NAME _____ INDEX NO. _____

CANDIDATE'S SIGNATURE _____

DATE _____

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

MAKINDU DISTRICT INTER-SECONDARY SCHOOLS EXAMINATION
Kenya Certificate of Secondary Education
PHYSICS
PAPER 1
THEORY
2 HOURS

INSTRUCTIONS TO CANDIDATES

(a) Write your name and index number in the spaces left above
(b) Sign and write the date of Examination in the spaces provided above
(c) This paper consists of Two section: 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) Mathematical tables and electronic calculators may be used
Take: Acceleration due to gravity, g = $10m/s^2$

For Examiners use only

Section	Questions	Max score	Score
A	1-12	25	
B	13 14 15 16 17 18	11 11 10 08 09 06	
	Total	80	

This paper consists of 11 printed pages

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SECTION A – 25 MARKS ANSWER ALL THE QUESTIONS

1. The glass beaker below has a base cross-sectional area of $105cm^2$

Glass beaker Water

When a metal of mass 250g is immersed into the water, the level of water rises by 3.5cm. Determine the density of the metal. Express your answer in Kg/m^3. (3mks)

2. Two liquids A and B were carefully poured onto a clean flat plastic base and formed drops as shown below

liquid A liquid B Plastic base

Explain the shapes of the drops. (2mks)

3. The air pressure at the base of Mt. Kenya is 70.0cm of mercury while at the top of the mountain it is 55cm of mercury. Given that the average density of air is $1.30Kgm^{-3}$ and the density of mercury is $13600Kgm^{-3}$, calculate the height of the mountain. (3mks)

4. In the diagram below, when the flask is warmed, the level of the column inside the glass tube rises slightly then drops

Glass flask Air Glass tube Cork Water

On further warming, some bubbles are seen at the end of the tube in water. Explain these observations. (2mks)

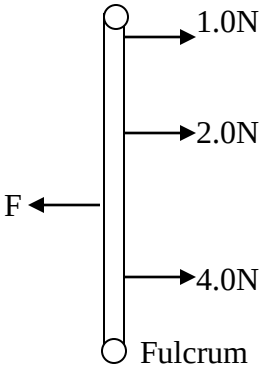
5. State the law of flotation. (1mk)

6. (i) Define the term "least count" as used in vernier calipers. (1mk)

(ii) State the vernier calipers reading in the diagram below. (2mks)

0 7 8 10

7. A uniform metre-rule is suspended vertically from a fulcrum at the 0cm mark. It is maintained in the vertical position by four horizontal forces acting in the directions shown.



Given that the 4.0N force acts through the 80cm mark, the 2.0N acts through the 40cm mark and the10N acts through 95cm mark, calculate F which acts through 35cm mark. (Diagram not drawn to scale) (3mks)

8. State two factors that affect stability of an object. (2mks)

9. The figure below shows the motion of a trolley on ticker timer. The ticker timer has a frequency of 50Hz.

P Q R S 1.5cm 4.5cm

Calculate the acceleration of the trolley. (3mks)

10. State how heat loss by radiation is minimized in a vacuum flask. (1mk)

11. Define elastic limit as used in verification of Hooke's law. (1mk)

12. State one factor that affects the boiling point of a liquid. (1mk)

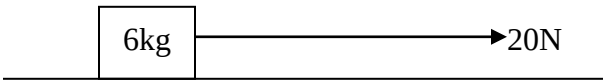
SECTION B – 55 MARKS

13. (a) A bullet of mass 1.5g is fired horizontally into a wooden block whose mass is 500g. The block is suspended using a thread so that it is free to move in a vertical plane. The bullet embeds into the block and rise together through a vertical height of 7.4cm as shown below.

fixed support thread wooden block bullet 7.4cm

Calculate the speed of the bullet before the impact with the block. (5mks)

(b) The diagram below shows a body pulled by a constant force of 20N for a distance of 2m over a wooden horizontal surface. The coefficient of friction is 0.025



Calculate

(i) The acceleration of the body (Take g = 10N/Kg) (3mks)

(ii) The velocity V of the body after the two metres. (3mks)

14. (a) State two factors that affect centripetal force. (2mks)

(b) In an amusement park the merry go round seat was held by a firm metal chain of length 4m along the central pole.

(i) Explain what happens to the angle between the chain and the central pole when the system is switched on (1mk)

(ii) After sometime the angle between the chain and the central pole was 30^0 .A lady of mass 45kg (the mass of the seat inclusive) was moving at a uniform linear speed of 4m/s. Find the centripetal force on the lady. (3mks)

(c) The figure below shows a toy car moving in a circular path in a vertical plane. If the mass of the toy car is 400g and the radius of the path is 2m.

(i) Calculate the minimum velocity at which the car passes point A. (3mks)

(ii) If the car moves with a velocity of 5m/s as it passes point B find the angular velocity at point B.(3mks)

15. (a) The figure below shows a pulley system for lifting loads
Effort Load 300N

(i) What is the velocity ratio of the pulley system. (1mk)

(ii) If its efficiency is 80%, what is its mechanical advantage (3mks)

(iii) If the load is 300N, calculate the effort. (3mks)

(b) The diagram below shows an end view of a wheel and axle. It consists of a large wheel of radius R attached to an axle of radius r. If the effort is applied on the wheel while the load is attached to the axle show that the velocity ratio = $\frac{R}{r}$ where R = Radius of wheel r = radius of axle (3mks)

16. (a) State the two variable factors affecting pressure in liquids. (2mks)

(b) The figure below shows an hydraulic lift used to lift heavy loads
Radius 4 cm

Calculate the maximum weight of the car that can be lifted using a download effort of 200N as shown above (Assume the pistons are friction less) (3mks)

(c) Explain why a siphon does not work in a vacuum. (1mk)

(d) Explain why it is not possible to raise water to a height greater than 10m. (2mks)

17. (a) State the Charles law (1mk)

(b) Carbon dioxide is compressed at constant temperature until its pressure rises from 44cm Hg to 76cmHg. If the final volume of carbon dioxide is $70cm^3$, find the initial volume of carbon dioxide. (3mks)

(c) Explain why a small car travelling at a very high speed is likely to be dragged into a long truck travelling in the opposite direction, also at a high speed. (2mks)

(d) The diagram below shows a U-tube connected to a pipe of different cross-section areas
A B U-tube Mercury Pipe

(i) Re-draw the diagram indicating the new mercury levels when gas is moving very fast through the pipe. (1mk)

(ii) Explain your answer in d (i) above. (2mks)

18. (a) (i) Define latent heat of vaporization. (1mk)

(b) Dry steam is passed into a well-lagged copper calorimeter of mass 0.30kg kg containing 0.75kg of water and 0.015Kg of ice at 0^0C.The mixture is well stirred and the steam supply cut off when the temperature of the calorimeter and its contents reaches 40^0C. Assuming no heat losses. Find the specific latent heat of vaporization of water. If 40g of steam is found to have condensed to water.

Take Sp heat capacity of copper = $400JKg^{-1}k^{-1}$
Sp heat capacity of water = $4200JKg^{-1}k^{-1}$
Latent heat of fusion of water = $3.36 \times 10^5 JKg^{-1}$

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THEORY
MARKING SCHEME

1. Soln

$\rho = \frac{M}{V}$ √ formula

$= \frac{250}{105 \times 3.5}$ √ substitution

$= 0.6802\ g/cm^3$ √ C.A.O in Kg/m^3

$= 680\ Kg/m^3$

2. Liquid A: forces of adhesion are more than the cohesive forces√
Liquid B: forces of cohesion are more than the adhesive forces.√

3. Pressure difference due to column of air = pressure difference due to mercury column

$\rho_a g h_a = \rho_m g h_m$ √ where h_{air} = height of mountain

$1.3 \times 10 \times (ha) = 13600 \times 10 \times \frac{(70 - 55)}{100}$

$h_{air} = 13600 \times 10 \times \frac{(70 - 55)}{100} \times \frac{1}{1.3 \times 10}$√

$= \frac{13600 \times 10 \times 15}{1300}$

$= 1{,}569.2$ metres√

4. The glass flask first expands leading to decrease in pressure inside the flask. The higher atmospheric pressure pushes the liquid up slightly.
The column inside the glass tube then drops indicating that air expands more than glass. Bubbles areseen at the end of the tube as air escapes from the flask. (A.W.T.E)

5. A floating body displaces its own weight of the fluid in which it floats.

6. (i) The difference in length between the main scale division and the vernier scale division
(ii) Main scale reading: 6.7cm; correct m. scale reading
Vernier scale reading: 6 x 0.01 = 0.06cm
Reading of the vernier caliper = (6.7 + 0.06) cm
= 6.76cm; C.A.O

This paper consists of 5 printed pages

Turn Over

7. Sum of anticlockwise moments = sum of clockwise moments;

$(4.0 \times 0.08) + (2.0 \times 0.4) + (1.0 \times 0.95) = 0.35F$;

$0.32 + 0.8 + 0.95 = 0.35F$

$2.07 = 0.35F$

$F = \frac{2.07}{0.35}$

$= 5.914N$

8. - Base area;
- Centre of gravity;

9. Time between consecutive dots $= \frac{1}{50} = 0.025$

Initial velocity $U = \frac{1.5}{0.02} = 75cm/s$

Final velocity $V = \frac{4.5}{0.02} = 225\ cm/s$;

Time taken $= 0.02 \times 5 = 0.15$;

Acceleration $= \frac{v - y}{t} = \frac{225 - 75}{0.1}$

$= 1500cm/s^2$;

10. By use of a shiny or silvered wall in the vacuum flask;

11. Point in an elastic material which when exceeded the elastic material undergoes permanent extension/; permanent deformation.

12. (i) Pressure;
(ii) Presence of impurities; } any of the two

13. (a) Assuming all the K.E of bullet is converted to P.E then;

$\frac{1}{2} mv^2 = mgh$;

$V^2 = 2gh$

$V = \sqrt{2 \times 10 \times 0.074}$

$V = 1.216m/s$

Let v_1 be speed of bullet before impact

Momentum before impact = momentum after impact

$M_1V_1 + M_2V_2 = (M_1+M_2)\ V$;

$0.0015V_1 + 0.5 \times 0 = 0.5015V$

$0.0015V_1 = 0.5015 \sqrt{2 \times 10 \times 0.074}$;

$V_1 = 406.5m/s$;

(b) $W = mg$

$= 6 \times 10 = 60N$

Frictional force = UR;

$0.025 \times 60 = 1.5N$

Force due to acceleration = 20 – 1.5
= 18.5N;

But F = ma

$a = \frac{F}{M} = \frac{18.5}{6}$

$= 3.08\ m/s^2$;

(ii) $a = 3.08m/s^2$

S = 2m

U = 0

From $V^2 = U^2 + 2as$;

$V^2 = 2as$

$= 2 \times 3.08 \times 2$;

$= 12.32$

$V = \sqrt{12.32}$

$= 3.51m/s$;

14. (a) - Angular velocity;
- Radius; any two
- Mass

(b) (i) The angle increases gradually;

(ii) 30^0 4m

$\sin 30 = \frac{r}{4}$

$r = 4 \sin 30^0$

$r = 4 \times 0.5$

$= 2m$

Centripetal force (F) $= \frac{MV^2}{r}$

$= \frac{45 \times (4)^2}{2}$

$= 360N$;

(c) $F = mg + T$

$\frac{MV^2}{r} = mg + T$ when V_{min} T = 0;

$\frac{MV^2}{r} = mg$

$V^2 = gr$

$V = \sqrt{gr}$

$= \sqrt{10 \times 2}$

4.47m/s;

(ii) V = wr;

$w = {}^{v}/_{r}$

$= \frac{5;}{2}$

= 2.5 rad/s;

15. (a) (i) 3 (no of ropes supporting the load);

(ii) Efficiency = $\frac{M.A}{V.R}$;

$\frac{80}{100} = \frac{M.A}{3}$;

$\frac{240}{100}$ = M.A;

M.A = 2.4;

(iii) M.A = $\frac{Load}{Effort}$;

$2.4 = \frac{300}{Effort}$

Effort = $\frac{300}{2.4}$;

= 125N;

(b) In one complete revolution the wheel moves through a distance $2\pi R$;

One complete revolution the load moves $2\pi R$;

V.R = $\frac{\text{Distance moved by effort}}{\text{Distance moved by load}}$;

= $\frac{2\pi R}{2\pi r}$;

= $\frac{R}{r}$

16. (a) – Depth or height;

- Density of the liquid;

(b) $\frac{F_1}{A_1} = \frac{F_2}{A_2}$

$\frac{200}{\pi \times (4)^2} = \frac{F2}{\pi \times (20)^2}$

$\frac{50}{} \quad \frac{100}{}$

$F_2 = \frac{200 \times 400}{16}$

$\frac{4}{1}$

= 5000N;

(c) In a vacuum there is no atmospheric pressure to act on the liquid surface;

(d) There is low atmospheric pressure in places high above sea level;

17. (a) Charles law – for a fixed mass of gas at constant pressure the volume is directly proportional to the absolute temperature;

(b) From Boyle's law; $P_1V_1 = P_2V_2$

P_1 = 44cmHg P_2 = 76cm Hg

V_1 =? $V_2 = 70cm^3$

$V_1 = \frac{P_2V_2}{P_1}$

$= \frac{76 \times 70}{44}$;

$= 120.9$

$= 121 cm^3$;

(c) This is because the air in between them moves with a very high speed; reducing the pressure between them;

(d) (i) Mercury Gas flowing Pipe

(ii) Velocity in the wider cross-section of the pipe is low creating a region of high pressure thus pushing the mercury level downwards; velocity of gas in the narrow section of the pipe is high creating a region of low pressure hence the mercury level rises;

18. (a) (i) Specific latent heat of vaporization – quantity of heat required to change a unit mass of the material from liquid to vapour without change of temperature;

(b) Heat lost by steam + Heat lost by water = Heat gained by ice + heat gained by water + heat gained by Calorimeter;

$$ML_v + MC\overset{\Delta}{\theta} = ML_f + MC\overset{\Delta}{\theta} + Mc\overset{\Delta}{\theta}$$

$0.04L_v + 0.04 \times 4200 (100^0C - 40^0C) = (0.015 \times 3.36 \times 10^5) + (0.75 + 0.01^5) 4200 \times 40 + (0.3 \times 400 \times 40)$

$0.04L_v + 0.04 \times 4200 \times 60 = 138,360$

$0.04L_v = 138,360 - 10,080$;

$L_v = \frac{128,280}{0.04}$

$= 3.207 \times 10^6 JKg^{-1}$;

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PHYSICS
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Kenya Certificate of Secondary Education
PHYSICS
PAPER 2
THEORY
2 HOURS

INSTRUCTIONS TO CANDIDATES

- This paper consists of section A and B
- Answer ALL questions in section A and B in the spaces provided
- All working must be clearly shown
- Mathematical tables and calculators may be used

For Examiners use only

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A	1-10	25	
B	11 12 13 14 15 16	12 09 10 09 09 06	
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SECTION A 25 MARKS
Answer <u>all</u> the questions in this section in the spaces provided

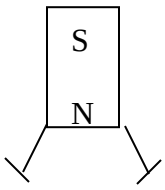
1. State the number of images formed when an object is between two plane mirrors placed in parallel. (1mk)

2. An electromagnet is made by winding insulated copper wire on an iron core. State two changes that could be made to increase the strength of the electromagnet. (2mks)

3. Determine the speed of light in water given that the speed of light in air is 3.0×10^8 ms^{-1} and the refractive index of water is 1.33 (3mks)

4. In an x-ray tube it is observed that the intensity of x-rays increases when potential difference across the filament is increased. Explain this observation. (3mks)

5. The pins are hanging from a magnet as shown in the diagram below.



(a) Indicate the poles on the ends of the pins. (1mk)

(b) Explain why they do not hang vertically. (2mks)

6. (a) State two main differences between sound and light waves. (2mks)

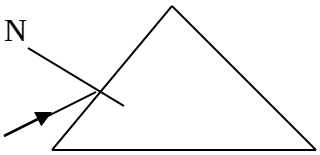
(b) An echo sounder had produced continuous waves of frequency 25 KHz. What would be their wavelength in the water if the velocity of sound in water is 1400m/s. (2mks)

7. Arrange the following radiations in order of increasing wavelength. Ultraviolet, Gamma rays, radio waves, infrared. (1mk)

8. (a) State the purpose of introducing a donor impurity in a semi-conductor material. (1mk)

(b) Draw a symbol for a Zener diode. (1mk)

9. A ray of white light is incident on one face of a triangular glass prism. Complete the diagram. (3mks)



10. The figure below is of human eye with a defect.
Image Eye lens Object Eyeball

(i) Name the defect (1mk)

(ii) State one possible cause of the defect. (1mk)

(iii) Name one appropriate lens that can be used to correct the defect. (1mk)

SECTION B (55 MARKS)
Answer all the questions in this section in the spaces provided

11. In an experiment with a capacitor by form four students, the charge which was stored was measured for different values of charging P.d. From the results obtained, the following graph was plotted UC

(a) (i) Use the graph to calculate the capacitance of the capacitor used in the experiment. (3mks)

(ii) State two factors affecting capacitance of the capacitor. (2mks)

(b)(i) A positively charged rod is brought near a flame as shown. State and explain what is observed. (2mks)

(ii) Explain as to why a brass rod cannot be charged by frictional method (rubbing). (2mks)

(c) The figure below shows part of a circuit containing the capacitors of 4uf and 6uf respectively

A B 6uf 4uf

Determine the p.d across AB given that the total charge in the capacitors is 1×10^{-6}C. (3mks)

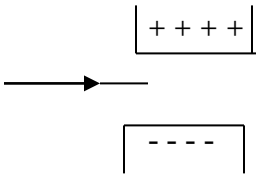
12. The diagram below shows apparatus used to produce x-rays.
E.H.T Cooling fins Y X

(a) (i) Name the parts marked X and Y (2mks)

(ii) Suggest a suitable material for Y and give a reason to support your answer. (2mks)

(b) Give a reason why x-rays tubes are evacuated. (1mk)

(c) Complete the diagram below to show the path of an x-ray beam when it enters an electric field. (1mk)



(d) Calculate the minimum wavelength of x-rays emitted when electrons are accelerated through 30kv to strike a target. (Take electron charge e = 1.6×10^{-19}C, planks constant h = 6.63×10^{-34} Js speed of light C = 3.0×10^{8}m/s) (3mks)

13. (a) State why mains electricity is produced inform of a.c and not d.c

(b) Distinguish between a fuse and a circuit breaker as safety devices in electric circuits

(c) In domestic wiring system lighting points and other power outlets are connected in parallel. Explain why.

(d) Calculate the amount of electrical energy (in KWh) used by an electric cooker labelled 3KW when switched on for two hours on a day.

(e) Calculate the cost of running the cooker for one month of 30 days given the cost of 1 KWh = Ksh 15.00

(f) Calculate the value of the most appropriate fuse for the three pin plug on which this cooker is connected. Assume the voltage supply is 220V

14. (a) State Lenz's law. (1mk)

(b) A transformer is connected to a d.c source and the secondary coil is connected to a centre zero galvanometer. State and explain the observation on the galvanometer. (2mks)

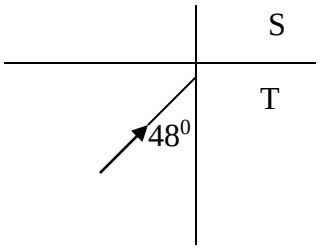
(c)State three ways in which energy is lost in a transformer and how it can be minimized in each case. (3mks)

(d) The primary coil of a transformer has 2000 turns and the secondary coil has 50 turns. If an input voltage of 240V is connected, determine the output voltage. (3mks)

15. (a) State the 'Snell's law' (1mk)

(b) Prisms are preferred to plane mirrors for use in periscopes. Explain. (2mks)

(c) In the figure below, a ray of light is incident on a boundary of two optical media S and T.



If the refractive index of T is 1.33, determine the angle of refraction of the light ray. (3mks)

(d) Give two conditions for total internal reflection. (2mks)

16. (a) It is observed that when ultra-violet radiation is directed on to a zinc plate connected to the cap of a negatively charged leaf electroscope, the leaf falls
(i) Explain this observation. (2mks)

(ii) State why this observation does not occur if the electroscope is positively charged. (1mk)

(iii) Explain why the leaf of the electroscope does not fall when infa-red radiation is directed on to the Zinc plate. (1mk)

(b) State the effect on the electrons emitted by the photoelectric when:

(i) The intensity of incident radiation is increased (1mk)

(ii) The frequency of the incident radiation is increased (1mk)

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THEORY
MARKING SCHEME

1. Infinite√ (very many, uncountable, several) 1mk for any of these

2. Increase the magnitude of current through the wire√
Increase the number of turns per unit length √use U shaped iron core.√ (2mks)

3. $n = \frac{\text{velocity of light in air}}{\text{Velocity of light in water}}$√

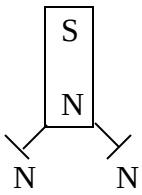
$1.33 = \frac{3.0 \times 10^8}{v}$ √ where v – velocity of light in water

$\Rightarrow v = \frac{3.0 \times 10^8}{1.33}$

$= 2.26 \times 10^8 m/s$√

4. Increase in p.d increases current in filament or increase in p.d√ increases heating effect. This produces more electrons by thermionic√ emission. Hence results on more intense X√ rays.

5. (a)



√ (1mark when the two are correctly indicated)

(b) The pins are induced with the same √poles at the top and at the bottom hence the free ends repel.√

6. (a) Sound waves are mechanical while light waves are electromagnetic.√
Sound waves are longitudinal while light waves are transverse.√

(b) Velocity = frequency x wavelength √

$1400 = 25000 \times \lambda$

$\Rightarrow \lambda = (^{1400}/_{25000})$ m

$= 0.056m$√

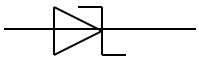
$= 56mm$

This paper consists of 4 printed pages

Turn over

7. Gamma rays, ultraviolet, infra red√, radio waves (1mk)

8. (a) This is to enhance conductivity by increasing the number of charge carriers√

(b) 

9. N Red Violet
- show dispersion
- show deviation
- arrows to show they are light rays

10. (i) Long sightedness√ or Hypermetropia.
(ii) Eye ball being too short/eye lens being too weak.√
(iii) Convex lens.√

11. (a) (i) Gradient = $\frac{(60 - 30) \times 10^{-6}}{(8 - 4)}$

$= {}^{30}/_{4} \times 10^{-6}$

$= 7.5 \times 10^{-6}$ f√

Capacitance = Gradient √

Hence capacitance = 7.5×10^{-6} f√

(ii) Area of overlap of the plates√
Separation distance between the pates√
The nature of the dielectric material√

(b) (i) The flame is blown away.√
This is due to an electric wind √set up by the positive ions repelling the ones in the rod.
(ii) Brass rod is a metal and metals have free electrons√ which conduct √away the charges formed on the surface.

(c) Total capacitance = $(4 + 6) \times 10^{-6}$f

= 10uf√

But $C = {}^{Q}/_{V}$

=> $V = {}^{Q}/_{C}$√

$= \frac{1.0 \times 10^{-6}}{1.0 \times 10^{-5}}$

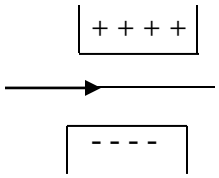
= 0.1V.√

12. (a) (i) X – Cathode√
Y – Metal target√

(ii) Y – Tungsten or molybdenum√. This is because of it's high melting point√

(b) To ensure that electrons do not collide with other particles hence loosing their energy.√

(c)



√ (Straight line/underiated)

(d) $eV = \frac{hc}{\lambda}$

$\Rightarrow \lambda = \frac{hc}{eV}$√

$= \frac{6.63 \times 10^{-34} \times 3.0 \times 10^{8}}{1.60 \times 10^{-19} \times 30{,}000}$√

$= \frac{19.89 \times 10^{-26}}{4.8 \times 10^{-11}}$

$= 4.14 \times 10^{-15}$m √

13. (a) a.c is easily stepped up or down using power transformers which only function with a.c and not d.c√

(b) Fuse – A wire which when heated up due to excess current melts and breaks the circuit√
Circuit breaker – An automatic switch which retrieves when excess current flows through hence circuit is broken.√

(c) The parallel connection ensures that all devices share equal voltage from the mains supply√
Independent repair services can be done on one line without affecting the others.√

(d)E = VIt = Pt√

∴ E = 3000W x 60 x 60 x 2 sec
E = 21600 000J
But 1KWh = 1000 x 60 x 60 = 3600 000J
∴
No. of KWh used = $\frac{21600\ 000}{3600\ 000}$
= 6 KWh√

(e) 1 day = 6 KWh
30 days = 30 x 6 = 180 KWh
Cost = 180 x 15 = Ksh 2700√

(f) P = VI
I = P/V
= $\frac{3000\text{W}}{220\text{V}}$√
= 13.636A
Fuse rating should be 14A – 15A range√

14. (a) The direction of the induced current is always such as to opposes the change of magnetic flux which produces it√

(b) No deflection.√ For a transformer to work, there must be a change in magnetic flux in one coil to induce an e.m.f. in the other.√

(c) (i) Hysteresis loss – use of iron core which magnetizes and demagnetizes easily√
(ii) Heating due eddy currents in the core – laminating √the core.
(iii) Loss of magnetic flux between the primary and the secondary coils – linkage obtained by winding the secondary coil on top of the primary coil.√
(iv) Resistance of the coils – thick copper wires are used where large currents are to be carried.

(d) $\frac{Vs}{Vp} = \frac{Ns}{Np}$√

$\frac{Vs}{240} = \frac{50}{2000}$√

$= Vs = \frac{240 \times 50}{2000}$

$= 6V$.√

15. (a) The ratio of the sine of the angle of incidence to the sine of the angle of refraction is a constant for a given pair of media.√

(b) – They do not absorb some of the incident light√
- They do not tarnish and peel off√
- They don't produce multiple images√ (max. 2mks)

(c) $n = \frac{\sin i}{\text{Sin r}}$√

$1.33 = \frac{\sin 48^0}{\text{Sin r}}$

$\text{Sin r} = \frac{\sin 48^0}{1.33}$√

$= \frac{0.743}{1.33}$

$= 0.559$

$r = \sin^{-1} 0.559$

$= 33.97^0$√

(d) – Light must be traveling from a denser medium to a less dense medium√
- The angle of incidence must be greater than the critical angle√

16. (a) (i) Electrons are emitted from Zinc plate.√
This reduce the charge on the leaf.√
(ii) Any electron emitted is attracted back to the electroscope√
(iii) Protons of infra-red have a lower frequency than ultraviolet, hence have less energy to eject the electrons.√

(b) (i) Number of electrons emitted will increase.√
(ii) Maximum kinetic energy of the emitted electrons will increase.√

NAME _____ INDEX NO. _____

CANDIDATE'S SIGNATURE _____

DATE _____

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

MAKINDU DISTRICT INTER-SECONDARY SCHOOLS EXAMINATION
Kenya Certificate of Secondary Education
PHYSICS
PAPER 3
PRACTICAL
2 ½ HOURS

INSTRUCTIONS TO CANDIDATES

- Write your name, index number and sign in the spaces provided above
- Answer ALL the questions in the spaces provided in the question paper
- 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
- Marks are given for a clear record of observations actually made, their suitability, accuracy and the use of them
- Candidates are advised to record their observations as soon as they are made
- Non-programmable, silent electronic calculators and KNEC mathematical tables may be used except where stated otherwise.

For Examiners use only

Question 1	a	b
Maximum score	14	6
Candidates score		

Maximum 20mks

Total

Question 2	2 a	b	e	f (i)
Maximum score	1	1	8	10
Candidates score				

Maximum 20mks

Total

Grand Total

This paper consists of 8 printed pages

Turn Over

Candidates should check the question paper to ascertain that all the pages are printed as indicated and no questions are missing.

1. (a) You are provided with the following apparatus
   - Metre rule
   - Knife edge
   - One 100g mass
   - One 50g mass
   - Two 20g masses
   - One 10g mass
   - Two strings (about 30cm each)

Proceed as follows

(i) Set the metre rule in equilibrium. Record the point of balance x of the metre when no mass is attached to it

X = _____ cm (1mk)

(ii) Arrange the apparatus as shown below

0 20 40 100 cm d metre rule Thread M1 100g mass Knife edge M2 50g mass

(iii) Place the 100g mass M1 at the 20cm mark of the metre rule with the aid of the thread. The knife edge is placed at the 40cm mark of the metre rule.

(iv) Balance the metre rule by using the mass M2 = 50g. Record the distance d in centimeters for the 100g mass, M1.

(v) Repeat procedure (iii) and (iv) for different masses shown in the table.

Mass M1 (g)	100	120	140	150	160	170
Distance d (cm)						

(vi) On the grid provided, plot a graph of M1 (y-axis) against d. (5mks)

(vii) Determine the gradient of the graph. (2mks)

(viii) Given that the equation of the graph is given as

$$M1 = \frac{M_2 d}{K} + \frac{m(x - 40)}{K}$$

Use your graph to determiner the value of K and M (2mks)

(ix) What does the value for m represent (1mk)

1. (b) You are provided with the following apparatus
   - Six connecting wires
   - 36cm long wire coiled on a rod labelled R
   - Ammeter
   - Voltmeter
   - Micrometer screw gauge
   - One dry cell
   - A switch s

Proceed as follows

A R V

(i) Connect the circuit as shown.

(ii) Using the micrometer screw gauge measure the thickness of the wire labelled R

Diameter = _____ m (1mk)

(iii) Calculate the cross-sectional area A of the wire coiled on the rod labelled R

A = _____ M^2 (1mk)

(iv) Close the switch and record the ammeter and voltmeter readings

Ammeter reading = _____ A

Voltmeter reading = _____ V (2mks)

(v) Calculate the value of P from the equation given that the length of the wire is L, I is the current flowing through the wire and V is the potential difference across the wire and A the cross-sectional area of the wire

$$A = \frac{PIL}{V}$$ (1mk)

(vi) What does the constant P represent (1mk)

2. You are provided with the following apparatus
   - Pendulum bob
   - Thread (about 1.5m)
   - Stop watch
   - Retort stand, boss and clamp
   - Vernier calipers
   - Beam balance
   - Metre rule
   - Two pieces of wood

Proceed as follows

(a) Measure the diameter of the pendulum bob

d = _____m (1mk)

(b) Determine the mass of the pendulum bob using the beam balance

M = _____ kg (1mk)

(c) Set up the apparatus as shown below
Thread Pieces of wood pendulum bob retort stand y

(d) Tie the pendulum bob to the thread. Measure the length of the thread to y = 1.0m and fix it as shown above. The pieces of wood should help hold thread firmly.

(e) Displace the pendulum bob through a small angle. Determine the time taken for it to make 20 complete oscillations.
Repeat the procedure for other values of y as shown in the table and record the corresponding time.

Length y (m)	Time for 20 oscillations t (s)	Period T (s)	T^2 (s^2)
1.0 0.9 0.8 0.7 0.6 0.5 0.4 0.3			

(8mks)

(f) (i) Plot a graph of T^2 (y – axis) against y (5mks)

(ii) Calculate the slope of the graph. (2mks)

(iii) The graph is given by the equation

$$T^2 = \frac{4\pi^2 y}{p}$$

Calculate the value of p (2mks)

(iv) The weight of the pendulum bob is given by the equation w = mp, calculate the weight of the bob. (1mk)

232/3
PHYSICS
PAPER 3
(PRACTICAL)
JULY/AUGUST 2011

MAKINDU DISTRICT INTER-SECONDARY SCHOOLS EXAMINATION
Kenya Certificate of Secondary Education
PHYSICS
PAPER 3
PRACTICAL
MARKING SCHEME

1. (a) (ii) x = 50.5cm $\pm$ 0.1cm

(v)

Mass M_1 (g)	100	120	140	150	160	170
Distance d (cm)	17.1	25.2	32.9	38.0	41.3	47.9

½ mark for each correct entry to a maximum of 3 marks

A GRAPH OF M_1(g) AGAINST d (cm)
M1 (g) d (cm) -30 -20 -10 0 10 20 30 40 50 20 40 60 80 100 120 140 160 180 y x

Labelled axis √1
Uniform scale √1
Line graph √1
Plotting points
5 – 6 √2
2 – 4 √1
0 – 2 √0
Maximum = 5

(vii) Gradient = $\frac{(120 - 30)\ g}{(25 - \bar{}12)\ cm}$√1
= $\frac{90g}{37}$/cm
= 2.4324g/cm
≈ = 2.43g/cm√1

(viii) $M_1 = \frac{M_2 d}{K} + \frac{m\ (x - 40)}{K}$

Y = mx + c
Slope = $\frac{M_2}{K}$ but M_2 = 50g
K = $\frac{M_2}{\text{Slope}}$ = $\frac{50g}{2.43g/cm}$ √½ mk
= 20.576cm
≈ = 20.58 √½ mk

This paper consists of 5 printed pages

Turn Over

y intercept = $\frac{m\,(x - 40)}{k}$

$59 = \frac{m\,(50.5 - 40)}{20.58}\ g$ √½ mk

$M = \frac{59 \times 20.58}{10.5}$

$= 115.64g$ √½ mk

(ix) M represents the mass of the rule √1mk

1. (b) (ii) diameter $d = 0.36mm$

$= 3.6 \times 10^{-4}m$ √A_1

(iii) $A = \pi r^2$

$= \pi \times (3.6 \times 10^{-4})^2\ m^2$

$= 40.72 \times 10^{-8}m^2$

$= 4.072 \times 10^{-7}m^2$ √A_1

(iv) Ammeter reading = 0.23A ± 0.01 A√1mk

Voltmeter reading = 1.25V ± 0.02V√1mk

(v) $A = \frac{PIL}{V}$

$4.072 \times 10^{-7} = \frac{p \times 0.23 \times 0.36}{1.25}$

$P = \frac{4.072 \times 10^{-7} \times 1.25}{0.23 \times 0.36}$

$= 6.147 \times 10^{-6}\Omega m$√ A1

(vi) Constant P represents the resistivity of the conductor√ 1mk

2. (a) $d = 2.01 \times 10^{-2}m$√1

(b) $m = 3.08 \times 10^{-2}kg$√1

(e) Table

Length y (cm)	Time for 20 oscillations t (s)	Period T (s)	T^2 (s^2)
1.0	40.36	2.018	4.072
0.9	38.93	1.9465	3.789
0.8	36.64	1.832	3.356
0.7	34.30	1.715	2.941
0.6	31.89	1.5945	2.542
0.5	29.80	1.493	2.230
0.4	26.60	1.33	1.769
0.3	23.23	1.1615	1.349
	3mks	3mks	2mks

For t and T			For T^2
7 – 8 values correct	3mk	,,	4 – 8 values correct 2mks
4 – 6 values correct	2mks	,,	3 – 5 values correct 1mk
2 – 3 values correct	1mk	,,	0 – 2 values correct
0 – 1 value correct	0	,,	0mk
Total	3	3	2

(f) (i) A GRAPH OF T^2 (s^2) AGAINST Y (m)

T^2 (S^2) y (m) x y

0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1 2 3 4 5

Labelled axes √1

Uniform scale √1

Line graph √1

Plotting

6 – 8 point √2

3 – 5 point √1

0 – 2 √0

Max = 5

(ii) Slope = $\frac{\Delta Y}{\Delta X}$

$= \frac{(3.75 - 1.0)\ S^2}{(0.9 - 0.22)\ m}$√1

$= \frac{2.75\ S^2/M}{0.68}$

$= 4.044 S^2/M$√1

(iii) $T^2 = \frac{4\pi^2 y}{P}$

$Y = mx$

Slope $= \frac{4\pi^2}{P} = P = \frac{4\pi^2}{\text{slope}}$√1

$= \frac{4\pi^2}{4.044}$

$= 9.764 m/s^2$

(iv) $W = mp$

$= 3.08 \times 10^{-2} kg \times 9.764 m/s^2$

$= 3.01 \times 10^{-1} N$√1