EDUCATION SCIENCE CENTRE KAMPALA

SCIENCE EDUCATION CENTRE KAMPALA

"MAKING SCIENCES PASSABLE"

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ULSCE SCIENCE BOOSTER PACKAGE 2024

PHYSICS PAPER 1

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535/1

SET 1

2hours 30minutes

Name:.....

Signature .....

Random number						personal number		

INSTRUCTIONS TO CANDIDATES.

- *This paper consists of **seven** examination items, it has two sections **A** and **B**.*
- *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.*

FOR EXAMINER'S USE ONLY

SECTIONS	SCORE	EXAMINER
A		
B		
Total score		

SECTION A

Item 1

The article below was extracted from a newspaper by the ministry of energy and mineral development. Nuclear energy is the energy in the nucleus or core of an atom. Atoms are tiny units that make up matter in the universe. Nuclear energy can be used to create electricity but it must be released from an atom by a process known as nuclear fission. A radioactive isotope of uranium $^{239}_{92}\mathbf{U}$ is the most widely used to produce nuclear energy. If a uranium sample of mass 64kg decays to 4kg in 96 days by emission of two alpha particles and one beta particle to form thorium (**Th**), then large amounts of nuclear energy released can be trapped and used to power mega manufacturing industries without directly affecting the environment. However, the discovery of radioactivity has done a great role in enhancing the fields of medicine, agriculture, industries and archaeological sector.

Task

As a learner of Physics:

(a) Briefly explain how radioactivity has done a great role in enhancing medical and industrial sector and their effects.

(b) With a well-balanced equation, show how uranium is reduced to thorium.

(c) Determine the time taken uranium isotope to reduce to half of its original size.

Item 2

A group of students in the laboratory are confused about a couple of things they observed during an experiment. In a ripple tank, glass blocks were put on one side of the tank to make it 30cm deep and the other 60cm deep. A circular rod operating at 50Hz was used to produce ripples on the shallow end of the tank. The learners were cautioned that if the velocity of the ripple exceeded 5m/s, the walls of the tank would eventually break. The distance between successive crests is seen to change from 2cm to 5cm. A coin placed at the end of the ripple tank appears to be closer to the top of the water. After lining the walls of the ripple tank with a sponge, the ripple seems to disappear after striking the walls of the tank which is different from what was observed before the walls of the tank.

Task

As a student of Physics, you are asked to establish if it was safe to use a rod producing waves of 50Hz and also explain the causes of other occurrences.

Item 3

On November 7th, 2022, Uganda as a country launched its first satellite named Pearl Africa Sat-1 into space with the support from NASA. One of the purposes of the launch was to study weather patterns to help farmers. On the other hand, data collected from the satellite showed that while in Uganda was day time, it was night time in USA. And also, Europe was experiencing winter season while Uganda was receiving normal weather changes. The teacher told learners that "there is a lot of information and purposes that the satellite can provide." But the students couldn't understand and believe the teacher.

Task

As a learner of Physics, write an article to be published over the newspaper to educate the public about changes in time, seasons and all the major purposes of an artificial satellite.

SECTION B
Part I

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

Item 4

In a certain community, mining is a major economic activity carried out that help them to improve on their financial wellbeing. A chief finds a glittering cube of mass 521·1g and each side measures 3cm which he showed to his family. The family assured him that the metal is gold but he persisted. However, one of the family members decided to boil it in hot water at 100°C to see whether it fades. He quickly transferred it into a well lagged copper saucepan containing water at 10°C and the mass of water in the saucepan was 400g. The metal cooled as the temperature of the water increased to 30°C but the metal remained glittering. This was not evident enough to convince the family members about the treasure.

Task

As a Physics student:

(a) Help the family members to know whether the glittering metal is gold or not.

(b) Advise the family members to determine the amount of heat required to increase the temperature of a metal of mass 1kg by1°C.

(c) Explain the applications of specific heat quantity in our daily lives.

Hint

Specific heat capacity of water = $4200 Jkg^{-1}K^{-1}$

Mass of the saucepan = 400g

Density of the pure gold = $19 \cdot 3gcm^{-3}$ or $19300kgm^{-3}$

Specific heat capacity of copper = $400JKg^{-1}\ K^{-1}$

Item 5

A new model of a well-known brand of computer does not have a fan to keep the electronic circuit in it cool, unlike other personal computers (PCs). After raising this computer on the table of height 100cm above the ground, the accountant notices that the ventilation slots on this PC are positioned on the top and on the bottom surfaces of the computer.

She immediately contacted the seller of the computer saying it is duplicate and very light because of the heat it releases from the top slots. She also realized that the labeled mass of the computer is 0·65kg. When she was busy checking, the PC fell from the top of the table and hit her and crushed her foot.

The designer has applied the knowledge of Physics to solve the problem of keeping the computer cool.

Task

As a Physics student:

(a) Help the accountant understand why the new computer does not need a fan.

(b) Explain the effects of raising the computer to a higher height.

(c) (i) Describe some of the energy changes that occurred as the computer fell and hit the accountant.

(ii) Determine the rate of change of displacement used by the computer used to hit her foot.

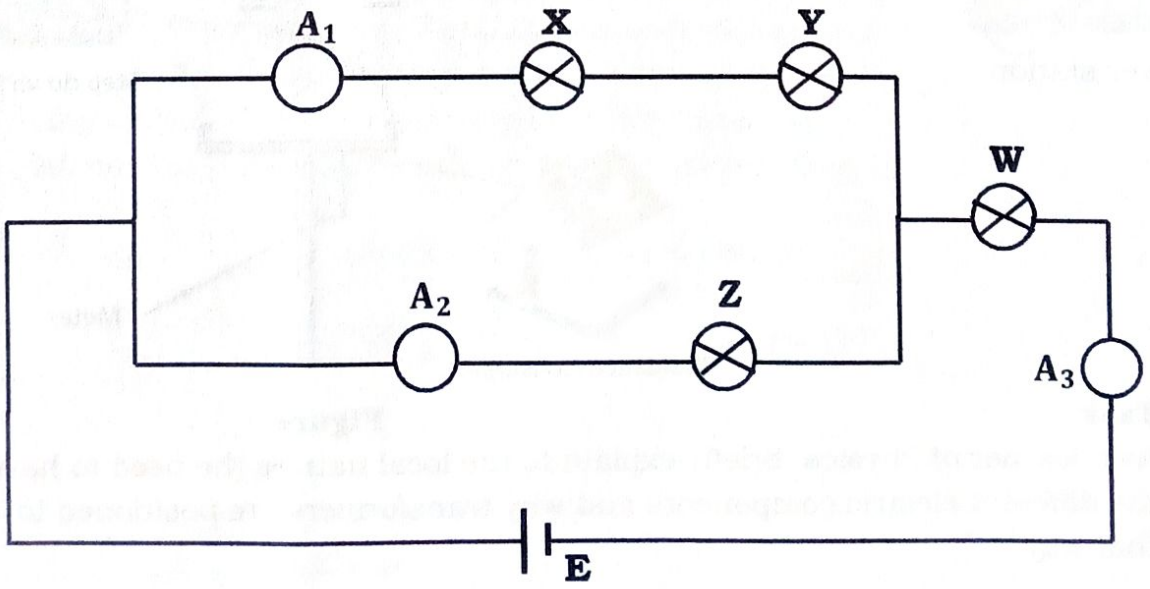
(iii) Briefly explain why her foot was crushed by the computer.

Part II

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

Item 6

A certain home owner intends to put bulbs of similar resistance **3Ω** in different rooms. The maximum current of **4·5A** is obtained when the bulbs are connected to the source of electromotive force **E**. The reading of ammeter A_1 was obtained as **2·5A**. The home owner was given the circuit in the figure below as the most appropriate circuit to light up the different rooms. The home owner is interested in installing the best bulb in the reading room. An analogue yaka meter was installed in a room with bulb **W** which reads 09373·4 and the digital meter was installed in the room which has bulb **Z** which reads 35697·1. At the end of the month, the meters now read 09389·1 and 35714 · 4 respectively and the cost of each unit is shs. 990/=



Figure

Task

As a learner of Physics:

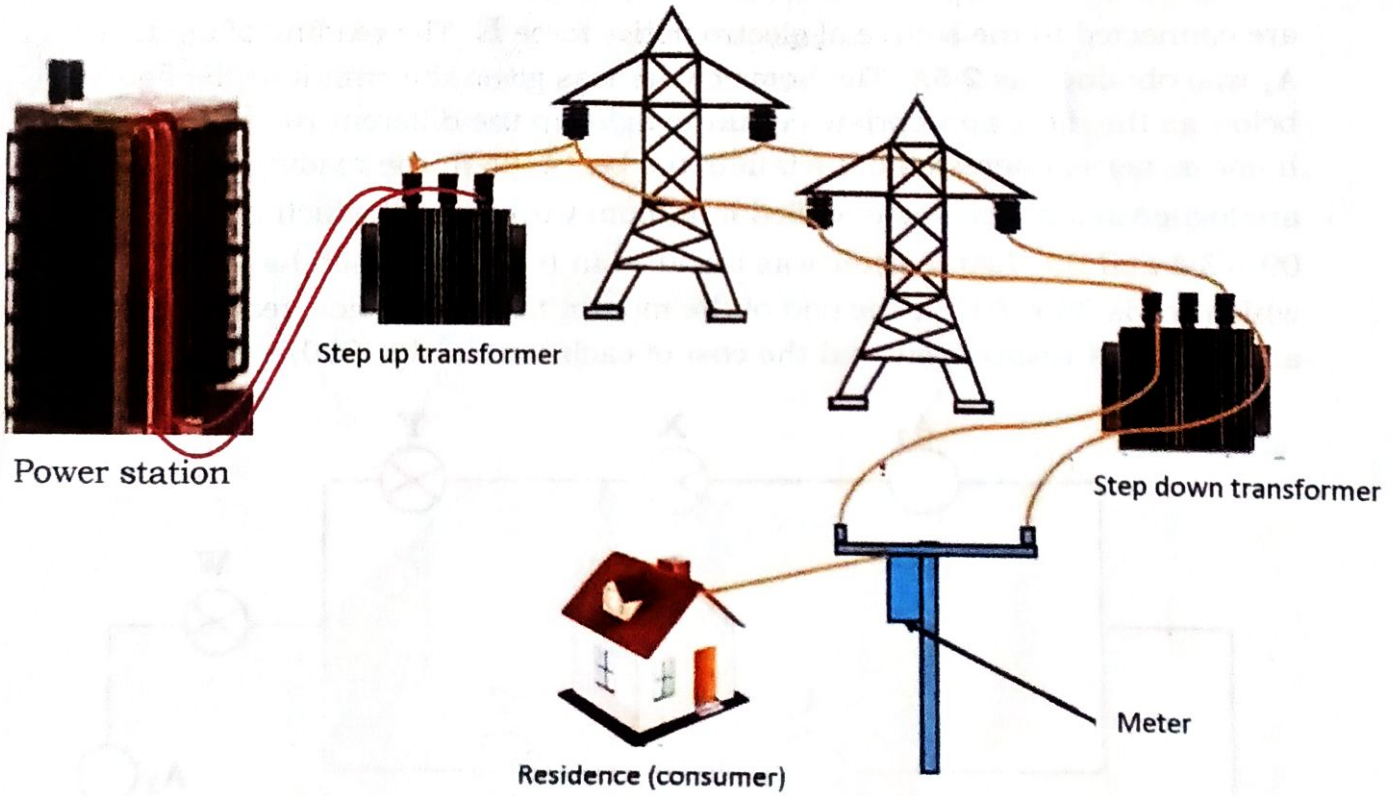
(a) Advise the home owner which of the bulbs **W**, **X**, **Y** and **Z** would be installed in the reading rooms and why?

(b) Help the home owner understand the value of the source required for the circuit to work.

(c) Explain to the house owner, in rooms with bulbs **Z** and **W** which will pay a higher cost and what advice would you give to the house owner so as to pay less at the end of the month.

Item 7

The Uganda government, through the Rural Electrification Agency (REA), has a goal of achieving a rural electrification rate of at least 51% by the year 2030 through extending electricity to all sub counties in Uganda from power station to consumers as shown in the figure below. The local natives steal and vandalize electric components like transformers, electric wires and poles for other uses.



Figure

Task

As a learner of Physics, briefly explain to the local natives the need to have the different electric components and why transformers are positioned in that way.

END