535/1
PHYSICS
Paper 1
2024
2½ hours

MATIGO EXAMINATIONS BOARD

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* **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.

During an attack of rebels in a certain district, two students hid themselves at the roof top of one of the buildings, it was risky for them to observe the soldiers around the corners and gather information to make informed decisions while minimizing exposure to danger. They noticed a muzzle flash light followed by louds sounds of gun shots which was directly over a village. Some distance behind the village is a mountain. They listened carefully and realized that, for each muzzle flash, they can hear a loud sound of gunshot followed by a quieter one.

The time between seeing a flash over the village and hearing the first sound of a gun is 4 seconds.

Hint: Two plane mirrors, plastic tube, glue, craft knife and marker were available for the students at the rooftop.

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

Task:

As a physics student, advise the two students;

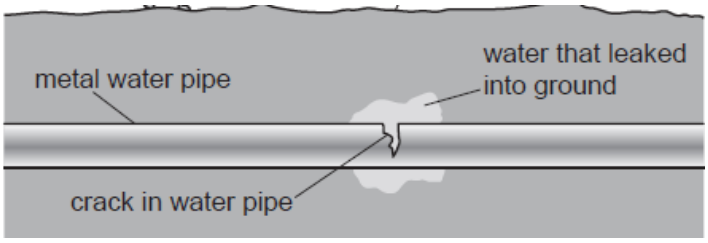
(a) to check for soldiers around corners and in blind spots

(b) know why they hears two sounds for each muzzle flash?

(c) identify how far away is the village from the students?

Item 2.

An underground water pipe in the school compound cracked and water gradually leaks into the surrounding ground. The school laboratory is well stocked with various radioactive materials. The school compound prefect tries to locate an actual point where water leaks but fails. The school hires a technician who introduced a radioactive isotope of half-life 6hours of 8g from the laboratory into the water supply and the water that leaks from the crack is radioactive.



Hint: Assume the safety desired maximum percentageof radiation is 6.25%

Task:

As a student of physics;

(a) explain the type of radiation that was emitted by the isotope for the leak to be detected.

(b) explain to the compound prefect why an isotope of half-life 6 hours is suitable for use.

(c) write a message to sensitise the members of the school about the risks associated with radioactive materials in the school laboratory and how such materials should be handled.
(d) how long shall it take for the water to be ready for use again?

Item 3

On a national radio station, it was announced that in one of the small towns of Pakwach in Uganda, residents observed the moon block the sun completely for about seven and a half minutes, it was further communicated that in most parts of the country annual precipitation occurred, fresh water quality improved and vegetation started growing substantially.

Task:

As a student of physics, help the listeners to understand:

(a) the possibility of the moon blocking the sun's light
(b) the occurrence of annual precipitation, improvement on fresh water quality and vegetation growth.
(c) how information in the radio station can be communicated live to listeners in different parts of the country.

SECTION B

PART 1

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

Item 4

Your family hires three vehicles for a convoy to attend a wedding ceremony of one of your relatives. The hiring company charges a fee according to the distance moved. On a hot day, the team sets off from home with inflated balloons at 7:00am and attains a maximum velocity of 72km/hr. in 60 minutes. On reaching the highway road, it maintains this velocity for 90 minutes, finally it reaches the reception at 10:00am. It was observed that some balloons burst and only a few were left. Later in the evening it rained heavily and cars failed to reach back home due to slippery roads.

Task:

As a physics student;

(a) help your family members compute the distance from home to church.
(b) explain to your relatives the reason(s) why most of the inflated balloons burst.
(c) provide guidance to the car owners to avoid the problem faced during the return journey.

Item 5

Your sister experiences a fatal accident and gets several minor wounds on her body. On taking her to hospital she was given tablets and advised to always apply Salin solution (a mixture of salt and warm water at 35^0C). A quantity of 50g of salt of is required to make a proper Salin solution. Your brother is to provide you with boiling water at 100^0C and 2 litres of water at room temperature to make this mixture.

Task

As a physics student;

(a) Help your friend find the quantity of water required to make a proper Salin solution.

(b) How would you ensure that Salin water is kept at a required temperature for so long?

Use:

Density of water $=1000\text{kgm}^{-3}$

Specific heat capacity of water $= 4200\text{Jkg}^{-1}\text{K}^{-1}$

Acceleration due to gravity $= 10\text{ms}^{-2}$

Density of salt $= 2.17\text{gcm}^{-3}$

PART II

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

Item 6

A certain team of sailors was navigating along a Lake. The team was involved in a series of violent storms thunderstorm at the lake. They lost the direction of their journey. Some members thought of sailing any how until they meet the lake shore while others refused because they knew fuel would get used up before arriving.

Hint: A sewing needle, 2 bar magnets, cork, medium sized bowl and water were available for the sailors.

Task:

As a student of physics:

(a) (i) help the sailors to determine the direction for their journey.

(ii) comment on the effectiveness of what you have designed.

(b) how can sailors stay safe in a thunderstorm?

(c) provide guidance how the bar magnets can be safely stored.

Item 7

In a certain village, electricity is normally supplied at 240V and 5A, electricity normally blacks out on weekends. On working days, a business man normally uses electricity to charge community batteries and also listens to radio programs. Later his radio failed to work and he noticed it had specifications 100V, 5A and 50Hz, Which he couldn't interpret, he checked in the empty box of the radio and found two devices labelled 20Ω and 8Ω which he couldn't use either. He wishes to work throughout the week and was advised to purchase a suitable generator of required specifications for weekend purpose. The business man does not know what a generator is, how it works and is bothered by the type of the generator that should be purchased.

Hint: The 20Ω and 8Ω devices must be connected either in series or parallel to lower the input voltage of the radio from 240V to 100V.

Task:

As a student of physics,

(a) describe the specifications of the radio
(b) help the business man to connect the devices to have his radio working.
(c) advise the business man to solve the weekend problems.

END

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