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MOCK PREPARATION SETS

O LEVEL (UCE)

SUBJECT: PHYSICS

SET: Set 2 of 10

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SET 2

SYLLABUS ALIGNMENT MAP

This table helps a teacher quickly find which scenario to use for their current lesson.

Item	Element of construct	Topics covered
Section A(compulsory)		
	Understands how waves are generated, propagated and their application in everyday life	➢ Nature of light; reflection of light at plane surfaces ➢ Reflection of light at curved surfaces ➢ Refraction, dispersion, and colour ➢ Lenses and optical instruments ➢ General wave properties ➢ Sound waves
Item two(2)	Understands the structure of atoms, nuclear processes and their application in every day life.	➢ Nuclear processes ➢ Atomic models
Item three(3)	Understands solar system galaxies, stars, satellites & digital communication in everyday life	➢ The solar system ➢ Stars and galaxies ➢ Satellites and communication ➢ Digital electronics

Section B (part I) Attempt one question only		
Item four and five(4 & 5)	Understands effect of force and heat on properties of matter	➢ Measurements in Physics ➢ States of matter ➢ Effects of forces ➢ Work, energy, and power ➢ Turning effect of forces, centre of gravity, and stability ➢ Pressure in solids and fluids ➢ Mechanical properties of Materials and Hooke's law ➢ Linear and non-linear motion ➢ Temperature measurements ➢ Heat transfer ➢ Expansion of solids, liquids, and gases ➢ Heat quantities and vapours
Section B (part II) Attempt one question only		
Item six and seven (7 & 8)	Appreciates electricity and magnetism in every day life Magnets and magnetic fields	➢ Electromagnetic effects ➢ Electrostatics ➢ Introduction to current electricity ➢ Voltage, resistance and Ohm's law

		➢ Electric energy distribution and consumption

SECTION A

Theme: light and waves

Topics	
Light	**Waves**
Nature of light; reflection of light at plane surfaces	General wave properties
Reflection of light at curved surfaces	Sound waves
Refraction, dispersion, and colour	
Lenses and optical instruments	

Item 1

A major cultural and music festival is being organized on the shores of Lake Bunyonyi. The event features two main stages. Stage A is an enclosed, newly constructed VIP auditorium made primarily of polished concrete walls and large glass windows to provide a view of the lake. The auditorium is 85 meters long. During the soundcheck, the sound engineers encounter a massive problem: whenever the bass drum is struck, a distinct, overlapping 'boom' is heard shortly after, making fast-paced traditional music sound like a chaotic rumble.

Stage B is an open-air amphitheater situated on a hillside overlooking the lake. The engineers notice a strange phenomenon during their outdoor testing. At 2:00 PM, under the hot sun, the music sounds faint to the audience seated at the top of the hill, and the sound seems to carry upwards, disappearing into the sky. However, during the main concert at 10:00 PM, when the air above the lake is cold, the sound travels remarkably well. People in a village across the water,

nearly 2 kilometers away, complain that the music is incredibly loud and clear, almost as if the speakers were right next to them.

Hints

- Speed of sound in air at the given temperatures is approximately 340 m/s.
- The time gap for the human ear to distinguish an echo from original sound is 0.1 seconds.

Tasks:

(a) Calculate the time it takes for a sound wave produced at the stage to travel to the back wall of the 85-meter auditorium and bounce back to the stage. Using this calculation, scientifically justify why the audience is experiencing a chaotic rumble (echoes/reverberation) rather than clear music.

(b) The festival organizers suggest replacing the glass windows with polished metal sheets to solve the acoustic problem. Evaluate this suggestion using wave principles, and propose two scientifically sound alternatives for treating the auditorium walls.

(c) Write a detailed explanation of why the outdoor music is faint at the top of the hill at 2:00 PM, but travels with immense clarity across the lake to the neighboring village at 10:00 PM.

Item 2

A team of wildlife researchers is conducting an expedition in the remote, arid plains of Kidepo Valley. At noon, the sun is intensely hot, baking the earth. As they drive along a long, flat dirt track, the driver suddenly brakes, claiming he sees a large, shimmering pool of water blocking the road about 300 meters ahead. However, as they cautiously walk toward it, the water vanishes entirely, leaving only dry dust.

Later that evening, their vehicle breaks down near a clear, shallow river. They have no matches, and their radio battery is dead. They must rely on their surroundings and their equipment to survive. One researcher tries to catch a fish in the river

using a sharpened stick. He aims exactly at where he sees the fish, but continuously misses, stabbing the riverbed slightly above the fish.

To start a fire, another researcher dismantles a broken professional camera and extracts a thick biconvex glass lens. She holds it up to the sun and successfully ignites some dry elephant grass. Finally, to signal a rescue aircraft flying high overhead the next morning, they use a solid 90-degree glass triangular prism from their surveying equipment to reflect a beam of sunlight directly upwards, rather than using a flat mirror which had shattered.

Tasks:

(a) Deconstruct the driver's optical illusion.
(b) Explain why the researcher missed the fish. What advice would you give him on where to aim.
(c) Describe the precise optical role of the biconvex lens in starting the fire. If the focal length of the camera lens is 8 cm, explain geometrically where the dry elephant grass must be positioned relative to the lens to achieve maximum heating, and why.
(d) Why does a 90-degree glass prism act as a perfect reflector (retro-reflector) for signaling the aircraft? Explain this phenomenon using the critical angle of glass (approx. 42 degrees) and Total Internal Reflection.

Item 3

Kato opened a modern unisex hair saloon in Masaka town. To attract customers, he installed large plane mirrors on opposite walls. However, customers frequently complain that the interior feels dimly lit despite having multiple light bulbs, and they cannot clearly view the styles cut at the back of their heads because the lighting creates complex overlapping patterns. Additionally, some customers have noted a series of multiple, fading images when looking directly forward.

Task:

(a) Explain how Kato's customers can utilize the opposite mirrors to check the haircuts at the back of their heads, illustrating the principles of reflection involved.

(b) Analyze the cause of the multiple fading images reported by the customers and advise Kato on how to eliminate this visual discomfort.

c). Suggest and explain a structural adjustment regarding wall paint or bulb placement that Kato can implement to improve overall illumination without increasing electricity bills.

Item 4

Akello recently purchased a new motorcycle (boda-boda) for her transport business in Gulu. The motorcycle came fitted with flat plane mirrors as rearview mirrors. During her first week, she narrowly escaped three accidents because vehicles approaching from behind appeared much closer than they actually were, and her field of view was too narrow to spot overtaking vehicles from the sides. A mechanic advised her to replace them with convex mirrors, but her colleague warns her that convex mirrors form distorted, smaller images.

Task:

(a) Explain why the original flat plane mirrors placed Akello at a high risk of accidents during city transport.

(b) Evaluate the mechanic's advice by comparing how light behaves on convex surfaces versus plane surfaces, explaining the advantage of a convex mirror's field of view.

c). Formulate a safety guideline for Akello on how to judge the true distance of an overtaking vehicle when using a convex rearview mirror.

SECTION A

NUCLEAR AND ATOMIC PHYSICS

THEME: MODERN PHYSICS

Topics
Atomic models
Nuclear processes

Item 5

At Mulago Hospital, a patient is undergoing targeted brachytherapy for cancer using a radioactive isotope with a half-life of 6 hours. The patient is placed in an isolated room with thick concrete and lead-lined walls. Outside the room, a large warning sign reads: 'DANGER: HIGH RADIATION ZONE. NO ENTRANCE FOR PREGNANT WOMEN AND CHILDREN. VISITATION LIMITED TO 5 MINUTES PER PERSON AFTER 24 HOURS.' The patient's relatives are confused and anxious about these strict rules.

Task:

(a) Calculate the fraction of the radioactive isotope that remains active in the patient's body after exactly 24 hours (1 day) of administration.

(b) Explain to the anxious relatives why they must wait 24 hours before entering, and why pregnant women and children are completely banned from the room.

c). Justify why lead and concrete are specifically used to line the walls of this isolation room instead of ordinary timber or brick.

Item 6

A local hospital in Kampala recently acquired a new medical imaging machine that uses a radioactive isotope, Cobalt-60, to treat localized tumors. A hospital technician, Mr. Otim, is responsible for storing and handling the source. He notices that when he holds a Geiger-Muller tube near the lead container storing the isotope, the counter registers a high count rate. However, when he places a thin

sheet of aluminum between the container and the detector, the count rate drops significantly. When he replaces the aluminum with a 10cm thick lead brick, the count rate drops almost to zero.

The hospital board is concerned about the waste management of these isotopes, as they have a half-life of about 5 years and will eventually become less effective for treatment. Some board members suggest throwing the 'spent' isotopes into the general hospital trash bin, arguing they are no longer useful.

Tasks:

(a) Identify the types of radiation being emitted by Cobalt-60 based on the technician's observations with the aluminum sheet and lead brick. Justify your answer using the penetrating power of different radioactive emissions.
(b) Critique the board member's suggestion to discard the isotopes in the general trash. Explain the dangers of this action, referencing the concept of half-life and ionizing radiation.
(c) Propose a standard safety protocol for the handling and disposal of these radioactive materials in a Ugandan hospital setting.

Item 7

An archaeological team excavating near the Source of the Nile discovers an ancient wooden boat buried deep in the mud. To determine the age of the boat, they use the Carbon-14 dating method. A laboratory analysis shows that the wood contains only 25% of the C-14 found in living trees. The half-life of Carbon-14 is approximately 5,730 years.

Tasks:

(a) ACalculate the approximate age of the ancient wooden boat based on the remaining 25% of C-14
(b) Explain the difference between Carbon-12 and Carbon-14 at the atomic level. Why are they considered isotopes of the same element?
(c) Describe the process of radioactive decay in C-14. What kind of particle is emitted when a Carbon-14 nucleus transforms into a Nitrogen-14 nucleus?

Item 8

A Physics club arrived for a scheduled tour of a regional Nuclear Power Station, only to find the facility under emergency lockdown. An alarm had been triggered following a “containment breach,” and several technicians had been rushed to the hospital for radiation exposure assessments and X-ray imaging.

While waiting at the security gate, the students were told that although the reactor was currently the only source of electricity for the district, it was now emitting levels of radiation far above the safety limit. The facility’s safety officer explained that the plant is only declared “safe for entry” when the detector reading drops to 95 counts per minute (cpm). Currently, the detector shows a total reading of 550 cpm, which includes a constant background radiation of 30 cpm.

Task: As a Physics learner assisting the safety officer:

(a) Calculate the time the team must wait before the facility is safe for the students to enter, given that the leaked source has a half-life of 25 minutes.

(b) Provide a briefing for the students explaining:

(i) The nuclear process occurring in the reactor that generates heat for electricity.

(ii) The three types of ionizing radiation typically emitted in such an accident and their relative penetrating powers.

c) Distinguish between the emitted nuclear radiations (Alpha, Beta, Gamma) and the X-rays the technicians received at the hospital.
d) Justify why the security guide was correct to block the students, and explain the safety equipment that allows regular operators to work in the plant daily under normal conditions.

SECTION A

THEME: EARTH AND SPACE PHYSICS

Topics

The solar system
Stars and galaxies
Satellites and communication
Digital electronics

Item 9

During a parliamentary budget debate, a politician stands up and strongly argues against allocating any funding toward space science education, satellite development, or international space research partnerships. She states: 'Space exploration is an expensive luxury that only wealthy Western nations can afford. Advanced space hardware like the Hubble Space Telescope or the International Space Station are completely useless to a developing nation like Uganda. They spend billions taking pictures of empty space and distant stars, which does absolutely nothing to help an ordinary Ugandan farmer increase crop yields, predict weather disasters, or improve daily life.' A passionate physics student sitting in the public gallery decides to write a detailed, scientifically sound disproving letter to a national newspaper to enlighten the public and policymakers.

Task

(a) Define an artificial space station and detail the critical roles played by the International Space Station (ISS) as a unique scientific laboratory

(b) Describe the design and purpose of the Hubble Space Telescope, explain why its location in space gives it a massive advantage over more powerful telescopes situated on Earth's surface, and highlight three major areas of cosmic history and planetary science that humans have learned exclusively from Hubble data.

c).Formulate a persuasive, fact-based argument to counter the politician's claim. Demonstrate exactly how space exploration and satellite technology directly benefit local socio-economic development.

Item 10

Akello lives in Kampala, Uganda, and is on a video call with her pen-pal, Austin, who resides in New York, USA. It is late June, and Akello mentions that it is a warm, dry afternoon in Kampala, with the sun setting around 7:00 PM as it always does year-round. Austin replies that it is also summer in New York, but his days are remarkably long, with sunset occurring after 8:30 PM, leaving them with over 14 hours of daylight. Furthermore, Austin mentions that his uncle is a commercial marine fisherman on the Atlantic coast who must carefully check 'tidal charts' every day because ocean water levels rise and fall predictably, affecting when his boat can safely dock or when fish are most abundant near the shores. Akello is deeply fascinated and wonders why equatorial countries like Uganda never experience four distinct seasons, massive fluctuations in daylight hours, or large ocean tides.

Task

(a) Explain the physical mechanism behind days and nights on Earth and clarify why it can simultaneously be broad daylight in Uganda while being pitch dark in countries on the opposite side of the globe like the USA .

(b) Explain why New York experiences significant variations in daylight hours and distinct seasonal transitions (summer, autumn, winter, spring), while equatorial countries like Uganda experience nearly constant daylight hours and only two weather seasons

c). Analyze the astronomical cause of ocean and sea tides on Earth. Explain how these tidal forces operate on opposite sides of the globe, how they assist Austin's uncle in navigation and fishing, and outline the potential environmental hazards they pose to coastal populations.

Item 11

Mukasa, a Senior Two student in Uganda, is preparing a presentation for the annual School Science Fair. He found an old astronomy textbook from 2004 that

lists Pluto as the ninth planet of the solar system. However, his teacher tells him that Pluto is no longer classified as a planet. Mukasa is confused because the book clearly shows Pluto orbiting the Sun just like Earth and Mars. In his presentation, he also wants to explain why future astronauts could theoretically walk on Mars or Mercury, but would immediately sink and perish if they tried to step onto Jupiter or Saturn, and how the entire solar system stays structurally bound together without flying apart into the deep vacuum of space.

Tasks

a) Explain the specific force responsible for holding the components of the solar system together, describe how its strength changes as a celestial body moves further away from the Sun, and deduce how this affects the orbital speeds of inner vs. outer planets.

(b) Help Mukasa understand the scientific criteria established by the International Astronomical Union (IAU) in 2006 to define a true planet, and explain clearly why Pluto failed to meet these criteria, leading to its reclassification as a dwarf planet.

c).Contrast the physical and structural characteristics of the inner terrestrial planets with the outer Jovian planets, and use this classification to explain why an astronaut can walk on Mars but would find it physically impossible to walk on the surface of Jupiter or Saturn.

Item 12

Mukasa, a commercial fish farmer near Lake Kyoga, recently installed an automated solar-powered fish feeding and security system on his cages. Because the site is remote, Mukasa uses a satellite internet terminal provided by an e-learning and agricultural NGO to monitor the farm remotely using a smartphone application. The app displays real-time water temperatures and sends alerts if unauthorized boats approach the cages. However, during a heavy localized thunderstorm, Mukasa noticed that the app lost its connection entirely, displaying a “Signal Lost” error, even though his phone had a full local cellular network battery.

At the lakeside station, the security system relies on a specialized control circuit to protect the fish from nighttime poachers. The system uses a submerged pressure sensor (which outputs a HIGH signal when a boat disturbs the water) and a manual override switch controlled by the night guard. An alarm horn is programmed to sound only if a boat is detected and the guard has not deactivated the system. The schematic of this control logic is shown below:

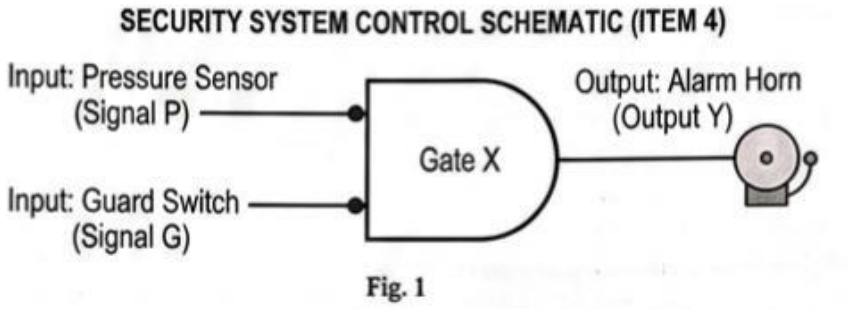

Fig. 1

Note: The Guard Switch outputs a HIGH (1) signal when the system is ARMED and active, and a LOW (0) signal when the guard turns it OFF).

Mukasa is fascinated by how he can monitor his farm from miles away using space technology, but he is confused by the sudden weather interference and wants to understand how the logic gates protect his investment. You have been approached as a physics student to assist Mukasa.

Task:

(a) Help Mukasa to understand:

(i) How the satellite system transmits data from his remote farm to his phone, and why a thunderstorm caused a total loss of signal.

(ii) The orbital characteristic of the satellite used that allows continuous, uninterrupted monitoring of a fixed location on Earth.

(b) Analyze the security circuit for Mukasa:

(i) Identify the type of logic gate represented by **Gate X** that ensures the alarm only sounds when *both* a boat is present (P = 1) and the system is armed (G = 1).

(ii) Construct a complete truth table for this security system.

(c) Suggest **one** modification Mukasa could make to the circuit to automatically turn on a floodlight alongside the alarm specifically when it is dark, using an LDR.

MECHANICS AND HEAT PROPERTIES

THEME: HEAT AND MECHANICS AND PROPERTIES OF MATTER

Topics	
Heat	**Mechanics**
Temperature measurements	Measurements in Physics
Heat transfer	States of matter
Expansion of solids, liquids, and gases	Effects of forces
Heat quantities and Vapours	Work, energy, and power
	Turning effect of forces, centre of gravity & stability
	Pressure in solids and fluids
	Mechanical properties of Materials and Hooke's law
	Linear and non-linear motion

Item 13

At a busy garage in Kampala, mechanics use a hydraulic car jack to lift heavy passenger taxis. A physics student visiting the garage observes that by applying a very small downward force on a narrow pump piston, the mechanic is able to effortlessly raise a massive 2000 kg taxi resting on a much wider piston. However, the student also notices that the mechanic has to pump the small piston down many times over a long distance just to raise the heavy taxi by a few centimeters. Furthermore, because the garage yard is muddy from recent rains, the mechanic places wide wooden planks on the mud before resting the hydraulic jack on them to prevent it from sinking.

Support material

Task

(a) Explain the physical principle that allows the hydraulic jack to multiply the mechanic's small input force to lift the massive taxi.

(b) Using the principle of conservation of energy (Work Done), explain why the mechanic must push the small piston down over a much greater distance to lift the heavy taxi by only a very small height.

c) Analyze the purpose of the wide wooden planks placed on the muddy ground.

Item 14

A family in rural Uganda has recently constructed a new house with a corrugated iron sheet roof. During hot, sunny afternoons, they hear loud 'popping' and 'creaking' sounds coming from the roof, which stop late at night. Inside the house, the mother prepares hot tea for the farm workers and stores it in a silver-coated vacuum flask (thermos) so it remains boiling hot for hours. Later, she suspects her infant child has malaria and uses a clinical liquid-in-glass thermometer to check

the baby's temperature, noticing a strange 'kink' (constriction) in the glass tube that she hasn't seen in standard school thermometers.

Tasks

(a) Explain the scientific reason behind the 'popping' sounds heard from the corrugated iron roof during the hot day and why they cease at night.

(b) Describe the structural design of a vacuum flask (thermos) and evaluate how its specific features

c). Explain the function of the 'kink' (constriction) in a clinical thermometer. Why is this feature essential for measuring human body temperature accurately compared to a standard laboratory thermometer?

Item 15

A heavily loaded transport truck is traveling from Mombasa to Kampala. The driver decides to maximize his profits by loading extremely heavy crates of metal parts on the top roof-rack of the truck, leaving the lighter goods inside the lower cargo hold. While negotiating a sharp corner on a sloped section of the highway near Kapchorwa, the truck abruptly tilts and topples over on its side. The traffic police report cites 'improper loading', ' centre of gravity', and 'the turning effect of forces' as the primary causes of the accident.

Support material

Task

(a) What is meant by the term 'Centre of Gravity' (CG). Explain how placing heavy metal crates on the roof-rack affected the truck's centre of gravity and severely affected its structural stability.

(b) Using the concept of the turning effect of forces (Moments), explain the exact mechanical process that caused the truck to tip over as it navigated the sloped road. Mention the relationship between the vertical line of action of weight and the truck's base.

c).Suggest two specific modifications to the truck's design or loading strategy that the transport company must implement to ensure high stability for future trips.

Item 16

A group of students visited a large water reservoir dam during a field trip. They noticed that the base of the dam wall was significantly thicker and wider than the top part. The engineer on-site explained that this design is a safety requirement due to the nature of the fluid it holds. Later that day, the students visited a construction site where workers were using long steel rods to reinforce concrete pillars. The engineer provided the following data for one steel rod: it has a length

of 4.0 m, a cross-sectional area of 2.0 x 10^{-4} m^2, and it extends by 0.5 mm when a load of 2.5 x 10^4 N is suspended from it.

On their way back, the students stopped at a lakeside park. They noticed that as the sun began to set, a refreshing breeze started blowing from the lake toward the land. One student remarked that this breeze is not just pleasant but is actually used in various traditional and modern technologies.

Hint:

Steel rods are considered high-quality and safe for construction if their Young's Modulus (ratio of stress to strain) is at least 2.0 x 10^{11} Nm^{-2}.

Task:

(a) Explain to the students why the dam wall must be built thicker at the bottom than at the top, referring to the relationship between liquid pressure and depth.

(b) Determine whether the steel rods at the construction site are of "high quality" based on the provided hint. (Show your working clearly).

(c) Identify the breeze the students experienced at the lake and explain two practical applications of such atmospheric movements in real life.

SECTION B

PART II (ANSWER ONE QUESTION FROM THIS SECTION)

THEME: ELECTRICITY AND MAGNETISM

Topics	
Electricity	**Magnetism**
Electrostatics	Magnets and magnetic fields
Introduction to current electricity	Electromagnetic effects
Voltage, resistance and Ohm's law	
Electric energy distribution and consumption	

Item 17

Mr. Kato operates a rapidly expanding scrap metal recycling yard in Kisenyi. Currently, his workers manually sort mixed scrap consisting of iron, steel, copper, and aluminum which is time-consuming and poses severe injury risks. To modernize, he has constructed a prototype of a motorized crane fitted with an electromagnet to lift heavy ferrous (iron/steel) scraps and drop them into a designated truck.

However, Mr. Kato is facing two major challenges with his prototype:

1. Insufficient Lifting Power: The electromagnet can only lift a few small pieces of metal at a time and fails to pick up heavier car engine blocks.

2. The Release Problem: When the crane operator switches off the electricity to drop the scrap into the truck, some of the steel pieces remain stuck to the magnet and have to be pried off manually.

Tasks

(a) Explain the scientific reasons behind the two problems his prototype is facing, paying close attention to the materials he might have used for his core and the design of his coil.

(b) Provide a step-by-step technical recommendation on how he must redesign his electromagnet to maximize its magnetic field strength.

c).Explain how the magnetic field around the current-carrying coil is formed, and suggest one additional safety mechanism utilizing electromagnetic principles (such as an electromagnetic relay or circuit breaker) that he should install to protect the crane's motor from overloading.

Item 18

A family is constructing a new residential home in a wetland estate near the Katabi swamp. Because the area is elevated, exposed, and prone to severe thunderstorms, they are deeply concerned about lightning strikes, which recently caused a fire in a neighboring house.

Simultaneously, the family is setting up their domestic electrical wiring connected to the main grid (supplying 240V). They want to ensure their house is economically viable and safe. Their daily usage plan includes:

• Lighting: 6 LED bulbs, each rated at 15W, used for 6 hours daily.

• Entertainment: 1 Television rated at 150W, used for 4 hours daily.

• Heating: 1 Electric flat iron rated at 1200W, used for 1.5 hours daily.

• Cooling: 1 Refrigerator rated at 250W, running 24 hours daily.

Hint

$I = \frac{P}{V}$

Tasks

(a) Using the principles of electrostatics, explain exactly how lightning occurs. Design a lightning protection system for their house, specifying the materials to be used, where they must be placed, and the physics behind how the system safely neutralizes or redirects the strike.

(b) Calculate the total current drawn from the main supply when all appliances are switched on simultaneously. Based on your calculation, determine the most appropriate fuse rating for the main household circuit from the following available options: 5A, 10A, 13A, or 30A. Justify your choice.

c).Calculate the total electrical energy consumed by the household in one month (assume 30 days) in kilowatt-hours (kWh). If the national energy distributor charges 800 UGX per unit (kWh), determine their monthly electricity bill. Conclude your brief with two scientifically sound recommendations on how they can reduce this monthly cost without compromising their basic needs.

Item 63

St. Henry's College kitovu has just installed a high-tech Industrial Water Purifier to provide clean drinking water for students. However, the Physics club is debating

its installation. The school receives high-voltage Alternating Current (A.C.) from the national grid at 13kV with a transmission current of 0.05A. The purifier, however, is designed to run on Direct Current (D.C.) and requires a steady current between 2A and 3A to function effectively. A transformer system with an efficiency of 80% is used to step down the voltage to 240V.

Task: Use your knowledge of electricity and electromagnetism to:

a). Explain the physics behind how the high voltage from the grid is reduced to 240V for school use.

b). Help the puzzled learners understand how a machine that requires D.C. can function when the school is supplied with A.C.

c). Perform a calculation to determine if the current delivered by the transformer system is sufficient to power the water purifier. Based on your result, state whether the machine will work.

Item 64

Mr. Katende has just moved into a new house connected to a 240V mains supply. Because he bought his appliances from a different country, his TV set (120V, 75W), Flat Iron (120V, 6000W), and four Bulbs (each 120V, 60W) are all rated for a lower voltage than his house provides. To manage his electronics, he bought a “Power King” extension cable fitted with a 5A fuse.

Additionally, he installed a magnetic electric bell with a resistance of 5ohms at his gate. He is now confused about why his extension cable stops working, how to wire his lights for the best brightness, and how much his entertainment is costing him.

Task

As a Physics student, prepare a Home Electrical Safety and Efficiency Guide for Mr. Katende. In your guide:

(a) Perform a calculation to show Mr. Katende whether his 5A fuse can actually support both the TV and the Flat Iron running at the same time. Comment on what would happen to the fuse when both are switched on.

(b) Advise him on whether to connect his four 120V bulbs in series or parallel to the 240V supply.

c).Explain to him the step-by-step process of how the electric bell produces sound immediately when a visitor presses the switch at the gate.

d).Calculate the daily cost of running the TV set for 24 hours, given that the electricity power company charges UGX 680 per kWh.

End

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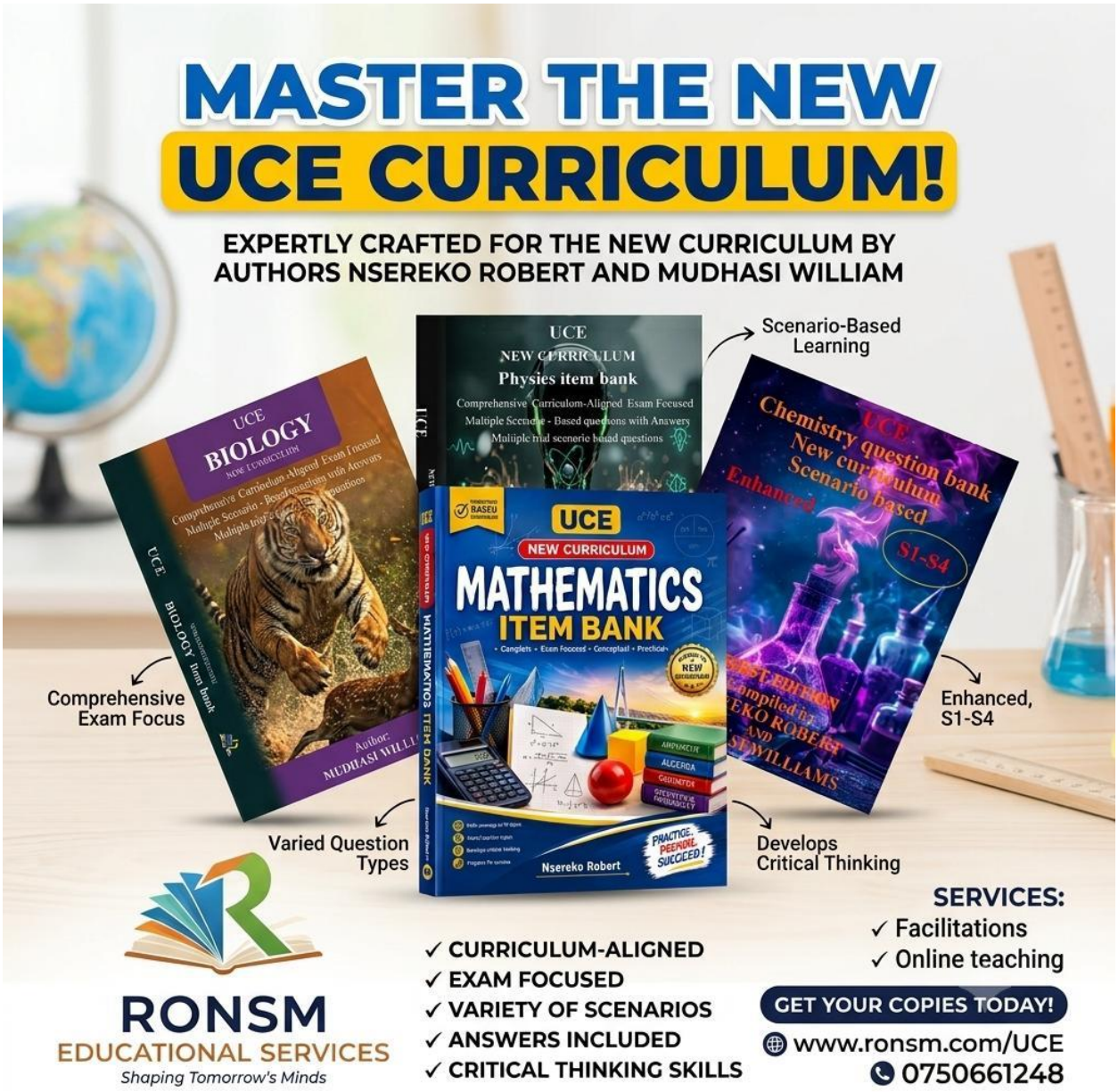

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