

PHYSICS

Date: 29/June/2023

Period: 8:30 am -11:30 am



END OF TERM III EXAMINATIONS

GRADE : S 1

COMBINATION : O'LEVEL

DURATION: 3 HOURS

MARKS:

..... /100

INSTRUCTIONS

This paper is composed of two Sections **A** and **B**

Section A: Attempt all 15 questions. **(70 marks)**

Section B: Attempt any three (3) out of 5 questions. **(30 marks)**

SECTION A: ATTEMPT ALL QUESTIONS (70 MARKS)

1) Match the following term (**column A**) with its meaning (**column B**)

Don't copy the table answer like this x) corresponds to ix)

Column A	Column B
a) Motion	i) The rate of change of position of an object in any direction at a specific moment in time
b) Velocity	ii) The total distance travelled divided by the total time elapsed.
c) Average speed	iii) It is the displacement covered per unit time.
d) Instantaneous Speed	iv) The change in position of an object with respect to its surroundings in a given interval of time.

(4 marks)

2) Choose the correct answer or choice that best describes the statement

a) Whenever a body is in motion, there is always to oppose the motion.

- i) friction ii) gravity iii) inertia iv) acceleration

(1 mark)

b) A force acting on an object causes the object to

- i) change its shape or size. ii) to start moving or stop moving.
iii) to accelerate or decelerate. iv) i), ii and iii

(1 mark)

c) Consider the following forces

- A) Muscular force B) Magnetic force
C) Tension force D) Action and reaction force E) Electric force

Which of the following are contact forces?

- i) A and C only
- ii) A, B and D only
- iii) A, C and D only
- iv) B, C, D and E

(1 mark)

d) What is the name of attractive force which act between any two bodies in our universe?

- i) Gravitational force
- ii) magnetic force
- iii) electric force
- iv) air resistance

(1 mark)

3) For each of the following statements, indicate whether the statement is **true or **false**.**

a) An object placed on a ground is in stable equilibrium. If the object is given a slight push, then initially the position of centre of gravity may remain at the same level.

(1 mark)

b) A body is said to be in unstable equilibrium when the body does not regain its original position when it experiences an external force.

(1 mark)

c) When an object is resting such that the position of its centre of gravity remains at the same vertical position even when the object is displaced, it is said to be in neutral equilibrium.

(1 mark)

d) When a body is resting with its centre of gravity at the highest point, it is in stable equilibrium.

(1 mark)

e) The formula for a two particles system where the symbols have their usual

meanings is $r_{cm} = \frac{m_1r_1+m_2r_2}{2}$. **(1mark)**

4) Write the name of the simple machine that is described below.

Word Bank to be used: Screw, Wheel & Axle, Pulley, Lever, Inclined Plane and Wedge.

a) These two parts act as one simple machine. They roll and are found on cars, bikes and wheelbarrows. **(1 mark)**

b) This simple machine can be used to lift a weight. It has a fulcrum, or pivot point, which can be located in the center, near the end or at the end.

(1mark)

c) Examples of this simple machine are used to hold things together. It is made up of an inclined plane wrapped around a cylinder. **(1mark)**

d)A heavy object could be rolled up this simple machine, instead of lifting it straight up. Using this simple machine can save effort, although the object must usually cover more distance if this simple machine is used. **(1mark)**

e) Simple machine used to separate two objects, or portions of objects, through the application of force. It is made up of two inclined planes.

(1mark)

5) a) What is the use of lightning arrester?

(1mark)

b) Name any two methods of charging bodies.

(2 marks)

c) State the laws of electrostatic charges.

(2 marks)

6) a) Define the following terms.

- i) Heat. **(1 mark)**
- ii) Temperature. **(1 mark)**
- iii) Thermometer. **(1 mark)**
- b) Give the lower and upper fixed points of the Celsius scale. **(2 marks)**
- 7) a)** If two different samples of the same liquid have different mass and same temperature, do they still have the same density? Explain. **(2 marks)**
- b) Differentiate between fundamental physical quantity and derived physical quantity. **(2 marks)**
- 8) a)** Explain why a person travelling in a bus found himself kicking forward when the bus stopped abruptly. **(2 marks)**
- b) Does the Newton's third law of motion work for objects in motion or for objects at rest? Explain your answer. **(2 marks)**
- 9) a) i)** Give an example of case in which kinetic energy is converted into potential energy. **(1 mark)**
- ii) Explain your answer to the sub question a) i). **(2 marks)**
- b) Why do we need to conserve energy? **(2 marks)**
- 10) You have three magnets whose poles are respectively A and B for the first, C and D for the second and E and F for the third.**
- a) Copy and fill the following table

	C	D	E	F
A	Attracts			
B				Repels

(3 marks)

b) If pole A is a south pole, determine the poles C and F. **(2 marks)**

11) a) A ray of light is incident towards a plane mirror at an angle of 30-degrees with the mirror surface. Determine the following angles.

i) Angle of incidence. **(1 mark)**

ii) Angle between incident ray of light and reflected ray of light. **(2 marks)**

b) What is the angle of inclination between two plane mirrors when 19 images are formed? **(2 marks)**

12) Add geometrically the forces below and find the magnitude of the net force.

a) A 5 N and a 15 N forces are acting opposite to one another as shown



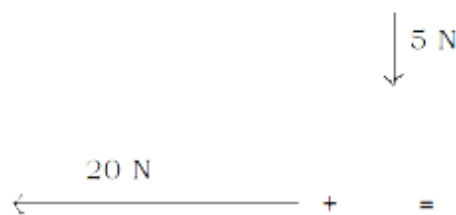
(2 marks)

b)



(1 mark)

c)



(2 marks)

13) You are provided with a battery, electric wires, insulated wire, steel

nail and magnetic material.

a) Design a well labelled diagram to show how the steel nail can be magnetized by electrical method. **(4 marks)**

b) Is the magnet made in a) permanent or temporary? Explain. **(2 marks)**

14) a) The diameter of the steel ball is measured using a micrometer screw gauge shown in the figure 1 below.

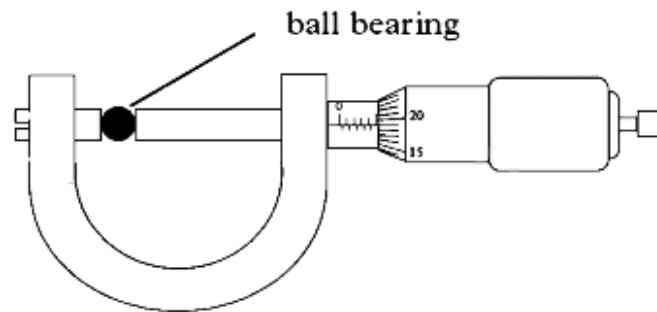


Figure 1

Main scale/sleeve scale is in mm.

Small division on thimble scale is 0.01 mm and there is no zero error.

Find the diameter of the ball being measured in figure 1. **(2 marks)**

b) The zero error of the Vernier calliper shown in figure 2 is 0.9 mm.

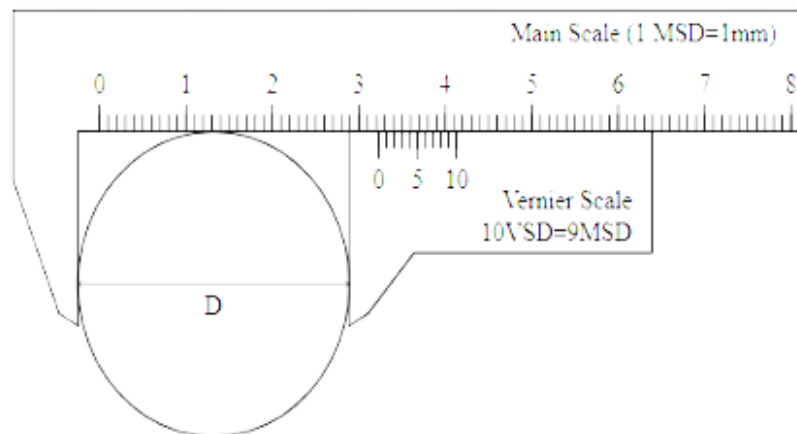


Figure 2
7

What is the diameter of the sphere being measured in figure 2? **(2 marks)**

15)a) What would happen if the gravitational force of the Sun suddenly vanishes/disappears? Develop your ideas in 8 lines maximum.

(2 marks)

b) If Newton's first law of motion holds true, why does a ball that is rolling on ground stop on its own? **(2 marks)**

SECTION B: ATTEMPT ANY THREE QUESTIONS (30 MARKS)

16) The figure 3 below represents the velocity-time graph of a body during a period of 25 s.

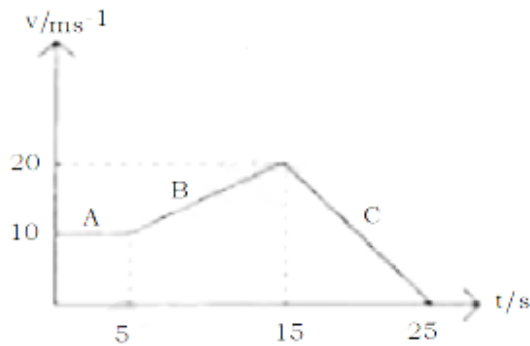


Figure 3

Analyze the above figure and then answer related questions

a) Provide the characteristics of the following stages of the motion

Stage	Initial velocity	Types of the motion
A		
B		
C		

(6 marks)

- b) From the motion represented by the figure 3, find
the displacement of the body in first 15 s. **(2 marks)**
- c) Calculate the displacement of the body during the stage C. **(2 marks)**
- 17) a) Explain energy transformation in the following devices.**
- i) Chargeable flashlight. **(2 marks)**
- ii) Television. **(2 marks)**
- b) A lift motor has to move a fully loaded lift 4 m between floors in 1.5 s.
The lift has a total mass of 1850 kg (ignore friction force).
Acceleration due to gravity $g = 10 \text{ m/s}^2$.
- i) Calculate the weight of the fully loaded lift. **(2 marks)**
- ii) The upward force in the cable when the lift is moving at a
constant speed is equal to the weight of the lift.
What is the work done by the motor? **(2 marks)**
- iii) What is the minimum power of the motor to raise the lift at a steady
speed? **(2 marks)**
- 18) a) i) What is matter? **(1 mark)****
- ii) What are the physical properties of liquid except the melting and
freezing points? **(2 marks)**
- b) Are the freezing and melting points of water the same?
Explain your answer. **(2 marks)**

c) Table of electrical resistivity and conductivity at 20°C and melting points of some materials are given below.

Materials	Electrical resistivity ρ ($\Omega \cdot m$) at 20 °C	Electrical conductivity σ (S/m) at 20 °C	Melting point/°C
Copper	1.68×10^{-8}	5.96×10^7	1084.60
Silver	1.59×10^{-8}	6.30×10^7	961.00
Gold	2.44×10^{-8}	4.10×10^7	1064.58

i) Which of the above metals is the best conductor of electricity?

Justify your answer.

(2 marks)

ii) Why is electrical wiring usually made of copper but not silver or gold?

(3 marks)

19) a) i) Identify the following measuring instrument (figure 4).

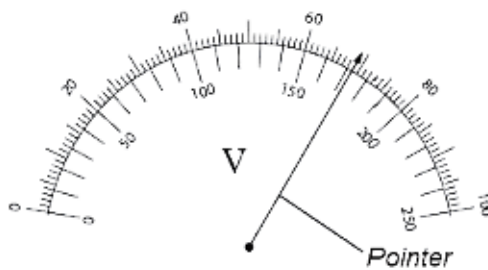


Figure 4

(1 mark)

ii) Determine the reading shown by the pointer if the range is:

▪ 0-250 mV.

(1 mark)

▪ 0-100 mV.

(1 mark)

iii) Are the above readings the same? Explain

(2 marks)

b) i) A 3kW immersion heater is used to heat water. Calculate the electrical energy converted into heat energy in 40 minutes **(3 marks)**

ii) If 750 μA is flowing through 11k Ω resistor, what is the voltage drop across the resistor? **(2 marks)**

20) a) With the help of labelled diagram, describe the formation of the total lunar eclipse. **(4 marks)**

b) Is Moon a luminous body?

If yes explain your answer

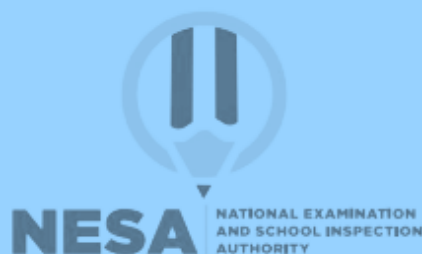
If no explain why it is visible during both day and night.

(2 marks)

c) i) What is a penumbral lunar eclipse? **(1 mark)**

ii) Does a lunar eclipse happen during the day or night? **(1 mark)**

iii) Is it possible to have a partial lunar eclipse? Explain. **(2 marks)**



END OF TERM III EXAMINATIONS

MARKING SCHEME OF S1 PHYSICS THEORY EXAM 2023

SECTION A: 70 MARKS

- 1)a) corresponds to iv) **(1mark)** b) corresponds to iii) **(1mark)**
c) corresponds to ii) **(1mark)** d) corresponds to i) **(1mark)**
- 2)a) i) **(1mark)** b) iv) **(1mark)** c) iii) **(1mark)** d) i) **(1mark)**
- 3) a) False **(1mark)** b) True**(1mark)** c) True **(1mark)** d) False **(1mark)**
e) False **(1mark)**
- 4) a) Wheel and axle **(1mark)** b) lever **(1mark)**
c) Screw **(1mark)** d) inclined plane **(1mark)** e) wedge **(1mark)**
- 5) a) A lightning arrester is a device or conductor used to protect tall buildings and towers against the destructive effect of lightning. **(1mark)**
b) Charging by friction **(1mark)** charging by induction) **(1mark)** and charging by contact
c) Like charges repel **(1mark)**and unlike charges attract each other.**(1 mark)**
- 6) a) i) Heat is a form of energy which passes from a body at high temperature to a body at low temperature. **(1mark)**
ii) Temperature is the degree of hotness or coldness of a body or a place. **(1mark)**
iii)Thermometer is an instrument used to measure the temperature. **(1mark)**

b) The lower and upper fixed points of the Celsius scale are 0°C **(1mark)** and 100°C **(1mark)**.

7) a) Yes, they will have the same density **(1mark)**. They will occupy different volumes so that the ratio of the mass to volume will remain constant for both cases. **(1mark)** If the mass doubles, the volume also will be double.

b)

Fundamental physical quantity	Derived physical quantity
Fundamental physical quantities are independent of any other physical quantity (1mark)	Derived quantities are those quantities which depends on the other quantities. (1mark) .
Fundamental units cannot be expressed in terms of derived units.	Derived units can be expressed in terms of fundamental units
Only seven fundamental units exist in metric system of SI units	There are a large number of derived units in metric system

8)a) The person kicks forward when the bus stops abruptly in trying to resist stopping due to inertia **(1mark)**. He wants to keep its state of motion. **(1 mark)**

b) The third law of motion states that for every action, there is an equal and opposite reaction **(1mark)**. This can be observed both in objects at rest and those that are accelerating**(1mark)**.

9)a) i)A ball thrown up into air**(1mark)** simple pendulum etc.

ii)As the ball leaves the hand, you have given it kinetic energy or upward velocity **(1 mark)**. As it goes up, it will slow down due to gravity (ignoring air resistance), kinetic energy decreases and the potential energy increases until the ball reaches its maximum height**(1mark)** and there it has minimum kinetic energy and maximum potential energy. In slowing down the total mechanical energy remains constant.

Note that the ball will fall down and the opposite will happen. Potential energy will decrease while kinetic energy will increase.

b) Reduce living expenses **(1mark)** or save money

Conserve natural resources **(1mark)** such as trees etc.

Create healthier living environment for people and animals.

Reduce air and water pollution.

Save energy and ensure that the affordable energy is available for future generations because some of the resources that people use to generate

electricity are finite for example coal, natural gas etc. Or

Conserving energy prolongs the existence of fossil fuels

10) a)

	C	D	E	F
A	Attracts	Repels	Repels	Attracts
		(0.5 marks)	(0.5 marks)	(0.5 marks)

B	Repels (0.5 marks)	Attracts (0.5 marks)	Attracts (0.5 marks)	Repels
---	------------------------------	--------------------------------	--------------------------------	--------

b) Pole C is north pole **(1mark)** Pole F is north pole **(1mark)**

11) a) i) Angle of incidence : $90^\circ - 30^\circ = 60^\circ$ (1mark)

ii) Angle of reflection is 60° **(1mark)** so the angle between the incident ray of light and reflected ray of light is $60^\circ + 60^\circ = 120^\circ$ **(1 mark)**

b) The number of images is given by $n = \frac{360^\circ}{\theta} - 1$ **(1mark)**

$$\theta = \frac{360^\circ}{(19+1)} = 18^\circ \text{ (1mark)}$$

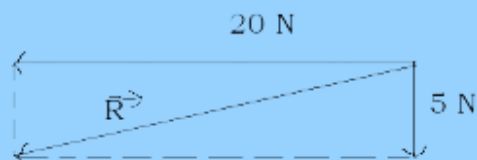
12)a) Magnitude 10 N (1 mark)

Direction **1 mark**



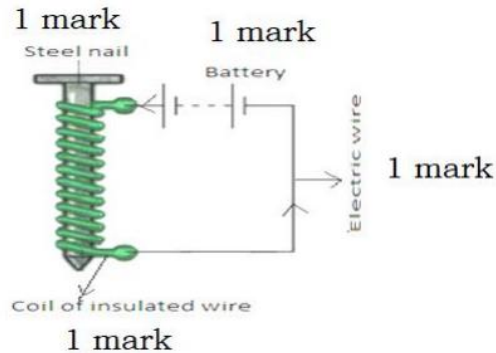
b) 0 N **(1mark)** The net force is zero

c) Direction **(1 mark)**



Magnitude of the net force $R = \sqrt{20^2 + 5^2} = 20.61 \text{ N}$ **(1mark)**

13) a) Design



- b) Temporary(**1mark**) because if the electric circuit is open, the nail will no longer attract magnetic materials. (**1mark**)

14) a) Main scale reading/sleeve reading =5.0 mm (0.5 marks)

Head scale coincidence/thimble reading =19 divisions (**0.5 marks**)

Head scale reading =19 x 0.01 =0.19 mm(**0.5 marks**)

The diameter of the ball bearing =5.0 mm+0.19 mm=5.19 mm(**0.5 marks**)

b) Main scale reading: 3.2 cm (**0.5 marks**) (Immediate left of zero of the vernier scale)

Vernier scale reading: 0.03 cm (**0.5 marks**) (Alignment of scale lines from main scale and vernier scale)

Correct reading =obtained reading - zero error

The diameter D=3.2 cm +0.03 cm -0.09 cm = 3.14 cm (**1 mark**)

15) a) The gravitational force is the universal force of attraction, which is acting between objects. (0.5 marks). If the gravitational force of the Sun suddenly vanishes, Planets including the Earth will not be able to orbit around the Sun (0.5 marks). They may collide each other (0.5 marks) or may move away from the Solar system (0.5 marks).

Earth will not be able to receive light from the Sun. Life on

the Earth may be hard, Earth's environment, atmosphere and season will change etc.

b) Newton's first law of motion states that an object at rest remains at rest, if in motion, remains in motion at a constant velocity unless acted on by a net external force**(1 mark)**. The rolling ball stops on its own because of the friction force over the surface of the ground which opposes the motion and brings down its motion **(1 mark)**

SECTION B: 30 MARKS

16) a)

Stage	Initial velocity	Types of the motion
A	10 m/s (1 mark)	Uniform rectilinear motion (1 mark)
B	10 m/s (1 mark)	Uniformly accelerated rectilinear motion (1 mark)
C	20 m/s (1 mark)	Uniformly decelerated rectilinear motion (1 mark)

b) The displacement $d = d_1 + d_2$

$$= 10 \times 5 \text{ m} + \frac{10(10+20)}{2} \text{ m} \text{ (1 mark)}$$

$$= 50 \text{ m} + 150 \text{ m} = 200 \text{ m} \text{ (1 mark)}$$

Or stage A: $d_1 = vt$

$$= 10 \text{ m/s} \times 5 \text{ s} = 50 \text{ m}$$

Stage B: acceleration $a_1 = \frac{\Delta v}{\Delta t}$

$$= \frac{20-10}{15-10} m/s^2 = 1 m/s^2$$

The displacement $d_2 = ut + \frac{1}{2}at^2$

$$= 10 \times 10 m + 0.5 \times 1 \times 10^2 m = 150 m$$

$$d = 150 m + 50 m = 200 m$$

c) $d_3 = \frac{1}{2}(25 - 15) \times 20$ **(1 mark)**

$$= 100 m$$
 (1 mark)

Stage C: deceleration $a_2 = \frac{0-20}{25-15} m/s^2 = -2 m/s^2$

$$d_3 = ut + \frac{1}{2}at^2$$

$$= 20 \times 10 m - 0.5 \times 2 \times 10^2 m = 100 m$$

17) a) Any two elements of energy transformation

i) Electrical energy - chemical energy **(1 mark)** light energy **(1 mark)** -heat energy.

ii) Electrical energy-light energy **(1 mark)**- -sound energy **(1 mark)**

b)i) The weight of loaded lift $W = mg$ **(1 mark)**

$$= 1\ 850 \times 10 = 18\ 500 N$$
 (1 mark)

ii) At constant speed, forces must be balanced.

Upward force = downward force (weight)

Upward force = 18 500N

Work done $W_d = F \times d$ **(1 mark)** = 18 500 x 4 J = 74 000 J **(1 mark)**

iii) Steady speed means forces are balanced.

$$\text{Power} = W_d / t \text{ (1mark)} = 7400 : 1.5 \text{ W} = 493.33 \text{ W (1mark)}$$

18) a) i) Matter is anything that takes up space (has volume) **0.5 marks** and can be weighed (has mass) **0.5 marks**.

ii) Viscosity **(1mark)** boiling point **(1mark)** capillary action, surface tension, definite volume, indefinite shape, density.

b) Freezing occurs at the same temperature as melting, hence, the melting point and freezing point of a substance are the same temperature **(1mark)**. The melting/freezing point of a substance is defined as the temperature above which, the substance is liquid and below which, it is solid **(1mark)**. Or The Freezing point is the temperature of a liquid at which it changes its state from liquid to solid at atmospheric pressure. The melting point of a substance is the temperature at which the substance changes from a solid to a liquid.

c) i) The best conductor of electric charges out of these metals is silver **(1mark)** it has the greatest electrical conductivity. Electrical conductivity means the ability of material to conduct electricity. More easily the electric current flows, more will be the electrical conductivity **(1mark)**.

Or Silver has the lowest electrical resistivity. Electrical conductivity (or specific conductance) is the reciprocal of electrical resistivity. It represents a material's ability to conduct electric current.

ii) Gold is a precious metal (very expensive) and has the lowest electrical

conductivity **(1mark)** Silver is a precious metal and it has higher electrical conductivity than copper but it is an expensive metal compared to copper**(1mark)**. Copper has become the universal standard in wires and cabling because of its good conductivity, thermal resistance (high melting point compared to silver and gold) **(1mark)** affordability (cheapest metal), ductility, malleability.

19) a)i)Voltmeter (1mark)

ii)Range 0-250 mV : Reading is 172.5mV (**1mark**). Accept any value slightly different such as 172 mV.

Range 0- 100 mV : Reading is 69.0 mV **(1 mark)**

iii)They are the same**(1mark)** because the voltmeter was used to measure a given potential difference **(1mark) or**

Range0- 250 mV, the reading is 172.5 mV

Range 0-1 mV gives 172.5 mV /250 mV

Range 0-100 mV gives (172.5 mV /250 mV)x100 mV =68.96 mV

b) i) $t=40 \text{ min} =40 \times 60 \text{ s}=2400 \text{ s}$ **(1mark)**

Electrical energy $E=Pt$ **(1mark)** $E= 3\text{kW} \times 2400 \text{ s}= 7\ 200 \text{ kJ}$ **(1mark)**

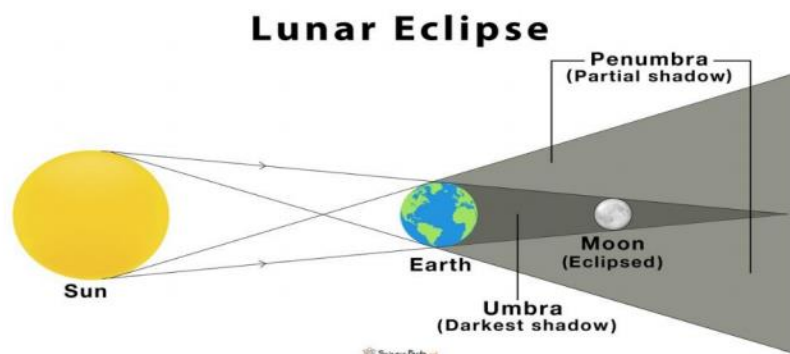
ii) The voltage across the resistor $V=RI$ **(1mark)**

$=750 \times 10^{-6} \times 11 \times 10^3 \text{ V}=8.25 \text{ V}$ **(1mark)**

20) a) Figure shows setup to demonstrate total lunar eclipse's formation.

Rays of light from the Sun: **0.5 marks** Position of the Moon **(1mark)**

Position of the Earth :**0.5 marks**



A total lunar eclipse occurs when the Earth aligns between the Sun and the Moon **(1mark)** and covers the moon entirely with its shadow **(1mark)**

Note that during a total lunar eclipse, the fully-eclipsed Moon appears reddish and is thus also called a blood Moon.

b) Moon is non luminous object **(1mark)** as it does not produce its own light. We can see the Moon during the day for the same reason we see the moon at night. The surface of the moon is reflecting the sun's light into our eyes**(1mark)**

c) During this phenomenon, the Earth blocks some amount of solar light from directly reaching the moon's surface by covering all or part of the Moon with the outer part of its shadow. This partially dark part of the shadow is called the penumbra. **(1mark)**

ii) Lunar eclipse happens during night **(1mark)**

iii) Yes **(1mark)** As its name might imply, a partial lunar eclipse occurs when the Sun, Earth and Moon aren't exactly aligned, so only part of the Moon passes into Earth's umbral shadow and thus only part of it appears red**(1mark)**

**ALTERNATIVE TO PHYSICS
PRACTICAL**

Date: 27/June /2023

Period: 8:30 am -10:00 am



END OF TERM III EXAMINATIONS

GRADE : S 1
COMBINATION : O'LEVEL
DURATION: 1 H 30 MIN
MARKS:

..... /20

INSTRUCTIONS

This paper is composed of **ONE** compulsory question

Non programmable calculator and set of mathematical instruments may be used.

Use only a blue or black pen.

Use pencil for drawing.

ATTEMPT ALL QUESTIONS (20 MARKS)

In experiment to investigate the change in velocity of a moving body with respect to time, the following table of results was obtained.

Table of results

Time/s	Velocity/ms ⁻¹
5	20
10	30
15	40
20	50
25	50
30	60
40	70

Questions

- a) State any two laboratory safety rules. **(2 marks)**
- b) Identify the
- i) measuring instrument used to determine the time. **(1 mark)**
 - ii) dependent variable. **(1 mark)**
 - iii) independent variable. **(1 mark)**
- c) Plot the graph of the velocity (y-axis) against time (x-axis). **(9 marks)**
- d) i) Use your graph to estimate the initial velocity of the moving body. **(2 marks)**
- ii) Put the letter A on any part of the graph where the velocity is constant. **(1 mark)**
 - iii) For how long is the velocity constant? **(1 mark)**
- e) Is the motion of the body uniformly rectilinear accelerated?
Justify your answer. **(2 marks)**



END OF TERM III EXAMINATIONS

MARKING GUIDE OF S1 ALTERNATIVE TO PHYSICS PRACTICAL EXA 2023

ATTEMPT ALL QUESTIONS (20 MARKS)

a) Never smell or taste chemicals **(1mark)**

Do not pipette by mouth **(1mark)**

Do not chew gum, drink, or eat while working in the lab

Always work in properly-ventilated areas.

Etc.

b) i) Stop clock **(1mark)** pendulum clock, quartz clock etc.

ii) velocity **(1 mark)**

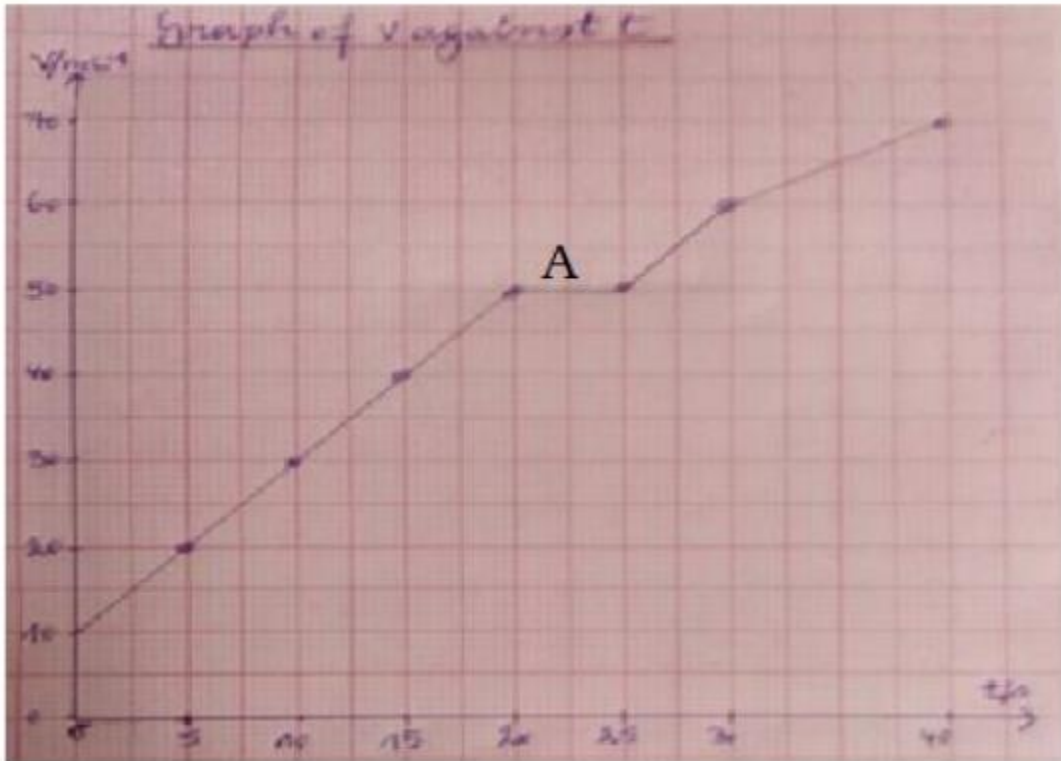
iii) time **(1mark)**

c) Two well labelled axes : 1 markx2 = **2 marks**

Two uniform scales 1 markx2 = **2 marks**

Any six plotted points 0.5 marks x6 = **3 marks**

Graph including 4 stages: 0.5 marks x2 = **2 marks**



- d)i) Initial velocity: y-intercept $v_0=10$ m/s (value :**(1 mark)**, unit (**1 mark**)
- ii) See the graph (**1mark**)
- iii)The speed is constant for 5 s.**(1mark)**
- e) No**(1mark)** the acceleration is not constant from 0s to 40 s**(1mark)**

END