535/1
PHYSICS
Paper 1
July/August, 2024
2½ Hours

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U3962/010

MASAKA DIOCESAN EXAMINATIONS BOARD
JOINT MOCK EXAMINATIONS 2024
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 booklets provided.*

SECTION A:

Answer all items from this section

1. During a student exchange program between a school in Uganda and another in Canada, the learners complained about not being able to communicate when it was night time in one of the countries. The learners however agreed to the appearance of the sky at night;
    - The sky was filled with stars of different colours and brightness.
    - The shape of the moon kept changing in a 28-day cycle.

The students however could not explain how a more accurate study of the stars could be done using satellites.

Use your knowledge of physics to explain;

a. Why the stars had different colors and brightness.
b. Why the shape of the moon kept varying?
c. How an accurate study of the stars can be done.

2. A certain factory that releases its waste into the river is under investigation for releasing radioactive material into the river. The factory manager was tasked to take a sample of their waste for testing and results are given in the table below.

Activity per hour	600	310	155	75	40	18
Time (hour)	0	5	10	15	20	25

Hint; Background radiation in the area is 50 counts per hour.

Use your knowledge of physics to;

a. Determine if the waste was radioactive.
b. Determine when to release the waste into the river.
c. Explain to the manager the dangers of radioactive wastes to people.
d. Explain how radioactive materials should be handled.

3. The management of a town council has received several complaints about the town hall which might be closed.
The people who use the hall say the music of wavelength 5.5 cm could damage their ears.
The security needs to be improved by checking every car that comes to the hall. The town council leaders however do not know what to use to check under the cars.
The people who use the hall are wondering which colour to use while painting the inner walls to ensure the hall appears darker even when the lights are switched on.
There is a distortion of sound in the hall.

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

Use your knowledge of physics to:

a. Determine if the sound in the hall was safe to listen to.
b. Suggest what the town council can use to check under cars.
c. Suggest which colour would be suitable when painting the inner walls of the hall.
d. Identify the cause of the distortion and how it can be reduced.

SECTION B:

PART 1

Answer one item from this part.

4. The manager at a children's play centre is worried about the reduced number of children who use the see-saw in the afternoon when it is hot. The children who were asked why they did not use the see-saw in the afternoon said the seesaw is very hot. The see-saw AB is metallic, of length 6 m, painted black, and is pivoted at its centre. On a certain day, a child of mass 45 kg wanted to play on the see-saw but was alone.

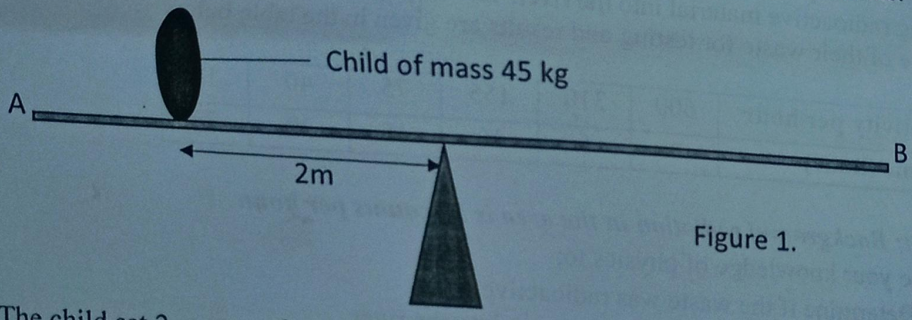

Figure 1.

The child sat 2 m away from the pivot as shown in figure 1. One of the workers whose mass was 55 kg decided to play with the child but was unsure if the see-saw would balance when he sat midway between the pivot and end B 1.5 from the pivot). He also wondered whether to adjust his position toward the pivot or away from it if another child was on the same side as the first.

Use your knowledge of physics to;

a. Determine if the see-saw would balance when the worker mid-way between the pivot and end B.
b. Advise the worker on what to do to make the see-saw balance again in case another child sat close to the first.
c. Explain to the manager what made the see-saw hot in the afternoon.
d. Suggest to the manager measures that can be taken to ensure the see-saw does not become hot.

45 x 2 = 55 x 1.5
90 = 82.5
$W_1D_1 = W_2D_2$ 45 90
$\frac{45 \times 2}{55} = \frac{55D_2}{55}$

5. During a party, 2 litres of water at 24 °C were served to a man and a woman. They complained that it was warm and were given 50 g of ice blocks at -10 °C. They mixed the water and ice blocks in a wooden container with a negligible specific heat capacity. They were surprised by the ice blocks disappearing in the water. The man put his mixture in a plastic container of specific heat capacity 800 $JKg^{-1}K^{-1}$ while the woman put her mixture in a metallic container of specific heat capacity 800 $JKg^{-1}K^{-1}$. They were surprised to find their water at different temperatures after some time. After drinking, the man and man and woman walked on muddy ground. They noticed the lady's shoes were sinking in the ground while the man's shoes were not.

Hint; The area of the man's shoes was 50 cm^2 while those of the lady were 15 cm^2.
Specific Heat capacity of water = 4200 $JKg^{-1}K^{-1}$
Latent heat of fusion of ice = 340000 JKg^{-1}
Specific heat capacity of ice = 2100 $JKg^{-1}K^{-1}$

Use your knowledge of Physics to;

a. Determine if the water-cooled when mixed with ice given that water and ice blocks were shared equally.
b. Why do the ice cubes disappear when mixed with water?
c. Explain why there was a difference in temperatures in the water kept in the plastic and the metallic container.
d. Why the shoes of the lady sink in the mud while those of the man did not assuming they had the same mass?

PART 2

Answer only one item

6. A group of learners from a certain school visited a residence and were requested by a neighbour to press a switch by the door. On pressing it, they heard a loud bell sound, and the door was opened shortly afterwards. The learners were told it was an electric bell of 240 V, 40 W, with a piece of iron in it. They wanted to know how the bell works, what would happen if the bell was used in a house with a mains supply of 120 V like in the country where they come from, and how the sound of the bell could be increased.

Use your knowledge of physics to;

a. Explain how the electric bell works.
b. Explain why the electric bell has a piece of iron
c. What would happen if the electric bell was moved to a house with a voltage of 120V?
d. Suggest ways in which the sound of the bell can be increased.

0.17 0.17A
P = IV
V = IR
40 = 240 I
R
P = IV
= 120 X

when the switch is closed, the piece of iron is magnetised and then it attracts the armature from its position forcing it to hit the gong After that sound is the The iron metal loses heat and magnetism again as long as the switch is still on and the procedure

7. During the National Energy Week, learners are told that electricity at a substation is transmitted at 13 kV with a current of 0.05 A using thick aluminum wires for use inside a house at 240 V. The house has an appliance that requires a current of 15.0 A to work. They are also told that 20 % of the energy is lost as the voltage changes. The learners, however, wanted to know why thick aluminium wires are used when there are other wire types available for sale that are cheaper.

   Use your knowledge of Physics to;

   a. Understand how the voltage is changed.
   b. Why thick aluminium wires are used during power transmission.
   c. Determine if the appliance will work.
   d. Account for the energy losses as the voltage changes and how those losses can be reduced.

END