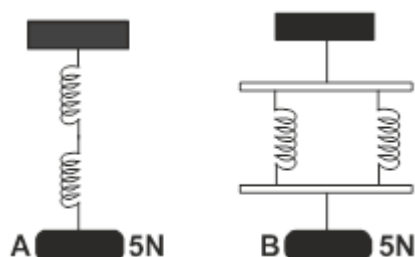


**BURETI SUB-COUNTY JOINT EVALUATION TEST**  
**Kenya Certificate of Secondary Education**  
**232/1**  
**PHYSICS**  
**Paper 1**  
**July/August 2016**  
**Time: 2 Hours**

**SECTION A : (25 MARKS)**

1. The water level in a burette is  $20.3\text{cm}^3$ . 50 drops of water each of volume  $0.1\text{cm}^3$  are added to the water in the burette. What is the final reading of the burette? (2 marks)
2. The springs in figure 1 are identical.

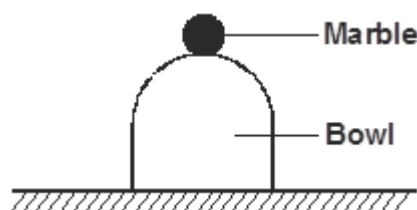
Fig. 1



The extension produced in A is 4cm. What is the extension in B? (3 marks)

3. Water flows through a narrow pipe of radius 6cm connected to another pipe of radius 9cm. If the speed of water in the narrow pipe is 3m/s, determine the speed of water in the wider section. (3 marks)
4. Figure 2 shows a marble placed on an inverted bowl.

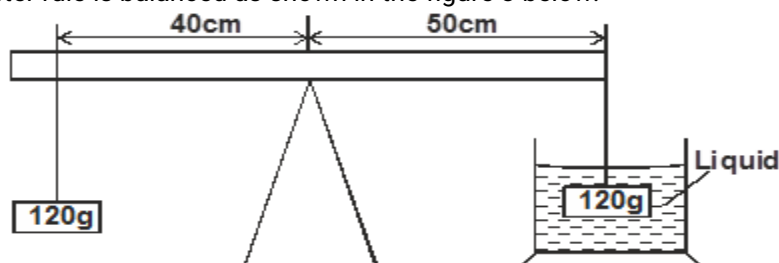
Fig. 2



State and explain the type of equilibrium the marble is. (3 marks)

5. A uniform meter rule is balanced as shown in the figure 3 below.

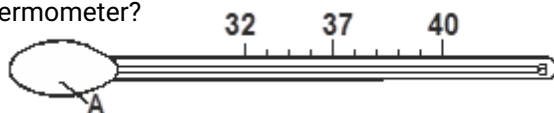
Fig. 3



By displacement method, the immersed object is found to occupy  $13.5\text{cm}^3$ . Determine the density of the liquid in SI units. (3 marks)

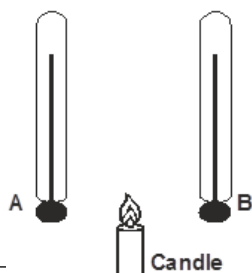
6. Figure 4 below shows a thermometer used by a doctor to determine the temperature of a patient. Why is it difficult to work with this thermometer? (2 marks)

Fig. 4



7. Figure 5 shows two identical thermometers. Thermometer A has a blackened bulb while thermometer B has a silvery bulb. A candle is placed equidistant between the two thermometers.

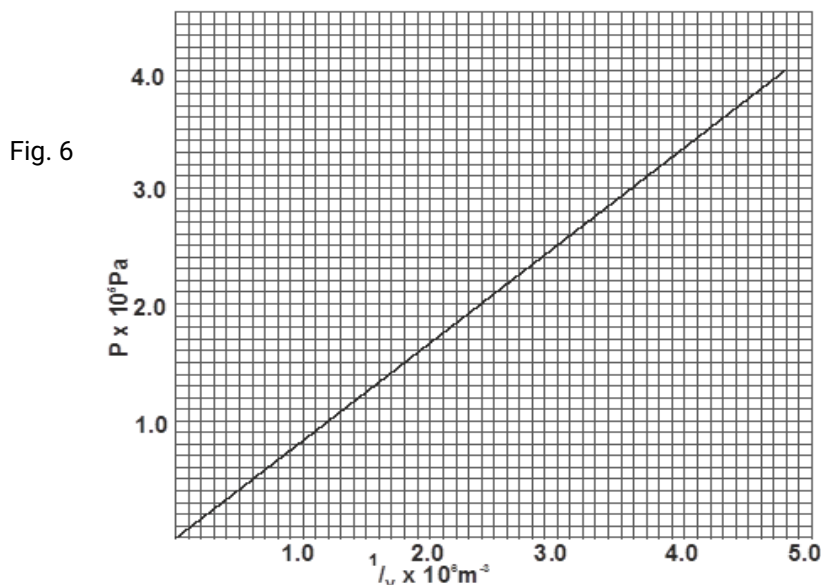
Fig. 5



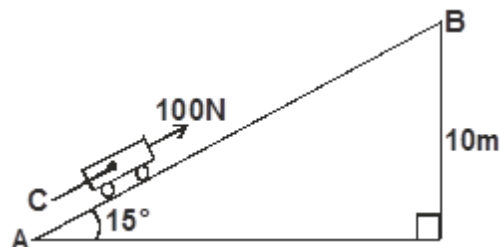
- State with a reason the observations made after sometime. (2 marks)
8. When a liquid is heated in a glass flask its level at first falls then falls then rises. Explain this observation. (2 marks)
9. Sketch a graph showing how volume of pure water varies with temperature from  $0^{\circ}$  to  $10^{\circ}\text{C}$ . (2 marks)
10. A tall building has two barometers, one at the ground floor reading 750mmHg and the other at the top reading 748mmHg. Determine the height of the building. (2 marks)
11. What does study of thermodynamics entails? (1 mark)

### SECTION B: (55 MARKS)

12. a) State what is meant by an ideal gas. (1 mark)
- b) The pressure acting in a gas in a container was changed steadily while the temperature of the gas as maintained constant. The value of volume  $V$  of the gas measured for various values of pressure. The graph in the figure 6 shows the relation between the pressure,  $P_1$  and the reciprocal of volume  $1/V$



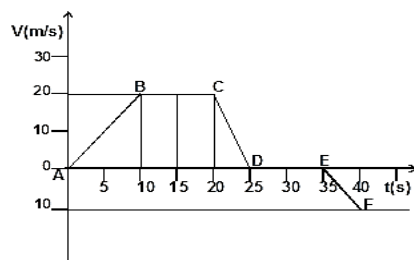
- i) Suggest how the temperature of the gas could be kept constant. (1 mark)
- ii) Given that the relation between the pressure  $P_1$  and the volume  $V_1$  of the gas is given by  $PV = k$ . Where  $k$  is a constant, use the graph to determine the value of  $k$ . (3 marks)
- iii) What physical quantity does  $k$  represent? (1 mark)
- iv) State one precaution you would take when performing such an experiment. (1 mark)
- c) A gas occupies a volume of 4000 litres temperature of  $37^{\circ}\text{C}$  and normal atmosphere pressure. Determine the new volume of the gas if it is heated at constant pressure to a temperature of  $67^{\circ}\text{C}$  (normal atmosphere pressure  $P = 1.01 \times 10^5 \text{Pa}$ ) (4marks)
13. Figure 7 below shows an inclined plane, a trolley of mass 30kg is pulled up a slope by a force of 100N parallel to the slope. The trolley moves so that the centre of mass  $C$  travels from points  $A$  to  $B$ .



- i) What is the work done on the trolley against the gravitational force in moving from  $A$  to  $B$ ? (2 marks)
- ii) Determine the work done by the force in moving the trolley from  $A$  to  $B$  (3 marks)
- iii) Determine the efficiency of the system. (1 mark)
- iv) Determine the work done in overcoming the frictional force. (3 marks)
- v) Determine the mechanical advantage of the system.

14. a) Figure 8 below is a graph showing the velocity of a body plotted against time.

Fig. 8



- i) Describe the motion of the boy over :  
CD, DE, EF

(3 marks)

- ii) What is the acceleration of the body over the region AB?

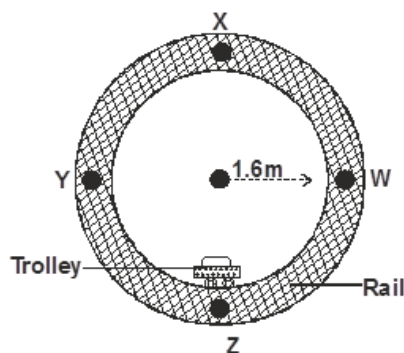
(1 mark)

- iii) What is the average velocity over the total journey?

(2 marks)

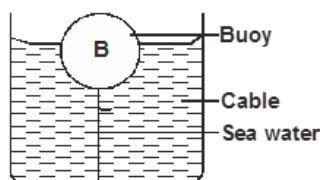
- b) Figure 9 below shows a trolley moving on a circular rail with a vertical plane, given that the mass of the trolley is 250g and the radius of the rail is 1.6m.

Fig. 9



- i) Determine the minimum velocity at which trolley passes point X. (3 marks)  
ii) Find the angular velocity at point Z (3 marks)  
iii) The force exerted on the rail at this point. (2 marks)
15. a) A boy throws a tennis ball vertically upwards from a truck moving at a constant velocity. Give the reason why the ball lands back exactly the same point where it was projected. (1 mark)  
b) Define impulse in terms of momentum. (1 mark)  
c) A trailer of mass 30 tonnes travelling at a velocity of 72km/h runs onto a stationary bus of mass 10 tonnes. The impact takes 0.5 seconds before the two vehicles move off together at a constant velocity for 15 seconds. Determine:  
i) The common velocity (3 marks)  
ii) The distance moved after the impact. (2 marks)  
iii) The impulsive force on the trailer on impact. (3 marks)  
d) Give a reason why when a passenger jumps from a floating boat, the boat moves backwards.
16. Figure 10 below shows a buoy B of volume 40 litres and mass 10kg. It is held in position in sea water of density  $1.04\text{gcm}^{-3}$  by a light cable fixed to the bottom so that  $\frac{3}{4}$  of the volume is below the surface of the sea water.

Fig. 10

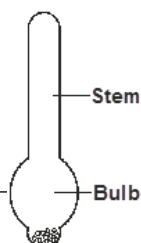


- i) Show all the forces acting on the buoy at equilibrium. (3 marks)

- ii) Determine the tension in the cable. (3 marks)

- c) Figure 11 shows a bulb hydrometer.

Fig. 13



i) State the principle in the hydrometer.

(1 mark)

ii) Explain why the hydrometer has a weighted bulb and narrow stem.

(1 mark)

### BURETI SUB-COUNTY JOINT EVALUATION TEST

Kenya Certificate of Secondary Education

232/2

PHYSICS

Paper 2

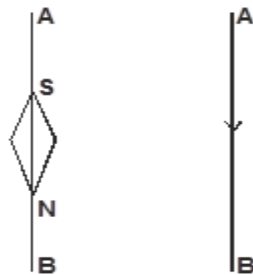
July/August 2016

Time: 2 Hours

### SECTION A : (25 MARKS)

Answer all the questions in this section in the spaces provided.

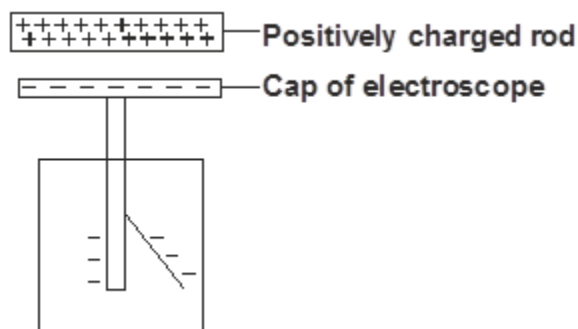
1. A current carrying wire is placed above a compass needle as shown in the figure below.



If the current flows in the direction A to B, show in the diagram the deflection of the compass needle. (1 mark)

2. State two differences between sound waves and microwaves. (2 marks)

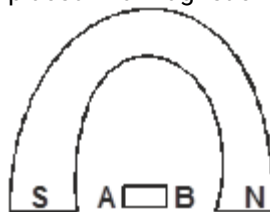
3. The figure below shows a highly positively charged rod being moved slowly downwards towards the cap of a negatively charged leaf electroscope. It is observed that the leaf initially falls then rises.



Explain this observation.

(2 marks)

4. A soft iron bar AB is placed in a magnetic field of a horse shoe magnet as shown below.



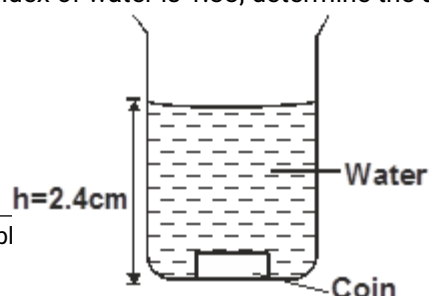
What are the polarities of A and B.

(1 mark)

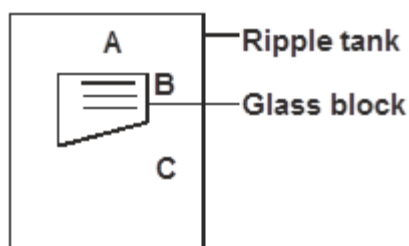
5. A certain car battery is rated 30Ah. Determine the amount of current it can supply in 10 minutes.

6. A coin is placed at the bottom of a beaker filled with water to a height of 2.4cm as shown in the figure below. Given that the refractive index of water is 1.33, determine the apparent depth of the coin.

(3 marks)

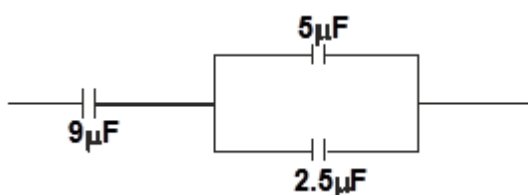


7. The figure below shows water waves travelling from region A through B to C in a ripple tank.



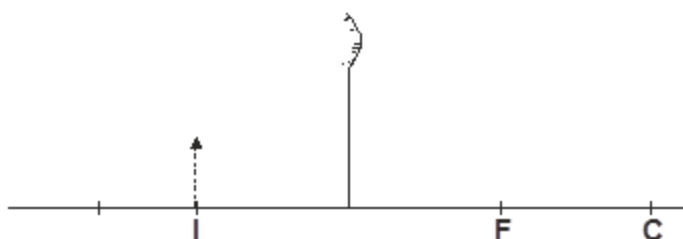
On the same diagram, complete the figure to show incident waves at region A and after crossing the boundary to C. (2 marks)

8. The figure below shows part of an electric circuit. The charge stored in the 9 F capacitor is 1.4 micro coulombs ( C)



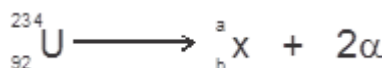
Determine the p.d across the 5 F capacitor. (3 (marks)

9. The figure below shows an image I formed by an object placed in front of a convex mirror. C and F are the centre of curvature and principal focus of the mirror respectively. Using appropriate rays locate the object position. (3 marks)



10. Given that the wavelength of a certain electromagnetic wave is 7500cm, determine its frequency. (Take the speed of light in a vacuum as  $3.0 \times 10^8 \text{ m/s}$ ) (2 marks)

11. Uranium -234 undergoes a radioactive decay represented by the equation shown below.



Find the value of a and b

(2 marks)

12. State two modifications that can be done to a pinhole camera in order to be used to take still photographs. (2 marks)

### SECTION B : (55 MARKS)

Answer all the questions in the spaces provided.

13. a) State the Faraday's law of electromagnetic induction. (1 mark)
- b) i) A transformer is connected to an a.c source of 240V to deliver 12A at 120V to a heating coil. If 20% of energy taken from the supply is dissipated in the transformer, calculate the current in the primary coil. (4 marks)
- ii) If the wire in the primary coil is charged to have a 2 determine the power dissipated as heat in the coil. (2 marks)
- c) A house has three rooms each with two 240V, 60W bulbs. If the bulbs are switched on from 7.00pm to 10.00pm daily.
- i) Calculate the power consumed per day in kilowatt-hours. (3 marks)

ii) Find the cost per week for lighting these rooms at sh.6.30 per kilowatt hour.

(2 marks)

d) What is the purpose of earthing in domestic wiring circuit?

(1

mark)

14. a) The distance of separation between the plates of a certain capacitor is reduced. State how this affects the capacitance of a capacitor. (1 mark)

b) You are provided with the following apparatus used for studying charging of a capacitor.

An uncharged capacitor, voltmeter, millimeter, 6V battery, connecting wires, a switch and a load resistor R.

i) Draw a circuit diagram that can be used to charge the capacitor.

(2

marks)

ii) Use the circuit diagram drawn above to explain how the capacitor gets charged.

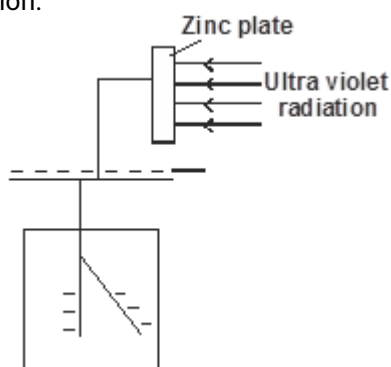
(3

marks)

iii) State the purpose of resistor R.

(1 mark)

c) The zinc plate shown below is connected to a negatively charged electroscope and is exposed to ultraviolet radiation.



i) Explain what happens to the leaf of the charged electroscope.

(3

marks)

ii) If the same experiment is repeated using a positively charged electroscope, explain the observation.

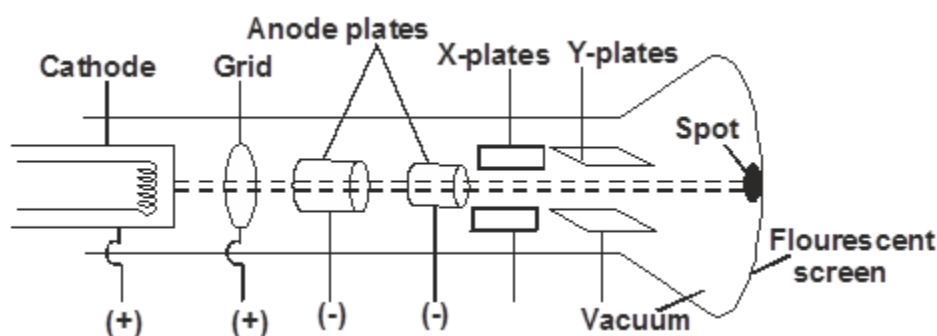
(3 marks)

15. a) Differentiate between X-rays and cathode rays in their mode of production.

(2

marks)

b) The figure below shows a cathode ray oscilloscope (CRO) drawn by a student.



i) Identify two mistakes in the diagram.

(2

marks)

ii) In a correctly drawn C.R.O, what adjustment can be made to obtain a very bright spot.

(1 mark)

ii) State the reason why the fluorescent screen should be earthed.

(1

mark)

iv) State two differences between a C.R.O and T.V tube.

(2

marks)

c) In an X-ray tube, the accelerating voltage is 100KV

i) Calculate the kinetic energy of the electrons arriving at the target (take  $e = 1.6 \times 10^{-19} \text{C}$ )

(3

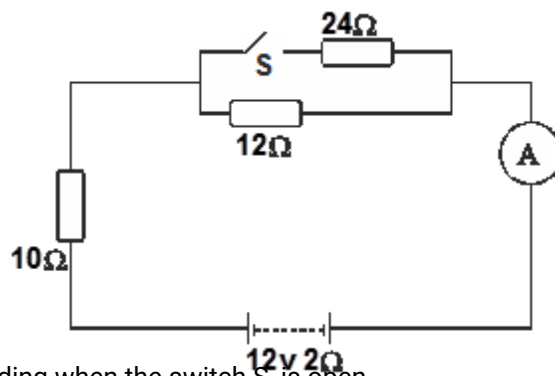
marks)

ii) If 0.5% of the kinetic energy is converted to X-rays, determine the minimum wavelength of the emitted X-rays (take  $h = 6.63 \times 10^{-34} \text{Js}$  and  $C = 3.0 \times 10^8 \text{m/s}$ )

(4 marks)

16. a) State one condition necessary for Ohm's law to be obeyed. (1 mark)

b) The figure below shows a battery of e.m.f 12V and internal resistance of  $2\Omega$  connected to resistors and an ammeter.



- i) Determine the ammeter reading when the switch S, is open. (3marks)

- ii) Find the ammeter reading when the switch is closed. (4 marks)

c) A lens forms an image on a screen when the distance between the object and the lens is 100cm.

- i) What kind of lens was used? Explain. (2 marks)

- ii) If the size of the image is twice the size of the object, determine the distance of the image from the lens. (2 marks)

- iii) Determine the power of the lens. (2 marks)

### BURETI SUB-COUNTY JOINT EVALUATION TEST

232/3

### PHYSICS

Paper 3

July/August 2016

Time: 2½ Hours

1. You are provided with the following apparatus :
- one resistor labelled  $R = 40\Omega$
  - a wire labelled W mounted on millimeter scale
  - a wire labelled S mounted on a millimeter scale
  - one dry cell and a cell holder
  - one jockey
  - one centre zero galvanometer
  - eight connecting wires, four with crocodile clips at both ends
  - a micrometer screw gauge
  - a switch

Proceed as follows

- a) Determine the average diameter  $D$ , of the wire labelled W using the micrometer screws gauge provided.

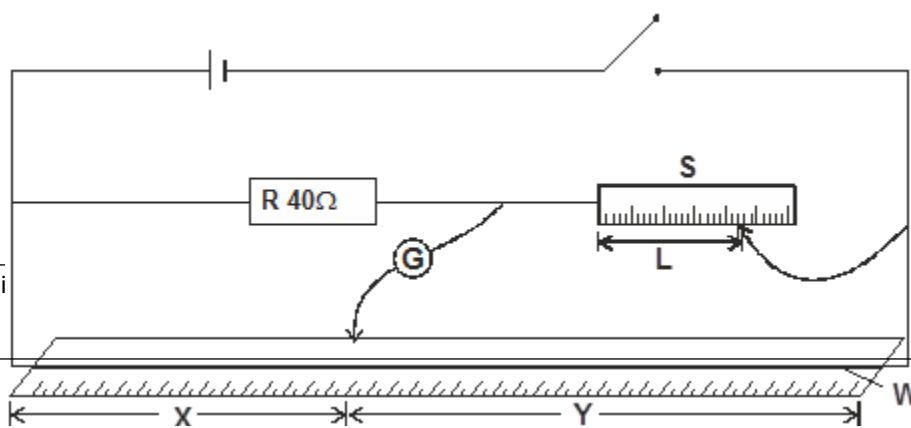
$D_1 = \dots\dots\dots$  mm (½ mark)

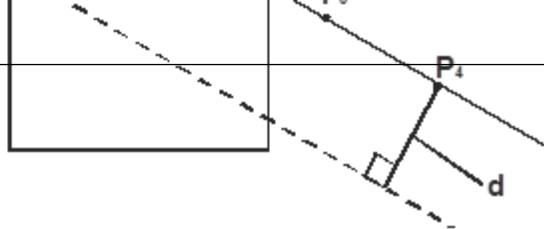
$D_2 = \dots\dots\dots$  mm (½ mark)

$D = \frac{D_1 + D_2}{2}$  (½ mark)

- b) Set up the apparatus as shown in the circuit diagram in figure 1 below.

Use the crocodile clips to fix length  $L$ , of wire labelled S at 50cm from the end connected to the galvanometer G.





c) Close the switch and use the jockey to touch one end of the wire W, and then the other end. The deflections on the galvanometer should be in opposite directions, if not check the circuit. Adjust the positions of the jockey along the wire W until there is no deflection in the galvanometer. Record the value of  $x$  and  $y$ .

$x = \dots\dots\dots$  cm

( $\frac{1}{2}$  mark)

$y = \dots\dots\dots$  cm

( $\frac{1}{2}$  mark)

d) Record for other values of  $L$  in the table.

|                     |    |    |    |    |    |    |
|---------------------|----|----|----|----|----|----|
| L (cm)              | 45 | 40 | 35 | 30 | 25 | 20 |
| X (cm)              |    |    |    |    |    |    |
| Y (cm)              |    |    |    |    |    |    |
| $\frac{y}{x}$ (adp) |    |    |    |    |    |    |

(3 marks)

e) i) Plot a graph of  $y/x$  (y-axis) against  $L$ .

(4

marks)

Fig. 2

ii) Determine the slope,  $m$  of the graph.

(2 marks)

iii) Given that  $K = 100D$ , determine the value of  $K$ .

(2 marks)

### PART B

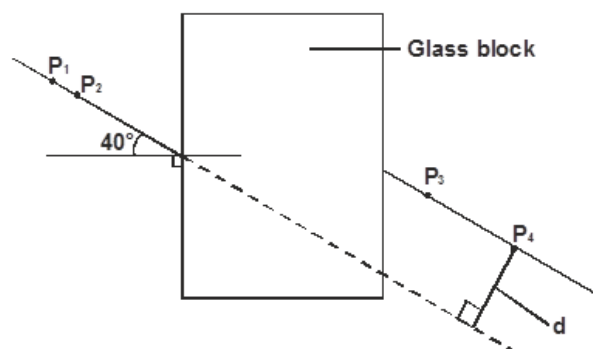
You are provided with the following apparatus :

- a rectangular glass block
- four optical pins
- a piece of soft board
- a plain sheet of paper
- 4 thumb tacks

### Proceed as follows

Place the plain sheet of paper on the soft board and fix it using the thumb tacks provided.

Place the glass block at the centre of the sheet, draw its outline. Remove the glass block.



ii) Draw normal at point 2cm from the end of one of the longer side of the block outline. Draw a line at an angle of  $= 40^\circ$  from the normal. Stick two pins  $p_1$  and  $p_2$  vertically on this line.

By viewing through the glass from the opposite side stick two other pins  $P_3$  and  $P_4$  vertically such that they are in

line with the images of the first two pins. Draw a line through the marks made by  $P_3$  and  $P_4$  to touch the outline.

Extend the line  $P_1P_2$  through the outline (dotted line)

Measure and record the perpendicular distance  $d_1$ , between the extended line and the line  $P_3P_4$

$d_1 = \dots\dots\dots$  cm

(1 mark)

Repeat the procedure in above  $= 60^\circ$   $d_2 = \dots\dots\dots$  cm

(1 mark)

Hence find  $d = \frac{d_1 + d_2}{2}$

(1 mark)

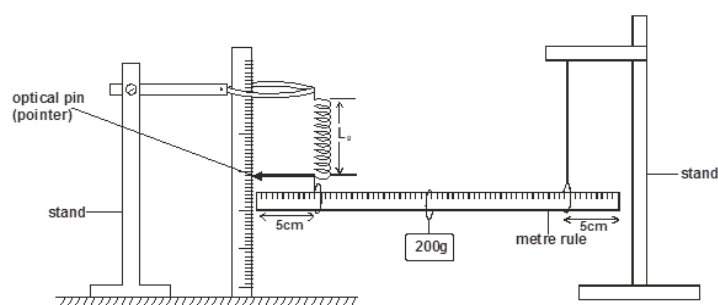
NB: The sheet of paper with the drawing MUST be handed in together with the question paper.

2. You are provided with the following apparatus :

- Two metre rule (not half metre rules)
- Two stands and two clamps
- Two bosses
- Three pieces of threads
- One optical pin
- A piece of cellotape (and or plasticine)
- A spring
- One mass of 200g
- A stop watch

Proceed as follow

i) Set up apparatus as shown in the figure 1 below. Attach the pin (to act as the pointer) at one end of the metre rule using a cellotape. the



ii) Suspend one end of the metre rule with a thread at 5cm mark from the end

iii) Suspend the other end with spring also 5cm from the end so that the metre rule is horizontal.

iv) Hold the other rule vertically on the bench so that it is near the end with a pointer as shown in the diagram above.

v) Read the pointer position,

$L_0 \dots\dots\dots$  cm

(1 mark)

a) Hang on the horizontal metre rule the 200g mass at a length  $l = 10$  cm from the spring record the extension,  $e$ , of the spring in the table below.

b) Displace the mass slightly downward and release it to oscillate vertically. Take time for 20 oscillation and record in the table below.

c) Repeat for other position of  $L$ , of the mass.

NB: Before taking the reading, ensure the oscillation is steady.

(4 marks)

vi) Plot a graph of extension,  $e$  (m) (y-axis) against  $T^2$  (s)<sup>2</sup> (5 marks)

vii) Calculate the gradient of the graph.

(2 marks)

viii) Given that determine the value of  $R$ .

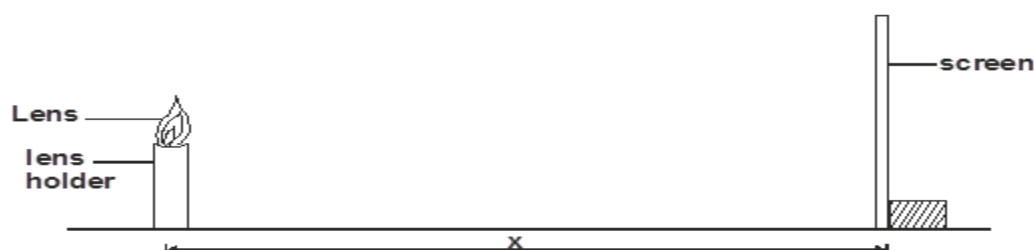
(3 marks)

### PART B

b) You are provided with a lens P a lens holder a white screen and a 30cm rule.

Procedure

i) Set the apparatus as shown in figure 4 below. Focus a sharp image of a distant object on the screen. The object should be 10cm away. The object should be at least 10cm away.



- a) Measure the distance  $x$  in cm between the lens and the screen at which a sharp image is obtained repeat this two times, using different objects and record your readings in table 3 below.

Table 3

| Object | Distance X, (cm) |
|--------|------------------|
| 1      |                  |
| 2      |                  |

- ii) Calculate the average value of  $x$ .

(2 marks)

- iii) What is the physical significance of the result obtained in (iii) above?  
(1 mark)

(2 marks)

(1

## BURETI SUB-COUNTY JOINT EVALUATION TEST

## PHYSICS

## Paper 1

July/August 2016

## MARKING SCHEME

## SECTION A:

$$1. \quad 20.3\text{cm}^3 - (0.1 \times 50)\text{cm}^3 \\ 20.3 - 5 \\ = 15.3\text{cm}^3$$

$$2. \quad K_1 = \frac{F}{e} = \frac{5}{2} = 2.5\text{Ncm}^{-1} \\ F = 2k_1e \\ e = \frac{F}{2k_1} = \frac{5}{2 \times 2} = 1\text{cm}$$

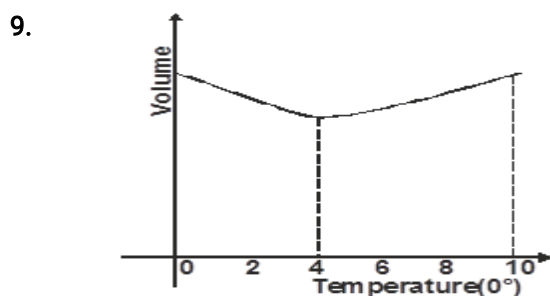
$$3. \quad A_1V_1 = A_2V_2 \\ \pi r^2V_1 = \pi R^2V_2 \\ 6 \times 3 = 9^2V_2 \\ V_2 = \frac{6 \times 6 \times 3}{9 \times 9} \\ = 1.333\text{ms}^{-1}$$

4. Unstable  
When displaced slightly it occupies a new position which is totally different from the original position

$$5. \quad \text{Clockwise moments} = \text{anticlockwise moments} \\ 1.2 \times 0.5 = (U \times 0.5) + (1.2 \times 0.4) \\ 0.6 = 0.5U + 0.48 \\ 0.5U = 0.6 - 0.48 = 0.12 \\ U = \frac{0.12}{0.5} = 0.24$$

$$U = V \rho g \\ 0.24 = 13.5 \times 10^{-6} \times \rho \times 10 \\ = \frac{0.24}{13.5 \times 10^{-6} \times 10} \\ = 1777.78\text{kgm}^{-3}$$

6. Has no constriction Mercury thread contract and go back to bulb before readings are taken
7. Readings of thermometer A is higher than that of thermometer B  
Black surfaces are better absorbers of radiant heat
8. Glass expand creating for space thus the fall.  
Water expands at a higher rate than glass



curve with 4° being lowest  
labelling of axes

$$10. \quad h_{\text{Hg}} \rho_{\text{Hg}} g = h_{\text{air}} \rho_{\text{Hg}} g$$

$$750 - 748 \times 13600 = h_{\text{air}} \times 1.25$$

1000

$$h_{\text{air}} = \frac{0.002 \times 13600}{1.25} \\ = 217.6\text{m}$$

11. Transformation of heat to and from other forms of energy

## SECTION B

12. a) Gas that perfectly obey gas laws at all conditions

b) i) When pressure is changed some time is allowed for temperature to adjust to room temperature before pressure and volume are read

$$\text{ii) } k = \text{slope} = \frac{\Delta P}{\Delta 1/v} = \frac{(3.0 - 0.6) \times 10^5}{(3.6 - 0.7) \times 10^6} \\ = \frac{2.4 \times 10^5}{2.8 \times 10^6} \\ = 8.571 \times 10^{-2}\text{Nm}$$

iii) Work done in compressing the gas

iv) The gas should be free from dust / particles

$$\text{c) } \frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$\frac{4000}{310} = \frac{V_2}{340} \\ V_2 = \frac{4000 \times 340}{310} \\ = 4387.10/$$

$$13. \text{ i) } \text{Work done} = mgh \\ = 30 \times 10 \times 10 \\ = 3000\text{J}$$

$$\text{ii) } \text{Work done by force} = \text{force} \times \text{distance} \\ = 100 \times \frac{10}{\sin 15^\circ} \\ = 3864\text{J}$$

$$\text{iii) } \eta = \frac{\text{work done on load}}{\text{work done by effort}} \times 100\% \\ = \frac{3000}{3864} \times 100\% \\ = 77.64\%$$

$$\text{iv) } \text{Work done to overcome friction} \\ = 3864 - 3000 \\ = 864\text{J}$$

$$\text{v) } M.A = \frac{L}{E} \\ = \frac{300}{100} = 3$$

14. i) CD - uniform deceleration  
DE - the body is at rest  
EF - uniform acceleration in the opposite direction

$$\text{ii) } a = \frac{\Delta V}{\Delta t} = \frac{20 - 0}{10 - 0} = \frac{20}{10} = 2\text{m/s}^2$$

$$\text{iii) } \text{Average velocity} = \frac{\text{total displacement}}{\text{time taken}}$$

$$\frac{\frac{1}{2}(25 + 10)20 + (\frac{1}{2} \times 5 \times -10)}{40} = \frac{350 - 25}{40} = \frac{325}{40} = 8.125 \text{ m/s}$$

b) i)  $\frac{mv^2}{r} - mg = 0$   
 $\frac{0.25V^2}{1.6} - 0.25 \times 10 = 0$   
 $0.15625V^2 - 2.5 = 0$

$$V = \sqrt{\frac{2.5}{0.15625}} = \sqrt{16}$$

$$V = 4 \text{ m/s}$$

ii)  $V = rw$   
 $4 = 1.6w$   
 $w = \frac{4}{1.6} = 2.5 \text{ rad s}^{-1}$

iii)  $F = \frac{mv^2}{r} + mg$   
 $= \frac{0.25 \times 4^2}{1.6} + 0.25 \times 10$   
 $= 2.5 + 2.5 = 5.0 \text{ N}$

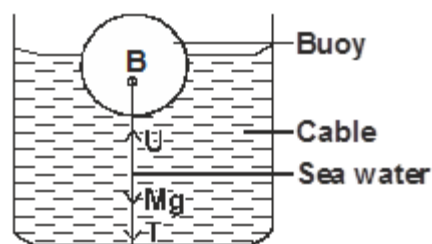
15. a) The ball has the same horizontal velocity as the truck  
 b) Impulse is the change in momentum  
 c) i)  $M_1V_1 + M_2V_2 = (M_1 + M_2)V$   
 $30,000 \times 20 + 0 = (30,000 + 10,000)V$   
 $V = \frac{600000}{40000} = 15 \text{ ms}^{-1}$

ii)  $S = Vt$   
 $= 15 \times 15 = 225 \text{ m}$

iii)  $Ft = m(v - u)$   
 $f = \frac{m(v - u)}{t}$   
 $= \frac{30000(15 - 20)}{0.5}$   
 $= -300,000 \text{ N}$

d) This is due to the passengers reaction force on the boat which acts backwards

16.



where  $u$  - upthrust  
 $mg$  - weight  
 $T$  - tension

ii)  $T + mg = U$   
 $T + 10 \times 10 = \frac{3}{4} \times 0.04 \times 1040 \times 10$   
 $T = 312 \text{ N} - 100$   
 $T = 212 \text{ N}$

- c) i) Law of floatation - a floating object displaces its own weight of fluid in which it floats  
 ii) Weighted bulb - to make the hydrometer float upright and narrow to increase its sensitivity

**BURETI SUB-COUNTY JOINT EVALUATION TEST**  
**PHYSICS**  
**Paper 2**  
**July/August 2016**  
**MARKING SCHEME**  
**SECTION A**

1.



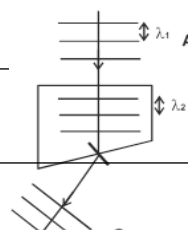
Using ampere's swimming rule, the N-pole is deflected to the right

2. - sound waves require a material medium to travel while microwaves do not require a material medium to travel / for transmission  
 - sound waves travel with slower speeds while microwaves travel with the speed of light ( $3.0 \times 10^8 \text{ m/s}$ )  
 - sound waves are longitudinal waves while microwaves are transverse in nature
3. Initially the rod attracts electrons / negative charges from the leaf to the cap, so the leaf falls.

As the rod gets closer to the cap, more electrons are attracted to the cap so the leaf and the plate become positively charged hence deflection

4. A - North pole  
 B - South pole  
 1 1mk (tied)
5.  $30 \text{ Ah} \rightarrow 1 \text{ h} = 30 \text{ A}$   
 $10 \text{ min} = \frac{10}{60} \times 30$   
 $= 5 \text{ A}$
6.  $n = \frac{\text{real depth}}{\text{apparent depth}}$   
 $1.33 = \frac{2.4}{\text{apparent depth}}$   
 $\text{apparent depth} = \frac{2.4}{1.33} = 1.805 \text{ cm}$

7.



correct wavefronts in A  $\lambda_1 > \lambda_2$

correct wavefronts in C

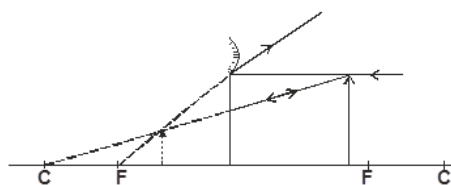
$\lambda_3 = \lambda_1 > \lambda_2$  and refracted away from the normal

8.  $C_p = 5 + 2.5$   
 $= 7.5 \mu\text{F}$

$$v = \frac{d}{c} = \frac{1.4 \times 10^6}{7.5 \times 10^6}$$

$$v = 0.1867\text{V}$$

9.

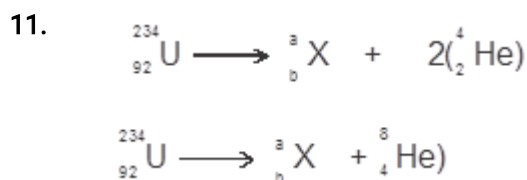


each ray incident and reflected object position

10.  $V = f\lambda \Rightarrow f = \frac{v}{\lambda}$

$$= \frac{3.0 \times 10^8}{7500/100}$$

$$= 4.0 \times 10^6 \text{ Hz}$$



$$a + 8 = 234 \quad a = 226$$

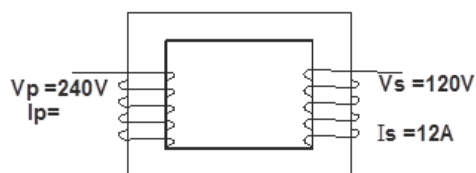
$$b + 4 = 92 \quad b = 88$$

12. - replacing the screen with a photographic film  
 - placing a sliding card in front to act as a shutter  
 - painting inside black to avoid reflection

### SECTION B

13. a) The magnitude of the induced e.m.f is directly proportional to the rate of change of magnetic flux linkage

b) i)



$$\text{secondary power} = 120 \times 12$$

$$= 1440 \text{ watts}$$

$$80\% = 1440$$

$$100\% = \frac{100 \times 1440}{80}$$

$$= 1800\text{W}$$

$$1800 = 240 \times I_p$$

$$I_p = 7.5\text{A}$$

ii)  $P = I_p R$

$$= 7.5^2 \times 2$$

$$= 112.5\text{W}$$

c) i) Power =  $\frac{60 \times 3 \times 2 \times 3\text{hrs}}{1000}$

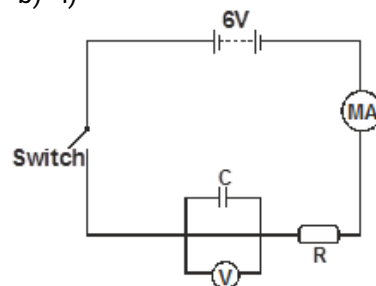
$$= 1.08\text{kwhr}$$

ii) cost =  $1.08 \times 6.30 \times 7$

$$= \text{sh.}47.628$$

d) To prevent electric shock

14. a) Capacitance increases  
 b) i)



ii) Negative charges flow from the negative terminal of the battery to one plate of the capacitor

Negative charges flow from the other plate of the capacitor to the positive terminal of the cell

Hence equal positive and negative charges gather on the plates opposing further flow of electrons when fully charged or p.d across the plates is equal to that of the battery

iii) To slow down the charging process so that current and voltage are observed

c) i) The leaf falls

When U.V falls on the zinc plate electrons are ejected / photoelectric effect takes place

The negative charges in the zinc plate and cap of the electroscope are repelled hence leaf falls

ii) There is no effect on the leaf of the electroscope

The electrons liberated by the UV light are attracted back by the positive charges on the zinc plate / cap of electroscope hence no effect on leaf divergence

15. a) X-rays are produced when fast moving electrons hit a metal target (or excited electrons lose energy in form of X-rays)

Cathode rays are produced when a metal is heated (by thermionic emission)

b) i) - cathode should be connected to then

negative terminal of a.c supply

- grid should be connected to the negative terminal

- the anode plates should be connected to the positive terminal

- Y-plates should be arranged to come before the X-plates

ii) By making the grid less negative w.v.t to the cathode

iii) To conduct away electrons / cathode rays on hitting the screen / reduce the accumulation of electrons on the screen

iii) C.R.O - deflection system done by electrons held while in the T.V tube deflection is done by the magnetic field

In a C.R.O there is a single time base while in a T.V tube there are two time bases

$$\begin{aligned} \text{c) i) } K.e &= \text{eV} \\ &= 1.6 \times 10^{-19} \times 100,000 \\ &= 1.6 \times 10^{-14} \text{ J} \end{aligned}$$

$$\begin{aligned} \text{iii) } 100\% &= 1.6 \times 10^{-14} \\ 0.5\% &= \frac{0.5 \times 1.6 \times 10^{-14}}{100} \\ &= 8.0 \times 10^{-17} \text{ J} \\ 8.0 \times 10^{-17} &= \frac{hc}{\lambda} \\ &= 2.486 \times 10^{-9} \text{ m} \end{aligned}$$

16. a) Temperature is kept constant physical conditions are kept constant

Length of wire is constant

Thickness of wire is constant

$$\begin{aligned} \text{b) i) } E &= I(R + r) \\ R &= 10 + 12 = 22\Omega \end{aligned}$$

$$\begin{aligned} 12 &= I(22 + 2) \\ I &= \frac{12}{24} = 0.5\text{A} \end{aligned}$$

24

$$\begin{aligned} \text{ii) } R_T &= \frac{24 \times 12}{24 + 12} \\ &= 8\Omega \end{aligned}$$

$$\begin{aligned} R_{\text{series}} &= 8 + 10 \\ &= 18\Omega \end{aligned}$$

$$\begin{aligned} 12 &= I(18 + 2) \\ I &= \frac{12}{20} \\ &= 0.6\text{A} \end{aligned}$$

c) i) Convex / converging lens  
If focuses images on a screen or forms a real image

$$\begin{aligned} \text{ii) } U + V &= 100\text{cm} \quad \frac{1}{2} \\ \frac{h_i}{h_o} &= \frac{v}{u} = 2 \\ v &= 2u \quad \frac{1}{2} \\ u + 2u &= 100 \\ u &= \frac{100}{3} = 33.33\text{cm} \\ v &= 100 - 33.33 \\ &= 66.67\text{cm} \end{aligned}$$

$$\begin{aligned} \text{d) } p &= \frac{1}{f} \quad \frac{1}{f} = \frac{1}{u} + \frac{1}{v} \\ &= \frac{1}{22.47 \times 10^{-2}} \quad \frac{1}{f} = \frac{1}{33.33} + \frac{1}{66.67} \\ &= 4.45\text{D} \quad f = 22.47\text{cm} \end{aligned}$$

## BURETI SUB-COUNTY JOINT EVALUATION TEST

### PHYSICS

#### Paper 3

July/August 2016

#### MARKING SCHEME

$$1. \text{ a) } D_1 = 0.32\text{mm} \quad \frac{1}{2} \quad D_2 = 0.32\text{mm} \quad \frac{1}{2}$$

$$\text{b) } D = \frac{0.32 + 0.32}{2} \quad \frac{1}{2} \quad 0.32 \times 10^{-3}\text{m} \quad \frac{1}{2}$$

$$\text{c) } x = 40\text{cm} \quad \frac{1}{2} \quad y = 60\text{cm} \quad \frac{1}{2}$$

d)

|                              |      |      |      |      |      |      |
|------------------------------|------|------|------|------|------|------|
| L (cm)                       | 45   | 40   | 35   | 30   | 25   | 20   |
| X (cm)                       | 43.2 | 49   | 51.2 | 55   | 58.7 | 63.7 |
| Y (cm)                       | 56.8 | 51   | 48.8 | 45   | 41.3 | 36.3 |
| Y                            | 1.31 | 1.04 | 0.95 | 0.82 | 0.70 | 0.57 |
| $\frac{Y}{X} (2 \text{ dp})$ |      |      |      |      |      |      |

$$\begin{aligned} \text{e) ii) } &= \frac{0.95 - 0.57}{35 - 20} \\ &= 0.02533 \end{aligned}$$

$$\text{iii) } K = \frac{100 \times 0.32 \times 10^{-3}}{0.02533} = 1.263$$

f) outline

$$d_1 = 2.1\text{cm}$$

$$d_2 = 3.6\text{cm}$$

$$d = \frac{2.1 + 3.6}{2}$$

$$= 2.85\text{cm}$$

2. a) (V)  $L_0 = 56\text{cm}$  (or any other value)

V (b)

| Length L (cm)                 | 10    | 20    | 30    | 40    | 50    |
|-------------------------------|-------|-------|-------|-------|-------|
| Extension e (cm)              | 8.8   | 7.7   | 6.6   | 5.6   | 4.5   |
| Time for 20 oscillation (sec) | 0.088 | 0.077 | 0.066 | 0.056 | 0.045 |
| Periodic time T (sec)         | 12.22 | 11.21 | 1.12  | 9.15  | 8.20  |
| $T^2 (\text{sec})^2$          | 0.611 | 0.561 | 0.506 | 0.458 | 0.410 |
|                               | 0.37  | 0.31  | 0.26  | 0.21  | 0.17  |

labelled axes and unit

1mark

appropriate scale

1mark

plotting 4 or 5 correct by

transferred

values

2marks

3 correctly transferred

1mark

best line

1mark

vii) Gradient  $\frac{\Delta e}{\Delta T^2}$ 

1mark

$$\Delta T^2$$

$$\text{Slope} = \frac{(86 - 2.5) \times 10^{-2}}{(3.6 - 0.5) \times 10^{-1}}$$

$$= \frac{6.1 \times 10^{-2}}{3.1 \times 10^{-1}}$$

$$= 0.1968\text{m/s}^2$$

viii) Gradient =  $\frac{R}{4\pi^2}$ 

$$R = \text{gradient} \times 4\pi^2$$

$$= 0.1968 \times 4 \times 3.142 \times 3.142 = 7.771$$

b) ii) table

| Object | Distance X, (cm) |
|--------|------------------|
| 1      | 10.1             |
| 2      | 9.9              |

iii) Average value of X

$$= \frac{10.1 + 9.9}{2} = 10.0\text{cm} \pm 0.1\text{cm}$$

iv) Physical significance of X = 10.0cm is the focal length of the lens used

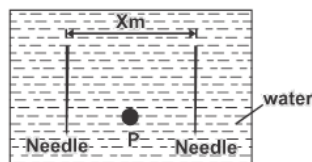
**GEM SUB-COUNTY FORM 4 JOINT EVALUATION****Kenya Certificate of Secondary Education**

232/1

**PHYSICS****Paper 1****July/August 2016****Time: 2 Hours**

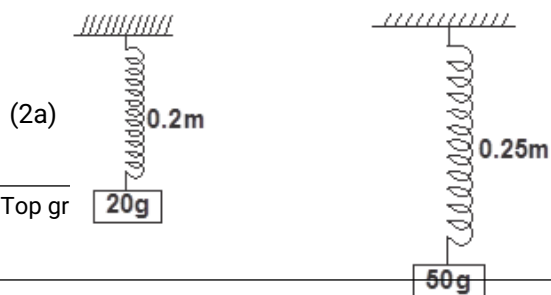
1. Figure 1 below shows a top view of two steel needles floating on water surface at a distance x metres apart.

Fig. 1



Very hot water is now poured at point P between the two needles. Explain any change in the distance x. (2 marks)

2. Figures 2a and 2b show a spring when carrying different masses.



(2b)

Determine :

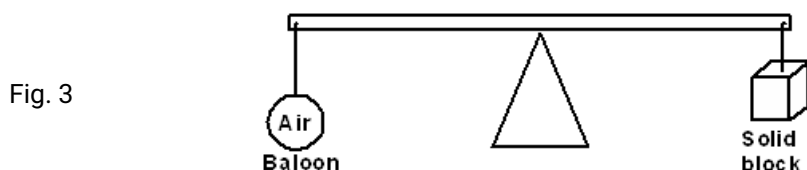
i) the elastic constant of the spring.

(1 mark)

ii) the length of the unloaded spring.

(2 marks)

3. Figure 3 below shows an air balloon and a wooden block at equilibrium on a hot day.

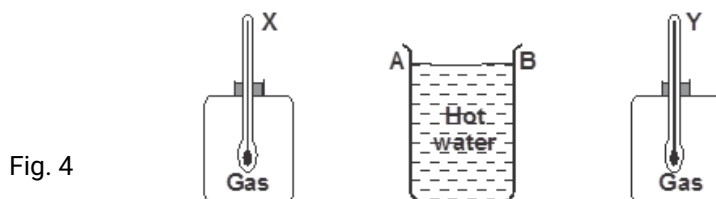


Explain how the equilibrium would be affected when the weather suddenly becomes cold.

(3 marks)

4. Figure 4 below shows a cylindrical container having hot water at  $95^{\circ}\text{C}$ . End A is shiny while end B is dull black. At equal distances from the container is placed two identical gas jars fitted with thermometers X and Y. Compare the readings of the two thermometers after two minutes.

(1 mark)



5. Explain how the propellers on top of a helicopter help in lifting the helicopter above the ground.

(2 marks)

6. On the axes provided below, sketch a graph of displacement against time for a body moving with uniform deceleration.

(1 mark)

7. A car got a breakdown along a road inclined at an angle of  $30^{\circ}$  to the horizontal. The driver used a stone to stop the car as he looked for a mechanic. However, a boy removed the stone and the car still moved down the road without the driver. State what provided the unbalanced force that made the car to accelerate downwards?(1 mark)

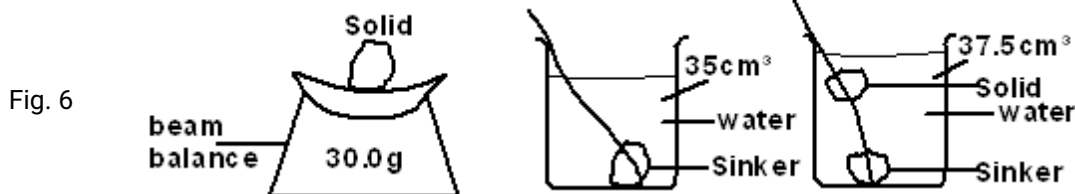
8. Figure 5 below shows a screw jack whose pitch is 5mm. If the handle has a length of 40cm and the jack is 80% efficient. Determine the effort needed to raise a car of mass 750kg.

(3 marks)



9. Some potassium permanganate crystals are introduced at the bottom of water in two cans. One can has hot water while the other can has very cold water. Explain the container in which diffusion will diffuse faster.(2 marks)

10. Figure 6 below shows a set up used by a form one student to measure the density of a solid that floats on water.



Determine the density of the solid.

(3 marks)

11.State a factor that affects melting point of ice.

(1 mark)

12.A hot air balloon made from a very light material displaces 360kg of air and contain  $300\text{m}^3$  of air of density  $0.25\text{kgm}^{-3}$ . Determine the maximum load the balloon can lift.

(3 marks)

13.State the SI unit of momentum.

(1 mark)

**SECTION B: (55 MARKS)****Answer all questions.**

14. Figure 7(a) and 7(b) show the readings of a micrometer screw gauge before and after a drop of oil are placed at the jaws.

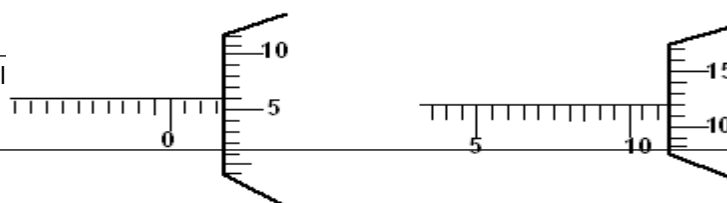


Fig. 7(a)(a)

Fig. 7(b)

When the drop was made to fall on a shallow tray having water whose surface was sprinkled with lycopodium powder, it spread on the surface to form a patch of area  $A \text{ cm}^2$ . Given that the size of one molecule of oil is  $3 \times 10^{-6} \text{ cm}$ .

a) Determine:

I. The diameter of the one drop of oil (2 marks)

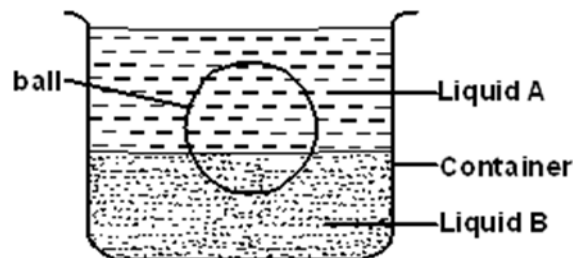
II. The area of the patch A (3 marks)

b) State one assumption made in this experiment. (1 mark)

15. State Archimedes' principle. (1 mark)

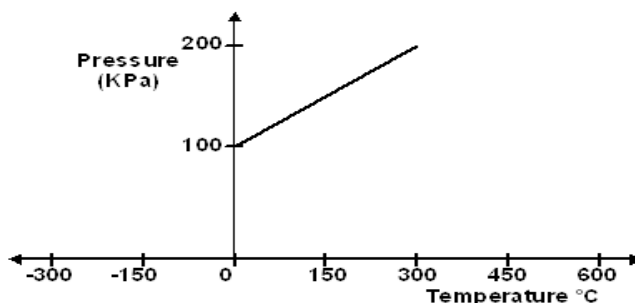
b) Figure 8 below shows a spherical ball of radius  $10.5 \text{ cm}$  in two immiscible liquids A and B of densities  $1.2 \text{ g/cm}^3$  and  $0.8 \text{ g/cm}^3$  respectively. If  $\frac{2}{3}$  of the ball is inside A and  $\frac{1}{3}$  of the ball is in liquid B.

Fig. 8



Determine the weight of the ball. (5 marks)

c) A gas is heated in a sealed container so that its volume cannot change. The graph below shows variation of pressure against temperature of the gas.



Use the graph to determine

i) The pressure of the gas at  $0^\circ\text{C}$ . (1 mark)

ii) The temperature at which the gas should exert zero pressure. (2 marks)

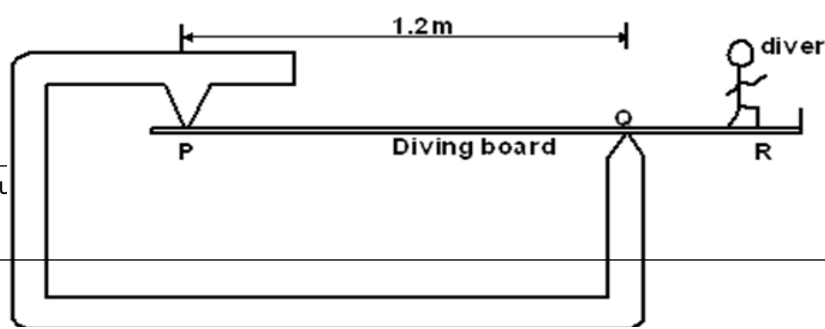
iii) Give a reason why part (ii) above is not practically obtainable. (1 mark)

16. a) Explain why it is easier to open the door when pushing further away from the hinge. (1 mark)

b) Figure 9 below shows a simple form of a uniform diving board of weight  $350 \text{ N}$  and length  $2 \text{ m}$ .

A diver of mass  $60 \text{ kg}$  walks from point Q towards end R and jumps into water when at a distance of  $0.2 \text{ m}$  from end R.

Fig. 9



- i) Determine the distance from point Q where the weight of the diving board acts. (1 mark)
- ii) In the axes provided below, sketch the graph of force exerted at P against distance of diver from R as diver moves from Q towards R (1 mark)



- iii) Determine the force experienced at Q just before the diver jumps in water. (4 marks)
- c) Figure 10 below shows a toy bird. State one method of increasing the stability of the bird on the support. (1 mark)

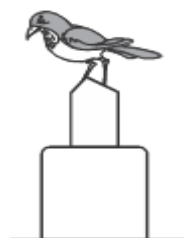


Fig. 10

17. a) Define the terms 'frequency' as used in uniform circular motion. (1 mark)
- b) Figure 11 below shows a turn table, centre O with a mass of 30g at a distance of 6cm from the centre. (1 mark)

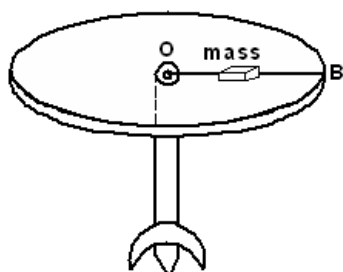


Fig. 11

- i) Determine the normal reaction between the 30g mass and the table. (2 marks)
- ii) The 30g mass just slides off the table when the turn table rotates at a frequency of 1 revolution per second. Determine:
- The angular velocity. (2 marks)
  - The coefficient of friction between the 30g mass and the table. (3 marks)
- iii) Oil is poured on the table and the table is made to rotate at the same frequency of 1 revolution per second. On the figure, mark a point P along line OB where the 30g mass will just slide off. (1 mark)
18. a) Distinguish between elastic and collision and inelastic collision. (1 mark)
- b) Figure 12 below shows two cars A and B moving in opposite direction along a straight road. The diagram shows their respective positions at equal time intervals before the crash until the cars collided at point M. The diagram is drawn to scale of 1:10

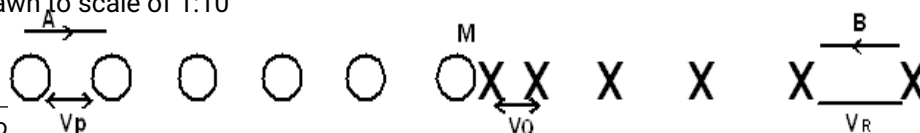


Fig. 12

- i) Explain which driver had anticipated the collision. (2 marks)
- ii) If the time between all the intervals was 0.5 seconds.
- I. Determine the velocities  $V_p$ ,  $V_Q$  and  $V_R$  (4 marks)
- II. Car A had a mass of 8000kg while B had a mass of 1200kg. The cars coalesced and moved together a distance of 8m before coming to rest.
- Determine:
- I. The velocity after collision. (2 marks)
- II. The common acceleration (3 marks)

19. a) Figure 13 below shows two conductors A and B tightly fitted onto each other at the junction. When some ice was placed at the junction then it became easy to separate the conductors. Explain which of the two a better conductor of heat was. (2 marks)

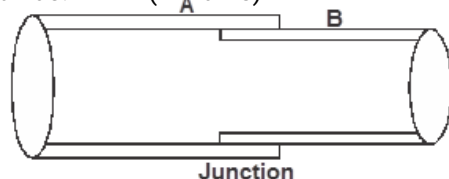


Fig. 13

- b) Explain why a finger feels colder when dipped in methylated spirit than when dipped in water at the same temperature. (2 marks)
- c) 50g of ice at  $-5^{\circ}\text{C}$  is dropped in a well lagged copper calorimeter of mass 30g having 150g of water at  $80^{\circ}\text{C}$ . A final steady temperature of  $35^{\circ}\text{C}$  is attained. Determine specific heat capacity of ice. (Take specific heat capacity of water =  $4200\text{Jkg}^{-1}\text{K}^{-1}$ , specific latent heat of fusion of ice =  $340,00\text{Jkg}^{-1}$  and specific heat capacity of copper =  $390\text{Jkg}^{-1}\text{K}^{-1}$ ) (4 marks)

- d) Figure 14 below shows a plastic bottle having a weighted cork floating on water inside the bottle. When the sides of the bottle are squeezed the cork sinks.

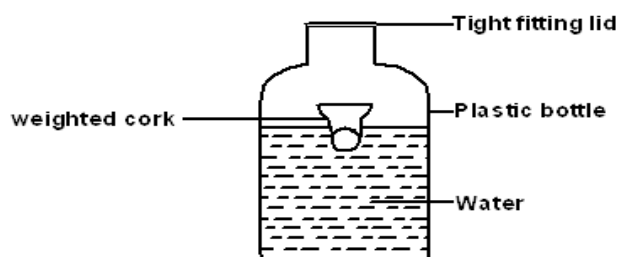


Fig. 14

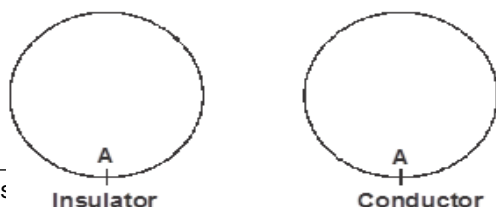
Explain the observation.

(2 marks)

**GEM SUB-COUNTY FORM 4 JOINT EVALUATION**  
**Kenya Certificate of Secondary Education**  
**232/2**  
**PHYSICS**  
**Paper 2**  
**July/August 2016**  
**Time: 2 Hours**

**SECTION A : (25 MARKS)**

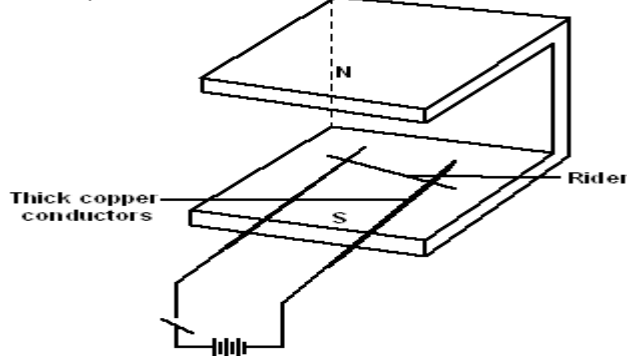
1. A vertical object placed on a bench is observed to have three shadows of different sharpness in different directions. Explain this observation. (3 marks)
2. The figure below shows two spherical materials, one an insulation conductor and the other a conductor. Negative charges are introduced at point A in each case.



On the same figure indicate the final position of the charges. Explain your answer.

(2 marks)

3. Give a reason why attraction in magnetism is not regarded as a reliable method of testing for polarity.
4. A lady holds a large concave mirror of focal length 1m, 80cm from her face. State two characteristics of her image in the mirror. (2 marks)
5. The diagram below shows two parallel thick copper conductors connected to a d.c power supply. A rider made from thin copper wire is placed on the conductors.

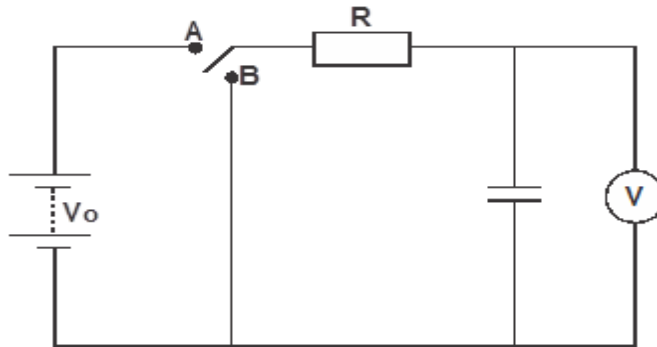


State and explain what is observed on the rider when the switch is closed.

(3 marks)

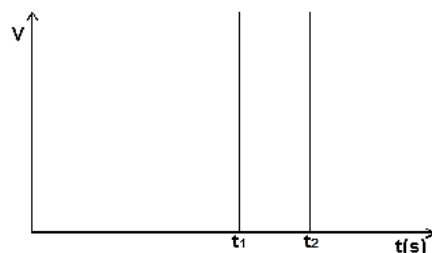
6. The audible frequency range for a certain person is 30Hz and 16500Hz. Determine the largest wavelength of sound in air the person can detect. (Speed of sound in air = 330m/s) (3 marks)
7. A small coin lies at the bottom of a water pond at a depth of 1.2m. How far from the water surface does the observer see it, given the speed of light in water is  $2.3 \times 10^8$  m/s and velocity of light in air is  $3.0 \times 10^8$  m/s. (4 marks)
8. State the cause of electromagnetic damping in a moving coil galvanometer. (1 mark)

9. Diagram below is a resistor-capacitor circuit. At time  $t = 0$ , the switch is closed at A for some time and then opened. The switch is then closed at B for some time.

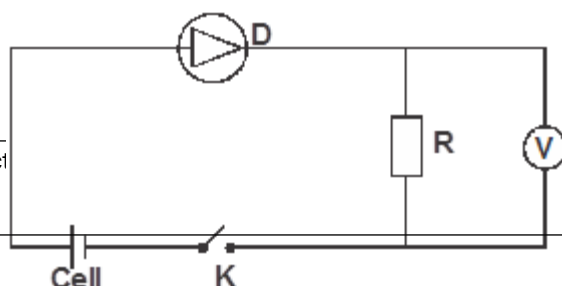


On the axes provided below, sketch graph of voltage  $V$  across the capacitor against time  $t$  ( $t_1$  and  $t_2$  represent time for opening at A and closing at B respectively).

(3 marks)



10.



Top grade predict

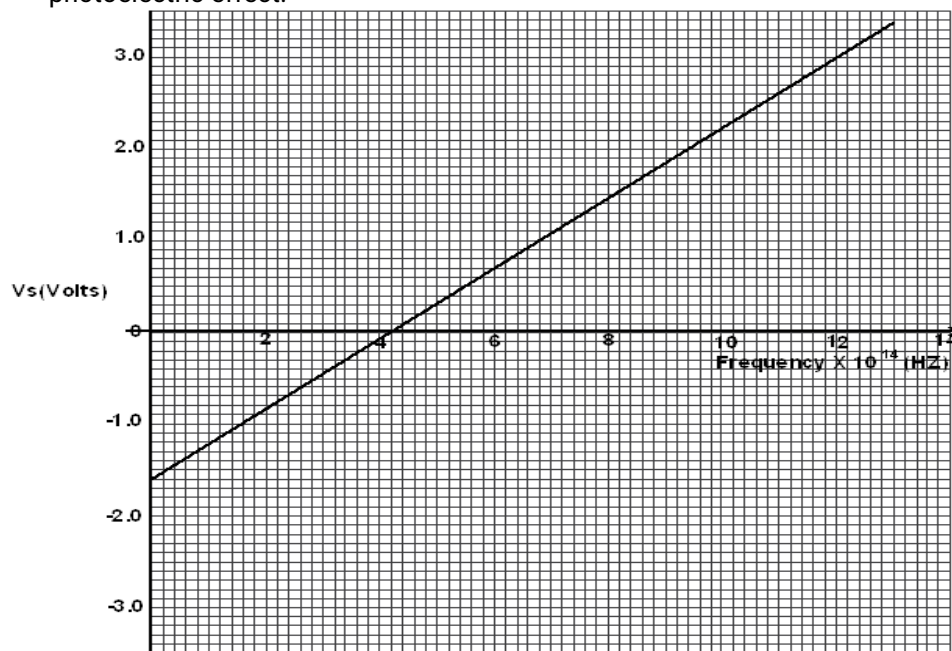
In the above diagram when the switch K is closed, the voltmeter shows a reading but when terminals of cell are reversed and switch K closed the voltmeter reading is zero. Explain these observations.

**SECTION B: (55 MARKS)**

11. a) State the property of radiation that determines the number of electrons emitted when the radiation falls on a metal surface.

(1 mark)

- b) The graph below is a variation of stopping potential,  $V_s$ , against frequency,  $f$ , in an experiment on photoelectric effect.



- i) Explain what is meant by stopping potential. (1 mark)

- ii) Given that the stopping potential  $V_s$  is related to the frequency by the equation

$$V_s = \frac{h}{e} f - \frac{W_0}{e}$$

where  $e$  is the charge of an electron.

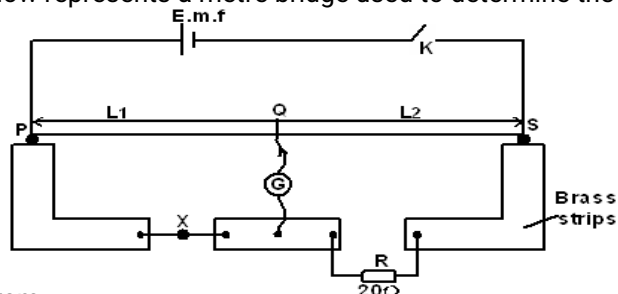
Determine the plank's constant  $h$ . ( $e = 1.6 \times 10^{-19} \text{C}$ )

(4 marks)

- iii) From the graph determine the work function  $W_0$  for the metal in electron volts (eV)

(3 marks)

12. a) Diagram below represents a metre bridge used to determine the resistance of an electrical component, X.



From the diagram,

- i) Explain why wide brass strips are used as terminals. (1 mark)

- ii) Explain why a cell of low e.m.f is preferable. (1 mark)

- iii) If null deflection was obtained when  $L_1$  was 60.0cm. Calculate the resistance of component marked X. (2 marks)

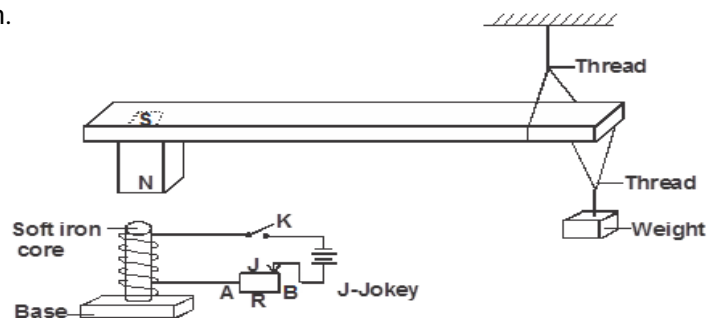
- iv) State three ways of ensuring that the error is minimized. (3 marks)

b) A uniform resistance wire of length 2.0m conducts a current of 0.25A when connected in series with a cell of e.m.f of 1.6V. How much current would be conducted if the wire is now cut into 2 equal lengths which are then arranged in parallel.

(4 marks)

13. a) State two factors that affect the strength of an electromagnet. (2 marks)

b) Figure below shows suspended metre rule in equilibrium balanced by the magnet and weight shown. The iron core is fixed to the bench.



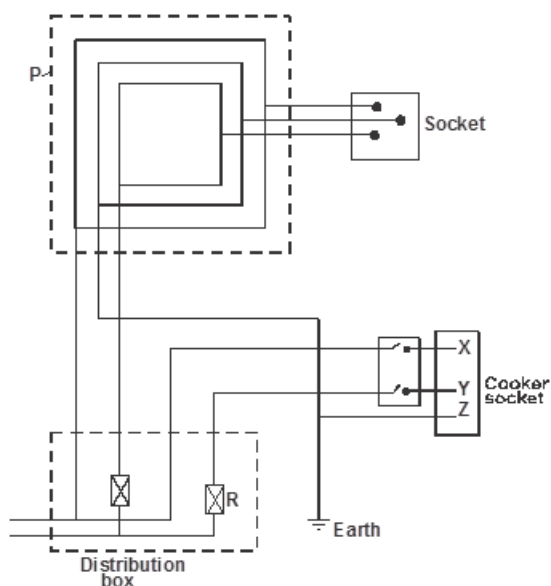
i) State and explain the effect on the metre rule when the switch S is closed. (3 marks)

ii) State and explain the effect on the metre rule when the terminals of battery are reversed. (2 marks)

iii) Suggest how J on the set up can be varied to have metre rule tilt anticlockwise faster. (1 mark)

iv) Explain your suggestion in b(iii) above. (3 marks)

14. a) The diagram below is a section of a house wiring system.



Name:

i) Circuit labelled P

(1 mark)

ii) Terminals labelled X and Y

(2marks)

iii) State the purpose of R in the circuit, hence explain why R is connected to Y and not X. (2 marks)

iv) Why is the earthing necessary in such a circuit? (1 mark)

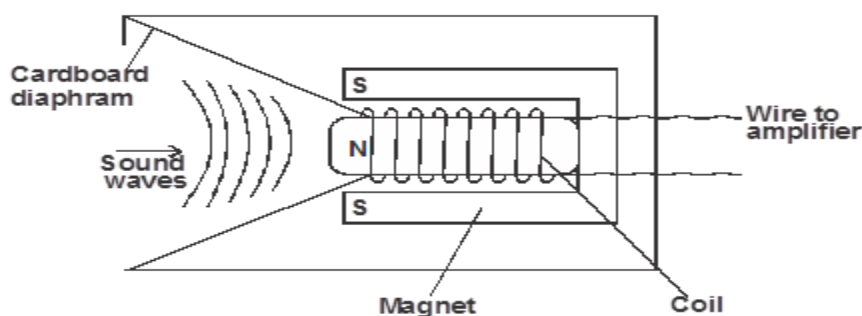
b) The cost of electricity per kilowatt hour- kWh is Ksh.8, determines how much a household running a device rated 1500W continuously for  $1.08 \times 10^5$  seconds, would pay. (2 marks)

c) Explain reason for transmission of electrical power over along distance at very high voltage. (1 mark)

d) Explain why for transmission of electrical power over long distance, alternating current (a.c) is preferred to a direct current (d.c) (1 mark)

e) How many 1000W electric iron rating could be safely connected to a 240V main circuit fitted with 13A fuse?(3 marks)

15. a) State Lenz's law of electromagnetic induction. (1 mark)  
 b) The figure below is a simple microphone in which sound waves from a speaker cause the cardboard diaphragm to vibrate.



- i) Explain how a varying current is induced in the coil when the diaphragm vibrates to and fro. (3 marks)  
 ii) State two ways in which the induced current in 15b(i) above can be increased. (2 marks)  
 c) A transformer with 1200 turns in the primary circuit and 120 turns in the secondary circuit has its primary circuit connected to a 400V a.c. source. It is found that when a heater is connected to the secondary circuit, it produces heat at the rate of 600W. Assuming 100% efficiency, determine the:  
 i) voltage in the secondary circuit. (2 marks)  
 ii) current in the primary circuit. (2 marks)  
 iii) current in the secondary circuit. (1 mark)

#### GEM SUB-COUNTY FORM 4 JOINT EVALUATION

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PHYSICS

Paper 3

July/August 2016

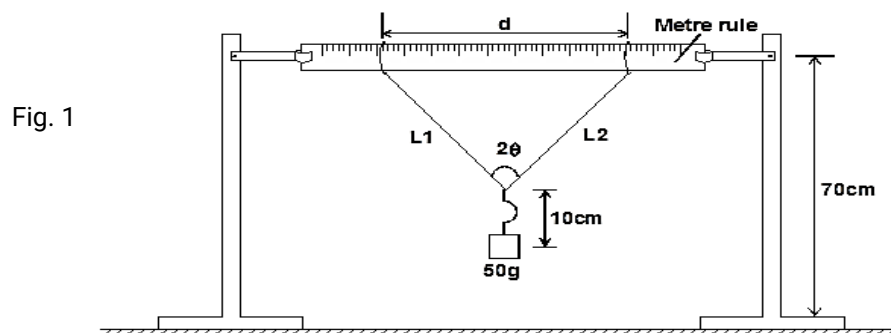
Time: 2½ Hours

1. You are provided with the following apparatus :

- two retort stands
- two clamps
- two bosses
- inextensible thread (about 120cm long)
- inextensible thread (about 20cm long)
- one 50g mass
- one stop watch
- two metre rules

Proceed as follows:

- a) i) Set up the apparatus as shown in figure 1 below.



Attach the ends of the thread to the metre rule and fasten the loops tightly so that the distance between the loops,  $d = 80\text{cm}$ . (Note :  $L_1 = L_2 = 50\text{cm}$  and should remain the same throughout the experiment)

- iii) Tie the 50g mass with a thread 20cm long. Fasten the mass at the centre of the thread on the rule such that the length of the pendulum from the point of suspension is 10cm as shown above.

- b) i) Measure the angle  $2\theta$

- ii) Pull the mass towards you through a small angular displacement and release it to swing freely.

The mass should oscillate perpendicular to the plane of the metre rule. Time 10 oscillations..

- iii) Repeat procedure b(i) and (ii) above by using different values of  $d$  and enter your values in table 1 below.

Table 1

| d (m)                           | 0.8 | 0.7 | 0.6 | 0.5 | 0.4 | 0.3 |
|---------------------------------|-----|-----|-----|-----|-----|-----|
| $2\theta$                       |     |     |     |     |     |     |
| $\theta$                        |     |     |     |     |     |     |
| $\cos \theta$                   |     |     |     |     |     |     |
| Time for 10 oscillations, t (s) |     |     |     |     |     |     |
| Periodic time T(s)              |     |     |     |     |     |     |
| $T^2 (S^2)$                     |     |     |     |     |     |     |

(10 marks)  
(5

c) On the grid provided below, plot a graph of  $T^2$  (y-axis) against  $\cos \theta$ .  
marks)

d) Find the slope, S, of the graph.

(3 marks)

e) Given that  $S = \frac{1.6\pi^2}{K}$ , determine the value of K.

(2 marks)

2. You are provided with the following:

- a 100ml beaker
- a 600ml beaker
- 2 thermometers range  $-10^\circ\text{C}$  to  $110^\circ\text{C}$
- a 100ml measuring cylinder (can be shared)
- some plasticine
- vernier callipers ( can be shared)
- metre rule or half metre rule
- some boiling water
- 100ml methylated spirit (at room temperature) in a beaker
- stop watch
- a stirrer

Proceed as follows:

a) Using the vernier callipers, measure the internal diameter  $d_1$  and external diameter  $d_2$  of the 100ml beaker.

$d_1 = \dots\dots \text{cm}$

$d_2 = \dots\dots \text{cm}$

(1 mark)

Hence determine the thickness, X, of the glass wall of the beaker given that

$$X = \frac{d_2 - d_1}{2}$$

$X = \dots\dots\text{cm}$

(1 mark)

b) Using the measuring cylinder provided, pour 80ml of methylated spirit into the small beaker. Measure the height, h, of the methylated spirit in the small beaker.

$h = \dots\dots \text{cm}$

(1 mark)

Hence determine the area, A, of the glass walls in contact with water, given that

$$A = \pi d_1 h$$

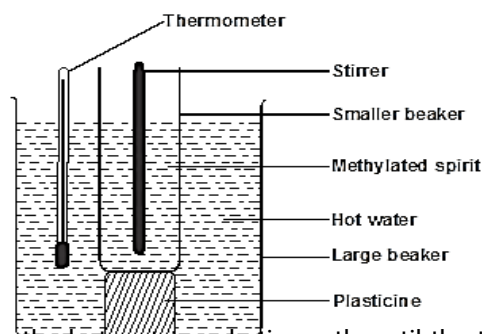
$$A = \dots\dots\text{cm}^2$$

(1 mark)

c) Using the plasticine provided, make a circular disc of about the same area as the bottom surface of the smaller beaker and about 1cm thick. Place this disc at the bottom of the larger beaker and place the small beaker on it. (The plasticine may be placed in a thin transparent polythene paper)

Now pour boiling water into the larger beaker until the levels of water in the two beakers are the same. See figure 2 below.

Figure 2



d) Place a thermometer in the hot water and stir gently until the temperature drops to  $80^\circ\text{C}$ . Now start the stop watch and measure the temperature,  $T_1$ , of the hot water at intervals of 20 seconds. Record the values in the table 2. **(Stir the water in the two beakers before taking readings)**

Pour out the contents of the two beakers.

e) Measure another 80ml of methylated spirit and put into the small beaker. Place the small beaker inside the larger beaker on the plasticine disc as before.

Again pour boiling water into the larger beaker until the levels of the water and the methylated spirit in the two beakers are the same. Place one thermometer in the methylated spirit and another in hot water. Stir gently until the temperature of the hot water drops to  $75^{\circ}\text{C}$ . Start the stop watch and immediately read and record in table 2 the temperature  $T_2$  of methylated spirit.

(You may now remove the thermometer in the hot water)

Read other values of  $T_2$  at intervals of 20s and record in table 2

Table

| Time, t (seconds)                        | 0 | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 | 180 | 200 |
|------------------------------------------|---|----|----|----|----|-----|-----|-----|-----|-----|-----|
| Temperature $T_1$ ( $^{\circ}\text{C}$ ) |   |    |    |    |    |     |     |     |     |     |     |
| Temperature $T_2$ ( $^{\circ}\text{C}$ ) |   |    |    |    |    |     |     |     |     |     |     |

f) Plot a graph of temperature,  $T_2$ , (y-axis) against time, t. (5 marks)

g) i) Determine the slope, S, of the graph at time  $t = 90$  seconds. (3 marks)

ii) Determine the constant K, given that  $K = \frac{315 SX}{A (T_1 - T_2)}$

where  $T_1$  and  $T_2$  are the temperatures of the hot water and methylated spirit at  $t = 90\text{s}$  and X and A are in  $\text{m}$  and  $\text{m}^2$  respectively. (2 marks)

## GEM SUB-COUNTY FORM 4 JOINT EVALUATION

### PHYSICS

#### Paper 3

July/August 2016

#### CONFIDENTIAL INSTRUCTIONS

The information contained in this paper is to enable the head of the school and the teacher incharge of Physics to make adequate preparations for this year's Physics Practical examination.

**NO ONE ELSE** should have access to this paper or acquire knowledge of its contents. **GREAT CARE** must be taken to ensure that the information herein does not reach the candidates either directly or indirectly. Doing so will constitute an examination irregularity which is punishable.

Each candidate will require the following apparatus :

#### Question 1

- 2 metre rules
- two retort stands
- two clamps
- two pieces of threads (about 20cm and 120cm long)
- one 50g mass
- one stopwatch
- two bosses

#### Question 2

- 100ml of beaker (glass)
- 600ml glass beaker
- 2 thermometers range  $-10^{\circ}\text{C}$  to  $110^{\circ}\text{C}$
- a 100ml measuring cylinder (can be shared)
- some plasticine
- vernier callipers (can be shared)
- metre rule or half metre rule
- some boiling water
- 100ml methylated spirit (at room temperature) in a beaker
- stop watch
- a glass stirrer

**GEM SUB-COUNTY FORM 4 JOINT EVALUATION****PHYSICS**

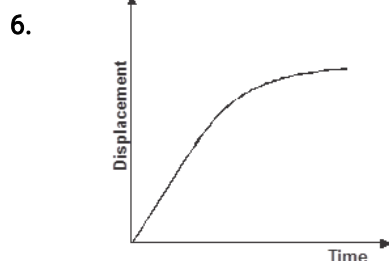
Paper 1

July/August 2016

**MARKING SCHEME**

1. x becomes larger  
Hot water breaks surface tension  
(of water making water to pull apart)
2. i) extension =  $0.25 - 0.20 = 0.05\text{m}$   
force =  $0.5 - 0.2 = 0.3\text{N}$   
 $K = \frac{F}{e} = \frac{0.3}{0.05} = 6\text{Nm}^{-1}$   
ii) Net original length be 10 extension  
 $0.2 - l_0$   
 $0.2 = 6(0.2 - l_0)$   
 $\frac{0.2}{6} = 0.2 - l_0$   
 $l_0 = 0.2 - \frac{0.2}{6}$   
 $= 0.1667\text{m}$   
**(Look for alternative working)**
3. The system will tip to the left  
Balloon (air) contracts more than solid hence lower upthrust on balloon than on solid
4. X lower than Y (Y higher than X)  
Dull black surface emits more radiant heat than shiny surface
5. As propellers rotate at high speed pressure above helicopter is lowered

Higher pressure below the helicopter pushes it upwards



7. Net force was provided for by the action of  $mg \sin 30$  i.e. action of force along incline
8.  $VR = 2 \times 3.142 \times 0.5 = 3.142\text{cm}$   
Efficiency =  $\frac{MA}{VR} \times 100\%$   
 $80 = \frac{MA}{3.142} \times 100$   
 $MA = \frac{80 \times 3.142}{100} = 2.513$   
But  $MA = \frac{L}{E} = E = \frac{L}{MA}$   
 $= \frac{7500}{2.513}$   
Effort =  $2984.16\text{N}$

$$E = \frac{MA}{VR} \times 100\% \text{ and } MA = \frac{L}{E}$$

**Accuracy**

9. Diffusion faster in can having hot water  
Increase in temperature increases rate of diffusion

$$10. \quad \int = \frac{M}{\int V}$$

$$= \frac{30\text{g}}{37.5 - 35} = \frac{30\text{g}}{2.5}$$

$$= 12\text{gcm}^{-3}$$

11. Impurity

Pressure

12. upthrust = wt of air displaced  
 $= 3600\text{N}$

$$\text{But } V = V \int g$$

$$\text{wt for air} = 300 \times 0.25 \times 10 = 750\text{N}$$

Maximum load

$$= \text{upthrust} - \text{weight}$$

$$= 3600 - 750$$

$$= 2850\text{N}$$

13. Kilogram metre per second

14. a) I. Diameter at one drop

$$= 2.32 - 0.26$$

$$= 2.06\text{mm}$$

$$\text{II. Volume of drop} = \frac{4}{3} \times 3.142 \times (0.206)^3$$

$$= 0.03662\text{cm}^3$$

$$\text{But } t = \frac{V}{A} \Rightarrow A = \frac{V}{t}$$

$$= \frac{0.03662}{3 \times 10^{-4}}$$

$$= 0.03662 \times 10^9$$

$$= 0.03662 \times 10^9$$

$$= 0.03662 \times 10^9$$

$$= 0.03662 \times 10^9$$

$$= 0.03662 \times 10^9$$

$$= 0.03662 \times 10^9$$

- b) Oil spreads to monolayer thickness  
Oil drop is assumed to be perfectly spherical

15. a) When a body is wholly or partially immersed in a fluid, it experience an upthrust equal to weight of fluid displaced

$$\text{b) Volume of liquid A displaced} = \frac{2}{3} \times \frac{4}{3} \times 3.142 \times (10.5)^3 = 3233.12\text{cm}^3$$

$$\text{Wt of liquid A displaced}$$

$$= 3233.12 \times 10^{-6} \times 1200 \times 10$$

$$= 38.8\text{N}$$

$$\text{Volume of liquid B displaced}$$

$$= \frac{1}{3} \times \frac{4}{3} \times 3.142 \times (10.5)^3$$

$$= 1607.3\text{cm}^3$$

$$\text{Wt of liquid B displaced}$$

$$= 1607.3 \times 10^{-6} \times 800 \times 10$$

$$= 12.86\text{N}$$

$$\text{Total upthrust}$$

$$= 38.8 + 12.86 = 51.66\text{N}$$

$$\text{Weight of sphere} = 51.66\text{N}$$

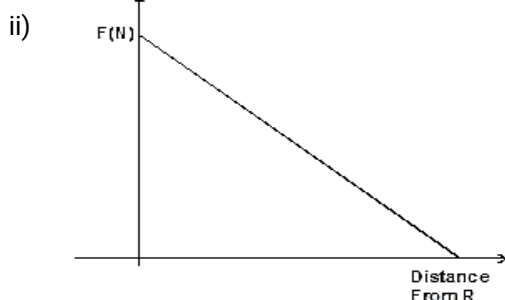
- c) i) 100KPa

- ii) -275K

iii) Real gases liquefy before reaching absolute zero temperature

**Extrapolation of the answer**

16. a) The longer the distance from the fulcrum, the lower the force (required to maintain equilibrium)  
b) i) 0.2m



**Accept line or curve with negative slope  
Distance intercept must exist**

$$F_1 d_1 = F_2 d_2$$

$$\begin{aligned} \text{iii) } 0.6 \times 600 &= 350 \times 0.2 + F_p \times 1.2 \\ 360 &= 70 + 1.2F_p \\ 290 &= 1.2F_p \\ F_p &= \frac{290}{1.2} = 241.67\text{N} \end{aligned}$$

$$\begin{aligned} \text{Force at Q} &= 600 + 350 + 24.67 \\ &= 1191.67\text{N} \end{aligned}$$

- c) - making feet shorter  
- pulling load at tail

**any one correct**

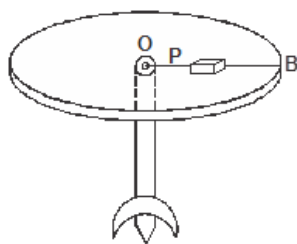
17. a) Number of complete oscillations made per second ( or cycles per second)

$$\text{b) i) } R = W = mg = \frac{30}{1000} \times 10 = 0.3\text{N}$$

$$\text{ii) I. } w = 2\pi f = 2 \times \frac{22}{7} \times 1 = 6.284\text{rad s}^{-1}$$

$$\begin{aligned} \text{II. } F_R &= mw^2 r \\ &= 0.03 \times (6.284)^2 \times 0.06 \\ &= 0.007107\text{N} \end{aligned}$$

$$\begin{aligned} \text{But } u &= \frac{F_R}{R} = \frac{0.007107}{0.3} \\ &= 0.2369 \end{aligned}$$



**P on line OB but nearer O**

18. a) Elastic collision is where both momentum and kinetic energy are conserved while inelastic

collision is where only momentum is conserved but not kinetic energy

**the two definitions must be connected with words like 'while' 'whereby' etc.**

- b) i) B anticipated collision since he decelerated

$$\text{ii) } V_p = \frac{1\text{cm}}{0.5} = 2\text{cm} = 2\text{cms}^{-1}$$

$$V_Q = \frac{0.5}{0.5} = 1\text{cm s}^{-1}$$

$$V_R = \frac{2\text{cm}}{0.5} = 4\text{cms}^{-1}$$

- iii) Total momentum before collision

$$\begin{aligned} &= m_1 v_1 + m_2 v_2 \\ &= 8000 \times 0.02 + 1200 \times -0.01 \\ &= 16 - 12 \\ &= 4\text{kgms}^{-1} \end{aligned}$$

let final velocity be V

$$\begin{aligned} m_1 v_1 + m_2 v_2 &= (m_1 + m_2) V \\ 4 &= (8000 + 1200) V \\ V &= \frac{4}{9200} \\ &= 0.0004348\text{ms}^{-1} \end{aligned}$$

$$\text{b) } v^2 - u^2 = 2as$$

$$0^2 - u^2 = 2 \times a \times 8$$

$$-(4 \times 348 \times 10^4)^2 = 16a$$

$$a = \frac{-16 \times 10^8}{16} = -1 \times 10^8\text{ms}^{-2}$$

19. a) B was better conductor since it contracted more than A (for easy separation)

b) Spirit (being more volatile) picks more latent heat of vaporization from the finger causing more cooling than water

c) Heat gained by ice = heat lost by water + heat lost by calorimeter

$$0.05C(5) + 0.05 \times 340000 + 0.05 \times 4200 \times 12$$

$$= 0.03 \times 390 \times 68 + 0.15 \times 4200 \times 68$$

$$0.25C + 17000 + 2520 = 795.6 +$$

$$42840$$

$$0.25C + 19520 = 43635.6$$

$$0.25C = 43635.6 - 19520$$

$$0.25C = 24115.6$$

$$C = \frac{24115.6}{0.25}$$

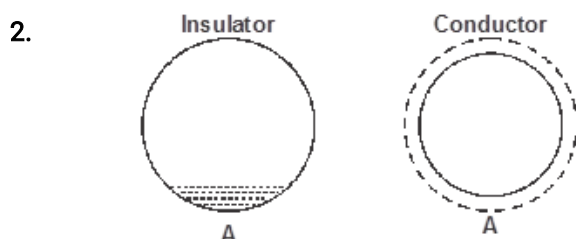
$$= 96462.4\text{Jkg}^{-1}\text{K}^{-1}$$

- d) Squeezing increases the pressure of air above the water

Pressure below water becomes lower and the cork moves down

**GEM SUB-COUNTY FORM 4 JOINT EVALUATION**  
**PHYSICS**  
**Paper 2**  
**July/August 2016**  
**MARKING SCHEME**

1. Three different sources of light  
 Three sources of light of different intensities  
 Three sources at different distances from the object



**NB:**

***Charges at insulator inside while conductor outside***

The conductor allows charge to be distributed while an insulator does not

3. Attraction occurs between unlike poles of a magnet and can also occur between a magnet and unmagnetised magnetic material
4. Magnified  
 Upright / erect  
 Virtual  
**any two**
5. The rider moves towards the magnet away from power supply The conductor experiences a force when placed in magnetic field due to interaction between two magnetic fields

6.  $V = f\lambda$   
 $\lambda = \frac{330}{30}$   
 $= 11\text{m}$

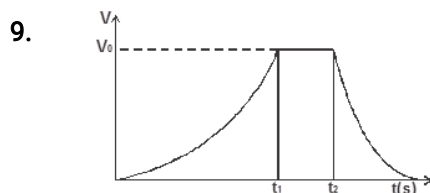
7. Apparent depth =  $\frac{\text{real depth}}{\text{refractive index}}$   
 Refractive index  $n = \frac{\text{velocity in air}}{\text{velocity in water}}$

$$= \frac{3.0 \times 10^8}{2.3 \times 10^8}$$

$$= 1.3$$

Apparent depth =  $\frac{1.2}{1.3}$   
 $= 0.92\text{m}$

8. Eddy currents



10. Voltmeter show reading when switch is closed and diode is forward biased. Reversing terminals reverses, biasing and no current flows  
 The depletion layer widens and potential hill increases

**SECTION B**

11. a) The intensity of radiation  
 b) i) Stopping potential is the opposing / negative potential sufficient to just stop the movement of electrons

ii) gradient =  $\frac{h}{e} = \frac{3 - 0}{(12 - 4.4) \times 10^{14} \text{Hz}}$   
 $\sim 3.95 \times 10^{-15}$   
 $h = 3.95 \times 10^{-15} \times 1.6 \times 10^{-19}$   
 $= 6.32 \times 10^{-34} \text{Js}$

iii) y intercept =  $\frac{w_0}{e}$   
 $= -16\text{V}$   
 $w_0 = 1.6\text{eV}$   
 Evidence read from graph  $\pm 1$  small sq.  
 (1.55 - 1.65)

12. a) To minimise resistance due to  
 i) Terminals  
 ii) To minimise current and the resulting heating effect that would alter resistance

iii)  $\frac{x}{20} = \frac{60}{40}$  or  $\frac{h}{2} = \frac{R_x}{R}$   
 $x = \frac{60 \times 20}{40}$   
 $= 30\Omega$

- iv) Use of short connecting wires  
 Use of a source with low e.m.f  
 The value of known resistance R should be comparable to X

b)  $R = \frac{V}{A}$   
 $= \frac{1.6}{0.25}$   
 $= 6.4\Omega$   
 Resistance of each piece =  $\frac{6.4}{2}$   
 $= 3.2\Omega$

$$R_T = \frac{R_1 R_2}{R_1 + R_2} \text{ (parallel)}$$

$$= \frac{3.2 \times 3.2}{3.2 + 3.2}$$

$$= 1.6\text{W}$$

$$I = \frac{1.6}{1.6} \Rightarrow \frac{V}{R}$$

$$= 1\text{A}$$

13. a) Amount of current  
 Number of coils / turns  
 Shape of the core  
 b) i) The metre rule tilt anticlockwise when switch is closed current flows in coil magnetising bar. End of coil facing magnet become south pole hence attract magnet to which ruler is attached

- ii) Metre rule tilt clockwise or weight comes down while magnet moves upwards. Reversing terminals reverses direction of current hence polarity of electro magnet. End facing magnet become North Pole hence repulsion
- iii) Move jockey J from B toward A / right to left of R. It reduces resistance and increase current hence stronger electromagnet
14. a) i) P - main ring circuit  
ii) X - neutral terminal  
Y - positive / live terminal  
iii) To protect / guard against excess current  
Ensure when R breaks the appliance does not remain live  
iv) To guard against electric shock channel / transfer excess charges to ground
- b)  $\frac{\text{kwh}}{1000} \times \frac{\text{h}}{3600} \times \frac{\text{sh.}}{8}$   

$$\frac{15000}{1000} \times \frac{1.08 \times 10^5}{3600} \times 8$$

$$= 360$$
- c) High voltage leads to low current hence lower power losses
- d) Alternating current (a.c) can easily be stepped up to high voltage
- e)  $IV = \text{No. of irons} \times 1000$   

$$\text{Number} = \frac{13 \times 240}{1000}$$

$$= 3.12$$
- Accept 3 only

15. a) The induced current flow in such a direction that produces magnetic effect that oppose the change producing it
- b) i) As the diaphragm vibrate due to sound wave impact to and fro, it causes the coil to move forth and back in magnetic field cutting field lines  
This causes a varying electro-magnetic force to be induced in the coil which causes a varying current to flow
- ii) Increase impulsive force of sound waves to diaphragm  
Increase sound frequency  
Increase no. of turns  
Increase strength of magnet / use magnet with closer poles
- any two**
- c) i)  $\frac{V_p}{V_s} = \frac{N_p}{N_s} = \frac{I_s}{I_p}$   

$$V_s = \frac{400}{1200} \times 120$$

$$= 40V$$
- ii)  $I_p = \frac{V}{R} = \frac{600}{400}$   

$$= 1.5A$$
- iii)  $I_s = \frac{P}{V} = \frac{600}{40}$   

$$= 15A$$

**GEM SUB-COUNTY FORM 4 JOINT EVALUATION**  
**PHYSICS**  
**Paper 3**  
**July/August 2016**  
**MARKING SCHEME**

1. b (iii)

| d (m)                            | 0.8    | 0.7    | 0.6    | 0.5    | 0.4    | 0.3    |
|----------------------------------|--------|--------|--------|--------|--------|--------|
| 2θ                               | 112    | 86     | 72     | 60     | 46     | 35     |
| θ                                | 56     | 43     | 36     | 30     | 23     | 17.5   |
| cos θ                            | 0.5592 | 0.7314 | 0.8090 | 0.8660 | 0.9205 | 0.9537 |
| Time for 10 oscillations         | 13.25  | 14.09  | 14.22  | 14.87  | 15.32  | 15.59  |
| Periodic time T(s)               | 1.325  | 1.409  | 1.422  | 1.487  | 1.532  | 1.559  |
| T <sup>2</sup> (S <sup>2</sup> ) | 1.7556 | 1.9852 | 2.0221 | 2.2112 | 2.3470 | 2.4305 |

c) **On Graph**

d) Slope,  $S = \frac{\text{change in } T^2}{\text{change in } \cos \theta}$

$$= \frac{2.15 - 1.2}{0.88 - 0.5}$$

$$= 2.7143S^2$$

e)  $K = \frac{1.6\pi^2}{S}$   

$$= \frac{1.6(3.142)^2}{2.7143}$$

$$= 5.8194S^2$$

2. a)  $d_1 = 3.50\text{cm} \pm 0.1$   
 $d_2 = 5.21\text{cm} \pm 0.1$   
 $X = 0.855\text{cm}$
- b.  $h = 4.0\text{cm} \pm 0.1$   
 $A = 43.988$

|                        |      |      |      |      |      |      |      |      |      |      |      |
|------------------------|------|------|------|------|------|------|------|------|------|------|------|
| Time t (seconds)       | 0    | 20   | 40   | 60   | 80   | 100  | 120  | 140  | 160  | 180  | 200  |
| Temperature $T_1$ (°C) | 80.0 | 76.0 | 73.0 | 70.0 | 68.0 | 66.0 | 64.0 | 62.0 | 60.5 | 59.0 | 57.5 |
| Temperature $T_2$ (°C) | 21.0 | 25.0 | 29.0 | 33.0 | 37.5 | 43.0 | 47.0 | 52.5 | 58.0 | 64.0 | 68.0 |

f) A graph of  $T_2$  (y-axis) against time.

g) i) Slope S at  $t = 90$ s

$$\frac{48.5 - 24.0}{130 - 20} = \frac{24.5}{90} = 0.2722$$

ii)  $K = \frac{315 SX}{A(T_1 - T_2)} = \frac{315 \times 0.2722 \times 0.855}{43.988 (64.0 - 40.0)}$

$$= \frac{74.63025}{1,055.712}$$

$$= 0.0707 \text{ (4d.p)}$$

# MAARA FORM FOUR JOINT EVALUATION

Kenya Certificate of Secondary Education

PHYSICS

Paper - 232/1

July/August 2016

Time: 2 hours

## SECTION A (25 marks)

Answer ALL the questions in the spaces provided.

- The water level in a burette is  $30.6\text{cm}^3$ , 50 drops of water each of volume  $0.2\text{cm}^3$  are added to the water in the burette. What is the final reading of the burette. (2 marks)
- Figure 1 shows a graph showing the behaviour of a helical spring.

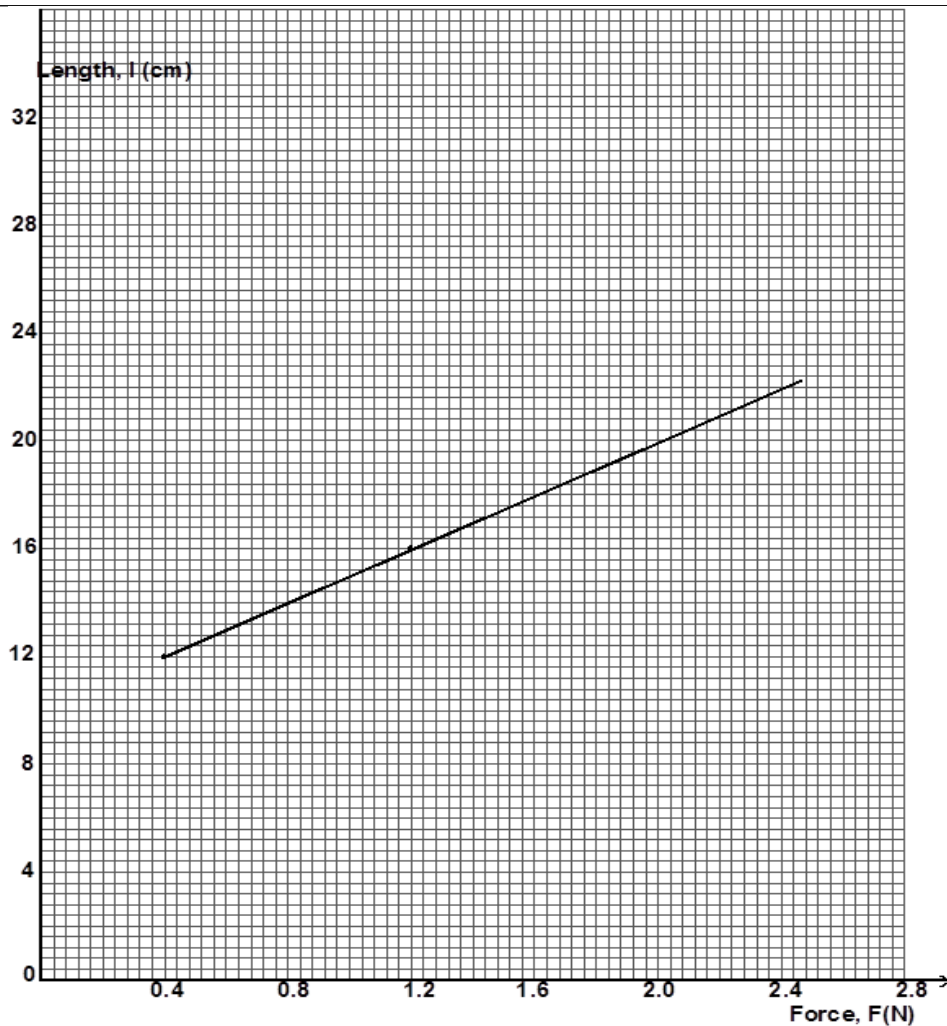


Fig 1

Determine the spring constant in SI units.

(3 marks)

3. Two forces are acting on a body as shown in figure 2.



Fig 2

By use of a vector, draw the body and show the resultant force.

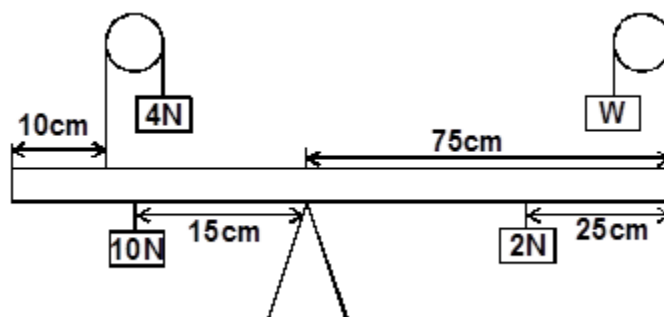
(1 mark)

4. Two identical beakers A and B containing equal volumes of water are placed on a bench. The water in A is cold while in B is warm. Identical pieces of potassium permanganate are placed gently at the bottom of each beaker inside the water. It is observed that the spread of colour in B is faster than in A. Explain this observation.

(2 marks)

5. Figure 3 shows a uniform bar of weight 5N and length 1.1m pivoted at a point and in equilibrium under the action of the forces shown.

Fig 3



Determine the value of weight W.

(3 marks)

6. State the contribution physics has made to the entertainment industry.

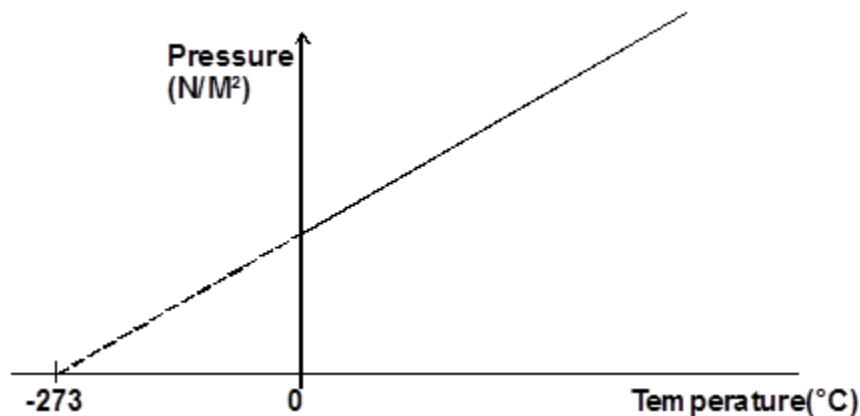
(1 mark)

7. State one limitation of the micrometer screw gauge.

(1 mark)

8.

Fig 4

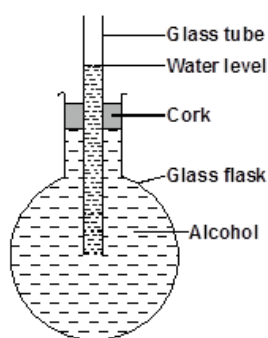


State the law represented in figure 4.

(1 mark)

9. Alcohol was placed in a flask fitted with an air tight cork as shown in figure 5.

Fig 5



State and explain what would be observed if the flask was cooled.

(3 marks)

10. A boy poured some boiling water into a plastic can and placed an air-tight cork on its open end. He then ran some cold water on it for about 20 seconds after which he shook the can vigorously. State and explain what he observed.

(3 marks)

11. Water flows along a horizontal pipe of cross-sectional area  $30\text{cm}^2$ . The speed of the water is  $4\text{m/s}$  but it reaches  $7.5\text{m/s}$  in a constriction in the pipe. Calculate the area of the constriction in  $\text{m}^2$

(3 marks)

12. The arrangement in figure 6 was used to determine the specific heat capacity of the metal.

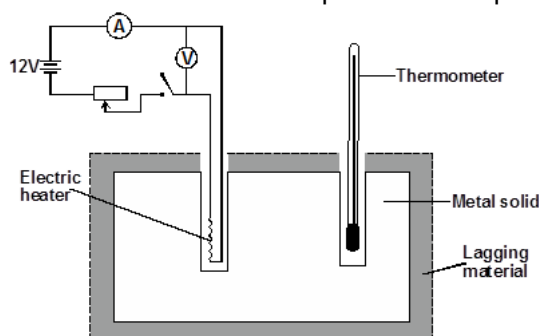


Fig 6

State the precautions that need to be taken.

(2 marks)

13. State Newton's second law of motion.

(1 mark)

**SECTION B : (55 marks)**

**Answer ALL questions in this section.**

14. a) i) State two conditions necessary for equilibrium of a body acted upon by a number of forces.

ii) Figure 7 shows beaker containing a block of ice.

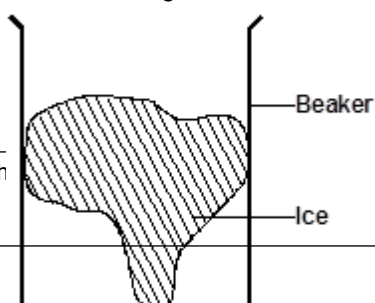


Fig 7

State and explain the change in stability when the ice melts.

(3 marks)

b) Figure 8 shows a drop of fatty acid on a wire of diameter 1.4mm

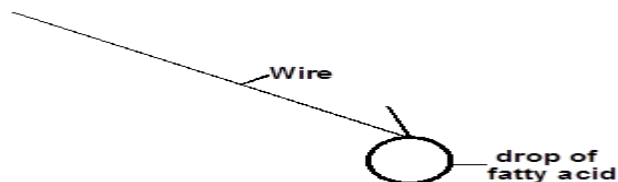


Fig 8

When the drop of the fatty acid was placed on clean water surface it formed a circular patch of diameter 91cm.

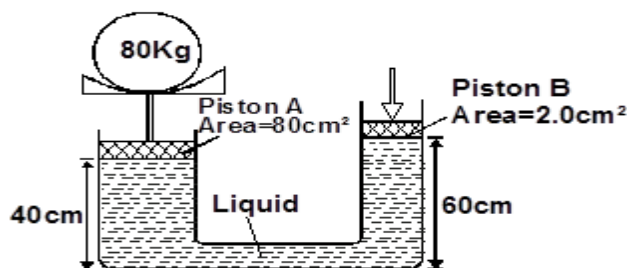
i) Estimate the length of the molecule of the fatty acid. (3 marks)

ii) State the assumption made in part (i) above. (1 mark)

15. a) State the principle of transmission of pressure in liquids. (1 mark)

b) A mass of 80kg is being lifted by a force  $F$  applied on the other piston of the machine as shown in figure 9.

Fig 9



Determine the value of  $F$  needed to just lift the  $80\text{kg}$  mass given the density of the liquid is  $1.2\text{g/cm}^3$ . (4 marks)

c) Give one reason why a lift pump raises water to heights less than  $10\text{m}$ . (1 mark)

d) In an experiment, it was observed that soapy water placed on a wet smooth surface displaced the particles of non-soapy water. State and explain this observation. (2 marks)

16. a) A block of metal of mass  $250\text{g}$  at  $100^\circ\text{C}$  is dropped into a lagged calorimeter of heat capacity  $40\text{J K}^{-1}$  containing  $100\text{g}$  of water at  $25^\circ\text{C}$ . The temperature of the resulting mixture was found to be  $40^\circ\text{C}$ . Determine; ( $C_w = 4200\text{J K}^{-1}$ )

i) Heat gained by calorimeter. (2 marks)

ii) Heat gained by water. (2 marks)

iii) Heat lost by the block. (2 marks)

iv) Specific heat capacity of the metal block. (3 marks)

b) Hot milk in a bottle cools faster when wrapped in a wet cloth than when the bottle is immersed in cold water in a bucket. Explain. (2 marks)

17. a) The machine represented in the diagram can be used to lift water from a well.

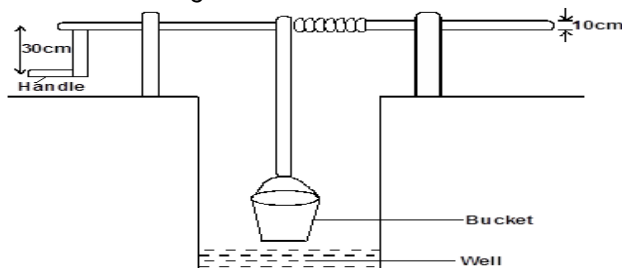


Fig 10

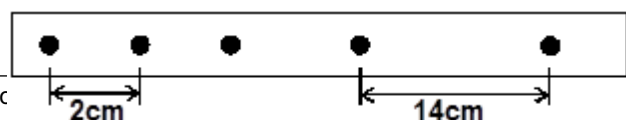
A force of  $50\text{N}$  applied on the handle lifts water of weight  $180\text{N}$

i) Calculate the efficiency of the machine. (4 marks)

ii) Give a reason why the efficiency is less than  $100\%$ . (1 mark)

b) The five-tick tape shown below was produced by a ticker timer connected to mains supply of  $50\text{Hz}$  when a force pulls the trolley.

Fig 11

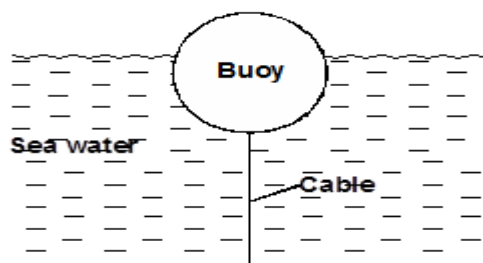


Determine the acceleration of the trolley. (4 marks)

18. a)i) State Archimede's principle. (1 mark)

ii) Figure 12 shows a buoy, M, of volume 120 litres and mass 60kg. It is held in position in sea water of density  $1.04\text{g/cm}^3$  by a light cable fixed to the bottom so that  $\frac{3}{4}$  of the volume of the buoy is below the surface of the sea water.

Fig 12



Determine the tension  $T$  in the cable. (4 marks)

b)i) During cold season boys looking after cattle lit a fire in a Kimbo tin and whirl it round vertically without its contents falling out. Explain. (1 mark)

ii) A particle is moving in a circular path of radius 0.4m with velocity of 7.5m/s. Determine its angular velocity. (3 marks)

19. a) State a condition which should be attained by a body in a viscous fluid to have terminal velocity. (1 mark)

ii) A block of metal having a mass of 30kg requires a horizontal force of 100N to move it with uniform velocity along a horizontal surface. Calculate the co-efficient of friction. (3 marks)

b)i) State Charles' law. (1 mark)

ii) Give **three** reasons why gas laws do not hold at low temperatures. (3 marks)

c) Distinguish between elastic and inelastic collisions. (1 mark)

**MAARA FORM FOUR JOINT EVALUATION**  
**Kenya Certificate of Secondary Education**  
**PHYSICS**

Paper - 232/2

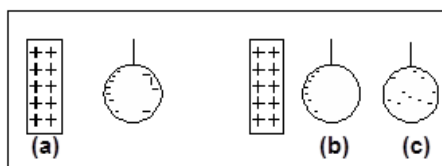
July/August 2016

Time: 2 hours

**SECTION A (25 marks)**

1. Figure 1 show a method used to charge conductors. The procedure follows steps a, b and c

Fig 1



i) State the method of charging above. (1 mark)

ii) Explain what happens in step (b) above. (1 mark)

2. In the space provided below, sketch a labelled diagram to show how a pinhole camera forms an image of a vertical object placed in front of the pinhole. (3 marks)
3. Define resistance of a Ohmic conductor. (1 mark)
4. State one reason why convex mirrors are used as driving mirrors. (1 mark)
5. How much current is taken by a bulb rated 100w, 250V. (2 marks)
6. Figure 2 shows an experimental arrangement  $S_1$ ,  $S_2$  and  $S$  are narrow slits.

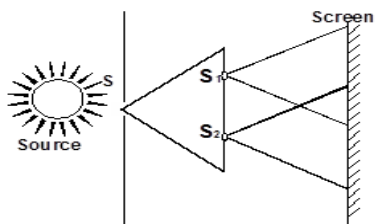
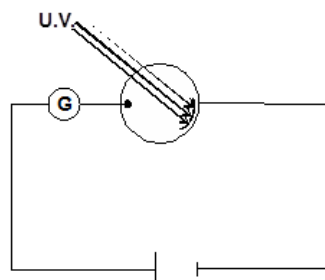


Fig 2

- State what is observed on the screen when the source is white light. (1 mark)
7. An x-ray machine produces radiation of wavelength  $1.5 \times 10^{-11} \text{ m}$ . Calculate the energy content. (Planks constant  $(h) = 6.63 \times 10^{-34} \text{ J s}$ ) (2 marks)
  8. A student set up an experiment in the laboratory as shown in figure 3.

Fig 3



He directed a U.V light on the cathode of the photocell and observed that the galvanometer deflects.

- i) Explain this observation. (1 mark)
  - ii) State one condition that must be met for the galvanometer to deflect. (1 mark)
9. Figure 4a and figure 4b shows a P-N junction connected to a battery. It is observed that the current in figure 4a is greater than the current in figure 4b

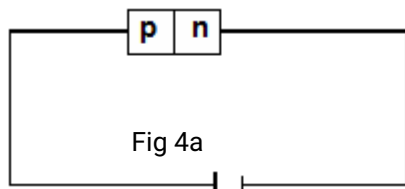


Fig 4a

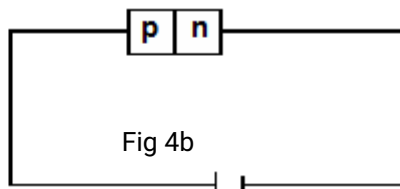


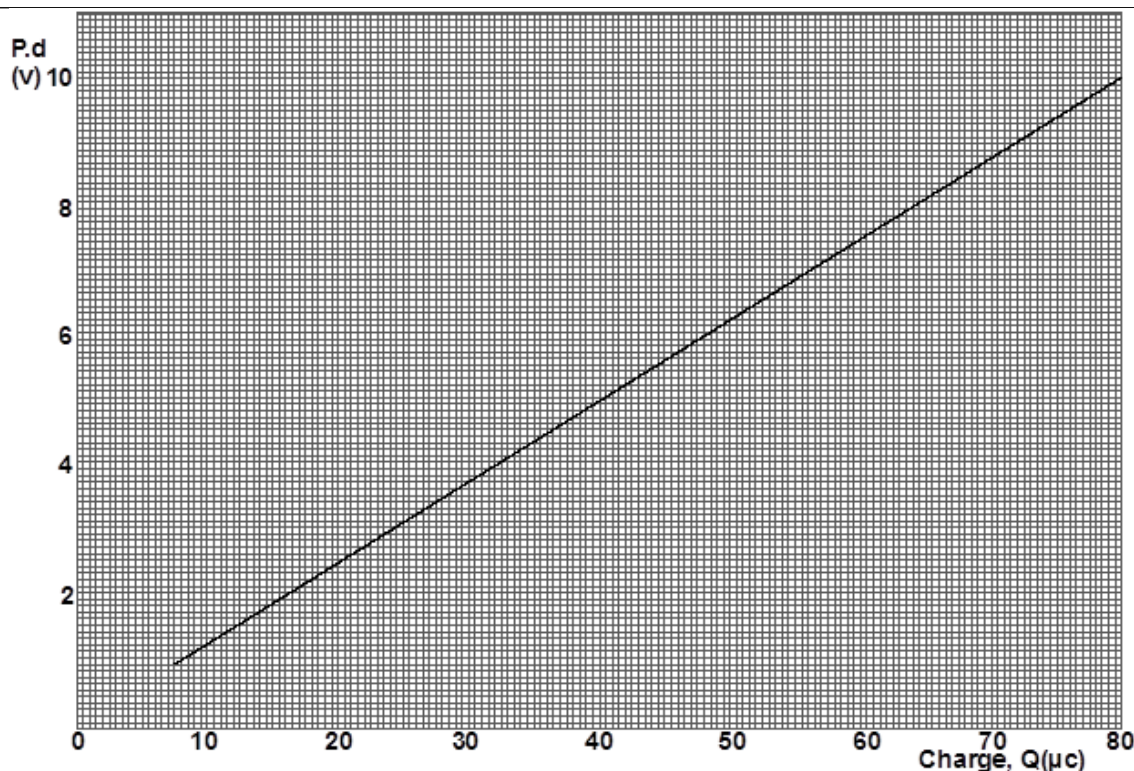
Fig 4b

Explain the observation.

(2 marks)

10. Figure 5 shows a relationship between potential difference  $V$  and the charge  $Q$  across and stored in a capacitor.

Fig 5



Determine the capacitance  $C$  of the capacitor. (3 marks)

11. Very strong x-rays have the same properties as gamma rays. What is the **main** difference between these two electromagnetic waves. (1 mark)
12. Figure 6 shows a radioactive substance contained in a thick lead box and emitting radiations B, C and D. Passing through a strong field directed out of the plane of the paper.

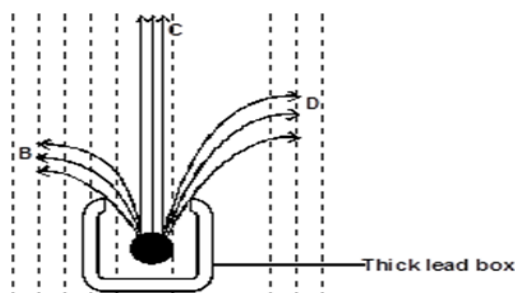


Fig 6

Identify with a reason the radiation labelled D. (2 marks)

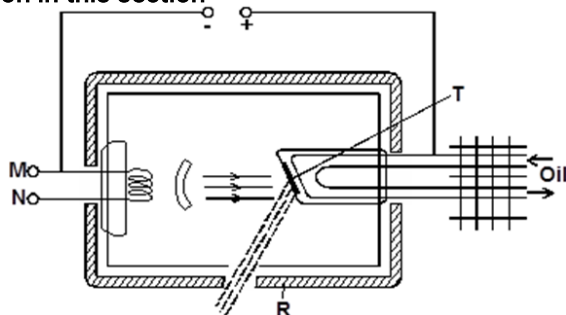
13. An object of height 10cm stands before a diverging lens of focal length 30cm and at a distance of 20cm from the lens. Determine the image distance. (3 marks)

### SECTION B (55 marks)

Answer ALL question in this section

14. a)

Fig 7



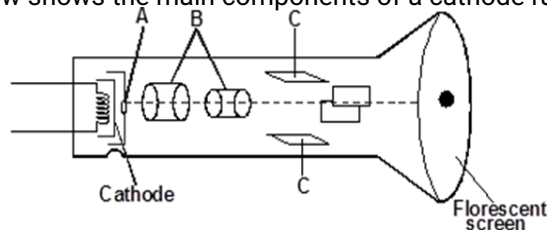
- i) Use figure 7 above to answer the question that follow; target T is made of a material of high melting point. Give a reason for this. (1 mark)
- ii) State **two** reasons why oil is used for cooling instead of water. (2 marks)

iii) What property does the material marked R have that makes it suitable for shielding. (1 mark)

iv) How can the intensity of x-rays produced be increased. (1 mark)

b) Figure 8 below shows the main components of a cathode ray oscilloscope.

Fig 8



Name the parts labelled A and B. (2 marks)

ii) What is the function of parts labelled C. (1 mark)

iii) Explain how electrons are produced. (1 mark)

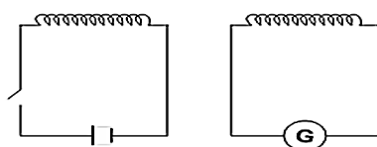
iv) Give a reason why the tube is evacuated. (1 mark)

15. a) i) In a consumer fuse box in domestic wiring, use of circuit breakers is preferred to fuses. State two advantages of using a circuit breaker over a fuse. (2 marks)

ii) A house is supplied with 240V from a power source which is fitted with a 13A fuse. What is the maximum number of 75W bulbs that can be fitted in the house. (2 marks)

b) Figure 9 shows two circuits close to each other.

Fig 9



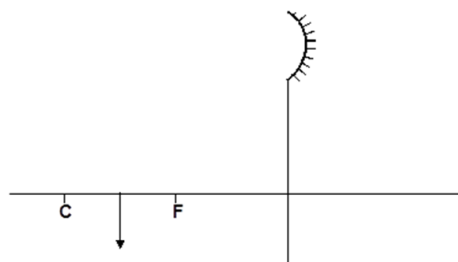
When the switch is closed, the galvanometer shows a reading and then returns to zero. When the switch is then opened, the galvanometer shows a reading in the opposite direction and then returns to zero. Explain this observation. (3 marks)

b) Explain how energy losses in a transformer are reduced by having a soft-iron core. (2 marks)

16. a) i) What is a virtual image? (1 mark)

ii) Complete the ray diagram in figure 10 below so as to form an image. (3 marks)

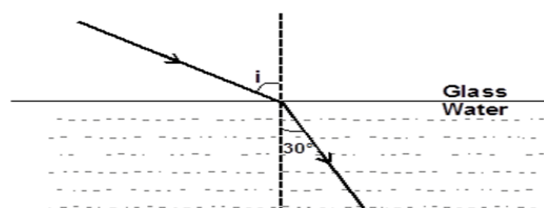
Fig 10



II. State **two** characteristics of the image formed. (2 marks)

b) i) A ray of light is incident on a glass-water interface as shown in figure 11 below.

Fig 11



Calculate the angle of incidence  $i$ . (Take the refractive index of glass and water  $\frac{3}{2}$  and  $\frac{4}{3}$  respectively. (3 marks)

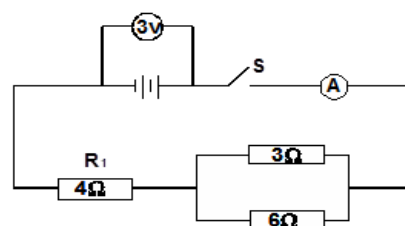
ii) State one application of total internal reflection. (1 mark)

iii) Prisms are preferred to plane mirrors for use in periscopes. Explain. (2 marks)

17. a) State two advantages of the alkaline accumulator over lead acid accumulator. (2 marks)

b) Figure 12 shows resistors in a circuit.

Fig 12



Calculate

i) The total resistance of the circuit.

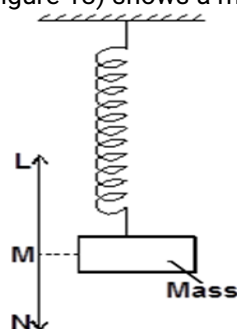
(2 marks)

ii) Current through the  $6\Omega$  resistor.

(3 marks)

18.a)i) The diagram below (figure 13) shows a mass oscillating on a spring above point m.

Fig 13



Identify the point at which

I. The system has maximum KE

(1 mark)

II. The kinetic energy is equal to potential energy.

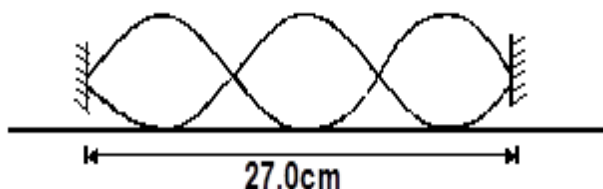
(1 mark)

ii) Distinguish between electromagnetic waves and mechanical waves giving an example in each.

(2 marks)

b) Figure 14 shows a standing wave on a string of length 27cm.

Fig 14



Determine the wavelength of the wave.

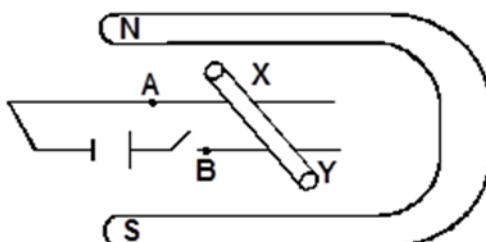
(3 marks)

c) Other than temperature state two other factors that affect speed of sound in air.

(2 marks)

19. a)

Fig 15



In figure 15 above an insulated copper wire XY lies over the fixed wire AB connected to a battery. When the key in the circuit is closed, the rod XY moves.

i) In which direction does the wire XY experience the force? Indicate using an arrow.

(1 mark)

ii) When is the force on the wire XY greatest.

(1 mark)

iii) What is the effect of reversing both the magnetic field and direction of flow of current.

(1 mark)

iv) How can the speed of the rod be decreased.

(1 mark)

c)i) Attraction is not the sure way for testing polarity of a magnetic. Explain.

(1 mark)

ii) Figure 16 below shows two similar iron pins. One is placed on a wooden block and the other on a soft iron block.

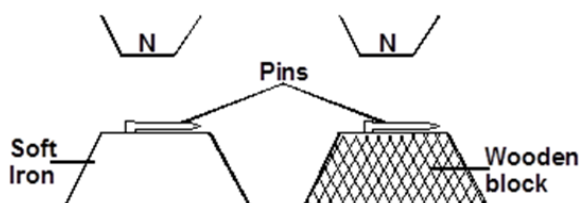


Fig 16

It was observed that the pins on the wooden block were attracted to the magnet while the other on the soft iron block was not. Explain.

(2 marks)

**MAARA FORM FOUR JOINT EVALUATION**

Kenya Certificate of Secondary Education

**PHYSICS**

Paper - 232/3

**July/August 2016****Time: 2½ hours****1. Part A**

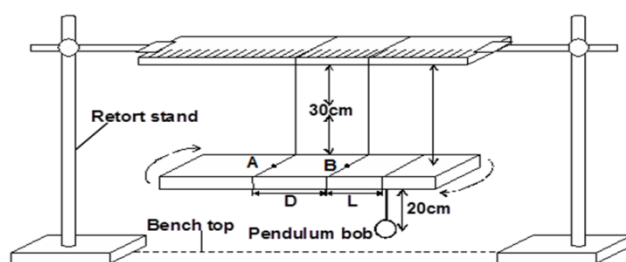
You are provided with the following.

- Two metre rules.
- A stop watch.
- A half-metre rule
- Two retort stands.
- Three pieces of thread.
- A pendulum bob.

**Proceed as follows:**

- Clamp one of the metre rules horizontally so that its largest face is in plane and then suspend the second metre rule on the clamped metre rule so that it balances horizontally as shown in figure 1
- Set the length of the thread suspending the metre rule, attached to it at A to 30 cm.

Fig 1

Tie a second thread attached at B to support the suspended metre rule at a distance  $D = 25\text{cm}$  from A

- Suspend the pendulum bob with a thread at  $l = 25\text{cm}$  from B so that its length is 20 cm as shown in figure 1
- Displace the hanging metre rule in a horizontal plane as shown by the arrowed lines in figure 1 to set it into horizontal oscillations.

Measure the duration,  $t$  of ten complete oscillations and a record in table 1 against the value 25 cm of  $D$ . Calculate the record the period,  $T$  and its square  $T^2$ 

- Repeat for the other values of  $D$  shown in table 1.

(7 marks)

**Table 1**

| $D(\text{cm})$ | $t$ (seconds) | $T$ (seconds) | $T^2$ (Second <sup>2</sup> ) |
|----------------|---------------|---------------|------------------------------|
| 25             |               |               |                              |
| 30             |               |               |                              |
| 35             |               |               |                              |
| 40             |               |               |                              |
| 45             |               |               |                              |

- Plot the graph of  $D$  (cm) against  $T^2$  (Second<sup>2</sup>)

(5 marks)

- Determine the slope,  $S$  of the graph.

(2 marks)

**PART B**

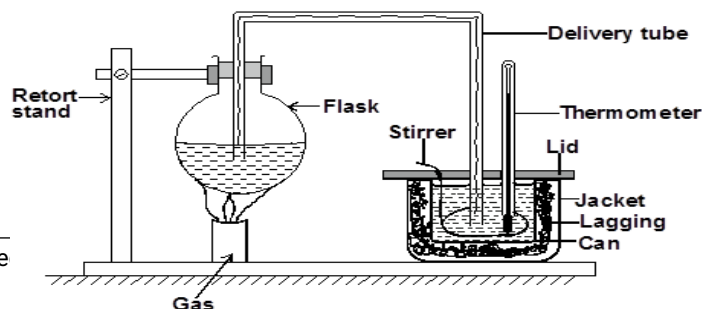
You are provided with the following,

- A round-bottomed flask containing some water and fitted with a delivery tube.
- A thermometer.
- A balance
- A measuring cylinder.
- A thermometer
- A retort stand
- A calorimeter
- A Bunsen burner.

**Proceed as follows**

- Clamp the flask and heat the water as shown in figure 2 and heat the water.

Fig 2



Top grade pre

- i) Measure the mass,  $m_c$  the calorimeter can and stirrer.  
 $m_c = \text{kg}$ . (1 mark)
- j) Measure  $60\text{cm}^3$  of water and put it in the calorimeter can.
- k) Measure the mass of the calorimeter can, stirrer and the water,  $m_1$   
 $m_1 = \text{kg}$ . (½ mark)
- l) Measure the temperature,  $T_1$  of the water in the calorimeter can.  
 $T_1 = ^\circ\text{C}$  (½ mark)
- m) Place the can and its contents into the Jacket. When the steam is issuing freely from the delivery tube, dip the end of the delivery tube into the water in the calorimeter can and keep stirring until the temperature of water rises by  $25^\circ\text{C}$ . Note the new temperature  $T_2$  as you quickly remove the tube from the water. (1 mark)
- n) Measure the mass  $m_2$  of the calorimeter and its content and hence determine the value of  $m = m_2 - m_1$   
 $m_2 = \text{kg}$  (1 mark)
- o) Calculate the quantity  $n$  given that  $mn = 100$   
 (Where  $m_w$  is the mass of water that was put in the calorimeter can,  $t$  is temperature change of the can and its contents,  $r$  is the change of the temperature of the condensed steam.) (2 marks)

## 2. PART A

You are provided with the following:

- A switch
- A resistance wire mounted on a millimeter scale
- Six connecting wires.
- An ammeter
- A voltmeter
- A micrometer screw gauge
- A pair of cells.

Proceed as follows.

- a) Measure the diameter,  $d$  of the resistance wire.
- i)  $d = \text{mm}$  (½ mark)
- ii)  $d = \text{m}$  (½ mark)
- b) Connect the circuit as shown in figure 3

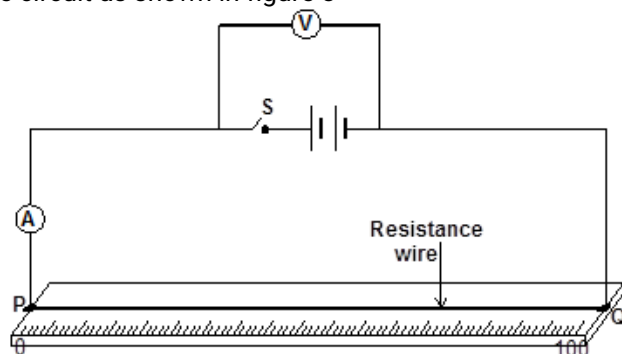


Figure 3

- i) Close the switch  $S$  and measure the potential difference,  $V_0$  across the  $1.0\text{m}$  length of resistance wire and current,  $I_0$   
 $V_0 =$  (1 mark)  
 $I_0 =$  (1 mark)
- ii) Calculate the resistance,  $R_0$  of the wire  $PQ$  (1 mark)
- iii) Calculate the area of the cross-section,  $A$  of the wire. (1 mark)
- iv) Determine the constant,  $K$  of the wire from the relation  $Kl = R_0A$ , where  $l$  is the length of the wire and  $A$  is the area of the cross-section of the wire. (2 marks)

## PART B

You are provided with the following

- A soft board
- Four optical pins
- Two thumb pins
- One half-metre rule
- One glass prism
- 2 Sheets of white paper.
- Some plastacine

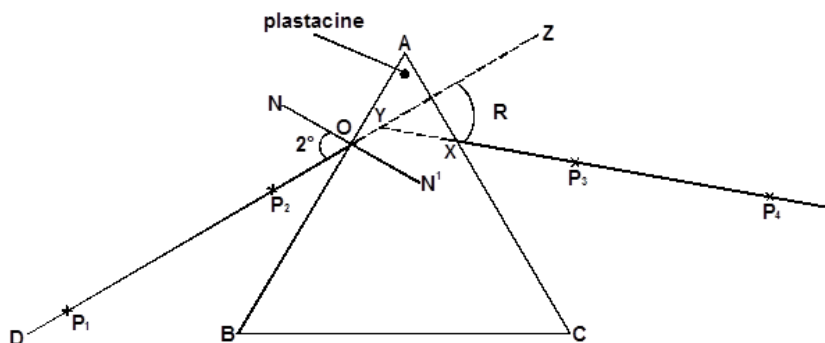
Proceed as follows:

- c) Measure one of the angles of the prism (the refracting angle),  $A$  (1 mark)  
 Mark this angle with some plasticine.  
*The plasticine should remain in place throughout the experiment to identify the refracting angle  $A$ .*
- d) Place one of the sheets of paper on the soft-board and fix it on the board with thumb pins placed at the corners.
- e) Place the prism on one of its triangular faces on the upper third of the sheet of paper and draw its outline  $ABC$ . Remove the prism and draw a normal  $NON'$  such that  $AO$  is about one third of  $AB$ . Draw also line  $DO$  making an angle  $i = \angle DON = 60^\circ$ . See figure 4, Replace the prism on its outline

Now fix two pins  $P_1$  and  $P_2$  on DO as upright as possible and as far apart as possible.

- f) View the pins through face AC and place pins  $P_3$  and  $P_4$  in line with the images of  $P_1$  and  $P_2$  seen through the prism.

Fig 4



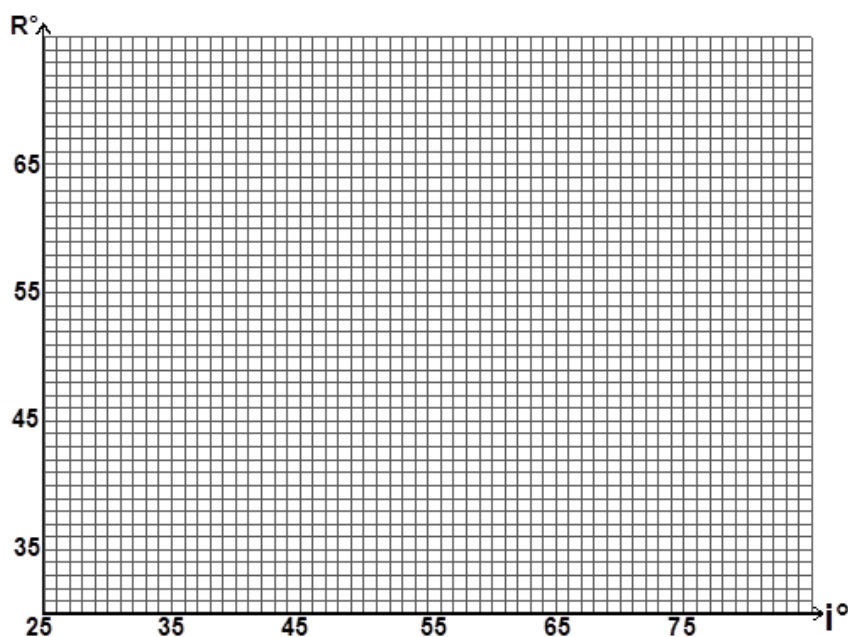
Remove the prism from its outline. Join  $P_3$  to  $P_4$  and extend it to meet DOZ at Y. Note, D, O and Z are collinear. Measure angle  $ZYX=R$ . Record its value in table 2.

- g) Draw another outline of the prism in the middle third of the sheet of paper and repeat parts (c), (d) and (e) with other values of  $i$  on table 2. Record your values in table 2. (6 marks)

|           |    |    |    |    |    |    |    |
|-----------|----|----|----|----|----|----|----|
| $i^\circ$ | 60 | 55 | 50 | 45 | 40 | 35 | 30 |
| $R^\circ$ |    |    |    |    |    |    |    |

- i) Plot a graph of  $R^\circ$  against  $i^\circ$  in figure 5.

(3 marks)



- j) Determine the minimum value  $R_{\min}$  of  $R$ .  
 k) Find  $V$  given that  
 l) Name of quantity  $V$ .

(2 marks)

(3 marks)

(1 mark)

**MAARA FORM FOUR JOINT EVALUATION**  
**Kenya Certificate of Secondary Education**  
**PHYSICS**  
**Paper - 232/1**  
**July/August - 2016**  
**MARKING SCHEME**

1.  $0.2 \times 50 = 10\text{cm}^3$   
 $30.6 - 10$   
 $= 20.6\text{cm}^3$

2.  $K = \text{slope}^{-1}$   

$$\frac{2.4 - 0.4}{0.21 - 0.12} = \frac{2.0}{0.9}$$
  
 $= 22.22\text{N/m}$



4. Diffusion is faster with warm liquid because the movement of particles is faster due to increased energy.

5. Clockwise moments = Anticlockwise moments.

$$(25 \times 4) + (50 \times 2) + (20 \times 5)$$

$$= (15 \times 10) + (75w)$$

$$100 + 100 + 100 = 150 + 75w$$

$$150 = 75w \quad w = 2\text{N}$$

6. Refinement of sound colour mixing techniques.
7. It cannot be used to measure internal diameters. It has high inefficiency due to the screw.
8. Pressure law
9. Water level first rises then after sometime it falls. Since glass flask has poor thermal conductivity the flask contracts first. After sometime the water contracts but a greater contraction than glass flask.

10. The can crushed inwards then it regained its shape. Shaking generate more steam in the can. The steam generated causes arise in pressure in the can pushing the wall of the can outward and shape was restored.

11.

$$\frac{30 \times 4}{10000} = A_2 \times 7$$

$$A_2 = \frac{30 \times 4}{70000} = 0.001714\text{m}^2$$

12. The metal cylinder must be highly polished and heavily lagged.
- The two holes should be filled with a light oil to improve thermal contact with the heater and the thermometer.
13. The rate of change of momentum of a body is directly proportional to the applied force and takes place in the direction in which this force acts.

**SECTION B - 55 marks**

14. a)
- Sum of clockwise moments must be equal to sum of anticlockwise moments.
  - Sum of downward forces must be equal to sum of upward forces
  - ii) Stability increase. When ice melts the volume decreases, this lowers the COG hence stability of the beaker.

b) i) Volume of drop = volume of cylindrical film

$$h = 0.7 \times 0.7 \times 0.7 \times \frac{4}{3} \left( \frac{910}{2} \right)^2$$

$$= 2.209 \times 10^{-7} \text{ mm}$$

- ii) All salty acid drop forms a film
- All molecular are in contact with water as well as themselves. **any one.**

15. a) Pressure applied at one part in a liquid is transmitted equally to all other parts of the enclosed liquid.

b) Pressure on B = Pressure of A

$$\frac{F}{0.0002} + 0.2 \times 1200 \times 10 - \frac{80 \times 10}{0.008}$$

$$\frac{F}{0.0002} = 100000 - 2400$$

$$F = 97600 \times 0.002$$

$$= 1952\text{N}$$

c) Low atmospheric pressure in places high above sea level

- Leakages at the valves and pistons **any one**

d) Soapy water is an impurity, which reduces the surface tension of water. The outside surface tension pulls water apart.

16. a) i)  $Q = m\theta = 40 \times 15 = 600 \text{ Joules}$   
 ii)  $Q = MC\theta$

$$= \frac{100}{1000} \times 4200 \times 15 = 6300 \text{ Joules}$$

$$\begin{aligned} \text{iii)} \quad Q &= MC\theta \\ &= \frac{250}{1000} \times 60C \\ &= 15C \text{ Joules} \end{aligned}$$

$$\begin{aligned} \text{iv)} \quad \text{Heat lost by block} &= \text{heat gained by water and calorimeter} \\ 15C &= 600 + 6300 \\ &= \frac{6900}{15} \\ \therefore C &= 460 \text{ J / kgK} \end{aligned}$$

b) Heat energy is conducted from the milk through the wall of bottle. This heat energy is absorbed by the water in the cloth which evaporate (latent heat of vaporisation)

Less heat is absorbed by the water in bucket due to convection hence slower cooling.

$$\begin{aligned} 17.\text{a)} \quad M \cdot A \div V \cdot R \\ \frac{180 \div 50}{30 \div 5} &= \frac{18 \div 5}{6} = \frac{18}{30} \\ 0.6 \times 100 \% &= 60 \% \end{aligned}$$

- ii)- Friction  
- Useless (wt of rope + bucket)

$$\begin{aligned} \text{b)} \quad a &= \frac{v-u}{t} = \frac{\frac{14}{0.02} - \frac{2}{0.02}}{3 \times 0.02} \\ &= \frac{700 - 100}{0.06} = 10000 \text{ cm / s} \end{aligned}$$

18. a) State that when a body is totally or partially

immersed in fluid, it experiences an upthrust force which is equal to the weight of the fluid displaced.

- ii) Volume of water displaced  
Weight of water  
Weight of buoy  
Upthrust = weight of displaced water.  
Tension T = upthrust - weight of buoy  
= 936 - 300  
= 636N

b)i) The centripetal force acting in the vertical position is greater than the weight of the content in tin

$$\begin{aligned} \text{ii) Angular velocity @} &= \frac{v}{r} \\ &= \frac{7.5}{0.4} \\ &= 18.75 \text{ rad / s} \end{aligned}$$

19. a) Net resultant force is zero

$$\begin{aligned} \text{or} \\ F_v + U &= mg \end{aligned}$$

$$\text{ii) } F = mg$$

$$\mu = \frac{F}{mg} = \frac{100}{30 \times 10} = \frac{100}{300} = 0.33$$

b) i) Volume of a fixed mass of a gas is directly proportional to absolute temperature provided that pressure is kept constant.

- ii) Neglecting the effect of the size of molecules of the gas.  
- Neglecting the presence of the inter-molecules force  
- Assumption of zero volume and pressure

c) Elastic collisions both KE and momentum are conserved while  
Inelastic collisions any momentum is conserved.

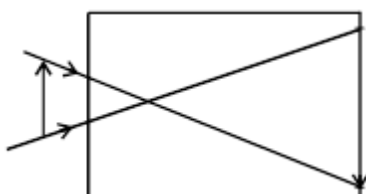
**MAARA FORM FOUR JOINT EVALUATION**  
**Kenya Certificate of Secondary Education**  
**PHYSICS**  
**Paper - 232/2**  
**July/August - 2016**  
**MARKING SCHEME**

1. i) Induction method  
ii) Earthing to neutralise positive charges

1 mark CAO

1 mark correct explanation

2.



1 mark 2 rays correctly intersecting.  
1 mark inverted image on the screen  
1 mark correctly labelled diagram (atleast 2 parts)

3. Resistance is the ratio of p.d., V across the ends of a conductor to the current, I passing through it. 1 mark definition.  
correction

- 4.- Convex mirror gives erect / upright image  
- Convex mirror has a wide field of view 1 mark any one correct
5.  $P = IV$   
 $100 = 250I$  1 mark substitution  
 $I = 0.04A$  1 mark correct answer
6. All fringes have coloured edges except the central one. 1 mark correct observations
7.  $E = hf$   
 $= 6.63 \times 10^{-34} \times \frac{3.0 \times 10^8}{1.5 \times 10^{-11}}$  1 mark correct substitution  
 $= 1.326 \times 10^{-14} J$  1 mark correct answer
8. Electrons are ejected from the cathode by the radiation and are accelerated towards the anode hence completing the circuit. 1 mark correct explanation
9. The diode in (a) is forward biased while 9(b) is reverse biased.  
The battery in 9(a) enhances flow of electrons across the barrier. 2 marks correct explanation
10. 1 mark correct formula  
$$C = \frac{1}{\text{Slope}}$$
  
$$= \frac{1}{(10-0)V}$$
  
$$= \frac{1}{(80-0)}$$
  
$$= 8\mu F$$
 1 mark correct substitution  
1 mark correct answer with units
11. X-rays are produced when fast moving electrons hit a metal target while gamma rays originate from disintegration of nucleus of an atom. 1 mark correct explanation
12. Alpha 1 mark CAO  
The path followed by the radiations is less curved / They have a large mass 1 mark any correct one mark
13.  $\frac{1}{U} + \frac{1}{V} = \frac{1}{f}$  1 mark formula  
 $\frac{1}{20} + \frac{1}{V} = \frac{1}{-30}$   
 $\frac{1}{V} = \frac{-2-3}{60}$  1 mark Substitution  
 $\frac{1}{V} = \frac{-5}{60}$   
 $V = -12cm$  1 mark correct answer

**SECTION B : 55 marks**

14. a) i) To prevent the target from melting due to immense heat / to withstand very high temperatures. 1 mark any correct  
ii) - Higher boiling point than water 1 mark CAO  
- Oil has a lower heat capacity than water 1 mark CAO  
iii) - Lead has a high density 1 mark CAO  
Increasing the heating current 1 mark CAO
- b) i) A - Grid 1 mark CAO  
B - Anode 1 mark CAO  
ii) To deflect the cathode rays vertically 1 mark CAO  
iii) Current heats up cathode and electrons are produced by thermionic emission 1 mark correct explanation  
iv) Reduce collision / loss of K.E of cathode rays 1 mark any correct  
- Prevent ionisation of gas in the CRT
15. a)i) Breaks the circuit instantaneously 1 mark  
- Its economical since it is not replaced after overload or short circuit 1 mark  
ii)

$$P = IV$$

$$= 240 \times 13 = 3120 \text{ W}$$

1 mark correct value of power

$$= \frac{3120}{75}$$

1 mark correct answer

$$= 41.6$$

$$= 41 \text{ bulbs}$$

- b)i) When the switch is closed, flux in the coil on the L.H.S grows and links the other coil thereby inducing E.M.F  
When current is steady no flux changes and hence no current.

When the switch is opened the flux, collapses, hence inducing current in the opposite direction. 1 mark  
correct explanation

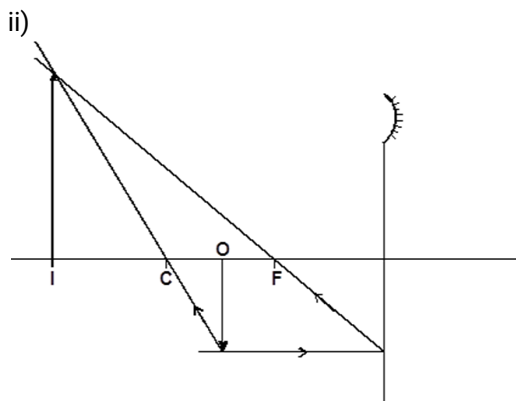
- ii) Soft iron reduces losses due to hysteresis.  
This is because it is easily magnetised and demagnetised.

1 mark

1 mark correct explanation

16. a) i) Image that cannot be captured on the screen

1 mark correct definition



1 mark two correctly drawn rays

1 mark correct location of the image

1 mark nature of the image

- iii) - Real  
- Vertically inverted  
- Larger than the object  
- Formed beyond C

1 mark

1 mark

- b) i)

any two correct.

1 mark formula

$$\mu_g \sin \theta_1 = \mu_w \sin \theta_2$$

$$\frac{3}{2} \sin i = \frac{4}{3} \sin 30$$

$$\sin i = \frac{4}{3} \sin 30 \times \frac{2}{3}$$

$$= 0.4444$$

$$i = 29.32^\circ$$

1 mark substitution

1 mark Answer

- ii) Communication to transmit waves.

In medicine to view internal organs

1 mark Any one correct

- iii)- Prisms do not absorb energy from incident radiation

1 mark any two correct

- prism do not produce multiple images
- Prism do not tarnish or peel off like mirrors

1 mark

- 17.a)i)

- Requires little attention to maintain 1 mark
- Large currents can be drawn from them over long period

1 mark

- ii) Gases are always produced during charging hence caps are opened for gassing. 1 mark

- b)

1 mark correct substitution

$$R_T = 4 + \frac{18}{9}$$

$$= 6\Omega$$

1 mark correct answer with units

- ii) Total current

$$= \frac{V}{R}$$

$$I = \frac{3}{6} = 0.5 \text{ A}$$

1 mark total current correct

Current divides in the ratio 1 : 2

1 mark substitution

$$I6\Omega = \frac{1}{3} \times 0.5 = 0.1666 \text{ A}$$

1 mark final answer

18. a) i) I. M

1 mark CAO

II. between L and M or N and M

1 mark any one correct

ii) E.M waves are waves which do not require material medium for transmission e.g. light waves while mechanical

waves are waves which require material medium for transmission e.g. sound waves.

1 mark correct example

1 mark correct example

b)

1.5  $\lambda$  is proportional to 27.0cm

1 mark proportionality

1 $\lambda$ = x

$$x = \frac{27 \times 1}{1.5}$$

1 mark correct substitution

= 18 cm

correct answer

c) - Humidity

1 mark CAO

- Wind (drought)

1 mark CAO

19. a) i) rod XY moves towards right hand side

1 mark CAO

ii) When the wire is positioned at right angles to the magnet field

1 mark CAO

iii) No effect

1 mark CAO

iv) Increasing the current using weak magnet

1 mark any one correct

b) i) Attraction occurs between a magnet and magnetic material or between unlike poles of a magnet.

1 mark

ii)- Soft iron become an induced magnet and attracts the pin

1 mark

- Wood is non magnetic material hence does not attract the pin

1 mark