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.*

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.

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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 $2 \times 4 \times 6 = 48 \text{ m}^3$ $48 \times 1000 = 48000$ litres 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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