

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

S/N	Basis of Assessment	Assessment Criteria	Scoring										
	category of substance with reason and example	<p>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.</p> <p>The salt from the shop is a compound and the one she took to her mother is a mixture.</p>	03										
	Properties of substances	<p>Salt from the shop differ from that she took to her mother in the following ways:</p> <table border="1" data-bbox="635 1070 1241 1729"> <tbody> <tr> <td data-bbox="635 1070 938 1169">Salt from shop</td> <td data-bbox="938 1070 1241 1169">Salt she took to her mother</td> </tr> <tr> <td data-bbox="635 1169 938 1267">Cannot be separated by physical means</td> <td data-bbox="938 1169 1241 1267">Can be separated by physical means</td> </tr> <tr> <td data-bbox="635 1267 938 1456">Has properties quite different from those of the elements in it</td> <td data-bbox="938 1267 1241 1456">Has properties which is the average of the substances in it e.g. colour, taste.</td> </tr> <tr> <td data-bbox="635 1456 938 1644">Has a fixed composition is formed with energy change</td> <td data-bbox="938 1456 1241 1644">Has variable composition is formed with no energy change</td> </tr> <tr> <td data-bbox="635 1644 938 1729">Has a chemical formula</td> <td data-bbox="938 1644 1241 1729">Has no chemical formula</td> </tr> </tbody> </table>	Salt from shop	Salt she took to her mother	Cannot be separated by physical means	Can be separated by physical means	Has properties quite different from those of the elements in it	Has properties which is the average of the substances in it e.g. colour, taste.	Has a fixed composition is formed with energy change	Has variable composition is formed with no energy change	Has a chemical formula	Has no chemical formula	03
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	Use of substance application of process	The filtrate (salt solution) is used for treating sore throat/canker sores/runny nose.	01										

Item 2

S/N	Basis of Assessment	Assessment Criteria	Scoring
A	CATEGORY / TYPE	<p>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.</p> $4\text{Fe}_{(s)} + 3\text{O}_{2(g)} + 2\text{H}_2\text{O}_{(l)} \longrightarrow 2\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$ <p>Iron + water + oxygen \longrightarrow hydrated iron(III)oxide.</p>	02
B.	FUNCTIONS OF PRODUCTS. (How It Works)	<p>The iron metal in the panga rusts ,blunt and appear dull.</p> <p>The iron metal changes into a compound which is weaker and dull. The process occurs as shown in the equation below.</p> $\text{Iron} + \text{oxygen} + \text{water} \longrightarrow \text{iron rust}$ $4\text{Fe}_{(s)} + 3\text{O}_{2(g)} + 2\text{H}_2\text{O}_{(l)} \longrightarrow 2\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$ <p>The rust is soft and easily falls off</p> <p>The rusting of tools of iron can be prevented by</p> <ul style="list-style-type: none"> -oiling or greasing the tool -painting or use of tar on the tool -Using stainless steel tools. 	03

Item 3:

S/N	Basis of Assessment	Assessment Criteria	Scoring
A.	A. RAW MATERIAL	Copper pyrites	02
	B. PROCESS OF PRODUCTION	<p>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(I) sulphide, copper(I) oxide and iron (II) oxide and sulphur dioxide.</p> <p>Silicon dioxide is then added to the heated mixture to remove iron (II) oxide in form of Iron (II) silicate (slag)</p> <p>The slag is run off.</p> <p>The Copper (I) sulphide is roasted in Air to form copper(I) Oxide and Sulphur dioxide , the copper(I) sulphide reacts with copper(I) oxide to form copper in impure form (blister copper).</p> <p>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.</p> <p>During electrolysis, the impure copper dissolves forming copper(II) ions which deposited as pure copper at the cathode.</p> <p>The production process occurs in flotation tank Blast furnace and electrolytic cell.</p> <p>The copper obtained is ductile, malleable, therefore its melted and shaped into electrical cables for electricity transmission.</p>	03
	Side effects and mitigation	<p>SO₂ 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 .</p> <p>Also acid rains lower the PH of water in water bodies like lakes and rivers which affects aquatic life.</p>	03

		<p>Sulphurdioxide also affects the respiratory organs of humans and other animals.</p> <p>Mitigation/Control/Prevention.</p> <p>Regular monitoring of the vessels and machines during the copper production process to minimize SO₂ escape into the atmosphere.</p> <p>Conversion of SO₂ into Sulphuric acid that can be used for other various purposes like in car accumulators.</p> <p>Water and soil pollution</p> <p>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.</p> <p>Mitigation</p> <p>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.</p> <p>Land degradation</p> <p>Improper disposal of effluent and other wastes, leads into loss of soil fertility. This consequently causes poverty and famine.</p> <p>Mitigation</p> <p>There is need for proper treatment and recycling of industrial waste before discharge into environment to prevent water and soil pollution.</p>	
	<p>Social benefits</p>	<p>Employment opportunity, the impact is improved income and better lively hood.</p> <p>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.</p> <p>Increased tax base and foreign exchange in the community.</p>	<p>03</p>

	Uses of the product	<p>Copper is used to make:</p> <p>Electricity cables because it's a good conductor of electricity</p> <p>Coils and money because it's malleable.</p> <p>Ornamental materials like wedding rings because luster is good .Alloys like Bronze.</p>	02
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Item 4

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

		<p>Calcium carbonate \longrightarrow calcium oxide + carbon dioxide</p> <p>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.</p> <p>Calcium oxide + silica \longrightarrow calcium silicate</p> <p>Calcium oxide + aluminium oxide \longrightarrow calcium aluminate</p> <p>The less dense slag floats on top of the iron and flows out of the furnace.</p> <p>The iron obtained from the furnace is called pig-iron and cast iron.</p>	
C	<p>SIDE EFFECTS OF THE PROCESS OF PRODUCTION AND MITIGATION</p>	<p>The extraction process and production of iron bars produces air pollutants from diesel, petrol in generators.</p> <p>Carbon dioxide produced accumulates in the atmosphere forming a layer that traps excess heat from the sun causing global warming</p> <p>Mitigation</p> <p>First growing trees must be planted to absorb carbon dioxide.</p> <p>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.</p> <p>Communities around the extraction site suffer from noise, air and land or water pollution</p> <p>Mitigation</p> <p>Recycle of the metal and other products may be considered.</p>	03

D	SOCIAL BENEFITS/USES OF PRODUCT	<p>Employment opportunities to the people in the community.</p> <p>The iron bars produced can be used for construction.</p> <p>Source of revenue and taxes which help the government to pay civil servants, building hospitals and schools and improve livelihood and health standards.</p> <p>Pure iron can be used to:</p> <ul style="list-style-type: none"> make iron sheets for roofing; make doors and windows strong; make alloys like steel with better properties of strength and durability; making ornaments and Jewellery; making new-craft parts; making auto mobile parts like pistons and plugs etc. 	03
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