535/2

PHYSICS THEORY

PAPER 2

July/August 2023

2 ½HRS

KANUNGU DISTRICT JOINT MOCK EXAMINATIONS

UGANDA CERTIFICATE OF EDUCATION

PHYSICS

PAPER 2

2HOURS 30MINUTES

INSTRUCTIONS

Attempt only five questions.

Any additional question(s) answered will not be marked.

Assume the following were necessary:

Acceleration due to gravity	$=10ms^{-2}$
Specific heat capacity of water	$=4200Jkg^{-1}k^{-1}$
Specific latent heat of vaporization of water	$=2260000Jkg^{-1}$
Specific latent heat of fusion of water	$=340,000Jkg^{-1}$
Speed of sound in air	$=330ms^{-1}$
Density of water	$=1000kgm^{-3}$

1. (a) (i). Name the state of matter that do not have a definite shape. (1mark)

   (ii). Give any two differences between the state of matter mentioned in a(i) above. (2marks)

   (b) (i). Distinguish between diffusion and capillarity. (2marks)

   (ii) Describe an experiment to demonstrate diffusion in gasses. (4marks)

   (iii). State any three advantages of capillarity in our daily lives. (2marks)

   (c)(i). A body weighs 12kg on earth. Determine its weight when on a planet whose acceleration due to gravity is $8ms^{-2}$. (3marks)

   (ii). Explain why weight varies with altitude. (2marks)

2. (a) state the newton's laws of motion. (3marks)

   (b) a body accelerates from rest to $5ms^{-1}$ in 2seconds. It then maintains this speed for 4seconds after which it decelerates to rest in 3seconds.

   i) Sketch the velocity-time graph of the motion. (4marks)
   ii) Use the graph to determine the total distance covered. (3marks)
   iii) Use the same graph to find the body's displacement from its original position. (2marks)

   (c) Describe the working of a rocket engine. (4marks)

3. (i) state materials used to produce concrete. (2marks)

   (ii) state any four advantages of concrete as a construction material. (2marks)

   (iii) glass is one of the roofing materials in Uganda. Give any four advantages of using glass to roof a house. (2marks)

   (b) (i) state the hooks law of elasticity. (1mrk)

   (ii) describe an experiment to determine the force constant of an elastic material. (5marks)

   (c) amass of 5kg extends rubber by 2cm. Determine;

   i) The force constant of the rubber. (2marks)
   ii) Extension caused by 3kg mass on the same rubber. (2marks)

4. (a) (i) Define the term fundamental interval as applied to thermometer (1mark)

   (ii) Briefly describe the steps taken to calibrate a thermometer.

   (b) When making a thermometer, water is not used as a thermometric liquid. Give any four reasons for this? (2marks)

   (c) (i) state pressure law. (1mrk)

(ii) Describe an experiment to verify the pressure law. (5marks)

(d) A gas at 0^0C occupies 250cm^3 when its pressure is 800mmHg. What volume will the same gas occupy at s.t.p. (3marks)

5. (a) (i) Distinguish between conductor and insulator as applied to electrostatics. (2marks)

(ii) state the law of electrostatics. (1mark)

(b) Describe how a body can be charged positively by induction.

(c)Explain how a lightening conductor safe guards a house against lightening. (5marks)

(d) Sketch the electric field pattern for the following;

i) Two negative charges close to each other. (2marks)
ii) Two opposite charges close to each other. (1mark)

6. (a) Define the following terms as applied to wave motion.
i) Wave length (1mark)
ii) Wave velocity (1mark)

(b) A wave of frequency (f) and velocity length (λ) travel from one point to another. Show that its velocity (V) is given by $V=\lambda f$ (3marks)

(c) Distinguish between mechanical and electromagnetic waves. (2marks)

(d) State the effect of observing the following.

i) When sound waves undergo constructive interference. (1mark)
ii) When light waves undergo constructive interference. (1mark)

(e) (i) What is sound? (1mark)

(ii) State any two properties of sound waves. (1mark)

(iii) Describe an experiment to verify the law of reflection of sound. (5marks)

7. (a) State the law of refraction. (2marks)

(b) Determine the power of a lens of focal length 20cm (2marks)

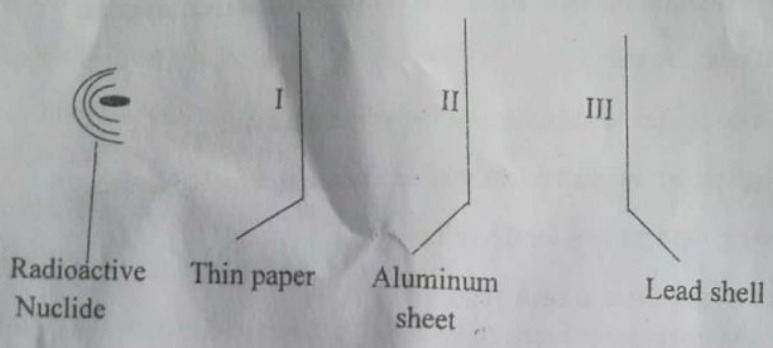
(c) (i) What is meant by the term dispersion (1mark)

(ii) Describe using a diagram, how dispersion in a glass prism forms a spectrum. (5marks)

(iii) Using a ray diagram, describe how long sightedness can be corrected. (4marks)

8. (a) Define the following terms as used in physics.
   i) Atomic mass (1mark)
   ii) Isotopes (1mark)

   b) The figure below shows a radioactive nuclide placed in the lead box.



   i) Identify the radiation /emission(s) in region I (1mark)
   ii) Identify the radiation/ emission in region II (1mark)

   (iii) Outline any three differences between emissions in region II. (3marks)

   c) Describe an experiment to distinguish between radioactive emissions using a gold leaf electroscope. (5marks)

   d) Explain why?

   i) Alpha particles are least deflected in an electric field. (2marks)
   ii) Isotopes cannot be separated by chemical means. (2marks)

END

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KANUNGU DISTRICT JOINT MOCK EXAMINATION

UCE 2023 MARKING GUIDE

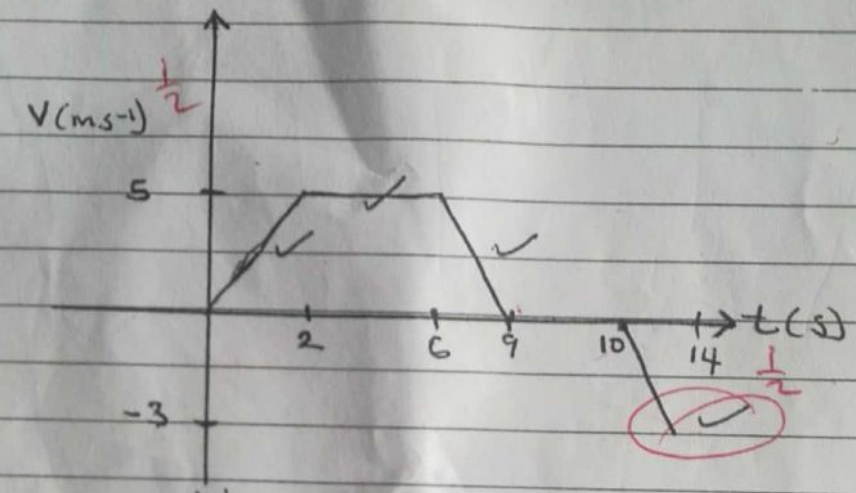
PHYSICS PAPER 2. 553/2

ANSWERS

		MARK
1 (a) (i)	Liquids ✓ and gases ✓ ~~plasma~~ MARK ⓪	01
(ii)	Liquid: - Molecules are close ✓ ~~- take shape of container~~ - Incompressible - rate of diffusion is low	Gases: molecules are far apart ✓ No shape compressible ✓ rate of diffusion is very high ✓ 02
(b) (i)	• Diffusion is the movement of molecules from high concentration areas to low concentration areas while • capillarity is the rise or fall of a liquid in the narrow tube ✓	02
(ii)	• Coloured gas is put in a transparent beaker • Another beaker is inverted on it • After sometime coloured gas spreads and fills ✓ the inverted beaker	04
(iii)	- Drying objects using towels ✓ - Fuel moving in a lamp wick ✓ - water moving up a plant from soil - Drainage of tears from the eyes lacrimal ducts	03
(c) (i)	W = mg ✓ = 12 x 8 ✓ = 96 N ✓	02 ~~03~~
(ii)	As ~~latitude~~ altitude increases, acceleration due to gravity reduces ✓ since W varies with g, weight reduces. ✓	02

2a) • Everybody remains at rest or uniform motion in a straight line unless acted upon by an external force. ✓
• The rate of change of momentum is proportional to force applied and acts in the direction of the force ✓
• For every action, there is an equal but opposite reaction ✓ 03

b(i)



04

Total distance = Area under the curve
formula (1) = ½(9+4)*5 + ½×4×3 ✓
= 32.5m + 6 ✓
= 38.5m ✓ 03
Award
(Note: ~~Allow~~ all marks whichever method used)

ii) Total displacement = ½×5(9+4) − ½×4×3 ✓
= 32.5m − 6
= 26.5m ✓ 02

c. • Fuel is burnt with oxygen ✓
• High speed gases are produced ✓
• The hot gases are expelled through the exhaust ✓
• They exert equal but opposite momentum on the rocket, hence forward motion of the rocket. ✓ 04

opposite force

3a(i) sand ✓, cement ✓, gravel ✗, small stones ✗, water ✗ 02

(ii)
- Durable ✗
- weather resistant ✗
- strong under tension ✗
- fire resistant ✗
- sound proof
- Any advantage of concrete

02

(ii)
- It is cheap ✗
- Poor conductor of heat ✗
- readily available ✗ → Transparent.
- Easy to use ✗
- Any advantage of glass

02

b(i) Extension of an elastic material is proportional to force applied provided the elastic limit is not exceeded. ✓ 01

(ii)
- spring with a pointer is suspended on stand with a ruler ✓
- Initial pointer position is noted ✗
- Mass is suspended on the spring ✗
- final pointer position is noted ✗
- Extension is calculated ✗
- Procedure is repeated for different masses ✓
- Results obtained are tabulated ✗
- A graph of mass against extension is plotted ✗
- Slope of the graph is determined ✗
- slope equals constant ✗

05

c(ii) $k = \frac{F}{e}$ ✓ $= \frac{5 \times 10}{0.02}$ ✓ $= 2500\ Nm^{-1}$ ✓ ✗ 02

(ii) $e = \frac{F}{k}$ ✓ $= \frac{3 \times 10}{2500}$ ✓ $= 0.012\ m$ ✓ ✗ 02

4(a)(i) Fundamental interval is the difference between the upper and lower fixed points

(ii)
- Upper fixed point is determined ✓
- Lower fixed point is determined ✓
- Fundamental interval is then found ✓
- The fundamental interval is divided into 100 equal divisions and each division is 1°C ✓

04

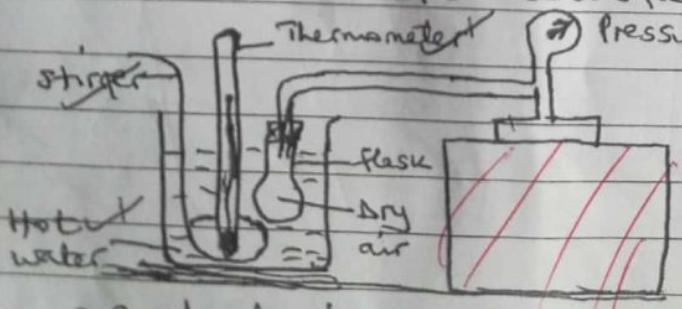
(b)
- Water is colourless, not easy to read ✗
- water has high heat capacity ✓
- water expands abnormally ✓
- water sticks on glass ✓

02

(c)(i) Pressure law states that the Pressure of a fixed mass of ~~a~~ gas is directly Proportional to its absolute temperature Provided volume is kept constant. ✓

01

(ii)



- enclosed air is Put in a water bath ✓
- Initial temperature, T and Pressure P are noted ✗
- water is heated
- Procedure is repeated for different temperatures ✗
- Table of results made ✓
- Graph of P against T is Plotted ✓
- its a straight line graph hence Pressure law ✓

05

(d) $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$ ✓ $V_2 = \frac{P_1V_1T_2}{T_1P_2} = \frac{800 \times 250 \times 273}{273 \times 760} = \frac{263.2}{cm^3}$

03

PAGE NO: / /

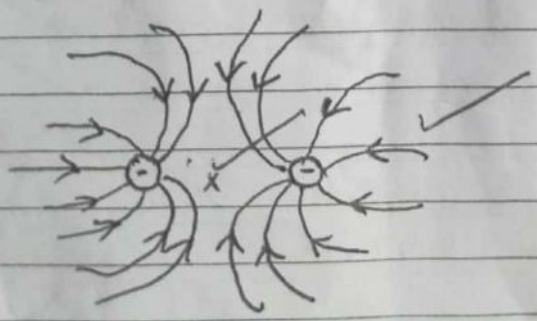
5 (a) (i) A conductor allows electrons to flow easily ✓
An insulator do not allow electrons to flow ✓

(ii) Like charges repel ✓
Unlike charges attract ✓

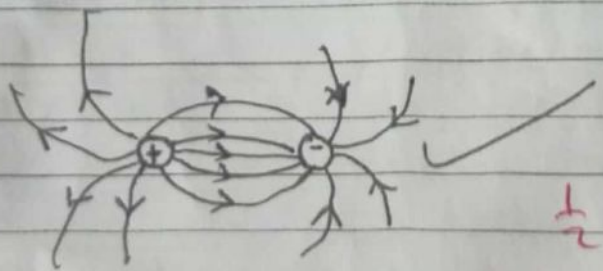
(b)
- Body is placed on an insulating stand ✓
- Negative inducing rod is placed close to the body ✓
- The body is then earthed ✓
- With rod in position, earthing is removed ✓
- Inducing rod is then removed and the body becomes positively charged. ✓ 05

(c)
- Negatively charged cloud passes over the spikes ✓
- It induces a positive charge on the spikes ✓
- A strong field is created around the spikes
- The field ionises air around ✓
- Positive charges are repelled to the cloud thus neutralizing it. ✓
- Negative charges are attracted to the spikes, harmlessly discharge (flows to) it to the ground. ✓ 05

(d)



02



$\frac{1}{2}$ $\frac{1}{2}$. 01 03

6 a(i) wavelength is the distance between two successive wave particles in a phase ✓
Consecutive ✓

(ii) wave velocity is the distance covered by the wave per second (unit time). ✓ 01

(b) Distance covered = λ
Time taken $t = T$ } for one wave cycle ✓

$$V = \frac{\text{distance}}{\text{time}} = \frac{\lambda}{T} \checkmark$$

But $T = \frac{1}{f}$ ✗

$$V = \frac{\lambda}{\frac{1}{f}} \checkmark$$

$$V = f\lambda \checkmark \checkmark \quad 03$$

(c) Mechanical is Produced by vibration of Particles of the medium ✓
Electromagnetic is Produced by vibrations of magnetic and electric sparks ✓ 02

d(i) Loud sound is heard ✓ 01

(ii) Bright light is obtained ✓ 01

e(i) Sound is a form of energy Produced by vibrating objects ✓ 01

~~(ii)~~ →

(iii) • It is mechanical ✓ 01
• It is longitudinal ✓ 01
- reflected, refracted, diffracted, interference

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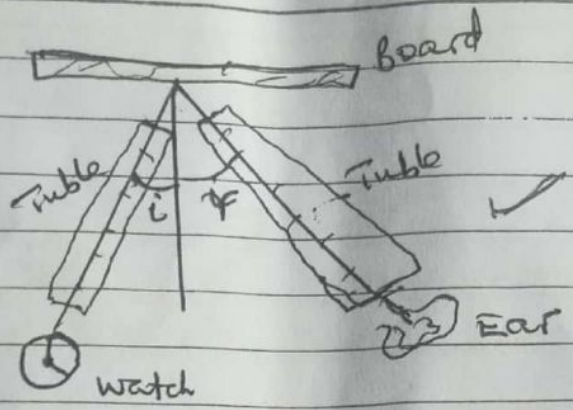
(iii)



- The apparatus is set up as shown above
- The watch ticks
- The ear is moved to detect maximum sound intensity
- The position is noted and angles i and r are measured and recorded
- It is found that $\angle i = \angle r$ 05

7a) - The incident ray, the refracted ray and the normal at the point of incidence all lie in the same plane
- Ratio of sine of angle of incidence to sine of angle of refraction is constant for agiven pair of media 02

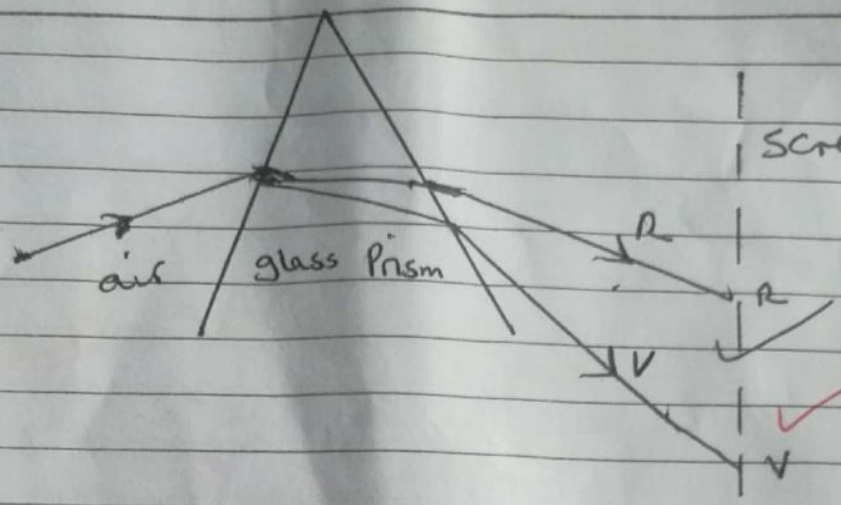
b) $\text{Power} = \frac{1}{f(m)}$

$= \frac{1}{0.2}$

$= 5$ Diopters. 02

c(i) Dispersion is separation of white light into its constituent colours. 01

c(ii)



+01 max

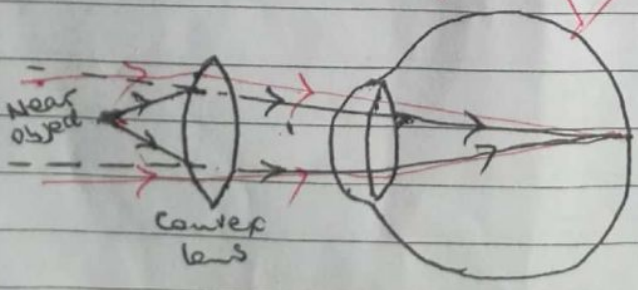
- White light is made of many colours 01b
- Colours move at different speed in glass
- Glass has different refractive indices for the different colours
- Different colours are deviated differently
- Red is least and Violet most deviated 02

d(i)

Eye	Camera
- Biological	Artificial ✓
- Focal length varies	Focal length is fixed ✓ 01
- Image distance fixed	Image distance varies

Not done

(ii)



- convex lens is put near the eye ✓
- Rays from near object are made parallel ✓
- The rays are converged at the retina ✓ 04 (01)

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8 (i) Atomic mass is the total number of neutrons and Protons ✓ 01

(ii) ~~Ato~~ Isotopes are atoms of the same element with same atomic number but different mass number ✓ 01

Accept:
atoms of similar Proton number but different neutron number ✓

(b) (i) I, Alpha, Beta, Gamma ✓ 01

(ii) Beta, Gamma ✓ 01

(iii)

- Negatively charged	Neutral ✓
- Less Penetrating	more Penetrating ✓
- More ionizing	less ionizing ✓
- deflected by electric and magnetic field	Cannot be deflected

02

(c) • Gold leaf electroscope is charged ✓
• Radiations are directed to the cap ✓
• If the leaf rises, then radiations are same charge as that on the Gold leaf ✓
• If the leaf falls, then are opposite charge ✓
• If no change in leaf, radiations have no charge ✓

(d) (i) Alpha Particles are massive. Hence less deviated ✓ 01

(ii) Isotopes have similar chemical properties, hence react same way. 01

-END-