

NAME:.....STREAM.....

SMASK

S.4 PROGRESSIVE ASSESSMENT TERM 1 2024

PHYSICS

PAPER ONE

TIME: 2 HOURS

INSTRUCTIONS

This paper consists of two sections, A and B. It has six(6) items

Attempt both questions from section A

Section B has two parts I and II. Attempt one item from each part

Answer 4 items in all

All answers should be written on the answer sheets provided

SECTION A

Attempt all questions from this section.

Item 1

John a S.4 student travelled along Masaka- Kampala highway and kept seeing a pool of water a head of him, which seemed to disappear as he got closer to it. On reaching home, he decided to watch a coloured television(TV), but realised he could only do so clearly when he was seated very near to the TV. The next day, he went to the school physics laboratory and made a beam of white light strike a glass block at an angle of incidence of 55° making an angle of refraction of 33° . He also passed the same light through a glass prism with an adjacent white screen, on which he observed colours of a rainbow.

Task:

As a physics student, help John;

(a) understand why he saw a pool of water on the highway (04 scores)

(b) use ray diagrams to explain why he can only see TV pictures clearly at a short distance and how this defect can be corrected (06 scores)

(c) Briefly show how a colour TV is able to display different coloured images on the screen (04 scores)

(d) Determine the refractive index of the material of the glass (03 scores)

(e) Show with the aid of a diagram, why he sees rainbow colours on the screen (03 scores)

Item 2

One old man who lives by the sea side has been observing the level of water at the shore for a long time. At times the water level is so high that most parts of the shore are filled with water and it is dangerous to go near the water. While some times the water level reduces and sea shells and some aquatic organisms are left exposed to the surface of the sand.

Task.

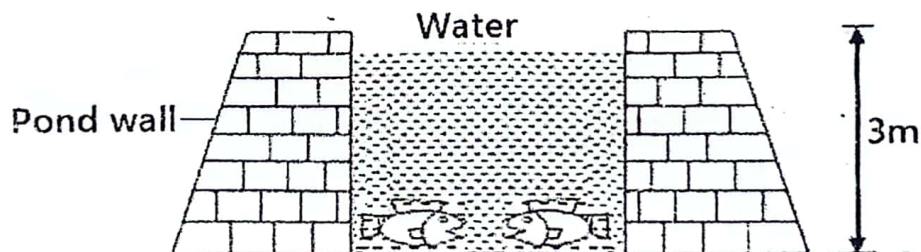
(i) As a physics student who has studied Earth and space physics, give a detailed explanation that will help the old man understand this occurrence. (10 scores)

ii) Help the old man also understand the usefulness and side effects of such occurrences. (10 scores)

SECTION B

Part I

Item 3



A fish farmer in Iceland uses a transparent glass fish pond with base area measuring 5m by 4m and height 3m, filled with water as shown in the figure above. He noticed that during winter at the temperature of -8°C , the top of the pond froze, but fish still survived.

Task

As the physics student;

a) Explain why the bottom of the pond is built the way it appears. (03 scores)

b) calculate the water pressure, hence the total pressure experienced by the fish at the bottom of the given Atmospheric pressure = $1.05 \times 10^5 \text{ Pa}$. (05 scores)

- c) draw a graph of volume versus temperature of water and use it to explain what happened to the water in the pond. (08 scores)
- d) explain any two other effects of the phenomenon that led to fish survive. (04 scores)

Item 4

Due to several cases of collapsing buildings in Masaka city swampy areas, it was discovered that the engineers were targeting money instead of quality.

-The buildings must support a known load.

-Glass to be used in the walling of the buildings.

-The metal bars to be used have a force constant of 1900Nm^{-1} causing an approximated extension of $2.0 \times 10^{-4}\text{ cm}$ having across sectional area of $14.5 \times 10^{-3}\text{ cm}^2$ and length 1000m .

Task: As a physics student, advice on the following:

- a) How can the strength of the foundation be increased? (03 scores)
- b) Which materials can be used at the top and reason for that selection? (06 scores)
- c) advantages and disadvantages of using glass for walling. (04scores)
- d) which **load** can those buildings support as well as the **tensile stress** of the metal bars so as to avoid collapsing of the buildings? (07 scores)

Part II

Item 5

A local boat that uses engines transports people and goods from Buvuma Island to Kasenyi landing site twice a week. On the unfortunate day as the boat was sailing at night, the helmsman (boat captain) was a bit sick and sleepy. He realized that they had lost their route after a while and could not easily find the original route without the use of an instrument.

As he was still puzzled, he saw a small magnetic compass on a baby doll and realized that it could be of help to him. However, he cannot use it to locate the route again.

Task

- a) As a student who is equipped with the knowledge of how to find the direction using a magnetic compass, help the helmsman to re-find their route to Kasenyi Landing site. (08 scores)
- b) Also briefly explain how the magnetic compass can be used to indicate the magnetic field pattern around a bar magnet whose polarity signs got rubbed off the bar. (07 scores)

c) If the bar magnet is placed in the earth's magnetic field with the north pole of the magnet facing in the geographical north, draw the magnetic field pattern showing the above arrangement
(05 scores)

Item 6

Photo copying machines, printers and electrostatic spraying machines are some of the daily life applications of electrostatics.

(a) Explain how a neutral hollow spherical body can acquire a positive charge and how you can use a gold leaf electroscope to prove that the charge attained is positive.

(12 scores)

(b) Describe how the charge distribution on the charged hollow spherical conductor can be determined. (04 scores)

(c) Describe how electrostatics is used during spraying of cars with paint. (04 scores)

END