

**SOLUTIONS TO THE ANNUAL NATIONAL LOWER
SECONDARY CURRICULUM PHYSICS
SEMINAR HELD ON 29/06/2025 AT SEETA HIGH
GREEN CAMPUS
PHYSICS 535/1 AND 535/2**

ITEM ONE

(i) Cross sectional area $A = \pi r^2$

$$= 3.14 \times \left(\frac{0.35}{1000}\right)^2$$

$$A = 3.85 \times 10^{-7} \text{ m}^2$$

$$\text{Tensile stress } \delta = \frac{\text{Force}}{\text{Area}, A}$$

$$\text{For iron } \delta = \frac{6000}{3.85 \times 10^{-7}}$$

$$= 1.56 \times 10^{10} \text{ Nm}^{-2}$$

$$\text{Tensile strain for iron } \epsilon = \frac{\text{extension}}{\text{original length}}$$

$$\epsilon = \frac{\frac{2}{100}}{10} \quad \epsilon = 0.002$$

$$\text{Young's modulus } E = \frac{\text{tensile stress}}{\text{tensile strain}}$$

$$= \frac{1.56 \times 10^{10}}{0.002}$$

$$E = 7.8 \times 10^{12} \text{ Nm}^{-2}$$

$$\text{Tensile stress for wood } \delta = \frac{\text{Force}}{\text{Area}, A}$$

$$= \frac{4000}{3.85 \times 10^{-7}}$$

$$= 1.04 \times 10^{10} \text{ Nm}^{-2}$$

$$\text{Tensile strain for wood } \epsilon = \frac{\text{extension}}{\text{original length}}$$

$$= \frac{\frac{2.5}{100}}{10}$$

$$= 0.0025$$

$$\text{Young's modulus } E = \frac{\text{tensile stress}}{\text{tensile strain}}$$

$$= \frac{1.04 \times 10^{10}}{0.0025}$$

$$= 4.16 \times 10^{12} \text{ Nm}^2$$

Since the tensile stress and young's modulus of iron is higher than that of wood, then iron is stronger than wood

(ii) Properties of bricks

- ✓ They have strong compressive strength
- ✓ They are resistant to weathering
- ✓ They have strong thermal insulation
- ✓ They can easily be recycled

Properties of tiles

- They are water proof
- They are strong under compression
- They are chemical resistant
- They are fire resistant

Properties of iron

- ❖ It is ductile
- ❖ It has high tensile and compressive strength
- ❖ It is fire resistant

Properties of wood

- It has high compressive strength
- It is easy to work with since it can be shaped or cut into different forms easily
- It has good thermal insulation

Properties of concrete

- ❖ It very strong under compression
- ❖ It is weather resistant
- ❖ It is fire resistant

- ❖ It can be molded to different shapes when reinforced
 - ❖ It is less corrosive
- (iii) The walls should be painted white because white is a reflector of heat and will keep the house cool during hot weather, while black is a good absorber of heat and will cause the house to become hot on hot days

The roof should be made of grass because grass is an insulator which will keep the house cool on hot days since it will not absorb heat quickly from the surroundings. It will also enable the house to remain warm on cold days since it will not easily conduct away heat. The iron roof would easily conduct heat since iron is a good conductor of heat this would make the house hot on hot days and cool on cold days.

ITEM TWO

- (a) Time taken by the nurse *During acceleration* $v = u + at$

$$40 = 0 + 2t$$

$$t = 20s$$

time taken during constant velocity $s = ut$

$$8000 = 40t$$

$$t = 200s$$

time taken during deceleration $v = u + at$

$$0 = 40 - 4t$$

$$t = 10s$$

$$\text{total time taken} = 20 + 200 + 10$$

$$t = 230s$$

heat gained = heat gained by ice in temperatures change + in melting

+ temp raise for water

+ heat gained by temperature raise of vaccine

$$m_1 c_1 (\theta_1 - \theta_2) + m l_f + m_2 c_2 (\theta_2 - \theta_3) + m_3 c_3 (\theta_3 - \theta_4)$$

$$200 \times 230 = \frac{110}{1000} \times 2100 \times (0 - -5) + \frac{110}{1000} \times 3.36 \times 10^5 + \frac{110}{1000} \times 4200 \times (\theta - 0) + \frac{400}{1000} \times 2000 \times (\theta - -5)$$

$$46000 = 1155 + 36960 + 462\theta + 800\theta + 4000$$

$$3885 = 1262\theta$$

$$\theta = 3.08^\circ C$$

The vaccine was delivered within the recommended temperature range since the temperature as the nurse reached the destination was below 4°C

(b) The tyres were worn out due to friction, this results into generation of heat and abrasion, causing the tyres to wear off.

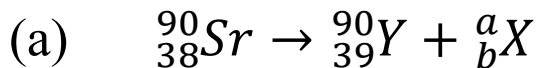
(c) The nurse should put on a helmet

The nurse should not drive above the recommended speed limit

The nurse should not over load the motorcycle

The nurse should put-on heavy-duty shoes or gum boots

ITEM THREE



$$a + 90 = 90 \qquad a = 0$$

$$b + 39 = 38 \qquad b = -1$$

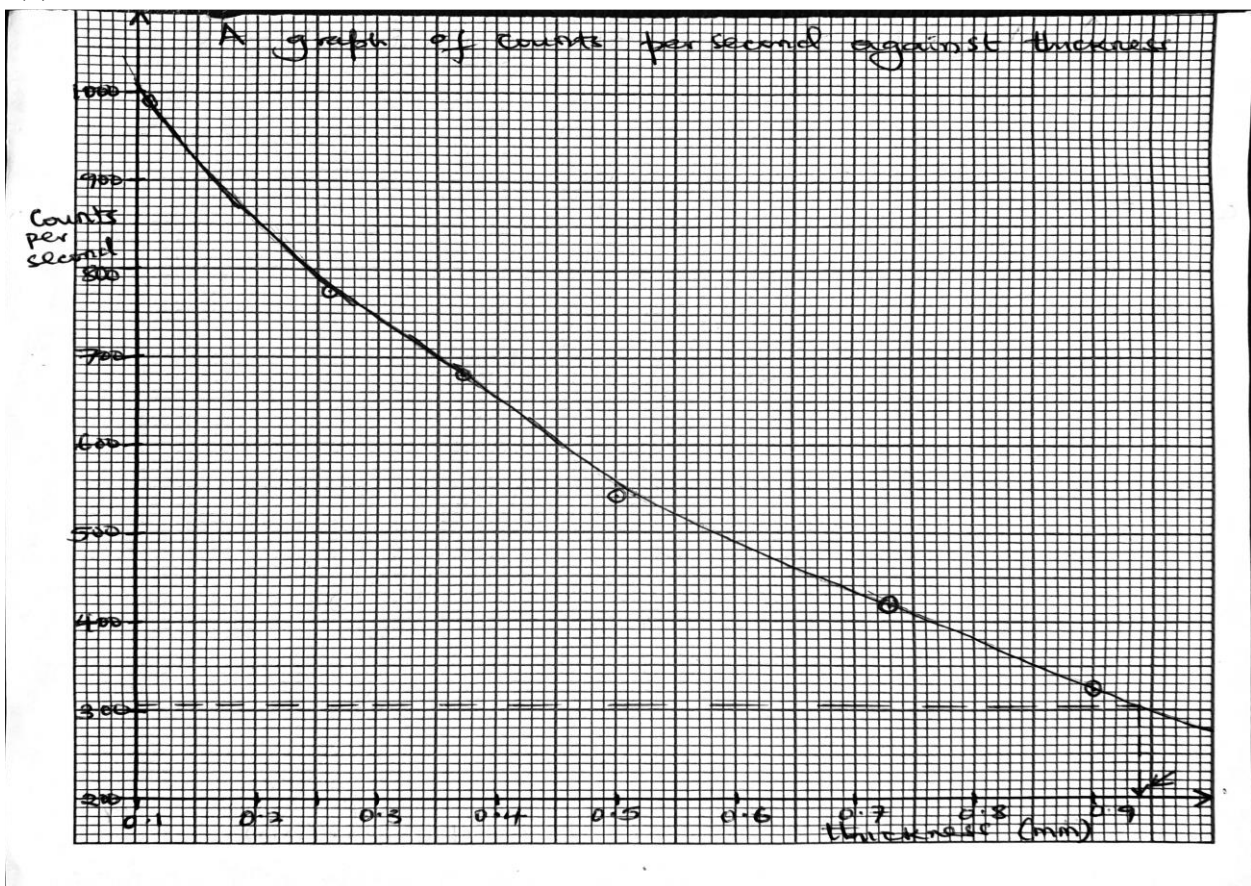
Therefore X is ${}_{-1}^0\text{X}$ hence an beta particle.

Beta particles are preferred for use in monitoring process during production of plastic sheets because they are partially absorbed depending on thickness. When the sheet is thick more of the beta particles are absorbed and a few penetrate through while if it is thin most beta particles pass through and detected, therefore control system can be adjusted according to produce the sheet of required thickness.

The alpha particles are completely absorbed by the sheet, irrespective of thickness and thus can't be used

The gamma rays have high penetrating power and are almost not absorbed even at higher thickness so can not be used

(b)



From the graph the thickness of 6 sheets = 0.94 mm

Thickness of one sheet = 0.156 mm

C) Precautions

People working with strontium should put on protective clothing lined with lead

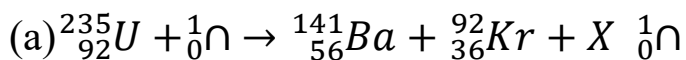
People working with strontium should handle it using long tongs

People working with strontium cover any open wounds

People working with strontium should avoid over exposure to the radiations emitted

People working with strontium should not eat or drink while working with it

ITEM FOUR

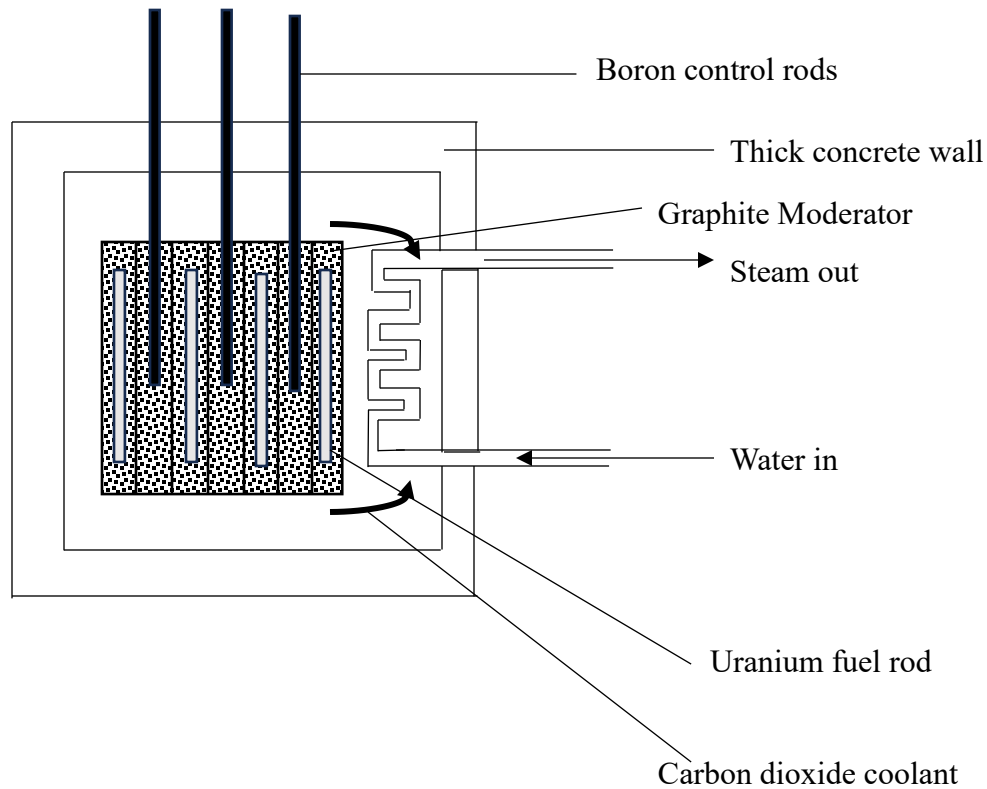


$$235 + 1 = 141 + 92 + X$$

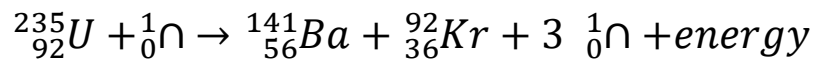
$$X = 3$$

Therefore three neutrons are produced

(b)



The atoms of uranium in the fuel rods capture a neutron and undergo a fission reaction producing barium, krypton, three neutrons and energy in form of heat according to the equation below



The heat produced is absorbed by the carbon dioxide circulating in the reactor which heats up the water in the heat exchanger producing steam which is used to drive the turbines to produce electricity.

The neutrons produce further fission reaction resulting in a chain reaction.

The control rods made of boron capture the excess neutrons keeping the fission reaction at the required rate

- (c) The moderator slows down the neutrons produced so that they can cause fission of uranium-235 other than the other isotopes

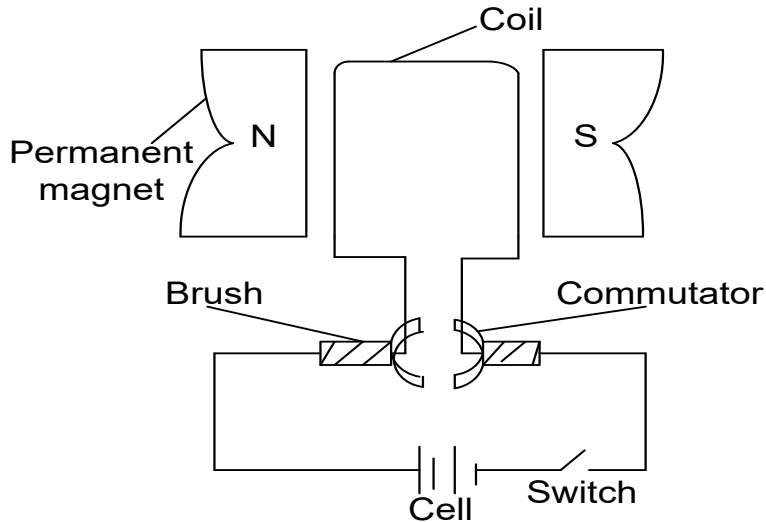
The control rods capture excess neutrons keeping the fission level to the required rate and prevent the reaction from growing out of control.

- (d) The people working in the plant should take precautions because the radiations emitted in the uranium fission are highly dangerous and can cause severe harm to human life.

ITEM FIVE

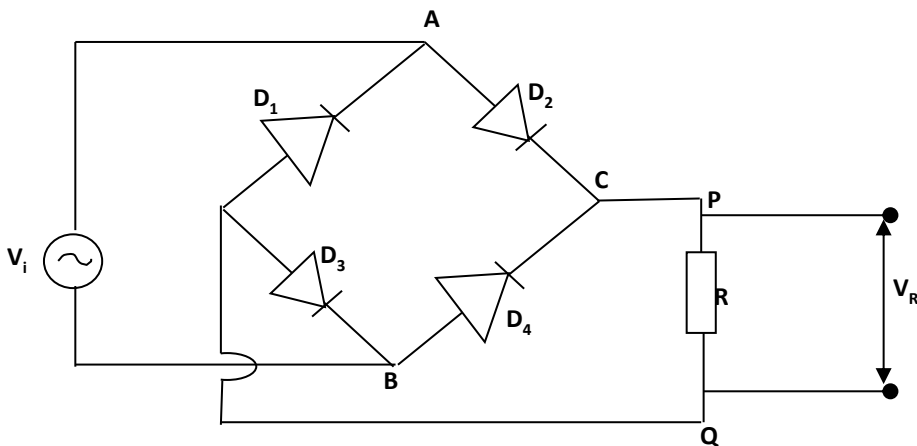
- (a) The fan is able to rotate due to an electric motor.

An electric motor is made of a rectangular coil wound on soft iron and placed between concave poles of a permanent magnet.



When the switch is closed current flows through the coil, side AB experiences a downward force and CD experience an upward force according to Fleming's lefthand rule. The two forces are equal but opposite which constitute a couple. This couple causes the coil to rotate, when the coil reaches vertical position, the commutators lose contact with the carbon brushes and the current is cut off. However, the coil is driven past this position due to the momentum. The commutators then change contact with the carbon brushes, current reverses direction in the coil but it continues to rotate in the same direction.

- (b) The a.c is converted to direct current through a process called rectification. This achieved by use four diodes



- During the first half cycle when A is positive diodes D₂ and D₃ conduct because they are forward biased while the diodes D₁ and D₄ do not conduct because they are reverse biased.
- In the second half cycle diodes D₁ and D₄ conduct while the diodes D₂ and D₃ do not conduct.
- During both half cycles current flows through the load in the same direction hence full wave rectification.

$$(c) P = \frac{v^2}{R} \qquad 1000 = \frac{240^2}{R}$$

$$R = \frac{57600}{1000}$$

$$R=57.6\Omega$$

The manager was wrong since the resistance of the speaker is 57.6Ω and not 60Ω

ITEM SEVEN

ITEM	NUMBER OF UNITS	COST
BULBS	$\frac{4 \times 2 \times 100 \times 15 \times 30}{1000} = 360$	360 X 900 = 324000
FLAT IRON	$\frac{2500 \times 20 \times 30}{1000 \times 60} = 25$	25 X 900 = 22500
LOUD SPEAKER	$\frac{2 \times 1800 \times 5 \times 30}{1000} = 540$	540 X 900 = 486000
REFRIGERATOR	$\frac{1000 \times 1 \times 30}{1000} = 30$	30 X 900 = 27000
	TOTAL	=859500

(a)

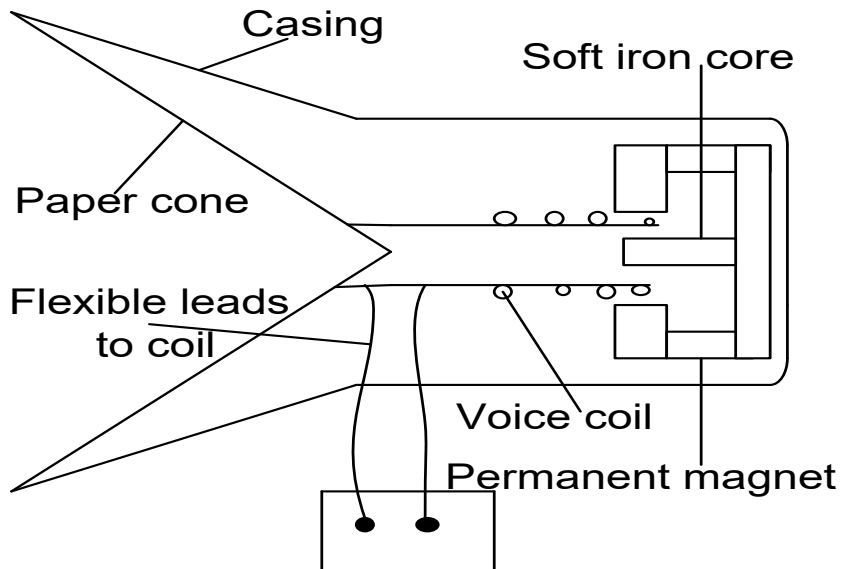
The cost of the monthly electricity bill is shs 859500 which means they are over charged by shs 500 by the land lord.

(b) They should switch off the lights during day time and when not in use

They should low power consuming and efficient appliances

They should use energy saving bulbs

(c) The loud speaker



A varying electric current passes through the speech coils. The speech coils experience a varying force due to the magnetic field which causes them to move to and fro together with the paper cone attached to it. The paper cone sets the air into vibration causing the air to vibrate at the same frequency as the current flowing through the speech coils reproducing the original sound.

ITEM EIGHT

(a) The government used the monitoring satellites to locate the position of the locusts

The monitoring satellites have cameras, thermometer and other instruments for capturing data. The data collected is sent to the ground station where it is analysed by experts and the right action is chosen.

With precision after the location of locust they were sprayed hence solving the problem in a short time.

(b) Speed of the satellite.

In a single rotation the satellite covers a circle, and the period is 24 hours

$$\text{Average speed} = \frac{\text{distance moved by satellite}}{\text{time}}$$

$$\text{average speed} = \frac{2\pi R}{T}$$

$$= \frac{2\pi [(35000 + 6300) \times 1000]}{24 \times 3600}$$

$$= 3.00 \times 10^3 \text{ms}^{-1} / 1.08 \times 10^4 \text{kmh}^{-1}$$

$$\text{speed of the island} = \frac{\text{distance covered}}{\text{time}}$$

In one rotation the island covers a distance equal to the circumference of the earth and takes time to make one revolution equal to 24 hours

$$\text{speed of island} = \frac{2\pi r}{T}$$

$$= \frac{2 \times \pi \times 6300 \times 1000}{24 \times 3600}$$

$$= 4.58 \times 10^2 \text{ms}^{-1} / 1.65 \times 10^3 \text{kmh}^{-1}$$

$$\text{Relative speed of the satellite} = 3.00 \times 10^3 - 4.58 \times 10^2$$

$$= 2.542 \times 10^3 \text{ms}^{-1}$$

(c) They will use the AND gate

Truth table for the gate

INPUT			OUT PUT
A	B	C	D
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

ITEM NINE

- (a) Energy in the sun is produced by nuclear fusion.

The hydrogen atoms in the fuse together to form helium and energy in form of heat. This results in very high temperatures causing further fission to occur.

- (b) The sun is the support of life in our solar system because;

It is the primary source of energy used by plants to produce carbohydrates in the process of photosynthesis

The sun provides heat energy which enables some organisms to die because of extreme heat.

Due to the heat the sun helps in the rain formation which essential for plant growth.

- (c) Surface temperature of the sun =6000K

$$\begin{aligned}\text{Difference in temperature between sun and Earth's surface} &= 6000 - (273 + 27) \\ &= 5700K\end{aligned}$$

$$\text{Time taken for the heat to reach the Earth} = \frac{\text{distance}}{\text{speed}}$$

$$\begin{aligned}&= \frac{149600000 \times 1000}{3.0 \times 10^8} \\ &= 498.69 \text{ s}\end{aligned}$$

$$\text{average rate of temperature loss} = \frac{5700}{498.6} = 11.43Ks^{-1}$$

- (d) *power consumption* = $4 \times 15 + 60$

$$\text{Power consumption} = 120W$$

$$\text{Rating for the solar} = Pxt$$

$$= 120 \times 5$$

$$= 600Wh$$

ITEM TEN

- (a) The lab technician should install a convex mirror which has a wide field of view and can be used to monitor a wider area. In addition, it forms upright virtual images which can be clearly identified
- (b) The mirror is used for security to check under neath cars. The mirror is moved below the car and since it has a wide field of view all the parts below the car can be seen clearly
The mirror can be used in reflecting telescopes
The mirror can be used as a driving mirror.

(c) $v = \frac{2d}{t}$ $340 = \frac{2d}{0.5}$

$$d = \frac{340 \times 0.5}{2}$$

$$d = 85\text{m}$$

The width of river Nile at that part is 85m

ITEM 11

- (a) The old woman is suffering from presbyopia. This occurs when the center of the lens hardens due to old age and the eye can not focus nearby and far objects. There is gradual thickening and loss of flexibility of the lens. A person suffering presbyopia experiences eye strain and headaches.
- This is corrected by use of a bifocal lens which has two parts to cater for both long and shortsightedness or by refractive surgery

(b) $V = \frac{2d}{t}$ $330 = \frac{2d}{0.365}$

$$d = \frac{330 \times 0.365}{2}$$
$$d = 60.225\text{m}$$

$$\text{Cost} = \text{distance} \times \text{cost per metre} = 60.225 \times 5000$$

$$= \text{Shs } 301125$$

The old woman will pay shs 301125 to the employees

PHYSICS PRACTICAL 535/2 OR 3

ITEM ONE

535/2 Physics Expected Responses

AIM:

An investigation to determine the density of the material of the rubber bung in the school laboratory to confirm whether it can be used as bottle covers.

VARIABLES:

Independent variable; distance x of rubber bung from pivot

Dependent variable; distance y of standard mass from pivot.

Fixed variable; position of pivot/centre of gravity, material of the metre rule

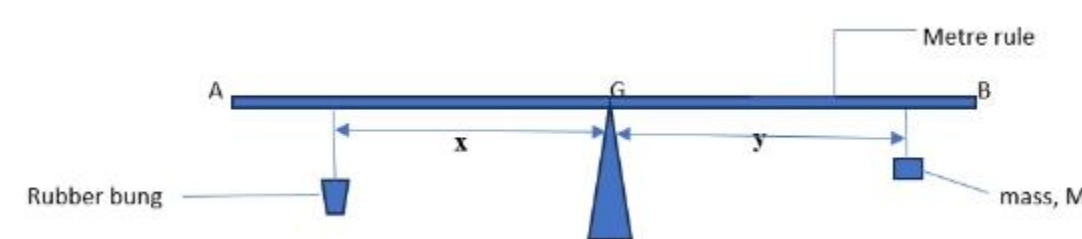
HYPOTHESIS:

Density of rubber bung lies in the range $0.9 \text{ gcm}^{-3} - 1.1 \text{ gcm}^{-3}$

LIST OF APPARATUS;

Rubber bung, 100g mass, pieces of thread, metre rule, knife edge, wooden block

DIAGRAM



- The metre rule AB was balanced on a knife edge and its balance point G noted.
- Rubber bung was suspended from end A of the metre rule such that it is at distance $x = 45.0$ cm from the pivot
- Mass $M = 100\text{g}$ was hung from end B of the metre rule and its position adjusted until the metre rule balances again horizontally.

- (d) Distance y of M from pivot G was measured and recorded
- (e) Steps (b) and (c) were repeated for values of $x = 40.0, 35.0, 30.0, 25.0$ and 20.0cm
- (f) Results were recorded in a table
- (g) A graph of y against x was plotted
- (h) Slope S of the graph was then calculated
- (i) The mass m of the rubber bung was calculated from the expression;
- $$m = 100S.$$
- (j) Water was poured into a beaker up to a level $V_1 = 200\text{cm}^3$ mark
- (k) Rubber bung was completely immersed in water such that water rises to a level V_2
- (l) The volume of the rubber bung $V = V_2 - V_1$
- (m) The density of the rubber bung was calculated from the expression $\rho = \frac{m}{v}$

POSSIBLE SOURCES OF ERRORS

- Parallax error in reading balance lengths, x and y
- Error in locating position G of the Centre of gravity
- Air resistance/wind
- Working surface not flat.

PRECAUTIONS

- Reading scale of the metre rule at a point directly in front of it to avoid parallax error.
- By ensuring that the windows were closed
- By ensuring that working surface was flat.

TABLE RESULTS;

$$G = 50.0\text{cm}$$

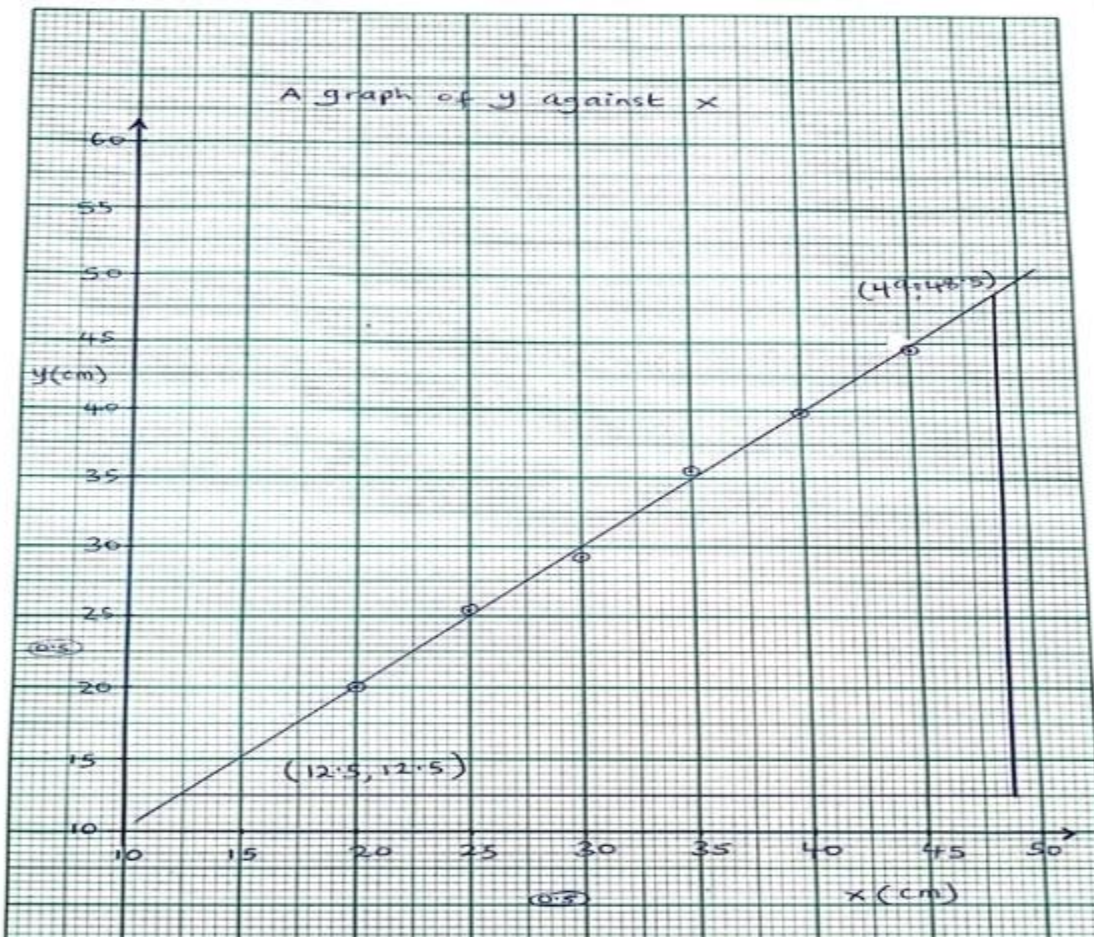
x(cm)	y(cm)
45.0	44.5
40.0	39.8
35.0	35.5
30.0	29.2
25.0	25.4
20.0	20.0

$$\text{Slope } S = \frac{\text{change in } y}{\text{change in } x}$$

$$= \frac{48.5 - 12.5}{49.0 - 12.5}$$

$$= \frac{36.0}{36.5}$$

$$= 0.986$$



The mass of rubber bung is calculated from formula $m = 100S$

$$= 100 \times 0.986$$

$$= 98.6\text{g}$$

$$\text{Initial volume } V_1 = 200 \text{ cm}^3$$

$$\text{Final volume } V_2 = 249 \text{ cm}^3$$

$$\text{Volume of the rubber bung } v = 249 - 200 = 49 \text{ cm}^3$$

$$\text{Density of the rubber bung } \rho = \frac{m}{v} = \frac{98.6}{49} = 2.0 \text{ gcm}^{-3}$$

Conclusion

The density of the rubber bung does not lie within the accepted range; therefore, the material of the rubber bung cannot be used as bottle covers.

THE ANNUAL NATIONAL LOWER SECONDARY CURRICULUM PHYSICS

SEMINAR HELD ON 29/06/2025 AT SEETA HIGH GREEN CAMPUS

PHYSICS 535/1 AND 535/2

(1) ELEMENTS OF CONSTRUCT FOR PHYSICS PAPER 1 THEORY

NOTE:

- Section A comprises of three compulsory items
- Section B comprises of Part I and Part II each having two questions and the learner answers one question from each part
- The paper is for 2 hours 30 minutes

SECTION A COMPULSORY		
ITEM	ELEMENT OF CONSTRUCT	TOPICS COVERED
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 • 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 • Temperature measurements • Heat transfer • Work, energy, and power • Turning effect of forces, centre of gravity, and stability

		• Pressure in solids and fluids • Linear and non-linear motion • Heat quantities and vapours
PART II		
ITEM SIX AND SEVEN	Appreciates electricity and magnetism in everyday life	• Magnets and magnetic fields • Electrostatics • Introduction to current electricity • Voltage, resistance and Ohm's law • Electromagnetic effects • Electric energy distribution and consumption

(2) PHYSICS PRACTICAL 535/2 OR 3

- This paper consists of two items and a student is required to attempt only one item
- The duration of the paper is 2 hours and the students are expected to use the first fifteen minutes for planning

ITEM	ELEMENT OF CONSTRUCT	SECTIONS
ITEM ONE OR TWO	Appreciates scientific investigation in physics	• Mechanics • Optics • Electricity

HEAT AND MECHANICS

ITEM ONE

During choosing materials for construction a group was provided with bricks, tiles, iron bars, pieces of wood, gravel, sand, cement and water. Different materials were to be used for different purposes. The walls of the house were to be painted black and use of iron roof but the students argued that the wall should be painted white and the roof made of grass.

Hint the diameter of wood and iron pieces is 0.7mm.

Iron of length 10m can withstand a force of 6000N which causes an extension 2.0cm

Wood piece of length 10m can withstand a force of 4000N which causes an extension of 2.5cm

Task; As a learner of physics;

- (i) Confirm that iron is stronger than wood
- (ii) Briefly give the properties that make any three of the listed materials ideal, for construction
- (iii) Give the justification for the choice of colour and nature of the roof materials.

(ST GYAVIIRA HIGH SCHOOL KAKIRI)

ITEM TWO

During transportation of vaccines to the village by a nurse, they have to be kept at low temperatures so as not to cause ailing of their biological nature. The vaccine must be transmitted within a temperature range of -5°C and 4°C . The vaccine is carried in a vaccine carrier that gains heat at 200Js^{-1} . The vaccine of mass 400g and specific heat capacity $2000\text{Jkg}^{-1}\text{K}^{-1}$ at temperature at -5°C is packed in the box with 110g of ice at the same temperature. The nurse rides a motorcycle starting from rest at the health-center accelerating at a rate of 2ms^{-2} and attains a velocity of 40ms^{-1} covering a distance of 800m , then he maintains the constant velocity covering a distance of 8000m . After which the nurse decelerates uniformly at a rate of 4ms^{-2} to rest covering a distance of 200m at the delivery point of the vaccine.

Hint

Specific heat capacity of ice $= 2100\text{Jkg}^{-1}\text{K}^{-1}$

Specific latent heat of fusion of ice $= 3.36 \times 10^5\text{Jkg}^{-1}\text{K}^{-1}$

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

Task; As a learner of physics;

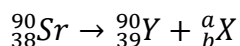
- (a) Find out whether the vaccine was delivered within the recommended temperature range.
- (b) Explain why after such a journey the tyres of the motorcycle are found worn out.
- (c) Suggest the precautions the nurse should undertake so as to reach safely.

(SHS GREEN CAMPUS)

NUCLEAR AND ATOMIC PHYSICS

ITEM THREE

During the manufacture of plastic sheets, Strontium which decays to Yttrium according to the equation below



during the monitoring process the following results were obtained

Thickness (mm)	Counts per second
0.11	988
0.26	786
0.37	679
0.50	542
0.73	417
0.90	323

Task; As a learner of physics;

- (a) Identify X and explain why it is suitable for detecting thickness of sheets other than any other radiation
 - (b) If the sheet is folded into 6 thickness and the count rate registered is 305 counts per second, find the thickness of the sheet.
 - (c) State any precautions that must be taken while using Strontium
- (UMAR BILAL)**

ITEM FOUR

During production of electrical energy using in a nuclear power plant individuals are advised only to work for two hours and put on coats lined with lead. In the process uranium ${}_{92}^{235}\text{U}$ fuel captures a neutron ${}_1^0\text{n}$ and under goes a reaction producing ${}_{56}^{141}\text{Ba}$, ${}_{36}^{92}\text{Kr}$ and neutrons. This process occurs inside a concrete wall having a graphite moderator and control rods made of boron.

Task; As a learner of physics;

- (a) Find the number of neutrons produced in the reaction above.
- (b) Briefly explain how electrical energy is produced
- (c) Explain the importance of the moderator and the control rods
- (d) Explain why the people working in the plant have to take the precautions.

ITEM FIVE

The standards agency of a given country got complaints about a certain Vaseline being sold without the recommendation of the standards agency. The Vaseline had no standards mark which raised more suspicion. The people complained of itching eyes, skin burns and development of sores. The standards agency took samples of the Vaseline and kept it in a dark room wrapped in a photographic film. After 60 days they realised that 60g of the Vaseline had reduced to 7.5 g and the photographic plates had darkened

Task; as a learner of physics help the people to;

- (a) Understand the nature of some of the contents in Vaseline
- (b) Understand the nature of any one likely emission from the Vaseline
- (c) Understand why they were experiencing the listed complaints
- (d) To confirm that the half-life the contents in the Vaseline is 20 days

ELECTRICITY AND MAGNETISM

ITEM SIX

A student went for the leadership conference at one of the facilities in their town, during the day the room became hot and the manager of the place switched on a fan that kept rotating and this resulted in cooling of the room. The student remained curious why the fan kept on rotating while connected to electricity. The manager tried to explain that a fan has a circuit that converts the a.c mains to another form of electric current. When the student went for lunch, he noted that the speaker they were using in the room was written 1000W,240V. The manager argued that the resistance of the speaker is less than 60Ω

Task; As a learner of physics;

- (a) Explain with a diagram how the fan is able to keep on rotating.
- (b) Help the student understand the process of converting the a.c current into another form
- (c) Find out whether the manager was right about the resistance

(IBUNI MASUDI)

ITEM SEVEN

In a certain town the land lord noted that the tenants were consuming a lot of electric power, yet he had warned the tenants against using devices that have high power ratings.

There are four tenants and it was discovered that they each use two light bulbs rated 100W for 15 hours every day, one tenant has a flat iron rated 2500W which is used for 20 minutes each day and the other two tenants each uses a loud speaker rated 1800W for 5 hours and one other tenant uses a refrigerator rated 1000W for 1 hour each day. The tenants kept disagreeing with the landlord claiming that he overcharges them for the electrical power. As the tenants were arguing one of them with the refrigerator gave them cold juice and all the others were happy.

Hint; one unit of electric power costs Shs. 900

Monthly bill of electricity that is paid to land lord Shs. 860000

Task; As a learner of physics

- (a) Find out whether the land lord was over charging the tenants
- (b) Advise the tenant on what can be done to pay a smaller bill
- (c) Help the other tenants understand how the speaker produces sound

(WANYANGE S.S.S)

EARTH AND SPACE PHYSICS

ITEM EIGHT

In February 2020, farmers in Teso sub region received information through radio, Tv and sms on their phones that (desert locusts) had crossed from Kenya into Karamoja and were leading towards Teso.

The government of Uganda together with **FAO** used satellites stationed 35,000km above an island in Lake Victoria and other technologies to destroy the large swarms of locusts to reduce their destruction that could result into famine within a short time which left every one surprised.

One of the officers working with **FAO** used a van whose engine could only start if three conditions are satisfied; i.e. the switch is on, seat belt fastened and a thumb pressed on a button.

In a discussion, the officer told them that the security system uses a **logic gate** but did not give details to the group of people that were amazed by the nature of the vehicle

Hint:

The radius of the earth is about 6300km at the equator.

Task

Use your knowledge of physics to:

- explain to the locals how this would be bad destruction was reduced in a short time using the methods employed.
- understand the relative speed of the satellites used to overcome the challenge.
- draw a simple circuit diagram involving a logic gate and the corresponding truth table.

(SEROMA CHS)

ITEM NINE

In a certain rural school, they have no electricity and therefore, teachers can't use projectors, charge phones or students can't read at well in the evening because they use dim kerosene lamps.

In one of the lessons in physics, the teacher told them that the sun which is in plasma state and it lies at the Centre of one solar system and he said that it is the major provider of energy which surprised the learners but the teacher never gave them chance to discuss how this information can be useful in their school.

When the area MP visited the school, the learners asked him find a way of solving their challenge of electricity by securing for them a solar system but he had little knowledge about it. therefor he challenged the s4 learner where you belong to find the size of the panel and battery in terms of watt-hour(wh) that can power 4 LED lamps each of 15W and a small computer that uses 60W so that they can work for 5hours each evening.

Hint:

- ✓ 1 Astronomical unit (AU)=149,600,000km
- ✓ Speed of light $=3.0 \times 10^8 \text{ ms}^{-1}$
- ✓ Average surface temperature of each=27°C

TASK

Use your physics knowledge to;

- Explain to your friends how energy in the sun is produced
- Understand the statement the teacher made that surprised the learners.
- Understand the average rate which temperature is reduced from the sources to the earth.
- Make the MP understand the power of system he can secure for the school.

LIGHT AND WAVES

ITEM TEN

The Physics department has been experiencing minor thefts of equipment such as spring balances, lenses, mirrors and many others.

The laboratory has one entrance and the storage shelves are located at a corner which is at one side of the lab. The laboratory attendant sits at a point near the doorway.

The school has no money to install expensive CCTV cameras and yet this vice should be stopped.

During the study visit to one of the banks of river Nile, they noted that one boat transports people as the cross the Nile, but when the boat in one side and people want it this side, a whistle is used to call and the

students noted that it takes 0.5 seconds for sound to be received. The students were acquisitive to know the width of the river at that point but the locals had no idea.

Hint.

Speed of sound = 340ms^{-1}

- a) Use an illustration to explain the type of mirror to be used giving reasons why it should be that type to stop the theft.
- b) Explain any other application of the mirror used in (a) above.
- c) Help the people at the bank to understand the width of river Nile at that point.

ITEM ELEVEN

When one of your friends who is a learner of S.3 visited his home after some years. It was strange for him to learn that one of the old women he used to be close to had a challenge in recognizing him, even when he moved very close to her which used not to be the case. While interacting with her she openly told him that her sight is worsening every year. The old woman had employed people to sink for her a deep well at a rate of shs 5000 per metre, but this old woman had to determine the exact amount of money to pay since she did not have a perfect measuring instrument. Your friend has a digital watch that can detect echoes.

Hint

Speed of sound = 330ms^{-1}

Time to receive the echo = 0.365 seconds

Task; use your knowledge of physics to;

- (a) Make the old woman understand her challenges and how it can be minimized.
- (b) Help her understand the exact amount of money to pay to the employees.

(SEROMA CHS)

PHYSICS PRACTICAL

535/2 OR 3

ITEM ONE

A certain organization has donated juice making machine to one of the farmers dealing in fruit business. The farmer plans to stock juice in bottles with tight covers made of rubber. The recommended type of rubber should have density that lies in the range 0.9gcm^{-3} to 1.1gcm^{-3} . The farmer was advised to design the cover using the rubber bung, but not sure whether specification of the rubber material will meet the required standard

Task;

Use the rubber bungs in your physics laboratory to confirm whether it is the type the farmer intends to acquire to be used as bottle covers.

END

