NAME ______________________________________ INDEX NO. _____________________

CANDIDATES SIGNATURE __________

DATE ____________________________

232/1
PHYSICS
PAPER 1
(THEORY)
JULY/AUGUST 2011
2 HOURS

NZAUI/MUKAA FORM 4 CLUSTER EXAMINATIONS 2011
Kenya Certificate of Secondary Education
PHYSICS
PAPER 1
THEORY
2 HOURS

INSTRUCTIONS TO CANDIDATES

a) Write your name and index number in the spaces provided above
b) Sign and write the date of examination in the spaces provided above
c) This paper consists of TWO sections A and B
d) Answer ALL the questions in section A and B in the spaces provided
e) All working MUST be clearly shown
f) KNEC mathematical tables and non-programmable silent electronic calculators may be used

For Examiner's use only

Section	Questions	Maximum score	Candidate's score
A	1 – 14	25	
B	15 16 17 18 19	09 11 11 12 12	
	Total score	80	

This paper consists of 13 printed pages

Turn over

SECTION A (25MARKS)

1. The micrometer screw gauge represented by the figure1. below has a thimble scale of 50 divisions

0 5 30 20 Fig 1

What is the reading shown? (1mk)

2. Why are gases more easily compressed than liquids or solids (1mk)

3. The figure 2 below show a thermoscope. Flask P is a glass painted black and flask Q is a clear transparent glass. Both are connected by a U– tube containing coloured water. They are placed inside a room at room temperature and the water levels are same at the limbs

P Q Water Fig 2

If the thermoscope is placed outside under sunny weather

(a) State what is observed 1mk

(b) Briefly explain your observation 1mk

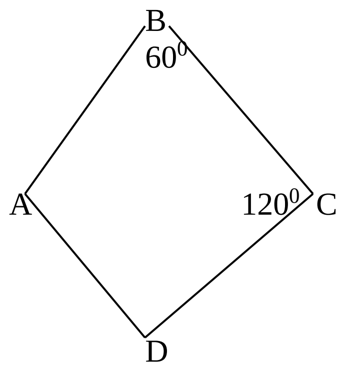
4. The ball race (ball bearings) are used in bicycle to reduce friction

(a) Give reason why ball bearings are made of hard steel 1mk

(b) Why the ball bearings are greased

5. Two blocks of ice are pressed against one another and the pressing force withdrawn. State why the blocks join as one mass 2mks

6. The figure show a thin quadrilateral plate in form of a rhombus (Not drawn to scale)



If it is cut across AC where the line bisect the angle A, locate the centre of gravity of lamina ABC 1mk

7. The figure 5 below shows the cross section of an aerofoil, with the aeroplane moving in the direction shown

Fig 5

Explain how dynamic lift of the aeroplane is caused by the aerofoil 2mks

8. Fig 3 below show an hydrometer
Air bulb Lead shots Fig 3

(a) What is the purpose of lead shots

(b) What is the use of air bulb

9. Other than defining relative density of a substance as the density of the substance divide by density of water, state the other alternative for the same definition 1mk

10. A car of mass 1050kg moves round a circular track of radius 900 metres at a constant speed of 10m/s. What is the centripetal force acting on the car. 3mks

11. In the figure 6 below state what is observed when the card is pulled horizontally very fast in the direction shown 1mk

Coin Card Bottle Fig. 6

12. State the SI unit of moment of a force 1mk

13. Figure A and B shows two capillary tubes inserted in mercury and water respectively

A B Fig. 7

Explain the difference in the levels of mercury and water in the capillary tubes 2mks

14. A block and tackle has three pulleys in both upper and lower blocks. A load of 60N is balanced by an effort of 20N. Determine the efficiency of the system

SECTION B (55 MARKS)

15. (a) State Hooke's law 1mk

(b) The figure 8. Below (not drawn to scale is a diagram representing similar springs which obey Hooke's law

(i) (ii) (iii) 14cm X 16cm 0.2N 0.45N 0.3N (i) (ii) (iii)

Determine X 4mks

(c) Sketch a graph of extension (e) against force (X-axis) of a rubber upto and beyond elastic limit 2mks

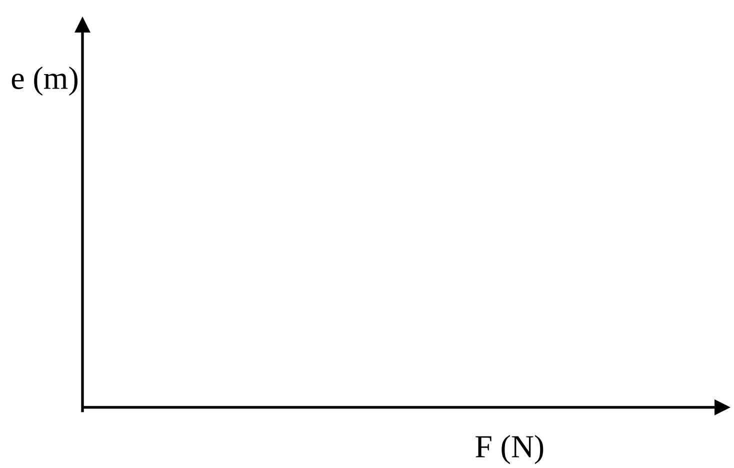


Fig. 9

(d) State the meaning of the gradient in (c) above 1mk

(e) On the same axis in (c) above, sketch the extension (c) against force of a rubber harder than in (c) 1mk

16. (a) State the Archimedes principle 1mk

(b) A test tube of mass 8g, length 10cm and uniform cross-section area of $2.5cm^2$ is partly filled with sand and floats vertically in water with 6cm of its length submerged as shown in figure 10.

Fig 10 Sand Water

Calculate

(i) The volume of water displaced 2mks

(ii) The mass of water displaced 2mks

(iii) The combined mass of the test tube and sand 1mk

(iv) The mass of sand 2mks

(v) The length of the test tube that would be submerged in a liquid of density $1.2g/cm^3$ 3mks

17. (a) The figure 11 (i) and (ii) shows a section of a tape pulled through a ticker timer of frequency 50H_2.

Fig 11(i) 5cm

(i) Determine the velocity of the body in cm/s for the tape in figure II (i) above 3mks

Fig. 11 (ii)
1cm 3cm

(ii) Find the acceleration of the body in cm/s^2 for the tape represented above in fig 11(ii) 4mks

(b) A car of mass 1200kg is traveling at 20m/s and is brought to rest in 10s
Determine
(i) The acceleration a 2mks

(ii) The average retarding force 2mks

18. The pressure of the liquid column XY in the figure 12 below supports the mass M on the piston

X Y 0.5m M Piston Liquid Fig. 12

(a) If the density of the liquid is $800kg/m^3$, calculate the pressure of y 3mks

(b) What is

(i) The pressure 2mks

(ii) The force on the lower surface of the piston if its area is $0.12m^2$ 3mks

(c) Calculate the value of M 2mks

(d) State the effect on the value of M if

(i) Tube XY were wider but with same height of liquid 1mk

(ii) Water of density $1000kg/m^3$ replaced the liquid 1mk

19. (a) State Boyles law for an ideal gas 1mk

(b) The set-up in fig. 13 shows an arrangement to determine the relationship between temperature and pressure of a gas at constant volume

Thermometer Bandon gauge Glass tube water Dry air HEAT Fig. 13

Describe how the experiment is carried out and explain how the results obtained verify the law 5mks

(c) A gas occupies a volume of $200cm^3$ at 25^0C and pressure of $2.6x10^5$pa. Calculate the volume it would occupy if the temperature is reduced to 4^0C and at pressure of 2.2×10^5pa 3mks

(d) Air is trapped inside a glass tube by a thread of mercury 220mm long. When tube is held horizontally the length of the air column is 260mm

260mm 220mm 750mmHg

Assuming that the atmospheric pressure is 750mmHg and the temperature is constant. Calculate the length of the air column when the tube is vertical with open end down 3mks

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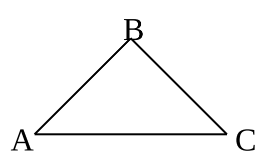
PAPER 1
THEORY
MARKING SCHEME

SECTION A

1. 5.50
   0 .23
   5.73mm√
2. Intermolecular distance in gases is larger than in liquids/solids√
3. (a) Coloured water under P mover down that under Q moves up√
   (b) Black surface absorb more heat therefore air under P expands more√
4. (a) To prevent wear√
   (b) To lubricate the rolling action√
5. Increased pressure on the ice make the ice molecules to melt down to water√
   The thermal energy used in melting is re-absorbed and the water freezes again so that the blocks join√
6. 60^0 60^0 60^0 c.o.g



NB/: The c.o.g should be at the centre of the equilateral triangle ABC

7. The air above the aerofoil moves faster√ than the air below. Pressure above is reduced√ or pressure below is higher hence the lift
8. (a) Keep the hydrometer up when it floats in a liquid√
   (b) Increase the volume of displaced fluid; which overcome the weight √of the sinker√
9. Mass of a substance divide by mass of equal volume (as that of the substance) of water√ or
   Weight of a substance divide by weight of equal volume (as that of the substance) of water√

This paper consists of 4 printed pages

10. F $= \frac{mv^2}{r}$; √

$= \frac{1050 \times (10)^2}{900}$;√

= 116.67N;√

11. The coin drops into the bottle as it resists change due to inertia√
12. Newton - metre√ (NM)
13. A: Cohesion force between mercury molecules is greater than adhesion force between mercury and glass molecules√

B: Adhesion force between water and glass molecules is greater than cohesion force between water molecules√

14. V.R = 6√

MA $= \frac{60}{20}$ = 3√

$\eta = \frac{3}{6} \times 100\%$
= 50% √

SECTION B

15. (a) The extension of a spring is directly proportional to the applied force provided the elastic limit is not exceeded√

(b) F = Ke√

$K = \frac{F}{e} = \frac{0.3 - 0.2}{.16 - 0.14}$

= 5 N/M√

$5 = \frac{0.45 - 0.20}{X - 0.14}$√

5x – 0.7 = 0.25

5x = 0.95

x = 0.18m

= 18cm√

(c)

(d) Change in length caused by a force of 1N√

(e) See on the diagram

16. (a) When a body is wholly or partially immersed in a fluid it experiences an upthrust equal to the weight of the fluid displaced

(b) (i) Volume = x – section area x length submerged;√

= 2.5 x 6

= 15.0cm^3;√

(ii) Mass of water displaces = volume x density
= 15.0 x 1.0;√
= 15g;√

(iii) Combined mass of test tube + sand = mass of water displaced
= 15g√

(iv) Mass of sand = mass of (sand + test tube) – mass of test tube
= 15g – 8g;√
= 7g;√

(v) Mass of liquid displaced = combined mass of test tube + sand

ρ x A x h = 15g;√

1.2 x 2.5 x h = 15

$h = \frac{15}{1.2 \times 2.5}$;√

= 5cm;√

17. (a) (i) $T = {}^{1}/_{50} = 0.02s$

Velocity = $\frac{\text{displacement}}{\text{Time}}$;√ = $\frac{5cm}{8 \times 0.02}$√

= 31.25cm/s; √

(ii) Initial average velocity = ${}^{1}/_{0.02}$ = 50cm/s;√

Final average velocity = ${}^{3}/_{0.02}$ = 150cm/s;√

Acceleration = $\frac{\text{final velocity} - \text{initial velocity}}{\text{Time}}$ or
= $\frac{150 - 50}{3 \times 0.02}$; √ $\frac{100}{0.06}$ } formular or substitution

= 1666.67 cm/s^2

(b) (i) $a = \frac{v - u}{t} = \frac{0.20}{10}$;√

= $-2m/s^2$√

(ii) f = ma√

= 1200 x (-2)

= -2400N;√

18. (a) P = ρ gh ;√

= 800 x 10 x 0.5;√

= 4000 N/m^2;√

(b) (i) Pressure at lower surface of piston = pressure at Y;√
= 4000N/m^2;√

(ii) Force = pressure x area;√

= P x A

= 4000 x 0.12;√

= 480N;√

(c) W = mg;√

M = w/g = $\frac{480}{10}$

= 48kg;√

(d) (i) No change √on value of M (cross-section area does not affect pressure)

(ii) Higher density results to higher pressure hence a bigger value of m√ is required to balance The liquid column

19. (a) The volume of a fixed mass of a gas is inversely proportional to its pressure provided temperature is kept constant

(b) Record the initial temperature of air using a thermometer and the corresponding pressure using a bourdon gauge;√

Heat the water, stop heating, record the temperature at intervals of say 10^0C, record also the corresponding pressure√

Repeat the experiment for various values of temperature and pressure.

Plot a graph of pressure against the temperature√

Graph obtained is straight line√ showing that as temperature increases, pressure increases√

(c) $P = 2.6 \times 10^5$ $P_1 = 2.2 \times 10^5$

$V = 200cm^2$ $V_1 = ?$

$T = 25 + 273 = 298K$ $T_1 = 4 + 273 = 277K$

$$\frac{PV}{T} = \frac{P_1V_1}{T_1}; \surd \quad \text{(formula)}$$

$$\frac{2.6 \times 10^5 \times 200}{298} = \frac{2.2 \times 10^5 \times V_1}{277}; \surd \text{ (substitution)}$$

$$V = \frac{2.6 \times 277}{2.2 \times 298} \times 200 = 219.71cm^2 \surd$$

(d) $PV = P_1V_1$

$P = 750 - 220$ $P_1 = 750mmHg$

$= 530mmHg;\surd$ $V_1 = 260mm$

$530 \times V = 750 \times 260;$ √ substitution

$$V = \frac{750 \times 260}{530}$$

$= 367.92mm;$ √

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PHYSICS
PAPER 2
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JULY/AUGUST 2011
2 HOURS

NZAUI/MUKAA FORM 4 CLUSTER EXAMINATIONS 2011
Kenya Certificate of Secondary Education
PHYSICS
PAPER 2
THEORY
2 HOURS

INSTRUCTIONS TO CANDIDATES

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b) Sign and write the date of examination in the spaces provided above
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d) Answer **ALL** the questions in section **A** and **B** in the spaces provided
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Section	Questions	Maximum score	Candidates score
A	1-14	25	
B	15	13	
	16	11	
	17	10	
	18	10	
	19	11	
	Total score	80	

This paper consists of 13 printed pages

Turn over

SECTION A (25MARKS)

Answer all the questions in this section in the spaces provided

1. Fig 1 below shows an image of an object O as seen by the eye in a plane mirror

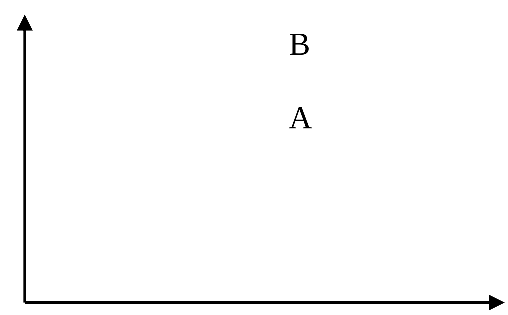
Fig 1 1 Mirror Eye

Complete the diagram by drawing suitable rays to show the position of the object (2mks)

2. State a precaution taken when charging a metal object (1mk)

3. The graph below shows the relationship between the attractive force of an electromagnet and the Magnetizing force. Use the domain theory to explain the curve (2mks)

Magnetizing current (A)



O

Attractive force (N)

4. Fig 2 below shows a waveform moving at 6.4 m/s

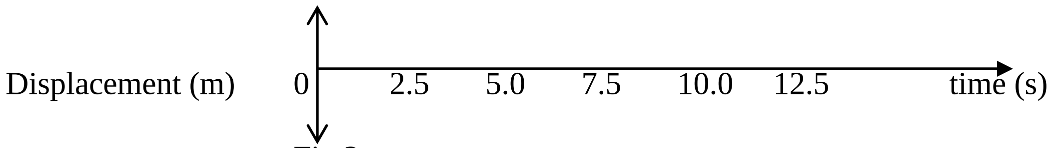


Fig 2

Determine the wavelength of the wave (3mks)

5. State one way of detecting ultraviolet radiation (1mk)

6. An electric immersion heater rated 240V, 3kw is to be connected to a 240V mains supply, using 10A fuse state whether the fuse is suitable or not (3mks)

7. Fig 3 below shows a windmill connected to the dome of a vandergraff generator

Fig 3 Vandergraff generator Candle flame

Explain why the flame is blown away as shown when brought close to the windmill (2mks)

8. What determines the quality of a musical note (1mk)

9. Fig 4 below shows a circuit of diodes

b_1 b_2 D_1 S_1 D_2 S_2 Fig 4

State what is observed when S_1 is closed and S_2 is open (1mk)

10. Give one advantage that a.c has over d.c (1mk)

11. Determine the ammeter reading when a p.d of 5.0V is applied across XY in Fig 5 below (3mks)

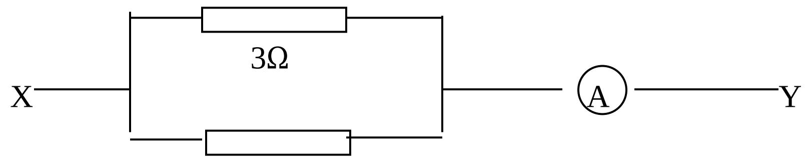


Fig 5

12. State how moving the camera away from the object affects the image formed by a pinhole camera (1mk)

13. Light travels through water of refractive index 1.3 with speed V. Calculate the value of V. (speed of light in air is 3.0×10^8 m/s) (2mks)

14. Fig 6 below shows three capacitors in a circuit

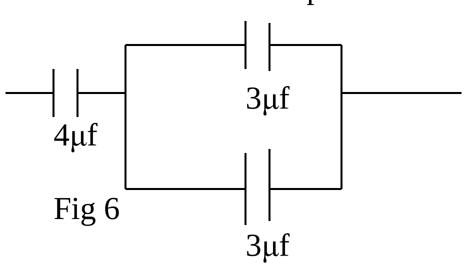


Fig 6

Calculate the effective capacitance of the circuit (2mks)

SECTION B (55 MARKS)

15. (a) An object O is placed infront of a convex mirror as shown in the fig ___
f f fig

(i) Draw by ray diagram to show the position of the image (2mks)

(ii) State any two characteristics of the image formed (2mks)

(iii) State one application of a convex mirror (1mk)

(b) The diagram in fig _8_ below shows the human eye
Cornea Pupil Cilliary muscles Optic nerve A B C

Name the parts labelled A, B and C (3mks)

A

B

C

(c) State any two similarities between the eye and the camera (2mks)

(d) An object placed infront of a concave mirror of focal length 10cm produced an image at a distance of 15cm from the mirror on the opposite side of the object. Determine the position of the object (3mks)

16. (a) The figure 9 below shows an arrangement used to observe interference pattern of a red light

Source of red light B S1 S2 Screen

S_1 and S_2 are slits, B is a source of light images or fringes are formed on the screen. State what happens to separation of fringes when

(i) Slit separation is increased (1mk)

(ii) Green light is used (1mk)

(iii) Distance between the slits and screen is increased (1mk)

(iv) State with a reason what is observed on the screen (2mks)

(b) Explain why interference pattern is due to both diffraction and interference (2mks)

(c) The speed of sound in air is 340 ms^{-1}. A loud speaker placed between two walls but nearer wall X than Y, is sending out constant sound pulses. How far is it from wall X. if the time between the two echoes received is 0.176 seconds (4mks)

17. (a) State Lenz's law of electromagnetic induction (1mk)

(b) A transformer supplies 12v when it is connected to a 240v a.c supply of electricity. The output of the transformer is connected to two 12v, 36w lamps connected in parallel and under these conditions the current drawn from the supply by the transformer is 0.5A

(i) What is the input power of the transformer? (2mks)

(ii) Calculate the output power of the transformer (2mks)

(iii) What is the efficiency of the transformer (2mks)

(c) Fig _10_ represents a step-down transformer with 500 turns in the primary and 50 turns in the secondary. The turns are wound uniformly on the core. The lengths of PQ and QR are as indicated

240V P Q R 1cm 2cm

Determine the p.d across PQ and QR (3mks)

18. (a) Define the term half life of a radio active material (1mk)

(b) A radioactive source and a detector are used to check the level of fruit juice in a carton. Cartons of fruit juices pass between the detector and radio active source, as shown in Fig _11_ the radioactive source emits β – particles

Conveyor belt Fruit juice carton Radioactive source radiation detector Counter

(i) State the name of a suitable detector of the β-particles (1mk)

(ii) Explain why the level of detected radiation falls when a full carton of juice goes past the detector (1mk)

(iii) Explain why a source emitting α– particles is not suitable for use (1mk)

(c) The half life of an isotope is 4 days. If its initial mass is 32mg, what mass of the isotope will decay after 12 days (2mks)

(d) Fig _12_ below shows the paths taken by three radiations, x, y and z from a radio active source through an electric field.

Radioactive source X Y Z

Identify the radiations Y and Z (2mks)

(e) State any two applications of radio isotopes (2mks)

19. (a) The graph below shows the stopping potential and the corresponding frequencies of a photocell

Stopping potential (Vs) (V) 1 2 3 4 5

Frequency f ($x10^{14}$ H_2) 2 4 6 8 10 12 14 16 18

From the graph determine

(i) The threshold wavelength (3mks)

(ii) The plank's constant (5mks)

(iii) The work function of the metal (3mks)

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MARKING SCHEME

1. I O E √correct rays with arrows from object o
   √Object o equal distance from mirror as the image is from the mirror line.

2. It must be isolated from ground√
3. OA, Domains in process of being aligned√
   AB, Domains are fully aligned (Saturation)

4. Frequency $f = \frac{1}{T} = \frac{1}{5} = 0.2HZ$√
   $V = \lambda f$√
   $\lambda = \frac{V}{f} = \frac{6.4}{0.2} = 32m$√

5. Using photocell√/fluorescent screen e.g. zinc sulphide/photographic plate
6. $I = {}^{P}/_{V} =$√ $\frac{3000}{240}$
   $= 12.5A$√
   A fuse of 10A is not√ suitable
7. The points of the windmill become highly charged√ thus ionize the surrounding air. An electric wind is set up which blows√ away the flame
8. Overtones/harmonics√
9. Only bulb 2 lights√ since the first diode conducts heavily shorting bulb 1
10. A.C can easily and cheaply be stepped up or down unlike D.C√

11. $R = \frac{3 \times 3}{6} = 1.5\Omega$√

$V = IR$√

$I = \frac{5}{1.5} = 3.3$ A√

12. Makes the image smaller√

13. $\frac{V_a}{V_w} = {}_an_w$

V_w √$= \frac{3.0 \times 10^8}{1.3} = 2.31 \times 10^8$ √m/s

14. For parallel capacitors C = (3 + 3) μf = 6μf√

Effective capacitance $C_T = \frac{6 \times 4}{(6 + 4)} = 2.4$ μf√

Total marks: 25 marks

15. (a) (i) Correct ray Correct image (must be virtual)

f I f e

(ii) - Virtual√ erect√

- Diminished/smaller than object√ any two (2mks)

(iii) Used as a driving mirror√

(b) A – iris;√ B – convex lens√ (or simply lens); C – retina√

(c) – Both use convex lens√

- Both form real and diminished images√

(d) $\frac{I}{f} = \frac{I}{u} + \frac{I}{u}$ √ | f = 10, u = 15

$\frac{I}{10} = \frac{I}{u} - \frac{I}{15}$√

$u = \frac{15 \times 10}{15 + 10} = 6$cm√

Total = 13 marks

16. (a) (i) Reduces√

(ii) Reduces√

(iii) Increases√

(iv) Alternating dark and bright fringes√ are observed due to destructive√ and constructive interference√

(b) Diffraction takes place√ and then wavefronts interfere

(c) X 200m xm Y

Let the time taken to hear from wall x be t_1 and wall y be t_2

$t_2 - t_1 = 0.176$

$t_1 = 2 \times \frac{200}{340}$√

$t_1 = \frac{2x}{340}$√

$\frac{2x}{340} - \frac{400}{340} = 0.176$√

$2x - 400 = 0.176 \times 340$

$X = \frac{0.176 \times 340 + 400}{2}$

$= 229.92$m√

Total 11 marks

17. (a) The directions of induced current is such as to oppose the change causing it√

(b) (i) $P = V_1 = 240 \times 0.5$√ $= 120$w√

(ii) $P = I_sV_s = 6 \times 12$√ $= 72$w√

(iii) $E = \frac{\text{partpot}}{\text{Pinpot}} \times 100 = \frac{72}{120} \times 100$√ $= 60\%$√

$\frac{V_s}{N_s} = \frac{V_p}{N_p}$

$V_{pR} = \frac{240}{500} \times 50 = 24V$√

p.d across PQ = $^2/_3 \times 24V = 16V$√

p.d across QR = $^1/_3 \times 24V = 8V$√/ or $24 - 16 = 8V$

18. (a) Time taken for half the original number of atoms to decay by half√

(b) (i) G – M tube√

(ii) Full cartons obstructs the radiation from penetrating to reach the counter√

(iii) They have a low penetrating power√

(c) 32 ½ 16 ½ 8√½ 4mg

No decayed = 32 – 4 = 28mg√

Or fraction remaining – $(½)^{12}/_4 = (½)^3$

Fractions decayed = $1 - {}^1/_{18} = {}^7/_8$

Mass decay = $^7/_8 \times 32 = 28$mg

or fraction remain = $(½)\ ^{13}/_4 = (½)\ 3$

fractions decay = $1 - {}^1/_{18} = {}^7/_8$

Mass decay = $^7/_8 \times 32 = 28$mg

(d) y – gamma rays√ z – alpha particles√

(e) – In medicine to kill cancerous√ growth and sterilize surgical equipment e.g. gamma rays from cobalt – 60

- In industry to gauge thickness of materials√
- In industry to detect flaws√

Total 10mks

19. (a) (i) $ev = hf - hf_o$√

$V_s = {}^h/_e\,(f – fo)$ but $V_s = O$, $hf = hf_o$

ƛ = fo√

= 6.4×10^{14} √Hz

(ii) Gradient = $\frac{DV√}{Df}$

$= \frac{2.75 – 1.5}{(13 – 10) \times 10^{14}}$√

= 4.167×10^{-14}√

${}^h/_e = 4.167 \times 10^{-14}$

$h = 4.167 \times 10^{-14} \times 1.6 \times 10^{-19}$Js√

= 6.67×10^{-34} Js

(iii) The work function of the metal

$W_o = hf_o$√

= 6.67×10^{-34} x√ 6.4×10^{14}

= 4.16×10^{-22}J√

Total marks 11

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232/3
PHYSICS
PAPER 3
(PRACTICAL)
JULY/AUGUST 2011
2 ½ HOURS

NZAUI / MUKAA FORM 4 CLUSTER EXAMINATION
Kenya Certificate of Secondary Education
PHYSICS
PAPER 3
PRACTICAL
2 ½ HOURS

INSTRUCTIONS TO CANDIDATES

a) Write your name and index number in the spaces provided above
b) Sign and write the date of examination in the spaces provided above
c) Answer all the questions in the spaces provided in the question paper
d) You are supposed to spend the first 15 minutes of the 2 ½ hours allowed for this paper reading the whole paper carefully before commencing your work.
e) Marks are given for a clear record of the observations actually made, their suitability, accuracy and the use made of them
f) Mathematical tables and electronic calculators may be used

For Examiner's use only

Question 1

	b	d	e	f	Total
Maximum score	11	5	2	2	
Candidates score					

Question 2

	d	e	f	g	f	Total
Maximum score	8	5	3	3	1	
Candidates score						
						Grand total

This paper consists of 7 printed pages

Turn Over

Question one

You are provided with the following

- A clean burette
- Stand
- Two clamps and 2 boss heads
- A metre rule
- Water
- 100ml beaker
- A stopwatch

Proceed as follows

(a)

- Clamp the metre rule vertically and place it as close as possible to the burette
- Adjust the position of the burette such that its lower end is about 10cm above the bench
- Place the 100ml beaker underneath the burette
- Fill the burette with water to a height above the 70cm mark of the metre rule as shown below.
- By trial and error method, adjust the rate of flow of water until the time taken for the water to flow from the 70cm mark to the 65cm mark is between 25-30 seconds
- Once this flow rate has been achieved, do not alter the flow rate for the rest of the experiment.

Metre rule burette clip 100ml beaker 10 20 30 40 50 60 70 80 90

(b)

- Fill the burette again with water to a level above the 70cm mark
- With the water level at the 70cm mark (at time t = o) start the stopwatch. Note the time taken for the height, h, of the water surface in the burette to decrease by 5.0cm. do not stop the watch
- Continue to record the time taken for the height, h of water surface to decrease by successive 5.0cm marks till you have 10 more readings
- Enter your results in the table below. Stop the watch and close the clip.

Height	Time t(s)			Mean time
h (cm)	Trial 1	Trial 2	Trial 3	t (s)
70				
65				
60				
55				
50				
45				
40				
35				
30				
25				
20				

(11mks)

(c) Repeat procedure, b above to get a second and a third set of readings for t. complete the table above and calculate the mean time, t (sec)

(d) On the grid provided, plot a graph of height, h against mean time, t. (5mks)

(e) Use your graph to determine the time taken for the height, h to change from 64cm to 32cm (3mks)

(f) From your graph, determine the time t, when h = 35 cm (1mk)

Question 2

You are provided with the following

- A converging lens
- A lens holder
- A mounted white screen
- A metre rule
- A candle

Proceed as follows

a) Set up the apparatus as shown in the figure below, such that the distance between the object, O and the screen D = 100cm

b) Place the lens between the object, O and the screen, nearer to the object, and move the lens towards the screen, until a sharp image appears on the screen. Note the position, P1 of the lens on the metre rule

D Screen O P_1 P_2 0 10 20 30 40 50 60 70 80 90 100 d 0

c) With the distance, D, unchanged, move the lens further towards the screen until a clear image appears again on the screen. Note the position, P2, of the lens on the metre rule. Calculate the distance, d, through which the lens has been displaced. Enter your results in the table below

Distance D(cm)	Position of the lens on the metre rule (cm)		Distance	D^2	d^2	$(D^2 – d^2)$
	P1	P2	D (cm)	(m^2)	(m^2)	(m^2)
100						
96						
92						
88						
84						

(8mks)

(d) Repeat parts b and c for other values of D, shown on the table. Enter your results in the table above and

(e) On the grid provided plot a graph of $(D^2 – d^2)$ against D (in metres) (5mks)

(f) Determine the slope of the graph (3mks)

(g) Give that $f = \frac{D^2 - d^2}{4D}$, find the value of, f, the focal length of the lens used (3mks)

(h) Calculate the power of the lens used (1mk)

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MARKING SCHEME

Question one

h (cm)	Trial 1	Trial 2	Trial 3	Meant time (t)
70	0	0	0	0
65	30	27	28	28.33
60	61	56	57	58.00
55	105	87	86	92.67
50	151	122	124	112.33
45	207	163	168	179.33
40	274	206	212	230.67
35	344	256	272	290.67
30	434	327	338	366.33
25	452	406	413	453.67
20	692	506	527	575.67
	√3	√3	√3	√2

Trial 1 – 3
Award, 1 mark for any 3 correct values
Mean time
Award 1 mark for any 4 correct values

(e) h = 64cm, t = 34 seconds
h = 32 cm, t = 332 seconds
Time taken 332 – 34 = 298 seconds√1

(f) t = 288 seconds√1

A GRAPH OF HEIGHT h (cm) against t (sec)
Y – axis X – axis Time (s) Height (cm)
0 10 20 30 40 50 60 70   80 160 240 320 400 480 560 640
P 2
L 1
Scale 1
Curve 1
(More than ¾ of the page on both axes)

Question 2

(c)

D cm	$P_1 \pm 0.5$cm	$P_2 \pm 0.5$cm	d(cm)	D^2 (m^2)	d^2(m^2)	d^2-d^2
100	29	71	42	1.0000	0.1764	0.824
96	30.5	66	35.5	0.9216	0.1260	0.7956
92	32	62	30	0.8464	0.0900	0.7564
88	33	56	23	0.7744	0.0529	0.7215
84	36	49	13	0.7056	0.0169	0.6887
	√2 Each value ½ correct	√2 each value ½ correct	√1 4 values correct	√1 4 values correct	√1 4 values correct	√1 4 values correct

(f) Slope $= \frac{\Delta y}{\Delta x} = \frac{(0.721 - 0.689)}{(0.88 - 0.84)\ m}$ m^2 √1

$= \frac{0.032}{0.04}$ √1 = 0.8m√1

(g) $f = \frac{D^2 - d^2}{4D}$

$D^2 - d^2 = 4fD$

4f = slope√1 realization

4f = 0.8 substitution

$f = \frac{0.8}{4}$ = √0.2m√ $\sim$ 20cm accuracy

(h) Power of the lens $= \frac{1}{f} = \frac{1}{20}$ = 0.05 dioptres√

A GRAPH OF ($D^2 - d^2$) m^2 Vs D (m)

Y – axis X – axis ($D^2 - d^2$) $(m)^2$ P_1 (0.84, 0.689) P_2 (0.88, 0.721) D (m)

0.62 0.64 0.66 0.68 0.72 0.74 0.76 0.78 0.80 0.82

0.84 0.86 0.88 0.90 0.92 0.94 0.96 0.98 1

P 2

L 1

A 1

S 1

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CONFIDENTIAL

Question 1

- A clean burette
- Stand
- Two clamps and 2 boss heads
- A metre rule
- Water
- 100ml beaker
- A stopwatch

Question 2

- A converging lens, f = 20cm
- A lens holder
- White screen
- A metre rule
- A candle