Students Name: .....

School Name..... Index Number .....

535/1

PHYSICS

Paper 1

2025

$2\frac{1}{2}$ hours

HES MOCK EXAMINATIONS 2025

UGANDA CERTIFICATE OF EDUCATION

PHYSICS

PAPER 1

THEORY

$2\frac{1}{2}$ hours

INSTRUCTIONS

- 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.
- Any additional item(s) answered will not be scored.
- All answers **must** be written in the booklets provided.

SECTION A

Answer **all** the items from this section

ITEM 1

At Kira college school, a huge event auditorium was under construction by a group of engineers that was going to serve multi-functions including hosting cultural shows, debates, and drama. During planning, the chairperson Board of governors raised various concerns about the confusing sounds, light diffusion, community disturbance during night-time events and suitable mirror installation. One of the engineers tried to explain to him about some incidences as he also tried to advise him on certain matters but he was not convinced.

As a senior four scholar doing physics,

TASK

Help the chairperson Board of governors to

a) Know the cause of the confusing sounds mostly in huge halls and how they can be minimized?

b) Choose a suitable wall paint Color to enhance interior lighting.

c) Understand how noise from the hall may disturb the neighboring homes and how to reduce it.

d) Identify suitable mirrors for ;

(i) Restroom walls

(ii) Security checks under vehicles and let him know why you recommend such types of mirrors?

ITEM 2

At Rwampara General Hospital, Nurse Kyomuhendo is responsible for preparing patients for diagnostic imaging examination. Recently a patient has been scheduled for imaging procedure. Mr. Kakuru, who suffered a sports injury and requires an examination to confirm a suspected bone fracture, the imaging unit utilizes a specific type of electromagnetic radiation to produce high quality diagnostic images. The radiologist Dr. Tumusime, operates the equipment to accommodate the examination and Nurse Kyomuhendo keeps on wondering about how As certain thing are possible.

TASK

As a physics learner the nurse,

a) To know the type of radiation used in the hospital's imaging unit as well its position on the electromagnetic spectrum.

b) How the radiation is used to trace the suspected fracture?

c) Know the safety protocols that Dr. Tumusiime and Mr. Kakuru should obey while using the hospital imaging unit.

ITEM 3

A group of students in Soroti gathered around a Computer screen to watch a live Video transmission from their peers in Chile. The Video showed a group of students standing outside on a clear evening, looking up at the sky.

As the students in soroti watched, they noticed that the sky behind their chilean friends seemed to be filled with tiny, flickering points of light that appeared to be twinkling or changing brightness. They also observed that these points of light that appeared to vary in color, with some appearing blue, others red and other white. Additionally, the points of light seemed to differ in size, with some appearing larger and brighter than others which made the students wonder.

TASK

As a physicist, help the students to;

a) Know how possible it is for them to watch a live video transmission from Chile.

b) Appreciate nature by explaining to them what could be causing the tiny points of light visible in the sky behind their friends to twinkle, appear in different colors and vary in size?

SECTION B

PART 1

Answer **one** item from this part

ITEM 4

You're on a camping trip in the mountains with your friends and decide to cook a hearty meal, but you notice that its taking a long time for the food to be ready. One of your friends suggests using a pressure cooker to speed up the process.

As you're waiting for the meal to cook, you take a break and sit by the nearby lake. You notice that the surface of the lake seems cooler than the surrounding air , even though it's a sunny day which made your other friends wonder and call this a ghost. As you observe the lake, Alex collects 3 liters of water at a temperature of 15 C from the lake and heats it to 80 C for a warm shower. To do this, he uses an electrical heater rated at 2000 W.

HINT

- Specific heat capacity of water, $4200 JKg^{-1}K^{-1}$
- Density of water, $1000 Kgm^{-3}$

TASK

Help your friends know;

a) Why you spent a lot of time cooking the food?

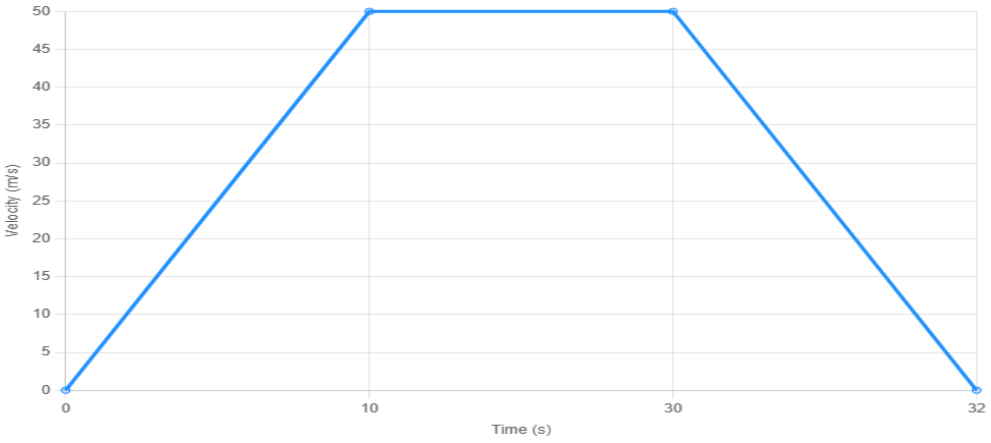
b) How the cooker will help to speed up the cooking pressure?

c) Why the lake remained cooler even on a sunny day?

d) The time it took Alex to heat the water?

ITEM 5

Mr. John, a UK resident visiting Uganda, drives from his hotel to a nearby town. His car's motion is described by the velocity-time graph below. Before starting, John fills his car with petrol worth USD 2. The car consumes 1 liter of petrol per kilometer traveled. The route has speed cameras enforcing a speed limit of 60 km/h. During the drive, John sprays a strong perfume in the front seat, unaware that his friend in the back seat is allergic to it. As John drives, he suddenly encounters a fallen boda boda (motorcycle) and stops abruptly. His friend remarks, "You're lucky you wore your seatbelt!" After checking on the rider, they notice the car's tyres are hot.



TASK

a) Address John whether the fuel he had bought was enough for to and from journey if he was to follow the fall the same route on his way back
b) Explain why the friend emphasized that John was lucky by having the belt on.
c) If the friend was wondering about how the perfume molecules moved from the front side to the back seat causing discomfort to John's allergic friend in the back and how this could have been reduced.

PART II

Answer **one** item from this part

ITEM 6

A landlord owns a property with 6 renting rooms**.** The household uses the following appliances:

Appliance	Power Rating	Time of Use
4 bulbs	20W each	16 hours every day
Cooker	2500W	50 minutes every day
Flat iron	1500W	55 minutes every day
Electric fence (low-resistance wire)	2200W	47 hours every week

TASKS

a) The landlord is preparing the July budget and has **sh. 800,000** for the electricity bill; however he is unsure whether it's enough for the whole July electricity consumption for the 6 rooms. Address him about his uncertainties.

b) Tenants complain that when one appliance malfunctions, other devices in the house also stop working. The landlord realizes this is due to poor electrical wiring. **Explain the best way to connect appliances so that one failure doesn't affect others.**

c) A technician suggests replacing the electric fence's **low-resistance wire** with **high-resistance wire** to cut costs. The landlord is skeptical but lacks technical knowledge about it**. Explain to the land lord whether the change was necessary.**

d) The electricity bill has spiked by **30%** over the past 3 months, straining the landlord's finances. Tenants are also unhappy with rising costs and have started to leave his rooms one at time. Address the landlord how he can maintain his tenants but still cater for the costs of electricity.

ITEM 7

Kibuku Steel & Iron Ltd. has been struggling to keep production running, and as the newly hired plant engineer, you've been called in to investigate three critical issues:
The factory's main hydraulic press—a massive machine that shapes molten steel into sheets—has been malfunctioning. Workers report that it operates sluggishly during peak hours, often stalling completely unless they reduce the load. When it does run, the copper wiring feeding it grows dangerously hot, sometimes even melting the insulation. The plant receives electricity at 240V, but the press seems to "drag" the entire system down, causing lights to flicker and other machines to slow. The foreman insists that the machine needs *stronger* electricity. Last month, during a heavy storm, a brilliant flash of light struck the storage yard. The explosion destroyed the main power distribution panel, leaving the factory without electricity for days. Since then, workers have grown fearful of storms, with some even refusing to work when rain clouds gather. An older technician, Mzee Waiswa, claims the strike was no accident he believes a rival factory used "lightning magic" to sabotage them. The plant manager scoffs at this but admits they have no way to prevent another strike.
The factory grounds are overrun with tall grass and thick shrubs, making it difficult for workers to move materials safely. The landscaping crew, led by foreman Kato, has been pushing for a mechanical solution. "**If we had**

a machine that could spin sharp blades fast enough," he argues, "we could clear this in hours instead of days!" But the plant's electrician warns that adding more equipment might overload the already-strained power system.

TASK

Write a detailed report explaining:

- Why the hydraulic press struggles to function and how to modify the electrical supply to fix it (include calculations).
- The real cause of the lightning strike and how to protect the factory from future strikes, addressing Mzee Waiswa's superstitions with scientific reasoning.
- Whether Kato's spinning blade proposal is feasible and how it could me made possible.

END