

**SEPTA- O'LEVEL PHYSICS SEMINAR SLATED FOR 4TH JULY 2026 AT
ST JOSEPH OF NAZARETH HIGH SCHOOL KAVULE-KATENDE**

ELEMENTS OF CONSTRUCT AND THEIR CHAPTER BREAK DOWN

1. Physics 535/1 (Theory paper)

Construct: Appreciates physics in everyday life

Item	Element of construct	Topics covered
SECTION A: Compulsory		
Item one	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	Understands the structure of atoms, nuclear processes and their application in everyday life.	☒ Atomic models
		☐ Nuclear processes
Item Three	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	
Item four and five	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

Item Six and Seven	Appreciates electricity and magnetism in everyday life	PART II
		☐ Magnets and magnetic fields
		☐ Electromagnetic effects
		☐ Electrostatics
		☐ Introduction to current electricity
		☐ Voltage, resistance and Ohm's law
		☐ Electric energy distribution and consumption

NOTE:

- Section A will comprise **three** compulsory items.
- Section B comprises Part I and Part II each having **two** items and a learner responds to only **one** question from each part.
- In total **five** items must be attempted by the learner.
- The paper is for 2 hours 30 minutes

2. Physics practical 535/2/3

Construct: Appreciates scientific investigation in physics

Item	Element of Construct	Sections
Item One or Two	Appreciate Scientific Investigation in Physics	☐ Mechanics
		☐ Optics
		☐ Electricity

NOTE:

- The examination duration is 2 hours.
- There are two examination items in this paper.
- Students select one item from the options provided.
- The **two** items can be set from either Mechanics and Electricity, Electricity and Optics or Mechanics and Optics.
- Learners are encouraged to practice all three sections: Mechanics Electricity, and light.

Avoid focusing solely on specific themes as any item may come from anywhere.

LIGHT AND WAVES

Item 1

At a certain district headquarters, a two storied building has been completed to house the district's various government offices. You and your team have been contracted as experts in interior design and wireless communication system (Wi-Fi) that uses radio waves to create new office spaces that maximize natural light and ensure smooth and wireless communication for employees. Your work plan involves availing a security device to be used at the gate of the perimeter wall enclosing the district headquarters so as to avoid entry of strangers by the gatekeepers.

Hint:

- The Wi-Fi system operates at a frequency of **2.4** Gigahertz (GHz) and it will be suitable if it produces radio waves of wavelength more than $3.5 \times 10^{-2}m$.
- $1GHz = 1 \times 10^9Hz$
- Speed of electromagnetic waves = $3.0 \times 10^8ms^{-1}$

Task; Help your brother to;

- (a) Know how would you enhance the brightness of the office spaces?
- (b) Establish the suitability of the Wi-Fi system and state any assumption made.
- (c) Design the security device that can be used at the gate.
- (d) Apart from setting up the Wi-Fi facility, briefly explain any other applications of waves used in wireless communication.

Item 2

Andrew was provided with two mirrors, mirror A and mirror B, to carry out research. The reflecting surface of mirror A curves inwards while mirror B curves outwards. While Andrew was carrying out research, his teacher received a call that his younger brother had been admitted to a national referral hospital for diagnostic purposes.

As soon as the brother arrived at the hospital, he saw a UV sterilizer machine used to disinfect medical tools.

Hint:

- Wavelength of electromagnetic waves produced by the UV sterilizer is **300nm**

- A suitable UV sterilizer machine for disinfection produces electromagnetic waves of frequency $9 \times 10^{14} \text{ Hz}$.
- ($1 \text{ nm} = 10^{-9} \text{ m}$)
- Speed of electromagnetic waves = $3.0 \times 10^8 \text{ ms}^{-1}$

Task: Help Andrew to;

(a) Identify

- mirrors A and B
 - any use of each of the mirrors A and B. (use ray diagrams and give reasons for their suitability)
- Know if the medical tools would be effectively disinfected by the machine.
 - Understand properties of the waves produced by the sterilizer machine
 - Suggest other applications of waves produced by the machine used to disinfect medical tools.
 - Identify effects of over exposure to the electromagnetic waves produced by the UV sterilizer machine.

Item 3

The captain of a certain ship intends to know if his ship could ably sail through the coastal sea when it is fully loaded. To achieve this, he must determine the depth of the sea using a sonar system connected to the bottom of the ship. The sonar transmitter sends ultra-sonic waves towards the sea bed. The reflected waves return to the receiver after 1.8 s . While observing underwater objects in the sea, a diver notices that a ray of light from his head torch travelling from the water to air bends away from normal at the water surface. He also noticed at certain angles, the rays fail to emerge into air, and they are completely reflected into water. This puzzled the diver and captain availed this data to a S.4 student for assistance.

Hint:

- A fully loaded ship can sail if the depth of the seabed is greater than 1.5 km .
- Speed of ultrasonic waves in water is 1500 ms^{-1}
- Refractive index of water is 1.33

Task:

Help the;

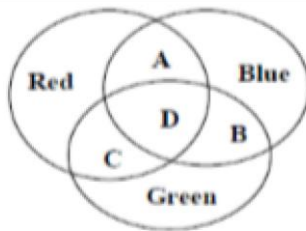
- Captain to ascertain if a fully loaded ship will be able to sail through the coastal sea.

- (b) Diver to understand the conditions necessary for a ray of light to be completely reflected into the water
- (c) Student to use a mathematical approach to justify whether the ray of light from the diver would emerge into air given the angle of incidence of a ray of light from his head torch is 38°
- (d) Student to briefly explain applications of the concept of a ray of light being completely reflected into water in everyday life.

Item 4

A certain school's laboratory is to be equipped with various apparatus, among them is mirror **P**, lens **Q** and lighting emitting diodes (LEDs) which were, red, blue and green. While in the laboratory, it was observed that mirror **P** forms a virtual image of the same size as the object irrespective of their position and lens **Q**, forms a magnified image of the head parts of a termite whenever it was moved closer to the specimen. Afterwards, an optical pin of **5cm** high at distance of **50cm** was placed along the principal axis of **Q** and a real, diminished and inverted image was formed. This confused the learners why the same lens **Q**, could form both diminished and magnified images.

The three LEDs were tested by projecting their light on a white screen, and when all of them were projected at once on the screen at different angles, an interesting pattern of different colors was formed onto the screen as shown below.



Hint;

- Lens **Q** has a focal length of **20cm**.
- Light from the LED with blue had a frequency of $6 \times 10^{14} \text{ Hz}$
- Light from the LED with red had a frequency of $4 \times 10^{14} \text{ Hz}$
- A colour with a high refractive index should have wavelength less than $6.0 \times 10^{-7} \text{ m}$

Task;

Help the learners to;

- Briefly explain which eye defect can be corrected by lens **Q** (include illustration of ray diagram)
- Use the ray diagram to determine the height and magnification of the image of the optical pin.
- Identify the color patterns represented by the letters A, B, C, and D.
- Which of the color patterns red and blue has the highest refractive index.
- Explain the practical application of mirror **P** in our everyday living.

ATOMIC MODELS AND NUCLEAR PROCESSES

Item 5

After complaining of water shortages in their village, the government decided to install a bore hole for them to get quick access to water. The problem of water shortage reduced significantly and therefore the villagers stopped moving long distances to fetch water.

However, after a few weeks, many villagers started complaining of developing skin rashes on their bodies, constant headaches and general body weakness. One of the villagers suggested that the problems they were facing could be coming from the water from the borehole. Once their complaints reached the sub county, a medical radiographer was sent to take samples of the water for testing. The test results indicated that the water contained thorium $^{232}_{90}\text{Th}$, which decays according to the equation below



With half-life of 2 days. The initial count rate of Thorium was 256 counts per day, and the residents were told to wait exactly 2 weeks before they could start fetching the water again from the bore hole on condition that the count rate of Thorium fell below 2 counts per day.

The villagers wondered why they had to wait for all that long and also demanded to know if at all there are any benefits of radioactive materials like Thorium.

You have been approached by one of the villagers to answer the queries.

Task: Help the villagers to;

- Identify **A** and **B**.
- Establish if the villagers will be able to fetch water from the borehole within two weeks as suggested.
- Help the villagers with the benefits they demanded to know.

- (d) Explain if there was need for the villagers to wait for the period suggested by the concerned authorities.

Item 6

The Ministry of Energy is planning to install a Nuclear reactor by 2040, in a move to reduce over dependence on Hydroelectricity power (HEP).

The reactor will use Uranium-235 fuel rods to generate neutrons needed for the production of nuclear energy. However, the nuclear reactor has to be monitored until the Activity of Uranium-235 is 2.5 counts per minute before the Nuclear power plant will be officially commissioned.

The data in the table below shows the Activity of Uranium at different time intervals

Activity (counts per minute)	42.0	34.0	24.0	18.5	14.0	9.0	7.5	5.0
Time(weeks)	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5

The Ugandans are eagerly waiting to use nuclear energy and survive the high costs of hydroelectricity.

One of the officials has no idea on how the nuclear reactor is able to generate electricity and further wants to be educated on the advantages of nuclear energy. You have been approached by the official to answer his queries.

Task: Help the official to;

- Understand his queries.
- Establish when the nuclear power plant will be officially commissioned. (using a graph)
- Know what could be the side effects of undertaking this project and the safety precautions that could be observed?

Item 7

At Entebbe international airport, security officers use a device to scan all the passengers' luggage to detect prohibited items from entry and exit. One of the passengers wonders how the device is able to find items, and if the device has other roles it performs.

The device operates at a wavelength of $2.5 \times 10^{-11}m$ and has a lead aligned curtain at the entrance and exit of the tunnel. The passenger is still puzzled and demands to know why the curtain is made of lead.

Officers are also warned not to use any device whose frequency is less than $2.0 \times 10^{19}Hz$ because the machine won't be effective.

Hint: speed of electromagnetic waves is $3.0 \times 10^8ms^{-1}$

Task: Use your knowledge of physics to;

- Determine whether the device is effective or not.
- Explain to the passenger the working of the device and state two other uses of the device.
- Explain the importance of the material used at the entrance and exit of the tunnel.

SOLAR SYSTEM, STARS AND GALAXIES, SATELLITES AND COMMUNICATION AND DIGITAL ELECTRONICS.

Item 8

John Speke Memorial School organized an Astronomy and Space Observation day after learners noticed unusual changes in the sky. For several days, they observed variations in water levels in nearby oceans and a solar eclipse was announced on radio and television.

The school invited a science expert from the national observatory team to guide learners during the event who told them that the Earth is approximately one *astronomical unit* ($1Au$) and learners could use charts, torches, balls, and digital applications to align the Earth, Moon, and Sun and study their movements. He added that consequently it can bring about natural phenomena like experiencing a dark shadow of the moon on earth's surfaces. During the discussion, some learners could not understand how that phenomena happens, why different countries experience day and night at different times and why seasons change.

The expert further emphasized that there is a need to explore more about space.

Learners were then grouped and assigned tasks to investigate and present their findings to the school community, but they are stuck. These learners have approached you for assistance.

Hint: Speed of light in vacuum is $3.0 \times 10^8ms^{-1}$

$$1Au = 1.5 \times 10^8km.$$

Task: Help the learners to

- (a) Use a suitable diagram to demonstrate the relative positions and movements of the Earth, Sun, and Moon and help the learners to understand how the natural phenomena the expert mentioned happens.
- (b) Understand their queries about time and seasons for different countries.
- (c) Understand the cause for variations in water levels and their significance to mankind.
- (d) Give reasons why scientists continue exploring space.
- (e) Estimate the time light takes to reach the Earth.

Item 9

During a long holiday, learners from a certain Secondary School attended a community science camp organized at a nearby district resource Centre. One evening, the learners observed the night sky using telescopes. They noticed that some stars appeared brighter than others with different colours.

The science instructor explained that stars produce enormous amounts of energy deep inside their cores and that the Sun, which is the nearest star to Earth, provides light and heat necessary for life. The instructor further explained that stars are born, grow, and eventually die which confused them.

The community science camp lasted to 9pm. However, by 7pm the participants were surprised to see the lighting system of the camp turn on automatically using a relay switch connected to a simple logic circuit with an LDR (light sensor) which was installed by the camp organizers

Learners were then assigned investigative and practical tasks to help the community understand the importance of stars and the Sun in everyday life.

Task: Help learners to;

- (a) Understand how the enormous amount of energy from the sun is produced and its importance to the community.
- (b) Explain why stars appeared as observed.
- (c) Clear their confusion.
- (d) Educate the community members on the working of logic circuit system.

Item 10

Unpredictable seasons have become a big concern to farmers in the country. Many of the farmers in the country blame it on the changing shape of the moon. The farmer demanded to know the different shapes of the moon, but no one could explain. During a village meeting, one of the farmers suggested that it is very possible for the weather patterns to be accurately predicted using satellites but did not know how this was done at the meteorological center in Entebbe. Another farmer suggested that they make use of their smartphones loaded with data to access weather updates.

For one to access the weather updates on their smartphones, an in-built logic circuit system within the phone provided weather updates only if data was turned on and the Google browser was working. One of the farmers wanted to know this logic system works but nobody could help him. The farmers have approached you for assistance.

Task; Help them to;

- (a) Respond to the farmers demands.
- (b) Explain how the weather was predicted at the meteorological centre at Entebbe.
- (c) Understand the type of logic gate used by the smartphone to provide weather updates. (include a truth table)
- (d) Identify other uses of satellites in our everyday life.

Item 11

During a student exchange program, an African university sent some of their students to Harvard University in USA. The students used to watch live pictures of football players from Kenya on the TV screens in their hostel. For several nights, they came to the balconies of their hotel and they were amazed that the sky was filled with star that seemed to twinkle and they also noticed that the shape of the moon changes over days.

One time while reading the science magazine, they found the following information.

- The diameter of earth is approximately $1.27 \times 10^7 m$
- Diameter of Sun is approximately $7.0 \times 10^7 km$.
- The earth is the most conducive and habitable planet for continuation of life in the solar system

You have been contacted by these students for assistance.

Task: help the students to;

- (a) Explain the causes of the events that amazed them
- (b) Know how the live pictures of the football players from Kenya could be broadcasted on their TV's
- (c) Determine the number of earths that can fit into sun.
- (d) Why the earth is considered as such in relation to life

HEAT AND MECHANICS

Item 12

A traditional fishmonger operating at a landing site on a large lake is faced with several challenges in his daily work. To weigh his catch, he sets up a balance using a uniform horizontal wooden rod of **3m** and **4kg** which he pivots at the **1m** mark. He suspends a large Nile Perch at the **2m** mark and places a known balancing mass of **3kg** at the extreme left end, which brings the wooden rod into perfect horizontal equilibrium.

To preserve his fish during transit, the fishmonger stores them in a tall commercial deep freezer with vertical shelves. He notices a strange phenomenon of water droplets left on the fish that expand significantly as they freeze, forming large ice blocks that sometimes crack his frozen glass storage containers of water that are tightly sealed.

As he packs the heavy fish into the freezer, he is strongly discouraged by a technician from putting the heaviest batches on the upper shelves, advising him to utilize the lower shelves instead and he wondered why. Furthermore, during his long working hours at the lake shore, he notices that he experiences a strong, chilly breeze during the hot afternoon while the lakeside felt relatively warmer at night which surprised him. You have been approached by this fishmonger for assistance.

Hint

- Acceleration due to gravity, $g = 10\text{ms}^{-2}$
- 1 kg of Nile perch costs Ugx. 20,000.

Task: help the fishmonger to:

- (a) Know how much he will earn from his catch.

- (b) Understand why the water droplets behave that way to the extent of cracking their storage containers.
- (c) Clear his wonder regarding packing of fish.
- (d) Understand more about his surprise in the afternoon.
- (e) Identify any applications of the concept of cracking of storage containers.

Item 13

A health worker at a remote hilltop laboratory needs to sterilize surgical instruments. She is supplied with an open electric water boiler rated **800W** that accommodates **2 litres** of pure water and **1kg** copper package of medical tools initially at a room temperature of **25°C**.

Medical safety guidelines state that instruments are only fully sterilized when kept in water boiling at **100°C**. However, she is warned that due to the high altitude of the hill, an open boiler may fail to reach **100°C**. The health worker needs to determine the exact height of the hill where the laboratory is located. This will help her justify the purchase of a standby gas burner kit. To gather data, she uses a portable barometer and records the atmospheric pressure at sea level as **76cmHg**, and at the hilltop laboratory as **72cmHg**. You have been approached by the health worker for assistance.

Hint:

- Densities of air and mercury respectively are = **1.25kgm⁻³**, **13600kgm⁻³**
- Specific heat capacity of water = **4200Jkg⁻¹K⁻¹**,
- Specific heat capacity of copper = **400Jkg⁻¹K⁻¹**
- **1kg of water = 1 litre of water**

Task; Help the health worker to;

- a) Determine how long it may take her to sterilize the equipment using the boiler.
- b) Understand why the boiler will fail to achieve the required temperature at that place.
- c) Understand how the standby device she is to buy operates.
- d) How high her laboratory is from the ground.
- e) Identify any other device she can use to achieve this recommended sterilization temperature.

Item 14

After months of intensive training, junior officers were put through driving tests at the field grounds involving military armored cars and fighter jets. During a tracking test, an armored car of mass **8tonnes** traveling at **108kmh^{-1}** suffered a mechanical fault and collided with another armored car of mass **12tonnes** traveling ahead of it in the same direction at **54kmh^{-1}** . The two vehicles locked together upon impact, attaining a common velocity. The military medical team used this velocity to assess the mechanical impact and potential trauma to the occupants based on principles of momentum.

Meanwhile, the junior officers wondered how such heavy machinery achieves flight however their senior officers had no response to this.

Additionally, as the training ground heated up in the bright afternoon sun, several vehicle tires suddenly began bursting, causing a loud scare across the training camp.

Hint: The officers sustain severe injuries if the common velocity immediately after the collision exceeds **72kmh^{-1}**

Task:

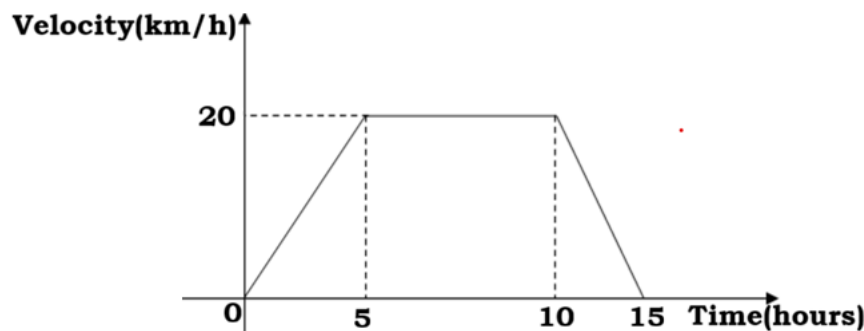
- (a) Ascertain extent of injuries attained by the junior officers after collision.
- (b) Explain why of tyres burst.
- (c) Help junior officers to understand their query to the senior officers.

Item 15

A materials engineer of a certain company wanted to innovate car engine cooling systems by replacing traditional copper cooling fins with a lightweight iron alloy to reduce production costs. To determine its thermal suitability, the engineer conducted a laboratory experiment: A piece of this iron alloy of mass **0.2kg** was heated to **100°C** and gently dropped into **0.08litres** of water at **13°C** . The water was contained within a well-lagged copper calorimeter of mass **0.12kg** . The trial cooling system could support the car to cover a maximum of **183.5km** .

Unaware of this engineering trial, a local village chief hired a commercial taxi that had been fitted with these experimental iron cooling fins. The chief began a long journey from his remote village to his home in the city.

The motion of the taxi during this journey was tracked and plotted on a velocity-time as shown below.



Hint

- Specific capacity for the iron alloy is $470 \text{ J kg}^{-1} \text{ K}^{-1}$
- Specific capacity for copper is $400 \text{ J kg}^{-1} \text{ K}^{-1}$
- Specific capacity for water is $4200 \text{ J kg}^{-1} \text{ K}^{-1}$
- The iron alloy is suitable for making cooling fins if its minimum temperature rise or difference is 16.8°C

Task:

- Know if the iron metal is suitable to be used in making cooling fins of car engines.
- Know if the taxi will break down on the way home.
- Develop experimental steps that the engineer can follow to establish the thermal capacity of the alloy.

ELECTRICITY AND MAGNETISM

Item 16

A barber bought a radio labelled **110V, 500W**. The barber rushed and connected the radio to usual **220V** mains supply for customers to enjoy the music. Unfortunately, he just saw smoke out of his new radio which confused him. On taking the radio to the mechanic, he was informed that he needed a transformer before connecting the radio. On opening the radio, the mechanic first found that the radio's fuse and LED had blown. He further found out that one of the four diodes circuit that convert alternating current (*a.c*) to direct current (*d.c*) had blown and needed replacement. This left the barber in a dilemma as he didn't know how all of these were useful to the functioning of the radio. The mechanic told the barber that they could locally make an affordable transformer since he had a soft iron core, which could accommodate a maximum of **400** turns only in any coil but was challenged on the number of turns in the other coil in order to suitably step down the above voltage.

Task: Help

- Clear the mechanic's challenge.
- Inform the barber the differences between the two currents above
- Explain to the barber, the relevance of the two devices the mechanic first found out had blown.
- With the aid of a diagram, explain how that four diode circuit functions.
- The barber understands the meaning of the label on the radio to avoid further mistakes.
- Discuss more applications of the device the mechanic plans to locally make.

Item 17

Juma operates a laundry shop with the following gadgets

Device	Specifications	Expected time of use per day
Washing machine	240V, 500W	Eight (8) hours
Flat iron	240V, 57.6Ω	45 minutes
A loudspeaker for advertisement	240V, 10W	30 minutes
A security light bulb	240V, 60W	15 hours

Juma is challenged on switching of the security light since he opens a little late and the bulb ends up lighting for extra hours per day needs to plan about automatic switching of the bulb. Juma has **Ugx.169, 650** but does not know whether it will be enough to pay for power consumed for a month since the cost of power was increased to **Ugx. 1,000** per unit

Support material: • A month has **30** days

Task: Help

- Juma know how the device used for advertisement works
- Clear Juma's challenge concerning the security light.
- Know if the amount will settle the bill
- Equip Juma with ways he can minimize excessive bill.
- Inform Juma the different mechanisms he can put in mind to safely use the electricity without getting challenges.

Item 18

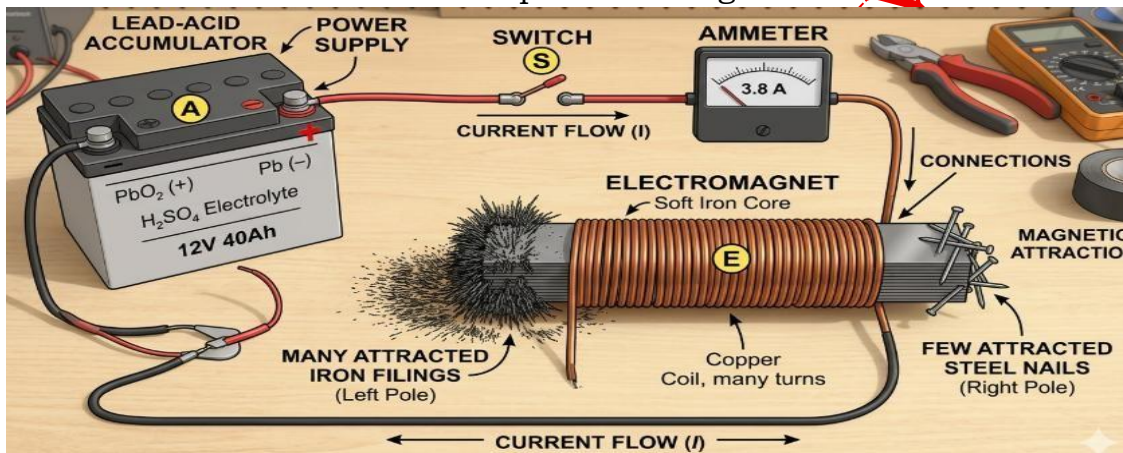
A female teacher of a certain secondary school, made an illustration of a circuit to make an electromagnet at home. Her son switched on the circuit, and a lot

of iron fillings and also some few small steel nails clung on the electromagnet. When her son was found; she rushed to switch off her lead acid accumulator battery to be prevent it from being drained since it was weak yet she had to use it for lighting the following day due to prolonged power blackouts.

His son then carried away the nails, but they were still attached together unlike the iron fillings that had all spread off. This made him wonder. In a bid to clean up the house, the son decided to switch on the fan labelled **240V, 1500W** to blow the fillings away, the fan was running at a low speed, but the son adjusted it and indeed all the filings flew away in **60 minutes**. This surprised the son and he was left wondering though the teacher got more annoyed as she claimed his son had already made the fan consume around **Ugsh. 1500** since each unit was costing **Ugsh. 1, 000**.

Support material

The teacher's set up for teaching illustration



Task: Help;

- The son to understand the behavior of nails and iron fillings during switching on and after switching off.
- The son understand how such an accumulator could be cared for to last longer.
- The teacher to understand her allegation on the money spent on the bill.
- The son understand how the device was able to adjust its speed.
- The son to know more examples of electric devices that use the same rotational device found in the fan.

Practical items

ITEM ONE (1):

In one of the schools, a learner in class finds difficulty while reading the words written on the chalkboard. The optician discovered long sight in the learner and

advised it can be corrected by wearing spectacles with convex lenses of power between $+8.3D$ and $+12.5D$ inclusive. The parent of the learner bought spectacles whose lenses had no power indicated on them and approached you for assistance.

TASK ONE (1):

You are provided with a convex lens from the laboratory with identical properties as the one bought by the parent, advise on its suitability in the spectacles.

HINT: In your report include the following;

Aim, variables (independent, dependent and controlled), hypothesis, procedure, errors anticipated, precautions to mitigate the errors, present data accurately (at least 5 sets), analyse data (using graph) and advice/recommend.

ITEM TWO (2):

Some of the community members complains about the new dry cells, called Pana-energy sold in the shops taking only a short time and get used up. One members said that the pana-energy dry cells have higher internal resistance and that a standard dry cell has an internal resistance in the range of 0.2Ω to 0.8Ω . Another member brings to you a new dry cell of the same type bought from the shop to discover the truth.

TASK TWO (2):

You are provided with one dry cell from the laboratory with similar properties like the one bought from the shop by the second member, comment on its quality.

HINT: In your report include the following;

Aim, variables (independent, dependent and controlled), hypothesis, procedure, errors anticipated, precautions to mitigate the errors, present data accurately (at least 5 sets), analyse data (using graph) and advice/recommend.

ITEM THREE (3):

One afternoon, the school secretary was drilling holes on the papers for filing using a heavy-duty punching machine, but suddenly the punching machine stopped working. The mechanic discovered that the spring of force constant between $200Nm - 1$ and $600Nm - 1$, in the punching machine was damaged and required replacement. The secretary bought a new spring from a nearby hardware, but without specification and contacted you for help.

TASK THREE (3):

You are provided with a spring from the laboratory, with identical properties as the one bought by the secretary and whose force constant is *twenty times* smaller than that in the punching machine, advise the secretary on its suitability for use in the punching machine.

HINT: Include the following in your report;

Aim, variables (independent, dependent and controlled), hypothesis, procedure, errors anticipated, precautions to mitigate the errors, present data accurately (at least 5 sets), analyze data (using graph) and advice/recommend.

ITEM FOUR (4):

A builder fixing windows for a community member proposed that the best glass for the window shutter should be of critical angle in the range of **38° to 42°** inclusive. The community member moved to a nearby shop that sells glasses and bought a large sheet of glass but was not sure of its critical angle and sought for assistance from you.

TASK FOUR (4):

You are provided with a glass block from the laboratory, with similar properties as the large sheet of glass bought by the community member, advise accordingly on its fitness for window shutter

HINT: Include the following in your report;

Aim, variables (independent, dependent and controlled), hypothesis, procedure, errors anticipated, precautions to mitigate the errors, present data accurately (at least 5 sets), analyze data (using graph) and advice/recommend

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End
18