ST ANDREW KAGGWA GOMBE HIGH SCHOOL KAWAALA

UGANDA CERTIFICATE OF EDUCATION

PRE-MOCK EXAMINATIONS 2024

PHYSICS ONE

TIME; 2 ½ HOURS

Instructions: Attempt all items in section A

Section B comprises of two parts, attempt one item from each part

SECTION A

ITEM 1

On a wedding day of a prominent local chairperson in Kabale village. Different musical instruments produced good music that was being enjoyed by people near his home and some people staying in the valley 9km away from his home heard repeated music which brought confusion. As it was approaching 10pm, the lights and sound suddenly went off after a certain boy plugging off the switch wire. The DJ immediately lit a torch light towards the boy who was standing 6m away from him and his shadow was cast on the mirror placed 10m away from the boy. On viewing the image of the boy on to the mirror some parts of the shadow were dark and light

TASK

a) As a physics student explain how sound travelled from the chairperson's place to the valley.

b) With illustrations explain why some parts of the image is dark and light, hence determine the magnification of the image formed.

c) Why did the people in the valley hear repeated sound and how can it be minimised.

d) If the wave length of the sound waves produced was 40cm, determine the frequency of the sound produced if the person hears the repeated sound after 10s

ITEM 2

During the study, different students came up with a series of different nuclear weapon and fuel cycles have contributed to release of radioactive particles to the environment. When radioactive particles are deposited in the environment weathering process occurs and cause effects to the environment. The survey mainly looked at the water samples collected from Lubijji swamp where the sewage plant is connected and mainly water colour changes were used for testing. The results for samples were collected as shown below.

Days	0	1	3	5	7

Activity	870	570	330	190	130

a) As a physics student, describe the different characteristics of radioactive samples released to the environments and their effects to human life.

b) From the sample results collected, determine the time it will take for the water sample to change colour.

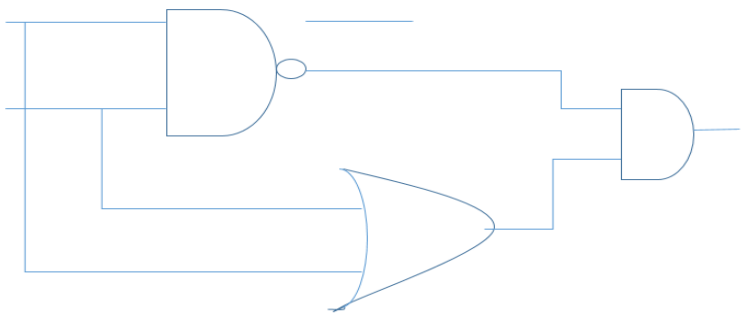
ITEM 3

A group of a astronomers working for space agency was tasked with developing a comprehensive mission to study the Milky Way galaxy including its stars, planets, satellites and the overall structure of the universe. The mission involves developing a constellation of advanced satellites equipped with various sensors and communication technologies to gather information and transmit data back to the earth however the data produced is processed and analysed using digital computers technologies which the mechanic has to fix after opening the computer.

Task

a) Using the knowledge of electronics, explain the different use of devices found in the computer when opened by the mechanic.

b) The astronomers came up with a logic gate below to have an input sensors and output sensors as shown below.



Using the logic gate above, draw the truth table to show the output at sensor x and hence identify the logic gates used.

SECTION B

PART I

ITEM 4

A block of mass 40kg at 40^0c is sliding down a frictionless incline at a height 20m and the angle y with the horizontal. At the bottom of the incline, it collides in elastically with a stationary block of the same mass and temperature. After collision both blocks move together along a rough surface with the coefficient of friction 0.52 sliding the blocks to rest. During the entire process it is assumed that all the kinetic energy lost due to temperature of the block is 90^0 c.

Task

a. Determine the velocity of the block at the bottom of the incline before collision.

b. Determine the velocity of the blocks moves with after collision

c. Determine the frictional force the blocks move with after collision and how best can you can reduce it.

d. Determine the specific heat capacity of the blocks due to heat generated.

ITEM 5

A trading company in Kabale deals in exporting modified liquid water melons to juba using trucks. Juba is located East of Kabale and trucks move at average speed of $20kmhr^{-1}$ for 2 hours carrying 700 watermelons each of mass 1500g using an engine of effort 8000N with effort distance of 60km and are safe for eating when its temperature of transportation is between 80^0c and -10^0c and in this range the watermelon is in vapour state. In order to regulate the temperature, the watermelons are put in a regular bucket which are then placed in a water bath of mass 3.5kg together and they are at 80^0c before departure. The temperature of the water bath drops at 4^0c per minute and it takes 10minutes to freeze. When frozen, its temperature drops to 2^0c per minute. By the time the tracks reach their destination, the total heat lost by the water and watermelon is 250000J.

Given

Assume that

- Heat absorbed by the liquid water melon is negligible
- Specific latent heat of fusion of ice is $3.36 \times 10^5 jkg^{-1}k^{-1}$
- Specific latent heat of vaporization of water is $2.3 \times 10^6 jkg^{-1}k^{-1}$
- Specific heat capacity of ice and water is $2100jkg^{-1}k^{-1}$ and $4200jkg^{-1}k^{-1}$

Task

As a physics student, determine the efficiency of the trucks and specific heat capacity of the water melons. State whether on arrival the watermelons will be safe for eating.

PART II

ITEM 6

A farm manager was given a transfer from a village to town. In the village the bell they used was being hit manually and, in the city, they used an electric bell. The teacher was so surprised and wondered how the electric bell worked. As he asked as one of s4 physics student to explain how the bell worked but he couldn't. On the rainy day the technician advised them to connect advice that steps up current through the electric bell since it normally doesn't work very well.

Task

a. As a physics student, using the knowledge of electromagnetism explain how the electric bell works basing on its structure.

b. Describe the mode and operation of the device that can be counted so as the current through the bell is stepped-up and hence state the energy losses in the device and how they can be minimised.

ITEM 7

A business man deals in exports and imports of goods however he doesn't want his goods to be affected by magnetic fields as this causes them to get damaged. He was provided with an iron rod, copper wire, connecting wires, 3 dry cells each of emf 1.5V and internal resistance of 0.5 ohms each and with other resistors of resistance, 2, 4, and 8 ohms to come with a device he can use to shield his goods from the magnetic field but he couldn't do anything since he was illiterate.

Task

a. As a physics learner, explain using domain theory how he can use the provided materials to come up with a device he can use to protect his goods.

b. Using the device made above, describe how the goods can be protected from the magnetic field.

c. With a drawn circuit, explain how the resistors and dry cells can be arranged to provide maximum current and hence determine the current through the 8-ohm resistor and voltage across the 2-ohm resistor.

END