

535/1
PHYSICS
AUGUST 2024
2 HOURS 30MINUTES

UGANDA PRIVATE AND INTEGRATED SCHOOLS ASSOCIATION
UGANDA CERTIFICATE OF EDUCATION
FINAL ASSESSMENT EXAMINATIONS YEAR 2024

PHYSICS
Paper 1
THEORY
Time 2 hours 30minutes

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 section

Item 1

Joyce while playing, placed a pencil slanting in a glass of height 9.6cm high with one end of the pencil touching the bottom. On pouring water into the glass up to height of 8.2cm, the pencil appeared bent to her with the pencil's lower end raised by 2.05cm. She got confused since the pencil was originally straight before pouring water into the glass. Different colours were seen coming from the portion of the pencil in water. She decided to ignore the pencil in water and went back home. Along the way she observed a rainbow and thought that God is planning to punish the world since it was originating from heaven and entering the earth at two points.

Task:

As Physics student;

- (a) Explain to Joyce why the pencil appeared bent and calculate the refractive index of water.
- (b) Explain the origin of colours on the rainbow.
- (c) Help Joyce with incidences where the phenomenon in the item above is beneficial to human life.

Item 2

Developed countries have a tendency of invading one another using dangerous weapons that may cause long term effects like cancer. These weapons cause mass destruction since they contain radioactive isotopes of Uranium with a half-life of 70 years.

Task:

- (a) Explain how the long term effect above can be destroyed in a suspected part of the body.
- (b) If a bomb of containing 800g of isotope was dropped in a certain city, for how long would the radiations reduce to $\frac{1}{16}$ of the original amount.

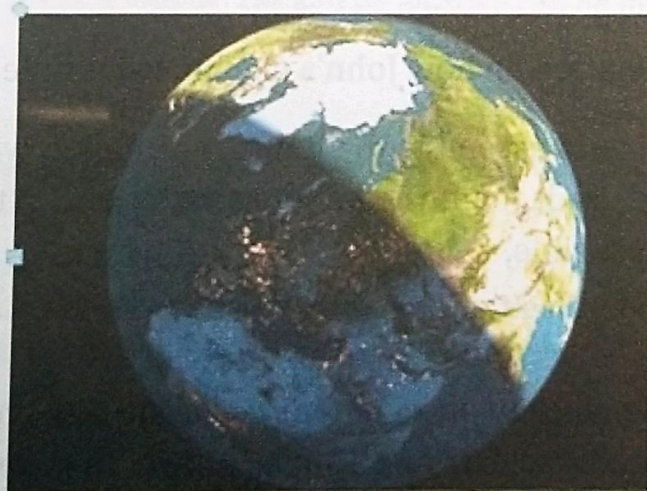
(c) How would you advise your government to use the above energy from radio isotopes to generate electric energy instead of making dangerous weapons?

ITEM 3

One of the most misunderstood branches of physics for many years has been space physics. Some of the examples of such misunderstandings include the following.

- The Africans in the old traditions knew that the sun orbits the earth, rather than the earth orbiting the sun.
- While watching the world cup which took place in Brazil in 2014 at 9pm East African time, the football fans watching the game in East Africa realized that it was still day time in Brazil and they were puzzled.
- While it snows (winter) in most European countries in December around Christmas season, the people in East Africa have never seen any snow fall in East Africa and some of them are always wondering.

Hint:



Task:

- a) How can you explain the above cases to your friends who need enlightenment about these astronomical events in order to promote deeper understanding of physics in the school and community at large.
- b) Explain how the football game matches were transmitted from Brazil to any East African country.

SECTION B

PART I

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

Item 4

At a certain Seed school located in a remote village, school dependents are required to participate and work on the ongoing school projects. During the December holidays the school resumed works of constructing a storied classroom block. John and Peter were tasked to carry bricks from the ground floor to the second floor that was being worked on. The task was tiresome by carrying bricks on their heads. After few hours John developed an idea of simplifying work by using a wheel barrow and an inclined plane. Later Peter sought of another idea of developing a single machine for raising the bricks vertically. When Peter looked in the vicinity, he realized that there was a motorcycle wheel, long ropes, straight poles, tall enough to reach the position where the bricks were to be put, and a large hemispherical pan.

Tasks

- (a) Make a brief explanation on how John's machine was able to simplify work.
- (b) Show how Peter could assemble the items to come up with a simple machine and how he would use it to lift the building materials up to the second floor in the shortest time possible.

Item 5

A chicken farmer rearing chicken on a commercial scale discovered that one-day old chicks are always vulnerable to extreme temperatures. In order for the farmer to be able to detect the level of temperature change, he approached his technician friend who designed for him a thermometer with no calibrations.

Task:

- (a) Suggest and explain the possible causes of extreme coldness in the chicken house.
- (b) Explain what the farmer should do to maintain the required temperatures in the chicken house.

PART II

Answer **one** item from this part

Item 6

John collects scrap in Masaka city which he normally sells to Musoke who delivers the scrap to steel milling factory. The factory produces iron bars but the scrap consists of many metallic types. The officials at the factory only want to buy iron pieces of scrap. Musoke remembered that he can sort out iron pieces from the scrap using a magnet.

Hint:

An iron bar, insulated connecting wires of resistance 0.75Ω , four dry cells each of $1.5V$ are available to Musoke.

Task:

As a Physics student;

- (a) Help Musoke to remove the pieces of iron from the scrap.
- (b) Comment on the effectiveness of what you have designed, given that current of $6.0A$ is enough to create a strong magnet.
- (c) Explain how the strength of a magnet created by Musoke can be increased

Item 7

During preparation for the function or party at your school, two decorators disagreed on the right way of connecting the coloured bulbs rate $240V$ to form a flood lamp operating on a fuse of $2.5A$. The source of electromotive force being one of the school alternating current generators of maximum power output $1200W$. The Headteacher is willing to allow the decorators use a half of the total power from the generator.

Task:

As a student completing a year course in Physics and using a simple diagram,

- (a) Explain to the decorators how the generator operates. Comment on the major sources of power losses.
- (b) Explain how the bulbs should be connected and how many are likely to be used.

END