CANDIDATE'S NAME:.....

SIGNATURE .....

Index number							

535 /1

PHYSICS

Paper 1

(THEORY)

2 $\frac{1}{2}$HOURS

Apex Examination Council

PRE- MOCK EXAMINATIONS 2025

Uganda Certificate of Education

PHYSICS

Paper 1

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.

Answers to all items **must** be written on the answer sheet(s) provided.

SECTION A

(Answer all items in this section)

Item 1:

Mr. Kato and Mr. Kamya were overseeing the construction of a 70m by 40m multipurpose hall at their school. This hall was designed to host various activities, including sports, performances, and meetings. However, as the planning progressed, several concerns arose regarding acoustics, lighting, noise disturbance, and the type of mirrors to be used.

The hall's acoustics were a concern due to echoes caused by the large, open space and hard surfaces. The lighting was another issue, as the wall colors would influence how much light was reflected inside. Additionally, noise from events could disturb the surrounding community, especially during night events. Finally, there was the issue of selecting appropriate mirrors for the bathrooms and for inspecting under cars, ensuring safety and functionality.

Task

a) Cause of sound distortion and how to reduce it?

b) Which paint color to improve lighting?

c) How sound reaches the community and how to reduce it?

d) Which mirrors should be used for bathrooms and checking under cars?

ITEM 2:

In a hospital setting, a patient has arrived with a suspected arm fracture, and another patient is scheduled for a dental examination. The X-ray machine in use produces electromagnetic waves with a frequency of . Your supervisor has tasked you with the following:

(i) Capture an X-ray image of the patient's arm to confirm the fracture diagnosis.

(ii) Capture a dental X-ray to check the alignment of the patient's teeth.

Hint:

The wavelength of the X-rays for detecting fractures is , providing high resolution.

The wavelength of X-rays for dental images is , offering lower resolution.

The resolution for detecting a fracture is high.

Task:

(a) Discuss the resolution of the images. How does this relate to detecting the fracture in the arm?

(b) Explain the connection between the wavelength of the X-rays and the choice of settings for both the arm X-ray and the dental examination. How does the wavelength affect the X-rays' penetrating power?

(c) Recommend safety precautions to follow when working with X-ray machines to ensure the safety of both patients and healthcare professionals.

Item 3

A group of people in Uganda was watching a live football match between England and France at 11:00 am. The match was interrupted to bring a live broadcast of an educational nighttime event in South Mexico. The broadcast showed children observing a clear, cloudless night sky. The dark sky had greyish areas with many bright, twinkling spots of varying brightness and colours. Some of the bright spots appeared to be moving. The TV presenter reported that, unlike at night, there was only one prominent bright object in the sky during the day, and that it is part of a constantly evolving universe. The group of people was unable to understand the broadcast and wanted a clearer explanation.

Task:

As a physics student, help the group to understand:

(a)

(i) What the observed grey areas that the children saw represent.

(ii) What the artificial bright spots represent.

(b) What the prominent bright object mentioned by the TV presenter is and its significance in the universe.

(c) Why there existed

Differences in colour for the bright spots.

SECTION B

PART I;(Answer one item from this part)

Item 4

During a family gathering, 3 liters of water at 22°C were served to two guests, Nalongo and Ssebunya. They complained that the water was too warm and were given 70 g of ice at -8°C. The ice was mixed with the water in a wooden container with negligible heat capacity. Surprisingly, the ice cubes disappeared completely after mixing.

Nalongo transferred her mixture into a plastic container (specific heat capacity 2900 $Jkg^{-1}K^{-1}$), while Ssebunya used a metallic container (specific heat capacity 900 $Jkg^{-1}K^{-1}$). After some time, they noticed that the temperatures of their water were different.

Task

Using your knowledge of Physics:

a) Determine whether the water cooled down after mixing with the ice.

b) Explain why the ice cubes disappeared when mixed with water.

c) Explain why there was a difference in temperatures between the water in the plastic and metallic containers.

Item 5

Nabirye, a restaurant owner, was driving to work early in the morning when her car suddenly developed a problem. A lot of steam started coming from the bonnet, and the engine shut down. She called a mechanic, who explained that the engine had overheated due to low water levels in the radiator. After refilling the radiator with water, the car resumed working.

When she finally reached her restaurant, she prepared 0.03 kg of ice cubes for customers who wanted to add them to their drinks. Later in the day, she steamed matooke for lunch and prepared 0.6 kg of hot tea, which she served in plastic cups.

Task & Answers:

What makes a car radiator efficient in cooling the engine?

A car radiator has thin metal fins to increase the surface area for heat loss and a coolant system that absorbs and releases heat.

Why did adding water to the radiator help restart the engine?

Water absorbs excess heat from the engine, preventing further overheating.

What states of water did Nabirye use throughout the day?

She used solid (ice cubes), liquid (water for cooking and drinking), and gas (steam from matooke and the radiator).

What process caused steam to come from the bonnet of her car?

The remaining water in the radiator boiled due to high engine temperature, producing steam.

PART II; (answer one item from this part)

Item 6

In a residential area, a house is connected to a 220V mains voltage supply. The homeowner, Mr. Samuel Nkurunziza, plans to connect the following electrical appliances:

A TV set rated 110V, consuming 80W of power

A flat iron rated 110V, consuming 500W of power

An electric bell with a resistance of 6 ohms, designed to instantly produce a sound when a switch is pressed, alerting the house owner about visitors at the gate

Four light bulbs rated 110V, consuming 55W each, which can be connected either in series or parallel for lighting purposes

Mr. Nkurunziza also purchased a Power King extension with a 6A fuse, where he plugs in both the TV set and flat iron. The TV is operated for 4 hours each day.

Tasks

(a): Comment on the effectiveness of the fuse in the extension when all the electrical appliances are plugged in together.

b): Advise Mr. Nkurunziza on how to connect the bulbs and explain why.

(c): Explain how sound is produced when the electric bell is pressed.

(d): Determine the cost of keeping the TV running for the whole day, if the electricity rate is ug shillings 860 per kv

Item 7

At a local school, a group of students visited a hydroelectric power plant and learned that electricity is generated in the form of alternating current (AC) at a 15kV voltage level but is transmitted at 500kV using aluminum transmission cables. However, in the physics laboratory, students can generate direct current (DC) using dilute sulfuric acid and two electrodes made of copper and zinc, connected to a filament. Over time, the brightness of the filament fades, leading to confusion among the students about how voltage is increased and how AC can be used to charge a mobile phone, considering that only DC is typically used for charging.

Task

a): Explain how voltage is changed from 15kV to 500kv

(b): Explain how AC from the power plant is used to charge a mobile phone.

(c): Determine the current in the transmission cables if 12% of the energy is lost during the voltage transformation, and if the current before the change is 18A. Additionally, explain why the brightness of the filament fades and how it can be restored.

End