535/1
PHYSICS
Paper 1
2024
$2\frac{1}{2}$ hours

DIOCESE OF KIGEZI

CHURCH OF UGANDA

Uganda Certificate of Education

PHYSICS

Paper 1

Theory

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES.

*This paper consists of two Sections A and B. It has **seven** examinations items*

Section A has three compulsory items

*Section B has two parts: I and II. Answer **one** item from each part.*

*Answer **five** items in all*

All responses must be written in the booklets provided

SECTION A

*Answer **all** the items from this section*

Item 1

While in the dinning hall watching an International T.V during lunch time, learners watched heavy rains with fog and floods being experienced in a certain outside country on live broadcast. To worsen matters the floods were happening at night and this risked many people as many of them were ambushed while asleep. Learners wondered how it would be night and seriously raining in a particular area yet it was day and the Sun was highly shinning at that time in their school. The learners also wondered how the T.V station managed to cast pictures from that far.

As a physics learner, help the learners clear their queries about

a) Occurrence of those different seasons at same time.

b) How the night in that outside country y was day in their area at that same time.

c) how T.V signals broadcast from where the floods were happening reached them.

d) where the Sun always got energy to so much shine and hit the Earth.

Item 2

There has been a continuous complain of eye problems in your community and members of the community have associated these eye problems to witchcraft as some see far clearly and other see nearer clearly. The L.C.I chairman announced across the community using a mobile speaker that the eye care organisation was to visit the community for eye defect tests and give free spectacles but the residents were against the move since they think the problem can not be addressed medically. While communicating, the LCI reached Infront of a big church whose priest thinks it may be demolished by UNRA for being in road reserve, the words mentioned were heard by the LC.I repeated at an interval of $\mathbf{1.1}s$.The L.C.1 wondered and said the speaker had got a problem as it wasn't doing that before.

Support material:

- The speed of sound in air is $320ms^{-1}$

- The total distance from church building to road including road reserve should not be less than $180m$

As a learner of physics:

(a) Write a message to the community that the above defects do are health disorders and can be solved medically.

(b) Help explain to the LCI the fate of the speaker.

(c) Advise the priest whether the church will be demolished.

Item 3

Smoke detectors contain a certain a mount of radioactive element. When the authority realised it stopped the factory from making them, this so much angered the traders that were dealing in these smoke detectors. The factory however appealed to the authority claiming the period of 60 years performance given to the detectors before expiry is safe detector radiating element is expected to be dangerous after the 60 years.

A scientist was contacted to investigate the presence of radioactive material in the smoke detectors. The scientist found out that the detectors were indeed radioactive as shown in Table I below:

Time (years)	0	22	42	62	82	102	122	142	162
Count rate (year−1)	106	83	66	56	47	36	31	26	15

As a learner of physics:

(a) Advise the authority with evidence, whether the smoke detectors should be used.

(b) Sensitise the traders to appreciate the decision of the authority to stop the making of the smoke detectors.

SECTION B

PART I

Answer **one** *item from this part*

Item 4

On a construction site a builder uses an electric lifter to transfer the motor from the ground to a height of **17.0m** on the building. When power went off and work has to continue, the builders get a rope, a pail of negligible mass

with a handle that lift a maximum of **20kg** of motor. They hope to design a simple machine with a help of a grooved rim which can enable them resume work. Given that the motor is at a temperature of **25°C** and the rope has a maximum thermal strength of **98kJ**.

Support materials

The heat capacity of the rope is **1500** JK^{-1}

Task.

(a) Help the builders to design the machine and guide the on how it works.

(b) Advise whether the rope will withstand the heat or it will break.

(c) suggest other properties the rope should possess to successfully execute the work.

Item 5

A compound worker in a certain uses an electric motor to draw water from a deep hole of depth. One early morning of a very cold day, the motor breaks down and splashes water all over to the worker and wondered why the drawn water was slightly warm with a temperature of 28^0C.

The worker needs to boil **10***l* of water for tea of the students using an electric heat

source drawing electricity from an electricity metre left with a total energy of 3300KJ and is disturbed as to whether the electricity will be sufficient to boil water.

You are provided with a jerrycan, a rope and a wheel and enough pieces of wood.

Specific heat capacity of water is $4200JKg^{-1}K^{-1}$

Task

As a student of physics:

(a) Help the worker draw water for cooking before the motor is repaired.

(b) Explain to the worker why the water was warm.

(c) Advise the worker whether the electricity will be sufficient to boil the water.

PART II

Answer **one** *item from this part*

Item 6

In a certain place, A house was connected to a **240V** mains voltage supply and the owner wished to connect a TV set rated **120V**, **75W**, a flat iron rated **120V**, **600W**, an electric bell of resistance **5** ohms that would instantly produce sound to alert the house owner about the visitors at the gate when a switch was pressed, and **4** bulbs rated **120V**, **60W** either in series or parallel connection for lighting purposes. The house owner also bought a Power King extension with a fuse rated **5A**, where he plugged in his TV set and Flat iron.

Task:

(a) Comment on the effectiveness of the fuse in the extension if it would support the above electrical appliances when plugged in the extension altogether.

(b) Assist the house owner to know in which way to connect his bulbs in the house and explain why?

(c) Explain how sound was produced when a switch was pressed.

Item 7

A refugee in a camp in Northern Uganda receives a package from UN which includes a rechargeable radio from USA with its input labelled $120V, 2A$. The radio is used successfully and produced very good sound which excited the refugee and wondered how the small radio produced such loud high music. The refugee is however challenged on how to charge the radio as the mains Socket is labelled $240V, 1.33A$ for **12** ***hours*** a day for **30** ***days*** but does not know how much cost is required to pay for electricity.

- You are provided with a soft iron core which can hold a coil of maximum 100 turns on each side and insulated copper wires.

- **One (1)** unit of electricity costs $Ugx.1,000$

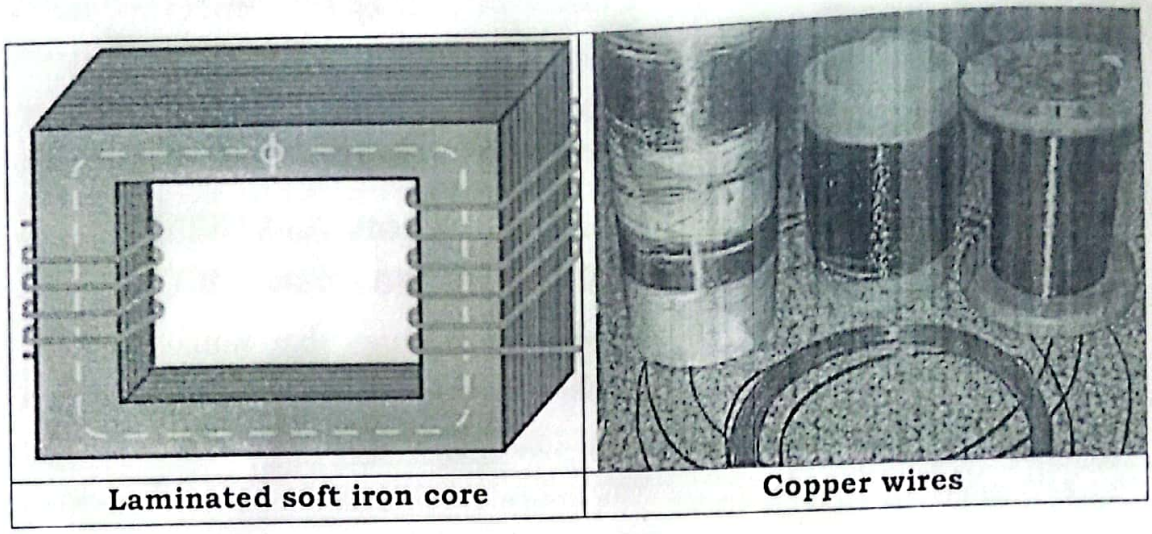

Fig 1 shows some support material

Task

(a) Help explain to the refugee the operation of the device that produced sound.

(b) Design a device that will that can help a refugee connect the radio.

(c) Help inform the refugee on the amount that will be used to buy electricity to run the radio.

END