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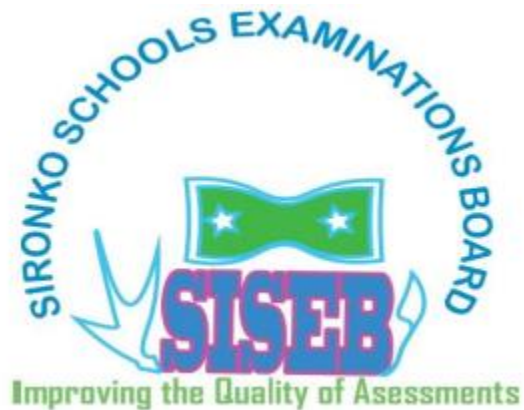
PHYSICS

PAPER 1

2024

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

PERSONAL NUMBER		



SISEB JOINT MOCK EXAMINATIONS

2024

Uganda Certificate of Education

PHYSICS PAPER ONE

2 Hours and 30 Minutes

INSTRUCTIONS TO CANDIDATES:

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

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

SECTION A

Item 1.

During the weekend a group of men in a trading center in Sironko district Eastern Uganda were watching one of the matches of euro 2024 which was taking place in Germany. The commentator of the match mentioned that it was still day time there in Germany yet for these men it was already night where they were. During the match they also observed on the screen that there was a lot of snow outside the stadium which for them they have never experienced. This made them wonder of these differences and how they come about.

Task

As a student of physics, help these men understand,

- i) Why it was still day time in Germany were experiencing yet for them it was already night time?
- ii) Why those in Germany experience the snow and these men in Uganda have never experienced this?
- iii) How the snow can be put into use?

Item 2.

During the weekend a group of girls went for a party to a certain hotel. They entered a hall where the music was being played but they were disappointed with unclear prolonged sound in the hall which made them not to enjoy the music. This made to go out and swim in the swimming pool which was in the compound of the hotel. Unfortunately one of them accidentally threw her phone in the pool. On looking down into the water the phone appeared nearer to the water surface but when she tried to pick it with her hand could not reach it which surprised her.

Task

Using the knowledge of physics,

- a) Help the girl to understand why she could not reach her phone with her hand yet it seemed to be near the water surface.

- b) Help the girls to know why there was a prolonged sound in the hall.
- c) Advise the hotel owner on how the can avoid this problem of prolonged sound.

Item 3

In a certain village some youth mine sand which they sell to earn a living. One day as they were digging deep one of them landed on some stone like substances which scared them to touch. They reported this to the nearby authorities who hired a scientist to investigate the nature of these stones. The scientist used a sensor which could give red light when brought near these substances, he placed a piece of paper between the substance and the sensor which still gave the red light, he tried again with an aluminium sheet between and the sensor did not give any light. For that matter he told the authorities that the substance was radioactive and can produce a certain radiation.

Task

Using the knowledge of physics and you wish to work with this scientist;

- a) Help the authorities and these youth understand what a radioactive material is and identify the radiation in these stone like substances.
- b) Sensitise the members about the dangers associated with these substances.
- c) Advise on how best these substances can be handled and stored.

SECTION B

PART 1 (Answer one item from this part)

Item 4

In a certain village, a farmer's goat fell in an underground water tank pit that was left uncovered. A worker in the farm has been tasked to remove the goat from the pit the goat is too heavy to be removed by carrying it on the ladder. The worker has been provided with two pulleys and a long strong string among other materials to help in the lifting the goat from the pit. The string will burn and break if the temperature at the contact points exceeds 59°C.

Hint: all the work done in lifting the goat from the pit transforms to heat energy at the contact points

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

Heat capacity of the material of the string = 102JK^{-1}

Mass of the goat = 65kg and the initial temperature at the contact points is expected to be 22°C .

The pit is 55m deep.

Task

As a student of physics, help the worker;

- a) With an appropriate design of a system that will help him to remove the goat from the pit.
- b) Why some heat will be generated and how it can be minimized.
- c) To determine whether the material of the string is appropriate for use.

Item 5

During a vacation a group of students went for a tour on a certain island in Lake Victoria. They used a ferry for which they were instructed to enter if only they had put on life jackets. One of the students suggested that they needed to have cold water for drinking as they reach their destination. For that case they decided to move with 50g of ice at -10°C which they mixed with 2000cm^3 of water in a container of mass 400g . The initial temperature of the water and container was measured with a thermometer and found to be 25°C . When they reached they opened the container and found that all the ice had disappeared in water which surprised some of them.

Hint:

Specific heat capacity of water is $4200\text{JKg}^{-1}\text{K}^{-1}$

Specific heat capacity of material of container is $800\text{JKg}^{-1}\text{K}^{-1}$

Latent heat of fusion of ice is $340,000\text{JKg}^{-1}$

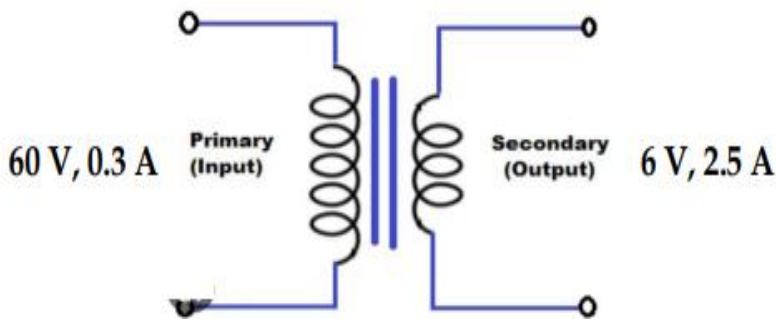
Using your knowledge of physics;

- a) Help the students understand why the ice cubes disappeared in water.
- b) Determine whether the water cooled
- c) Help them understand why they were forced to put on life jackets before they enter the pulley.

Part II (Answer one item from this part)

Item 6

A student bought a small chargeable radio for use at school. However the student discovered that whenever he turns it on when plugged in the electrical sockets, all metallic parts of the radio including its antenna are electrified and this is a dangerous occurrence since it may lead to electrocution. After opening the radio to check for the problem, it was discovered that there was no inbuilt transformer with in the radio figure 1 shows the diagram indicated inside the radio where the transformers should have been.



Task:

As a student of physics help the student to understand

- a) Why there was electricity in the external parts of the radio
- b) What should be done to rectify the problem
- c) Help with the design and specifications of a transformer that can solve the problem and how a transformer works

- d) A transformer will be reasonably effective if it is atleast 75% efficient. Comment on the effectiveness of the transformer model in figure 1.

Item 7

During a science project, learners are told that electricity at a substation is transmitted at 13kV with a current of 0.05A using thick aluminium wires for use inside a house at a voltage of 240V. The house has two television sets that operate on direct current but should be connected such that they receive maximum current and function properly. The learners however couldn't get an explanation of the issues mentioned.

Task:

Use the knowledge of physics to help learners;

- a) Understand how the voltage is changed from 13kV to 240V
- b) Why thick aluminium wires are used during power transmission.
- c) Determine the current in the house if 20% of the electrical energy is lost during voltage change.
- d) Understand how current is used in the televisions changed from alternating current to direct current.
- e) Understand how television sets should be connected to ensure they receive maximum current and function properly.

END