535/1
PHYSICS
Paper 1
July/August 2024
2 1/2 hours

WAKISSHA JOINT MOCK EXAMINATIONS

Uganda Certificate of Education

PHYSICS

Paper 1

Theory

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

This paper has **two** *sections;* **A** *and* **B** *It has* ***seven*** *examination 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.*

Any additional item(s) answered will not be scored.

All answers **must** *be written in the answer booklets/sheets provided.*

SECTION A

Answer **all** *the items in this section.*

Item 1

The manager of a certain store is faced with several challenges as highlighted below.

- Drinks from the fridge keep getting stolen. Initially, he could see the fridge directly but it was covered by a shelf. The manager could not afford to install cameras because of their cost.
- The manager could see near objects clearly but whenever he looked at an object that was far, it was unclear.
- Music played from a nearby bar was very loud. The sound was more disturbing at night than during the day. The owners of the bar claimed that their speakers produced sound waves of wavelength 1 cm which they thought was not harmful to anyone's ears.

Hint: Speed of sound in air = 330 ms^{-1}

Use your knowledge of Physics to;

(a) Identify which measures the manager of the store could take to be able to view the fridge.

(b) Explain why the manager of the store could not see far objects clearly and what he could do to improve his vision.

(c) Determine if the sound from the bar was harmful to the ears of those in the store, and explain why the sound was louder at night than during the day.

Item 2

Students were told to research on the construction of a nuclear power plant to provide a cheaper source of electricity. They discovered that a radioactive element, Uranium was used and it reacted as shown below;

$$^{235}_{92}U + {}^{1}_{0}n \rightarrow {}^{139}_{56}Ba + {}^{95}_{b}Kr + 2{}^{1}_{0}n$$

The students however couldn't tell; if one of the products was an isotope of an element with an atomic number 36, which conditions are required for that reaction to successfully take place; other benefits of radioactivity, and how radioactive materials are handled.

Use your knowledge of Physics to;

(a) To determine if Krypton is an isotope of an element with an atomic number of 36.

(b) Identify which conditions are necessary for the reaction to take place successfully and precautions that should be taken when handling such materials.

(c) Identify other benefits of radioactive materials.

Item 3

A man who stays in an area with a view of the ocean requested his mother to pay him a visit to Canada. On her arrival at her son's home, it was noon, but her watch set to Ugandan time read 8:00 pm. On looking through the window, she also noticed very high waves in the ocean which was different from the photos that were always sent to her.

The mother called you to confirm if it was indeed night in Uganda while it was daytime in Canada.

Task

As a Physics student, explain to the mother;

(a) why it was night in Uganda and daytime in Canada?

(b) the cause of the high waves in the sea.

(c) how a person in Canada is able to make a phone call to Uganda.

SECTION B

PART I

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

Item 4

A man set off for a destination 250 km away from his home at 4:00 am to be at his workplace at 8:00 am. The speed limit on that road is 80 kmh^{-1}. He set off on the journey without fastening his seatbelt and drove at an average of 60 kmh^{-1} for the first 2 hours. He saw a truck that had fallen covering the whole road and stepped on his brakes which brought the car to a sudden stop. This made him jerk forward almost crushing into his windscreen.

The man stopped for 45 minutes and resumed his journey, reaching his workplace on time. He got out of his car and discovered it was very cold so he decided to wear a black sweater which was against the choice of his workmates who said he looked smart in his white shirt.

Use your knowledge of Physics to;

(a) Determine if the driver exceeded the recommended speed limit.

(b) Explain what made the man jerk forward.

(c) Explain to the man's workmates why he chose a black sweater.

Item 5

During a dry season, a school resorted to drawing water from an underground well 8 m deep. Originally, they did it manually by lifting a metallic bucket of mass 4 kg and volume 20 liters. The school workers however complained that the bucket was very cold in the morning, very hot in the afternoon when the sun was up. It was also very tiring to keep pulling up the bucket manually. They suggested a pulley system of 4 wheels and an efficiency of 80 % be used to help them work quicker. None of them could however tell how the pulley works and how much effort would be required to raise the bucket.

Hint; Acceleration due to gravity = 10 ms^{-2}

Use your knowledge of physics to;

(a) Explain what makes the bucket very cold in the morning and hot when the sun is up?

(b) Show what the pulley system suggested above looks like and how it works.

(c) Determine if a force of 5 N will be enough to give the pulley system an efficiency of 80 %.

(d) Suggest ways in which the efficiency of the pulley system above can be improved.

Turn Over

PART II

Answer **one** item from this part.

Item 6

A certain landlord recently finished constructing a block of 2 houses and consulted an electrician to connect the houses to the electricity grid. The electrician informed him that the voltage of the electricity needed to be stepped down from 13 kV to 240 V before connecting the houses. The landlord thought the electrician wanted to cheat him so he decided to hire another person who was not qualified to do the job since he was cheaper. The houses were connected in a way that a breakdown in one house could affect all the houses. The tenants complained that the current was so low and some of their appliances could not work. The tenants have threatened to vacate the houses if he doesn't work on the problem. Given that the appliances in the houses are connected such that the effective resistances in the houses are 10 Ω and 12 Ω.

Use your knowledge of Physics to;

(a) Explain to the landlord why stepping down voltage is required and how it is done.

(b) Explain to the landlord the cause of the low current in the houses.

(c) Show with evidence the modifications that could be made to ensure more current flows in the houses.

Item 7

A household with various appliances **(a 3500 W cooker used for 4 hours daily, ten 60 W lights used for 10 hours daily, and a 2500 W water heater used for 30 minutes daily)** is connected to a 240 V mains supply. The owner struggles to estimate the monthly bill and is uncertain about why an electrician insisted on the heater being connected to a fuse. **Hint; The cost of one unit of electricity = Ush. 800**

Use your knowledge of physics to:

(a) Determine if 65,000/- will be enough for the monthly electricity bill.

(b) Recommend whether the appliances should be connected in parallel or in series for better functionality.

(c) Explain why the heater should be connected to a fuse and how it works.

END