PRE REGISTRATION EXAMINATIONS 2024
Uganda Certificate of Education
PHYSICS
Paper 1
Time: 2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

- This paper consists of **two** sections; **A** and **B**.
- It has **six** examination items.
- Section **A** has three compulsory items.
- Answer **one** item from section **B**
- Any additional item(s) answered will not be scored.
- All answers must be written in the booklets provided.

SECTION A

Item I
One of the rural areas in Mpigi is expanding, new housing developments are being built. This is causing power shed in the area and people's businesses are being affected especially those that depend so much on electricity.

Task
As a learner of physics;
a) Advise the business in this area on how to overcome this challenge.
b) Explain to the business men how this electricity grid can be upgraded.

Item 2
Many countries in the world are resorting to nuclear as their source of energy. At the nuclear power plant, nuclear fission is used to generate electricity.
Using your knowledge of physics,
a) Advise these countries on how they can generate electricity from nuclear.
b) What arguments would you present for and against its use, considering factors like cost, safety and environmental impact?

Item 3

On a rainy day, a student saw a rainbow in the sky. It's colours were arranged in circular form. He developed the interest to know how this occurred. When the school organized a science fair, he decided to make his presentation on rain bow formation.

Task

Having studied physics;

a) Help the student to know which materials to use in setting up the experiment.

b) Advise the student on how to arrange the apparatus given to form the rainbow.

SECTION B

Item 4

The ministry of health wishes to transport a vaccine whose effectiveness greatly depends on its temperature from National Medical Stores (NMS) in Kampala to Kigumba Health centre (IV) using its true trucks.

Kigumba is located 200km away from NMS and trucks move at an average speed of 80kmh^{-1}. The vaccine is only effective when its temperature is between 96^{0}C - 260C. In this range, the vaccine is in liquid state.

In order to regulate the temperature, the vaccine is put in a very thin container which is then placed in water bath of mass 2.5kg. The water bath and the vaccine are at 96^{0}C before departure. The temperature of the water in the bath drops at 1^{0}C/min and the water and the water takes 8 minutes to freeze. When frozen, its temperature drops at 0.5^{0}C/min. The temperature drops are only inevitable during transportation but can be dealt with when trucks reach their destination. By the time the trucks reach their destination, the total heat lost from the water and vaccine is 2 x 10^{6}J.

As a student with knowledge about heat quantity, help the medical team in charge of distributing the vaccine to determine its heat capacity and also help them know whether it will reach the health center when its effective.

Support

Assume that heat absorbed by the medicine container is negligible.

- Specific latent heat of fusion of ice = 3.36 x 10^{5}Jkg^{-1}
- Specific latent heat of vaporization of steam = 2.3 x 10^{6}Jkg^{-1}
- Specific heat capacity of water and ice are 4200Jkg^{-1}k^{-1} and 2100Jkg^{-1}k^{-1} respectively.

(20 scores)

Item 6

Your uncle operates a retail shop in a very busy street and sometimes having very many customers at the same time can be very challenging to handle since he is alone operating the shop. Like in most shops, the refrigerator is always put outside the shop besides the door where you can not see it directly when you are sited inside.

Task
As a physics learner, help your uncle to solve this problem by designing a device which your uncle will use to see the customers who pick soft drinks from the refrigerator behind the door (include illustrations). (20 scores)

END