

535/1  
PHYSICS  
Paper 1  
July /August, 2025  
2 ½ hours



**GLORISO EXAMINATIONS BOARD (GEB) - KAMPALA**  
**SECONDARY SCHOOLS JOINT MOCK ASSESSMENTS, 2025**

*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** examination items.*
- ✓ *Section **A** has **three** compulsory items.*
- ✓ *Section **B** has to 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 answer booklet (s) provided.*

**SECTION A**

Answer **all** items from this section

**Item 1.**

Your school is organizing to have an annual music, dance and drama event and expects to accommodate a large number of spectators. The organizing committee of the event has been tasked to build a large stage in the school compound. The stage is positioned adjacent to the main hall to minimize interference due to echoes. To ensure optimal stage location, the committee is advised to use a parabolic mirror to focus a laser beam of light from the proposed stage position to the main hall wall to check for echoes. Additionally, they need to decorate the stage with unique sources of light. However, the committee members are not familiar with some of these tasks and seek your assistance.

**Hint:**

- Speed of sound in air  $330\text{ms}^{-1}$
- During the testing, sound from the laser source took **0.16s** to make one roundtrip.
- Stage has been decorated with a source of red light.

**Task:** As a physics student, help the committee to;

- understand how echoes are formed and explain why it's important to avoid them during such performances.
- know whether the selected position is a perfect spot for the stage in order to avoid interference of echoes.
- understand why a laser beam should be preferred to the ordinary light in determining distance for the most appropriate echo free stage position.
- describe the setup of the parabolic mirror and how it is used to focus a laser beam.
- understand how a yellow dress with blue spots will appear while on stage when the red light is shone on it.

**Item 2.**

Recently a nuclear power plant in a small town experienced a critical accident, leading to the release of radiation into the surrounding environment. The incident caused widespread concern, and emergency response teams were immediately deployed to evacuate residents and contain the situation. Among those affected were several workers who had been exposed to radiation during the accident. To assess the extent of internal injuries and damage caused by the by the radiation exposure, the workers were rushed to a nearby hospital for X-ray photography to determine the presence of internal bleeding, fractures and other injuries that might not be visible by naked eyes. As the workers undergo the process, the hospital worker mentioned that the X-rays are needed for detailed imaging of the human body and assured the patients about their awareness of the potential risks associated with both nuclear exposure and the use of X-rays and that they take stringent precautions to ensure the safety of both patients and staff though they did not tell them details and patients were worried and couldn't understand the message.

**Task:** As a learner of physics, help the patients to understand;

- how X-rays are applied to medical photography.
  - How X-rays are produced.
- the type of reactions that occur during a nuclear accident and explain the potential consequences of such reactions.
- what precautions should be taken to minimize these risks for both patients and medical personnel?
- analyze the environmental implications of a nuclear accident.

**Item 3.**

Recently your friend enrolled in an Astrophysics course in Japan under MasterCard Foundation scholarship. After a few days of settling in, she texted her parents via WhatsApp in Uganda at **8pm** local time in that

country, however in Uganda, it was **2pm**. Her parents had just received the news that the crescent moon had been sighted using the satellite communication indicating the start of fasting of the holly month. During the chat she mentioned that her first lecture was about the lifecycle of a star.

This interested her parents who wondered how a star could have a life cycle and were curious about the two countries. The parents seek your explanation about these events.

**Task:** As a student of physics, help the parents to understand;

- what causes the difference in time such that in the country of study is 8pm (**night time**) and in Uganda is 2pm (**day time**)?
- The crescent moon is believed to have two phases, explain the phases regarding the new moon to full moon.
- briefly describe the life cycle of a star.
- during the satellite communication, a combination of logic gates is used to encode and decode messages. An **OR gate** is used which combines two signals **A** and **B**, if the output is **TRUE**, the satellite transmits the signal back to earth otherwise it does not. Basing on the condition, explain whether the satellite will transmit a signal back to earth if **A** is **false** (logic 0) and **B** is **true** (logic 1).

## SECTION B PART I

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

### Item 4.

An investor seeking to establish a ceramics company requires guidance on using a hydraulic press to manufacture concrete pavers, blocks and bricks. The supplier when contacted, provided a manual booklet with a sketch drawing to help investor understand the technical aspects of the equipment. The manual includes instructions for operating the hydraulic press efficiently. One of the key instructions given states that the temperature of the hydraulic fluid should not rise beyond **20°C**. This is crucial to ensure the hydraulic press maintains an efficiency of **80%**, enabling it to produce an output work of **2000J**. During operation, if **340,000J** of heat is generated in the hydraulic fluid and the investor who is not a physicist is seeking guidance on how to manage, your role is to assist.

**Hint:** Specific heat capacity of the of the hydraulic fluid is **1750Jkg<sup>-1</sup>K<sup>-1</sup>**      1litre = **0.001m<sup>3</sup>**  
The minimum energy input for the press to start working is **1600J**  
Density of hydraulic fluid liquid is **800kgm<sup>-3</sup>**

**Task:** As a physics student help the investor to understand;

- the working principle of the hydraulic press
- why oil is used instead of air in the hydraulic press.
- whether it will remain effective if the entire system contains 10 litres of the fluid.
- advise whether it will be in position to start operating.
- the main components of concrete and why it is preferred as an effective construction material.

### Item 5.

A person hosted five visitors at his home who are to stay for a night. He has started the process of preparing warm water for bathing. He has an electric kettle of capacity 5 litres. He switches on the electrical heater plugged in the kettle at its bottom and waits until water boils at **100°C** then heater switches off automatically. He now mixes this hot water with 20 litres of cold water initially at **10°C**.

**Hint:** Density of water = **1000kgm<sup>-3</sup>**      Specific heat capacity of water = **4200Jkg<sup>-1</sup>k<sup>-1</sup>**

**Task:** As a physics learner;

- advise the host if the temperature of the mixed water is not too high for water to burn the visitors given that the best bathing water should not be beyond  $30^{\circ}\text{C}$ .
- suggest the number of litres to be used by each visitor if all of them are to use the same quantity of mixed water.
- advise the person on how to keep this mixed warm water for a long time since all visitors are to use the same bathroom one at a time. Explain your answer.

## PART II

Answer only **one** item from this part

### Item 6.

A certain household has a set of appliances as listed in the table below.

Appliance	Power rating	Time of use
4 bulbs	20W each	13 hours every day
Cooker	2500W	4 hours every day
Flat iron	1500W	5 hours every week
Electric fence of low resistance wire	2200W	10 hours every day

The owner of the household plans to make a budget to determine how much money would be required every week to cater for the electricity bill. He also wondered how the sockets for those appliances should be connected to ensure high current flows and why low resistance instead of high resistance wire is used. The owner only intends to spend **sh. 50,000** on electricity every week.

**Task:** As a student of Physics, help the household owner to;

- determine if **sh. 50000** would be enough to cater for the electricity bill for a week given that 1 unit of electricity costs **sh.750**.
- explain how the sockets of the appliances should be connected to ensure maximum current flows
- explain why low-resistance wires are used for the electric fence.
- suggest measures on how to reduce the electricity bill.

### Item 7.

A building was recently struck by lightning causing severe damage to its electrical system. The damage included a blown fuse, melted copper earthing wire and a malfunctioning transformer that was being used as a voltage regulator. The original transformer which had a power output of 80W failed to perform adequately. As a result, the building' owner decided to replace only the transformer and plans to resume operations. However, the owner has refused to install the lightning conductor or to re-establish proper earthing connections.

**Hint:** • The new transformer is designed to work on 240V, 60W a.c supply.

- Primary coil has **300 turns** and secondary coil has **200 turns** and its efficiency is **80%**.

**Task:** As a student of physics, explain to the building owner;

- (i) how installing a lightning conductor will protect the building.  
(ii) why proper earthing connection is essential for safety and system performance.
- Determine whether the newly acquired transformer is suitable for the building's voltage regulation needs. (support your answer with relevant calculations).
- Discuss the dangers associated with not replacing the fuse and failing to establish a proper earthing system in the building.

**\*\*THE END\*\***