
<tr><td>Has a chemical formula</td><td>Has no chemical formula</td></tr>
</table></td><td>03</td></tr>
<tr><td></td><td>Use of substance application of process</td><td>The filtrate (salt solution) is used for treating sore throat/canker sores/runny nose.</td><td>01</td></tr>
</table>

## Item 2

| S/N | Basis of Assessment | Assessment Criteria | Scoring |
|---|---|---|---|
| A | **CATEGORY / TYPE** | The panga is made of iron metal that is why on exposure to moisture and oxygen in the atmosphere it rusts. The brown coat on the panga is rust chemically known as hydrated iron(III) oxide.<br>$4Fe_{(s)}+3O_{2(g)}+2H_2O_{(l)} \longrightarrow 2Fe_2O_3{*}H_2O$<br>Iron+ water + oxygen $\longrightarrow$ hydrated iron(III)oxide. | 02 |
| **B.** | **FUNCTIONS OF PRODUCTS. (How It Works)** | The iron metal in the panga rusts ,blunt and appear dull.<br>The iron metal changes into a compound which is weaker and dull. The process occurs as shown in the equation below.<br>Iron + oxygen + water $\longrightarrow$ iron rust<br>$4Fe_{(s)}+3O_{2(g)}+2H_2O_{(l)} \longrightarrow 2Fe_2O_3{*}H_2O$<br>The rust is soft and easily falls off<br>The rusting of tools of iron can be prevented by<br>-oiling or greasing the tool<br>-painting or use of tar on the tool<br>-Using stainless steel tools. | 03 |

**Item 3:**

| S/N | Basis of Assessment | Assessment Criteria | Scoring |
|---|---|---|---|
| **A.** | **A. RAW MATERIAL** | Copper pyrites | 02 |
| | **B. PROCESSOF PRODUCTION** | The one obtained from the mines is crushed to form powder; the one is then concentrated by froth flotation to remove the Earthy materials. The concentrated one is then roasted in limited air to form copper(1) sulphide, copper(1)oxide and iron (II) oxide and sulphur dioxide.<br>Silicon dioxide is then added to the heated mixture to remove iron (II) oxide inform of<br>Iron (II) silicate (slag)<br>The slag is run off.<br>The Copper (1) sulphide is roasted in Air to form copper(1) Oxide and Sulphur dioxide , the copper(1) sulphide reacts with copper(1) oxide to form copper in impure form (blister copper).<br>The impure copper is purified by electrolysis, the impure copper is made the Anode and copper (II) sulphate solution is the electrolyte white a sheet of pure copper metal is the cathode.<br>During electrolysis, the impure copper dissolves forming copper(II) ions which deposited as pure copper at the cathode.<br>The production process occurs in flotation tank Blast furnace and electrolytic cell.<br>The copper obtained is ductile, malleable, therefore its melted and shaped into electrical cables for electricity transmission. | 03 |
| | **Side effects and mitigation** | $SO_2$ is a by-product in the production process, of copper, which when allowed in atmosphere causes acid rains which destroys buildings erodes rocks , and spoils plants .<br>Also acid rains lower the PH of water in water bodies like lakes and rivers which affects aquatic life. | 03 |

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| | | Sulphurdioxide also affects the respiratory organs of humans and other animals.<br><br>**Mitigation/Control/Prevention**.<br><br>Regular monitoring of the vessels and machines during the copper production process to minimize SO2 escape into the atmosphere.<br><br>Conversion of $SO_2$ into Sulphuric acid that can be used for other various purposes like in car accumulators.<br><br>Water and soil pollution<br><br>Extraction of copper also yields other heavy metals like silver, cobalt , zinc which get into water bodies for domestic and animal use and cause cancer leading to loss of life.<br><br>**Mitigation**<br><br>The wastes from the mines should be treated to remove heavy metals to avoid their exposure to humans and animals to avoid heavy metal poisons/cancers.<br><br>**Land degradation**<br><br>Improper disposal of effluent and other wastes, leads into loss of soil fertility .This consequently causes poverty and famine.<br><br>**Mitigation**<br><br>There is need for proper treatment and recycling of industrial waste before discharge into environment to prevent water and soil pollution. | |
| | **Social benefits** | Employment opportunity, the impact is improved income and better lively hood.<br><br>Production of fertilizers and other products like sulphuric acid which reduces their costs in the community . the fertilizer improves soil productivity and acid is used in car batteries.<br><br>Increased tax base and foreign exchange in the community. | 03 |

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| | **Uses of the product** | Copper is used to make:<br>Electricity cables because it's a good conductor of electricity<br>Coils and money because it's malleable.<br>Ornamental materials like wedding rings because luster is good .Alloys like Bronze. | 02 |

**Item 4**

| S/N | Basis of Assessment | Assessment Criteria | Scoring |
|---|---|---|---|
| **A.** | **RAW MATERIAL** | Haematite (iron ore ) | 02 |
| **B.** | **PROCESS OF PRODUCTION.** | Reaction vessel is Blast furnace.<br>Iron is extracted from iron ore in a large container called a blast furnace.<br>The ore haematite coke limestone and hot air are fed into the blast furnace.<br>Coke burns in oxygen to form.<br>Carbon dioxide which is reduced by carbon to carbon monoxide .<br>carbon + oxygen ⟶ Carbon dioxide<br>Carbon dioxide + carbon ⟶ carbon monoxide.<br>Carbon monoxide reduces iron one to form iron because carbons is more reactive than iron ash shown below:<br>iron (III) oxide + carbon monoxide<br>⟶ iron + carbon dioxide.<br>Process of purification:<br>Calcium carbonate in lime stone decomposes under high temperature to form calcium oxide and carbon dioxide | 03 |

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|---|---|---|---|
| | | Calcium carbonate ⟶ calcium oxide +carbon dioxide<br><br>Calcium oxide then reacts with impurities of silicon(iv) oxide (sand) and aluminium oxide in the iron ore ( haematite) to produce molten slag which is calcium silicate or calcium aluminate.<br><br>Calcium oxide + silica ⟶ calcium silicate<br><br>Calcium oxide + aluminium oxide ⟶ calcium aluminate<br><br>The less dense slag floats on top of the iron and flows out of the furnace.<br><br>The iron obtained from the furnace is called pig-iron and cast iron. | |
| C | **SIDE EFFECTS OF THE PROCESS OF PRODUCTION AND MITIGATION** | The extraction process and production of iron bars produces air pollutants from diesel, petrol in generators.<br><br>Carbon dioxide produced accumulates in the atmosphere forming a layer that traps excess heat from the sun causing global warming<br><br>Mitigation<br><br>First growing trees must be planted to absorb carbon dioxide.<br><br>Carbon monoxide from the furnaces is poisons. Carbon from the furnace can be burnt as fire but it must not be released into the air unless converted to biologically harmless converted to biologically harmless carbon monoxide.<br><br>Communities around the extraction site suffer from noise, air and land or water pollution<br><br>**Mitigation**<br><br>Recycle of the metal and other products may be considered. | 03 |

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| D | **SOCIAL BENEFITS/USES OF PRODUCT** | Employment opportunities to the people in the community.<br>The iron bars produced can be used for construction.<br>Source of revenue and taxes which help the government to pay civil servants, building hospitals and schools and improve livelihood and health standards.<br>Pure iron can be used to:<br>make iron sheets for roofing;<br>make doors and windows strong;<br>make alloys like steel with better properties of strength and durability;<br>making ornaments and Jewellery;<br>making new-craft parts;<br>making auto mobile parts like pistons and plugs etc. | 03 |