Candidate's Name: .....

Signature: …….....

Random No.						Personal No.		

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

500/1
GENERAL SCIENCE
Paper 1
2024
1 ½ hours

UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Certificate of Education

GENERAL SCIENCE

Paper 1
Physics

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.*

SECTION A

Answer **all** *the items in this section.*

Item 1.

The local council chairperson discovered that his car engine could not start yet he had a party to attend later in the day. After checking the car, the chairperson discovered that the battery was completely discharged. A neighbour with a car whose battery was fully charged found the chairperson stranded but could not let the chairperson borrow her car. The neighbour instead suggested that the chairperson uses the fully charged battery to charge the discharged battery. Unfortunately, both of them were ignorant about how it could be done.

Task

(a) As a student of general science, advise the chairperson on what to do to solve the problem.

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(b) Help the chairperson understand what should be done for a battery to retain its charge for a long time.

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Item 2.

A carpentry workshop in an area uses heavy machinery that produces loud noise when working. This noise pollution has become an inconvenience to the neighbours. The sound from the workshop is of wavelength 0.4 m and neighbours are worried that it could be harmful to their ears. The workshop was constructed with holes in the side walls. The manager wondered how the sound produced in the workshop reaches and inconveniences the people in their neighbourhood. He has no money to install modern sound proof machines but he can manage to use locally produced materials that can minimize sound exiting the workshop. [Use *Speed of sound in air* = 330 ms^{-1}]

Task

As a student of general science physics;

(a) Explain to the workshop manager ;

(i) how sound from the workshop reaches people in the neighbourhood.

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(ii) how to reduce the amount of sound reaching the neighbours.

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(b) Help the neighbour to determine if the sound from the workshop has an effect on their hearing ability.

Hint: speed of sound in air = 330 ms^{-1} . Sound waves of frequency 20Hz - 20kHz are not harmful to human ears.

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SECTION B

Answer only **one** *item in this section.*

Item 3.

The headteacher of a certain school intends to construct an underground water tank of dimensions 2 m by 4 m by 6 m to store water for use during the dry season. He has been advised to put into consideration the design of the tank that will contain 45000 litres of water and how the water from the tank will be supplied to the entire school community.

Task:

(a) Propose ways in which the;

(i) design of the tank can be made in order to withstand the weight of the water.

(ii) water from the tank will be supplied to the school community.

(b) Help the headteacher determine if the proposed tank design will be enough to contain 45000 litres of water.

Item 4.

A worker in a certain mechanical workshop was assigned to make two gears for a simple machine by the supervisor. One of the gears labelled **X** was made to have 28 teeth. When gear **Y** was made, the effort of 5 N was applied to lift the load of 16 N through a distance of 8 m. This led to an increase in the temperature of the machine which reduced its output and lowered its efficiency to 80%. The supervisor was puzzled and demanded to know why the temperature of the machine increased, output reduced and the number of teeth on gear **Y**.

Task:

As a student of general science physics;

(a) Help the supervisor to determine the number of teeth gear **Y** had.

(b) Explain to the supervisor why there is a reduction in output and an increase in temperature.

END

500/1
GENERAL
SCIENCE
Paper 1
2024

UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Certificate of Education

GENERAL SCIENCE

Paper 1
physics

SCORING GUIDE

GENERAL SCIENCE PHYSICS, 500/ 1

ITEM	EXPECTED RESPONSES/ ANSWERS
1	• Requirement, charging a battery: D.C source of greater emf than the battery to be charge • Positive supply is joined to the positive of the battery to be charged, and negative to negative • Engine of the battery to be charged is started while the connections are in place • When vehicle starts, its left on and connections removed • Chairpersons battery will be charged • Level of acid should be inspected and topped up • Acid never be added except in rare cases where spillage occurs. • Battery shld be charged regularly using recommended charging current • A battery should be charged once a month when not in use.
2(a)(i)	• Sound waves require a material medium for propagation, from one place to another. So air offers that medium. • Air particles that receive sound energy from the source transfer this energy to the sound energy from the source transfer this enegy to the neighbouring molecules • Process results into rarefactions and compressions as the source vibrates/ produces sound
(ii)	• Sound waves from machines through the holes need to be stopped to minimize the noise that goes to the neighbouhood. • Using locally produced materials like sponges, matresses, plywoods and other soft material are used to fix /cover hole and create soundproof on the walls inside.
(b)	• V = ʎf • 330 = 0.4 x f • F = 330/0.4 • F = 825 Hz • Since frequency of the sound waves from the work shop is in the range of harmless frequencies, the noise / sound they hear is not harmful to the ears
3(a)(i)	Design of the tank • Tank must be of thick walls at the base • Build the tank with materials that do not dissolve in water • Thick walls increase the area that supports the water and this reduces the pressure • Hence minimizing the effect of the weight of the water
(ii)	Supply of the water • A pump house to contain the pump at the underground tank should be put to pump water to the supply tank situated some level higher than all the buildings in the school. • Supply tank, supplies to other tanks situated in different locations/points of interest • Outlets on tanks should be at the bottom so that water comes out with high pressure

(b)	Volume of the tank = length x width x height 2 x 4 x 6 = 48 m^3 48 x 1000 = 48000litres Capacity of the tank is 48000 litres . Since the school requires 45000 litres, then the tank will be able to keep the required amount.
4.(a)	$\frac{80}{100} = \frac{MA}{VR}$, M.A $= \frac{L}{E} = \frac{16}{5}$ 0.8 $= \frac{3.2}{VR}$, VR = 4 4 $= \frac{No\ of\ teeth\ on\ X}{No.of\ teeth\ on\ Y}$ Ny = 28/4 = 7 teeth Gear Y will have 7 teeth
(b)	Reduction in out: • Machine doing work on its own parts other than in the load, this reduces the output • Friction reduces efficiency Increase in temperature: • Temperature increase is due to friction on the moving parts of the machine

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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.*

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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.

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. $4Fe_{(s)}+3O_{2(g)}+2H_2O_{(l)} \longrightarrow 2Fe_2O_3{*}H_2O$ 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. The iron metal changes into a compound which is weaker and dull. The process occurs as shown in the equation below. Iron + oxygen + water $\longrightarrow$ iron rust $4Fe_{(s)}+3O_{2(g)}+2H_2O_{(l)} \longrightarrow 2Fe_2O_3{*}H_2O$ The rust is soft and easily falls off The rusting of tools of iron can be prevented by -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. 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. Silicon dioxide is then added to the heated mixture to remove iron (II) oxide inform of Iron (II) silicate (slag) The slag is run off. 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). 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. During electrolysis, the impure copper dissolves forming copper(II) ions which deposited as pure copper at the cathode. The production process occurs in flotation tank Blast furnace and electrolytic cell. 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 . Also acid rains lower the PH of water in water bodies like lakes and rivers which affects aquatic life.	03

		Sulphurdioxide also affects the respiratory organs of humans and other animals. **Mitigation/Control/Prevention**. Regular monitoring of the vessels and machines during the copper production process to minimize SO2 escape into the atmosphere. Conversion of SO_2 into Sulphuric acid that can be used for other various purposes like in car accumulators. Water and soil pollution 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. **Mitigation** 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. **Land degradation** Improper disposal of effluent and other wastes, leads into loss of soil fertility .This consequently causes poverty and famine. **Mitigation** 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. 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. Increased tax base and foreign exchange in the community.	03

	Uses of the product	Copper is used to make: Electricity cables because it's a good conductor of electricity Coils and money because it's malleable. 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. Iron is extracted from iron ore in a large container called a blast furnace. The ore haematite coke limestone and hot air are fed into the blast furnace. Coke burns in oxygen to form. Carbon dioxide which is reduced by carbon to carbon monoxide . carbon + oxygen ⟶ Carbon dioxide Carbon dioxide + carbon ⟶ carbon monoxide. Carbon monoxide reduces iron one to form iron because carbons is more reactive than iron ash shown below: iron (III) oxide + carbon monoxide ⟶ iron + carbon dioxide. Process of purification: Calcium carbonate in lime stone decomposes under high temperature to form calcium oxide and carbon dioxide	03

		Calcium carbonate ⟶ calcium oxide +carbon dioxide 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. Calcium oxide + silica ⟶ calcium silicate Calcium oxide + aluminium oxide ⟶ calcium aluminate The less dense slag floats on top of the iron and flows out of the furnace. 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. Carbon dioxide produced accumulates in the atmosphere forming a layer that traps excess heat from the sun causing global warming Mitigation First growing trees must be planted to absorb carbon dioxide. 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. Communities around the extraction site suffer from noise, air and land or water pollution **Mitigation** Recycle of the metal and other products may be considered.	03

D	**SOCIAL BENEFITS/USES OF PRODUCT**	Employment opportunities to the people in the community. The iron bars produced can be used for construction. Source of revenue and taxes which help the government to pay civil servants, building hospitals and schools and improve livelihood and health standards. Pure iron can be used to: 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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500/3
GENERAL SCIENCE
Paper 3
2024
1½ hours

UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Certificate of Education

GENERAL SCIENCE

Paper 3
Biology

1 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

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

SECTION A

Answer **all** *the items in this section.*

Item 1.

Mr. Bagonza, whose farm is located on a hilly area grows crops and is worried after a heavy rain washed away part of the soil in his garden with some crops down into the river. Other plants were left with their roots exposed. Mr. Bagonza largely depends on farming and a natural environment for energy sources like firewood, burning charcoal for home use and sale. The District Environment officer said that Mr. Bagonza is responsible for the problems he is facing. Mr. Bagonza wishes to understand how he is responsible for the problems so as to solve the problem without moving away from his land.

Task

(a) Help Mr. Bagonza understand the problems caused by his activities and the natural resources affected.

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(b) What advice can you give to Mr. Bagonza on how to live in the same place without causing much harm to the environment.

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(c) Why is it important for Mr. Bagonza to conserve his environment?

Item 2.

Mr. Ali planted beans in his garden having mature sugarcanes. Just before the beans could flower, a heavy hailstorm hit the garden and all his crops were destroyed. After a month, Ali was surprised to see that there were new young sugarcanes growing but no new beans were growing.

Task

(a) Identify the plant structures affected by the hailstorm.

(b) Explain how the hailstorm affected the normal functioning of the crops

(c) Explain why Ali did not have to worry about his sugarcanes, but instead get worried about beans.

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SECTION B

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

Item 3

Three brothers, John, Khalid and Peter live together in a single room that is poorly ventilated. Peter smokes every day in the room in presence of his brothers. Peter later developed health complications including heavy coughing and chest pain. Four months later, John and Khalid also began coughing heavily, and they accused Peter of being responsible for their condition, a claim Peter denied.

Task

Explain to Peter the process by which his behaviour affected his brothers and possible health challenges faced, advise them on how to live a healthy lifestyle.

Item 4

Kirabo, a mother of four boys is currently pregnant expecting her fifth baby however her husband threatened to beat her if she produces a baby boy again since he wants to have a girl in his family. Due to the pressure and stress from her husband, Kirabo has resorted to heavy drinking of alcohol and missing antenatal visits.

Task

Help Kirabo's husband understand why the sex of the baby is not the choice of his wife but biologically determined. Explain the effects of Kirabo's behaviour on her body and the unborn baby and advise the family on how to overcome the challenges they are facing.

END

500/3
GENERAL
SCIENCE
Paper 3
2024

UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Certificate of Education

GENERAL SCIENCE

Paper 3
Biology

SCORING GUIDE

SECTION A

1. a) Farming on a hilly area increased chances of soil erosion, which swept away soil into the river. This exposed the plant roots, and led to the destruction of soil living organisms, loss of soil, vegetation and other organisms.

Charcoal burning led to destruction / loss of vegetation cover inform of trees. This exposed the soil to agents of erosion like running water. It also increased chances of global warming. This activity affected natural resources like wild animals by destroying their habitats and vegetation itself.

Air pollution as a result of charcoal burning can lead to respiratory diseases which can affect humans and other animals as natural resources.

The silting of swamps and rivers as a result of soil deposition can lead to flooding. This affects / blocks aquatic habitats and can lead to death of water living organisms.

b) *Advice to Mr. Bagonza*

- Practice better farming methods such as terracing, contour ploughing on the hills to reduce chances of soil erosion.
- Plant trees on the hill to hold the soil particles together so as to avoid soil erosion.
- Should also adopt better / alternative sources of fuel other than using charcoal.
- Should plant more cover crops in the swamp to overcome silting, and ensure firm holding of soils in the swamp.
- Desilting the rivers / swamps.

c)

- The vegetation when conserved can facilitate the process of rain formation, curb global warming and act as habitats for wild life.
- Desilting of rivers restores the aquatic ecosystem which provides better habitats for aquatic life forms like fish, frogs etc.
- Preserving soil maintains its good properties for production of food for human consumption.

2 a) *plant structures affected*

- Leaves
- Stems
- Roots

b) *the* hailstorms broke off and destroyed the leaves for both sugarcanes and beans. This affected the sites for photosynthesis. Therefore, the plants could not manufacture food to support life processes.

Stems were destroyed; which are useful in transporting raw materials and products of photosynthesis. This affected the normal plant functioning.

The roots of beans were also affected and these could not absorb water required for the survival of the plants.

c) Sugarcane stems have buds, which grow new shoots and these emerge as new sugarcane plants.

The sugarcane as well have stored food in the stems inform of sugars, which are used to support the process of growth of new structures like the shoots and buds.

Through the process of photosynthesis, the sugarcanes manufacture and store food inform of sugars in the stems which are used to support the process of regeneration / regrowth.

SECTION B

3. Peter's brothers breathed in inhaled the smoke from peter's smoking of cigarette.

During breathing in, the external intercostal muscles contract, while the internal intercostal muscles relax. The diaphragm muscles also contract, hence the diaphragm flattens. This increases the volume of the thoracic cavity and the lungs, while the pressure decreases below the atmospheric pressure.

Air including smoke from peter rushes into the lungs through the trachea. This smoke proceeds to the alveoli, where it is exchanged and causes the side effects like coughing after blocking the air passages.

Possible health challenges faced by the brothers

- Suffocation due to poor ventilation.
- Irritations / itching in the trachea due to smoke.
- Chest pain as a result of over coughing.
- Over coughing due to blocked air passages / air sacs.
- Lung cancer in the long run.
- Bronchitis.

Advice on *how* to live a healthy lifestyle

- Improve on the ventilation of the room.
- Brothers should go for treatment for cough and chest pain.

- They should go for cancer screening / testing.
- Improve on diet to contain especially fruits.
- Peter should go for medical counselling.
- Replace smoking with a more healthy lifestyle habit.

4. *Sex determination*

Sex is determined by two chromosomes X and Y. the mother has only X while the father has both X and Y. During fertilization, the male sperm / gamete containing either X of Y fuse with the female gamete / egg / ovum with X chromosome.

If the X sperm fuses with the egg, a baby girl is formed. If the Y sperm fuses with the egg, a boy is formed. Therefore, the baby's sex is determined by the chance of a given type of sperm cell fertilising the egg.

Effects of Kirabo's behaviour

- Increased risk of miscarriage.
- Increased risk of premature birth and still birth.
- Babies born with low birth weights.
- Risk of developing pregnancy complications when she misses antenatal visits.
- Liver and digestive diseases/ complications as a result of alcohol consumption.

Advice to overcome the challenges

- Should stop drinking alcohol.
- Should go for regular antenatal visits.
- Seek marital counselling to discuss about her challenges.
- Practice good nutrition and diet.