BUSIA COUNTY FORM 4 JOINT EVALUATION

Kenya Certificate of Secondary Education

232/2

PHYSICS

Paper 2

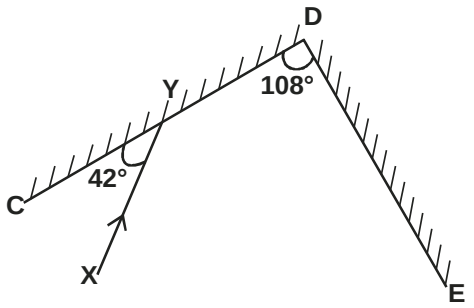
(Theory)

July/August 2015

SECTION A : (25 MARKS)

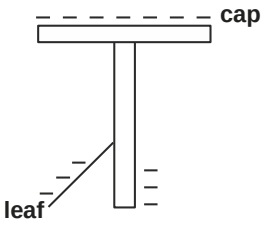
Answer all the questions in this section. Use the spaces provided below each question.

1. Figure 1 shows a ray of light XY striking the mirror CD held at an angle of 108^0 to mirror DE.



Complete the path of the ray XY and state the final angle of reflection. (3 marks)

2. Figure 2 shows a gold leaf electroscope charged negatively.

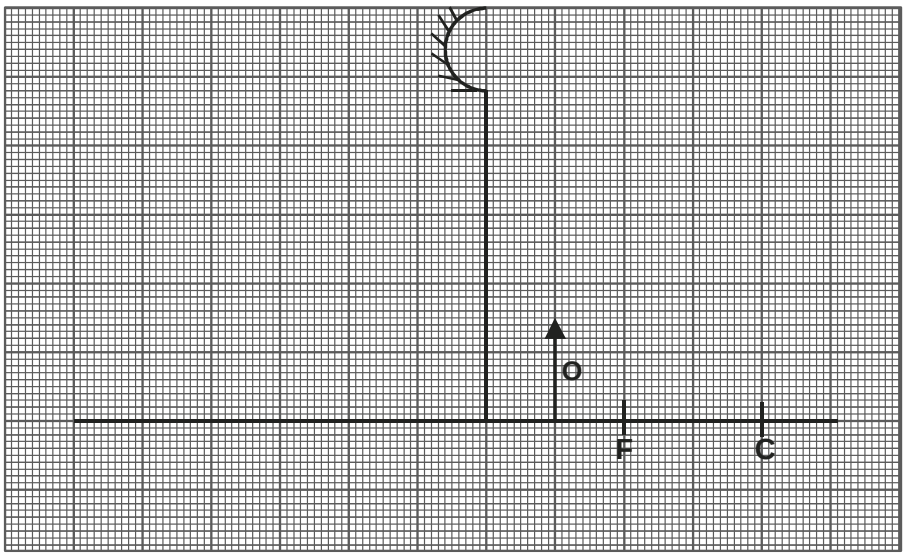


State and explain what happens to the leaf when a negative charged rod is brought near the cap without touching it. (2 marks)

3.
   a) What is meant by the term "topping" as applied to a lead acid accumulator ? (1 mark)
   b) State one advantage of a lead acid accumulator over nickel-iron accumulator. (1 mark)

4. When storing a pair of bar magnets, it is advisable to put a keeper at each end.
   a) Draw a diagram in the space below to show the above arrangement and label the poles of each magnet.(1 mark)
   b)Explain briefly how the above arrangement can minimize the loss of magnetism in the bar magnets. (1 mark)

5. Figure 3 shows an object O placed infront of a concave mirror.
   a) Draw rays of light from the object to the mirror to show how the image is formed. (3 marks)

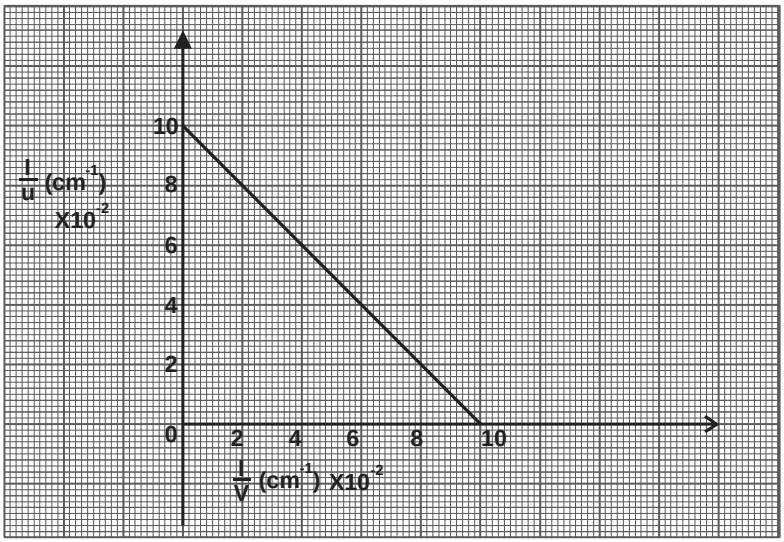


b) State one

i) similarity between the image formed in (a) above and that formed by a plane mirror. (1 mark

ii) application of the set up in (a) above. (1 mark)

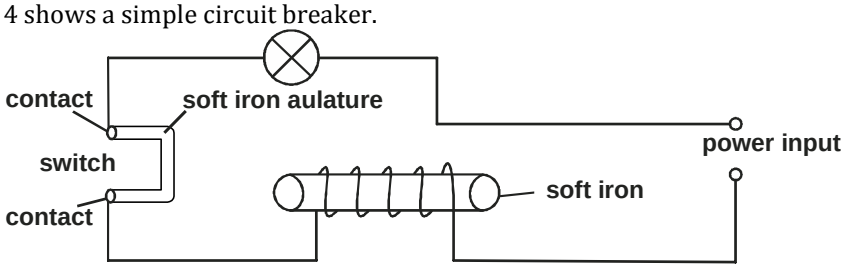
6. A student while investigating the focal length of a certain concave mirror, measured object and image distances and drew a graph of $^1/_u$ against $^1/_v$ shown below.



From the graph, determine the focal length. (2 marks)

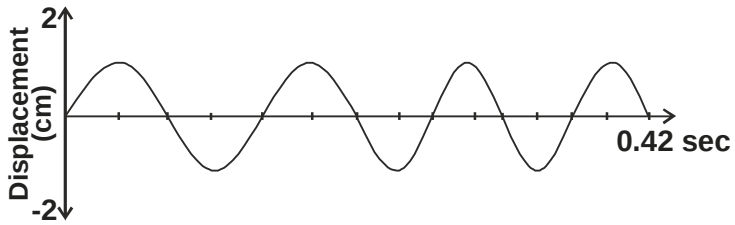
7. One method of making a simple d.c motor more powerful is to wind the coil on a soft iron core. Explain how this method increases the power of the motor. (1 mark)

8. Figure 4 shows a simple circuit breaker.



Explain briefly how it works. (2 marks)

9. Figure 5 shows a transverse wave.

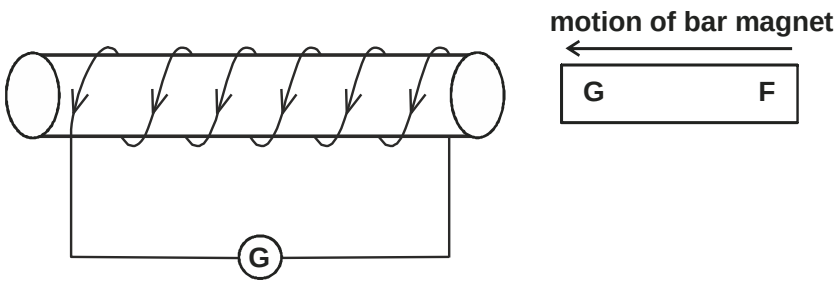


a) Calculate the frequency of the wave. (2 marks)

b) Sketch another wave on the same diagram that has double the frequency and half the amplitude and label it as *m*. (1 mark)

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

11. Figure 6 shows a bar magnet FG being pushed into a coil connected to a centre zero galvanometer. The current induced in the coil is shown.



State the polarity of F. (1 mark)

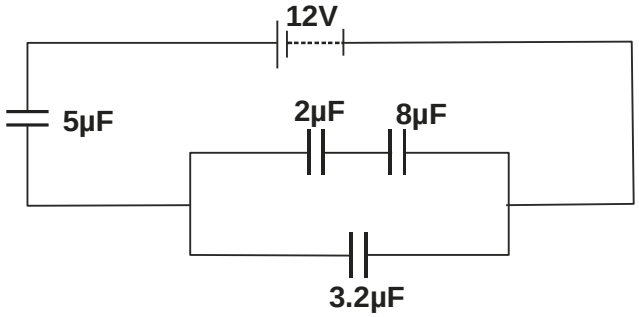
SECTIONB : (55 MARKS)

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

12.

a) State one application of a capacitor. (1 mark)

b) Figure 7 shows four capacitors connected to a battery of 12 volts.



Calculate :

i) effective capacitance. (3 marks)

ii) charge on 3.2μF (2 marks)

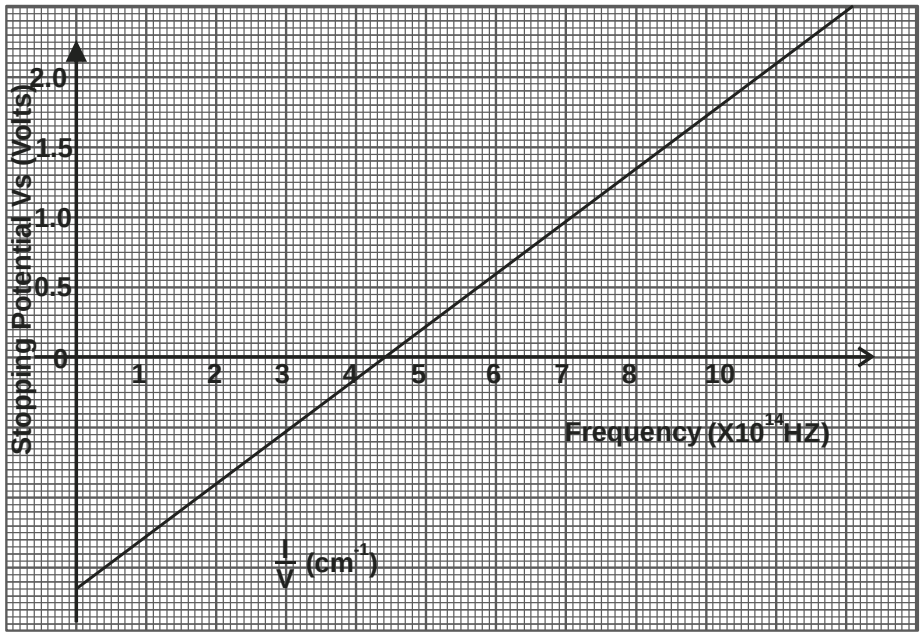
iii) p.d across 5μF (2 marks)

iv) the energy stored by 2μF (2 marks)

13.

a) Define threshold wavelength. (1 mark)

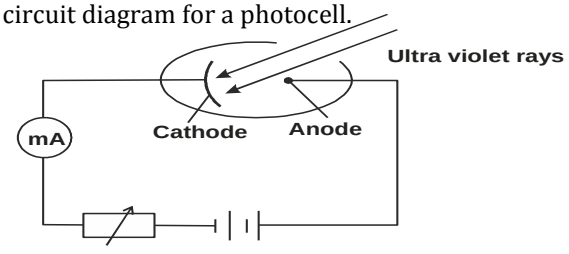
b) The graph below shows the variation of stopping potential against frequency.



From the graph, determine Plank's constant. (2 marks)

c) A certain metal has work function of 4.83eV. Calculate the maximum kinetic energy in joules of the electrons emitted when the metal is irradiated with ultaviolet light of frequency 1.9 x 10^{15}Hz. (Use Plans constant obtained above.) (3 marks)

d) Figure 8 below shows a circuit diagram for a photocell.

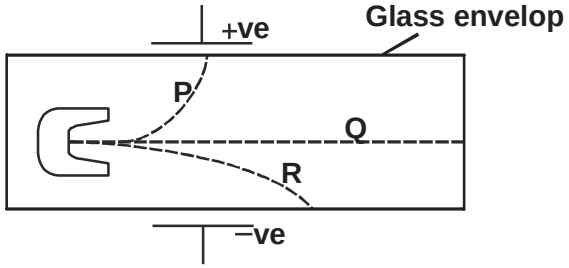


i) Explain why the milliameter shows a deflection when ultraviolet light is shone on the photocell. (1 mark)
ii) Explain how the milliameter reading is affected when the intensity of UV light is increased. (1 mark)

14.

a) Define the term radioactivity. (1 mark)

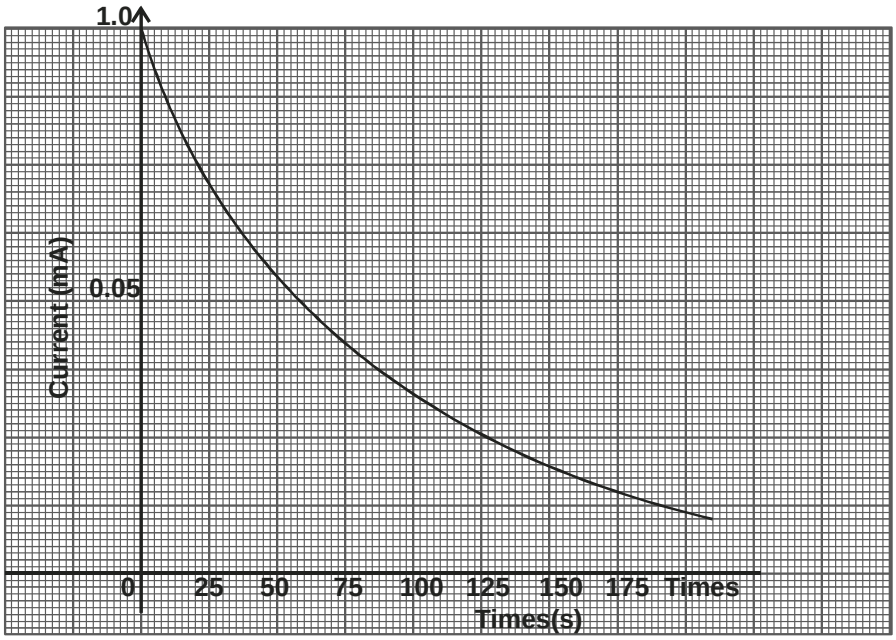
b) Figure 9 below shows the deflection of radiation from a radioactive substance by an electric field.



Identify the radiations P, Q and R (3 marks)

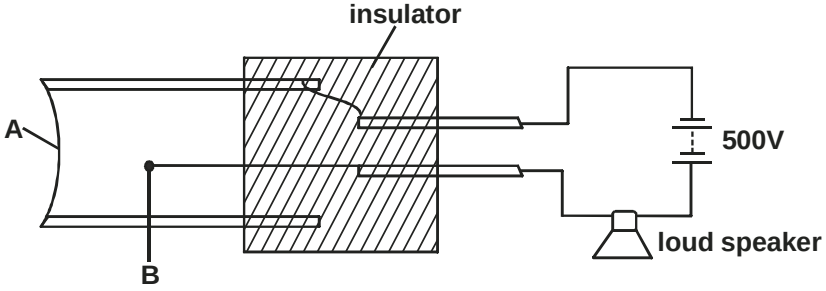
c) A certain radioactive material has half life of 20 minutes. Calculate the fraction of the original mass that would be remaining after two hours. (2 marks)

d) In an experiment to determine the half life of thoron 220, the results were plotted as shown.



From the graph, determine the half life of thoron 220. (1 mark)

e) Figure 10 shows a Geiger Muller (GM) tube.



i) Name the part labelled A and B (1 mark)
ii) State one reason why halogen gas is used in the GM tube. (1 mark)

f) In the nuclear equation below, find a and b

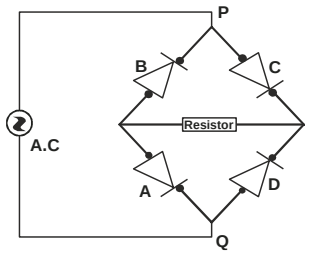
$$^{238}_{92}X \longrightarrow {}^{a}_{b}Y$$

a .....

b .....

15. a) What is meant by the term "A.C rectification". (1 mark)

b) Figure 11 shows one method of a.c rectification using four diodes, A, B, C, D



Explain how the a.c rectification is achieved in the above circuit. (2 marks)

c) In a transformer, a voltage of 240V is to be steppe down to 24V. The primary current is found to be 1.5A while the secondary current is 14A. Calculate :

i) Power input (1 mark)

ii) Power output (1 mark)

iii) Power wasted (1 mark)

iv) Efficiency of the transformer (2 marks)

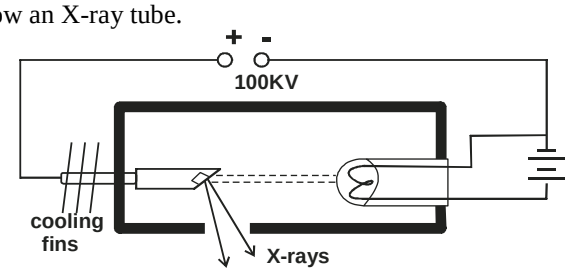
d) State one way in which the power in a transformer is wasted. (1 mark)

16. a) State one difference between mechanical waves and electromagnetic waves. (1 mark)

b) Arrange the electromagnetic wave below in ascending order of wavelength.***visible light, infrared, ultraviolet, radio waves, gamma rays, x-rays.*** (1 mark)

c) A radio station is transmitting at a frequency of 15MHz. Calculate the wavelength of the transmission. (2 marks)

d) Figure 12 below show an X-ray tube.



i) Briefly explain how X-rays are produced. (2 marks)

ii) What adjustment should be made on the tube to produce hard X-rays if initially it was producing soft X-rays.(1 mark)

e) What are the functions of the following on the cathode ray oscilloscope ?

i) X-plates (1 mark)

ii) Grid (1 mark)

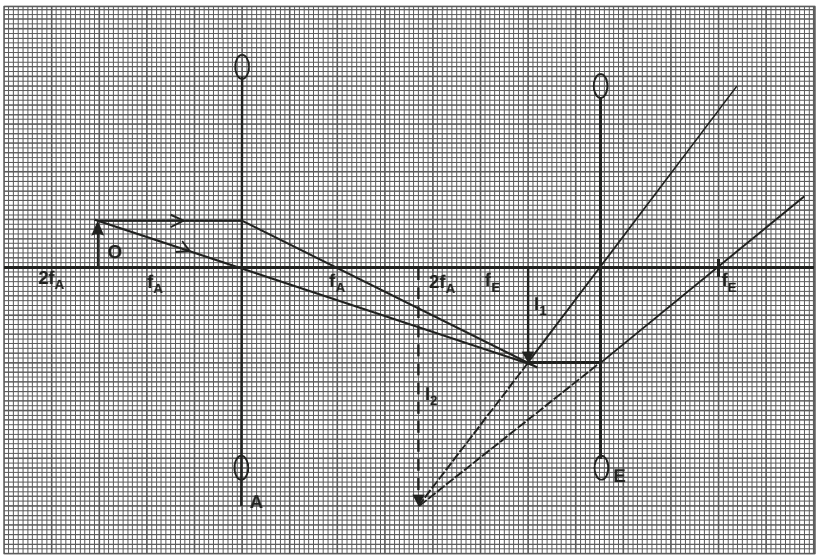
17. a) A convex lens forms an image four times the size of the object on a screen. If the distance between the object and the screen is 10cm.

Determine :

i) the image distance (2 marks)

ii) focal length of the lens (2 marks)

b) Figure 13 below shows a compound microscope where by O is object, I is the first image and I_2 is the final image. A is objective lens while E is the eyepiece.



Find the total magnification. (2 marks)

c) Define the term 'kilowatt hour' (1 mark)

d) A generator produces 0.1MW which is transmitted through a cable of resistance 10ohms. If the potential difference produced is 5KV, calculate current transmitted. (2 marks)

BUSIA COUNTY JOINT EXAMINATION
232/3
PHYSICS
Paper 3
(Practical)
July/August 2015
Time: 2½ Hours

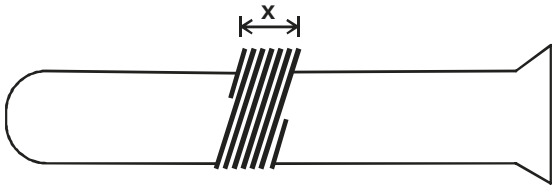
1. You are provided with the following apparatus :
- a copper wire
- a 50g mass
- a metre rule
- two pieces of wood
- a test tube
- a retort stand, boss and clamp
- a micrometer screw gauge

Proceed as follows :

a) i) Measure the length, L of the wire provided. (1 mark)

ii) Using a micrometer screw gauge measure the diameter d of the wire. (1 mark)

b) i) Wind the whole length of the wire tightly on the test tube making sure that the turns are as close as possible but not overlapping. Measure the length, x of the coil made.



x = ... cm (2 marks)

ii) Count and record the number, N, of the complete turns on the coils.

N = ... cm (1 mark)

c) Remove the coil from the test tube. Straighten the first and the last turns of coil. Bend one end to make a hook.

d) Count and record in the table below, the number, n, of complete turns remaining on the coil.

e) Measure and record in the table below, the distance, h_1 between the end turns of the coil as shown on the diagram below.

Number of turns n, remaining					
Distance, h_2 (cm)					
Distance, h_1 (cm)					
Extension, $e = h_2 - h_1$ (cm)					

f) Load a 20g mass on the coils as shown in figure 2 above. Measure and record in the table below, the distance h_2, between the end turns of the coil.

g) Remove the mass from the coil. Reduce the number of turns by straightening three turns of the coil from the upper end and adjust the point of suspension of the coil as shown in figure 2. Record the number of turns, n, remaining.

h) Measure and record the new distances, h_1, in the table below.

i) Load 50g mass on the coil. Measure and record the new h_2 in the table below.

j) Repeat the procedure (i) and (j) above so as to obtain four sets of readings for n, h_1 and h_2.
Calculate the corresponding extension and complete the table below.

k) Plot the graph of extension, e (y-axis) against the number of turns, n, on the grid provided. (5 marks)

m)

I. Determine the slope, s of the graph. (3marks)

II. Determine the constant, G, given that (2 marks)

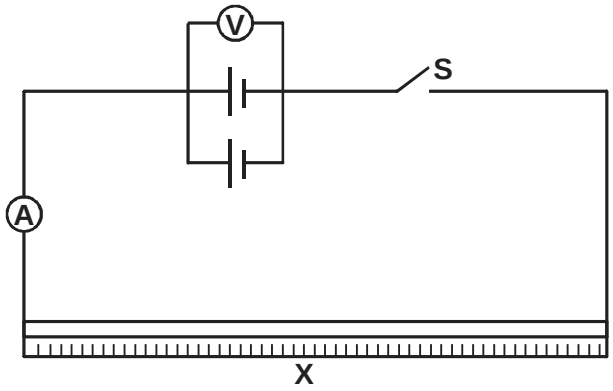
$$\ell = \frac{Gx}{d}n$$

2. You are provided with the following apparatus :
- two cells
- cell holder
- torch bulb fixed in bulb holder
- voltmeter (V)
- ammeter (A)
- switch (S)

– mounted wire (100cm) labelled X
– 7 connecting wires (4 with crocodile clips)

Proceed as follows :

a) Set up the circuit with the cells in parallel as shown in figure 4



b) With switch open, record the reading E of the voltmeter. (1 mark)

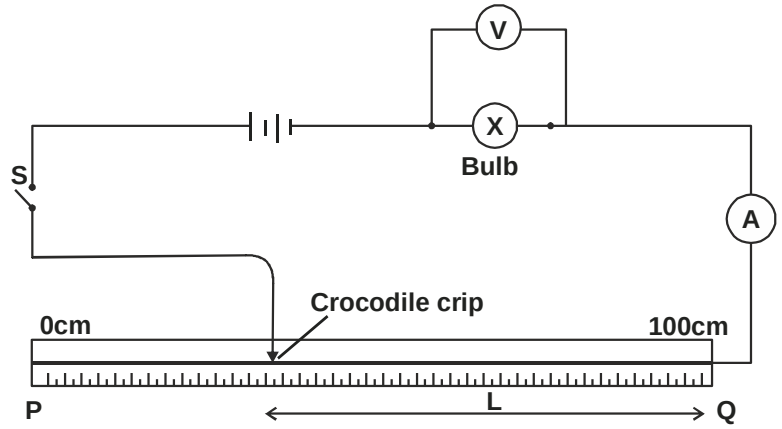
c) Close the switch. Record the current I flowing in the circuit and the potential difference V across the cells.

I = ... A (1 mark)

V = ...volts (1 mark)

d) Given that E = V + Ir and V = IX. Determine the internal resistance r of the combined cells and the resistance of the wire labelled X (2 mark)

Now set up the circuit as shown in figure 5 below.



e) With crocodile clip at P (i.e. L = 100cm) take the voltmeter reading (V) and the ammeter reading (I). Record the values of V and I in table 2 below.

f) Repeat the procedure (a) for the lengths L = 80, 60, 40, 20, 0cm respectively.

g) Complete the table for corresponding values of V^2 and R.

Length, L (cm)	100	80	60	40	20	0
Voltage, V (v)						
Current, I (A)						
V^2 (v^2)						
$R = \frac{V}{I} (\Omega)$						

(6 marks)

h) On the grid provided, plot a graph of V^2 (y-axis) against R. (5 marks)

(Graph paper provided on page 7)

i) Determine the slope of the graph at the point corresponding to L = 20cm. (3 marks)

j) What physical quantity is represented by the slope of the graph at any given point. (1 mark)

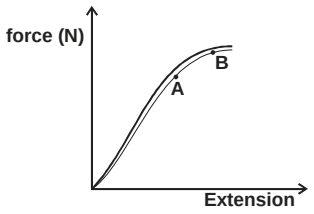
BUSIA COUNTY JOINT EXAMINATION
PHYSICS
Paper 1
July/August 2015
MARKING SCHEME

1. main scale reading = 9.50
   Thimble scale reading = 0.29 +
   Reading of the instrument = 9.79mm
2. Without external force acting on the body or otherwise, the velocity remains constant as the bullet moves hence acceleration equals to zero;
3. spring constant = $\frac{F}{e} = \frac{7.5}{0.05} = 150N/m$;
   work done in stretching elastic material
   $= \frac{1}{2}ke^2 = \frac{1}{2} \times 150 \times (0.08)^2$
   $= 0.48J$;
4. The density of the liquid reduces; this is because while the mass remains constant, the volume increases;
5. The resultant force = mg + ma
   = 60 x 10 + 60 x 3 ;
   = 600 + 180; = 780N;
6. The body is acceleration uniformly between 0 and 4 minutes in one direction;
   Between 4 and 8 seconds, the body is accelerating uniformly but in the opposite direction / the body is decelerating uniformly;
7. Direction is continuously changing;
8. The metallic block placed on the trolley will fall past the barrier while the trolley will remain blocked;
   The block remains in its state of motion as the trolley is stopped by the barrier;
9. Decrease in volume causes a decrease in the distance between the molecules and the walls of the container;
   There will be more collisions per unit time with the walls of the container;

10. Sum of anticlockwise moments = sum of anticlockwise moments
    180N x 0.2m = 60 x 0.2m + F x 0.6m;
    36 = 12 + 0.6F;
    24 = 0.6F
    $F = \frac{24}{0.6} = 40N$;
11. Reducing the cross section area;
12. Estimating the amount of oil spillage on water bodies;
13. The stability reduces, adding water increases the weight at the top hence raising the centre of gravity of the body;

14.

a) i)



   ii) Between the points, the material has exceeded the elastic limit;

b) i) Metal block causes an extension of
   (31.6 - 22 = 9.6cm)
   A force 0.72N causes an extension of
   (38 - 31.6 = 6.4)
   The spring constant
   F = ke
   $F = \frac{11.25 \times 9.6}{100} = 1.08N$
   $\frac{F}{e} = \frac{0.72}{0.064} = 11.25N$;
   $K = \frac{f}{e} = \frac{0.72}{0.064}$
   F = mg
   $= 11.25N$
   $\frac{1.08}{10} = 0.108kg$

   ii) Pressure = $\frac{F}{A} = \frac{1.08}{24 \times 10^{-4}}$;
   $= 450N/m^2$;

c) Pressure in liquids = h g

450 = 1.2 x x10 ;

e = $\frac{450}{12}$

= $\frac{450}{12}$;

= 37.5kg/m^3 ;

15.

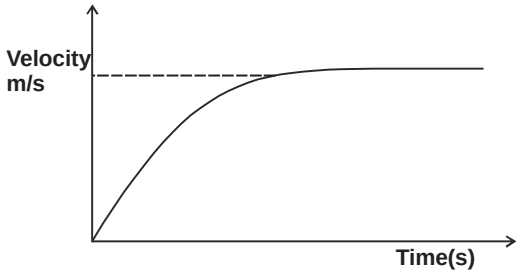
a) Net force = 24N - 4N = 20N

F = ma;

20 = 4a;

a = 5m/s^2 ;

b)



c) The net / resultant forces acting on the ball becomes zero;

d) V.R = 3 ;

e) To reduce the amount of the effort used to lift the load

f) Efficiency = 60%

$\frac{M.A}{V.R}$ x 100 = 60

$\frac{M.A}{3}$ x 100 = 60

M.A = $\frac{180}{100}$ = 1.8 ;

M.A = $\frac{L}{e}$

1.8 = $\frac{3000}{e}$ e = $\frac{3000}{1.8}$;

166666.7N;

g) Lubricating the movable parts of the system;

16. a) A floating object / body displaces its own weight in the fluid it floats in the liquid it floats in ;

b) i) The volume of the rod

= A x l = 4 x 10 = 400cm^3 ;

Mass = volume x

= 400 x 1.5

= 600g;

ii) Volume of water displaced = A x l

= 4 x 7.5 = 30cm^3;

= 30cm^3 ;

Weight of water displaced = vg

= 1050 x 30 x 10^{-6} x 10

= 0.315N ;

iii) The spring balance =total weight - upthrust reading

$$= \frac{600}{1000} \times 10 - 0.32$$

$$6 - 0.32 = 5.28N$$

iv) When the rod is wholly immersed the volume displaced = Al = 4 x 10 = 40cm^3 ;

Weight of the liquid displaced = vg

= 1050 x 40 x 10^{-6} x 10

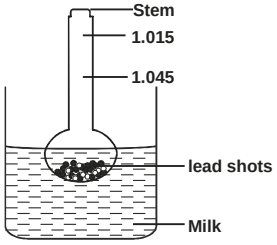
Reading of the spring balance

= 0.42N ;

The spring balance reading = 6 - 0.42 =5.18N

c) i) To improve the sensitivity of the hydrometer;

ii)



iii) The hydrometer will sink less in the liquid mixture

17. a)

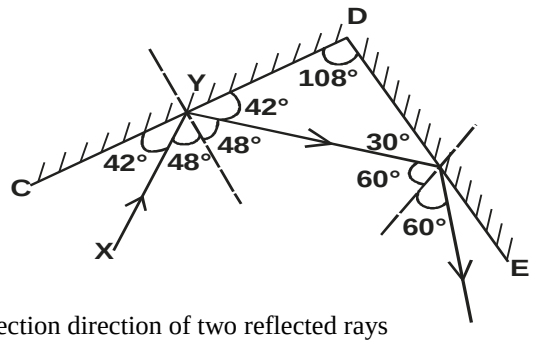
Boiling	Evaporation
– takes place at a particular temperature	- takes place at any temperature
– takes place throughout the liquid	- takes place at thesurface only

b) i) 10^oC
ii) 80^oC
iii) $t = 18^oC$
$T = 74^oC$
$\Rightarrow 74 - 18$
$= 56^oC$;
iv) $Q = Pt$
$= 50 \times 4.5 \times 60$;
$= 13500J$;
v) $MC\theta = Pt$;
$C = \frac{Pt}{M\theta} = \frac{13500}{0.01 \times 57}$;
$= 23,684.2Jkg^{-1}k^{-1}$;

18. a) i) To make the thermometer sensitive to heat changes ;
ii) 760mmHg ;
b) $Pa + hg = Pg$;
$Pg = 10^5 + 13.6 \times 10^3$
$Pg = 100,000 + 13600$;
$Pg = 113,600Pa$;
c) The temperature at which the volume and the temperature of the gas are assumed to be zero;
d) i) pressure;
ii) 1. Length of air column;
2.Temperature ;

BUSIA COUNTY JOINT EVALUATION
PHYSICS
Paper 2
July/August 2015
MARKING SCHEME

1.

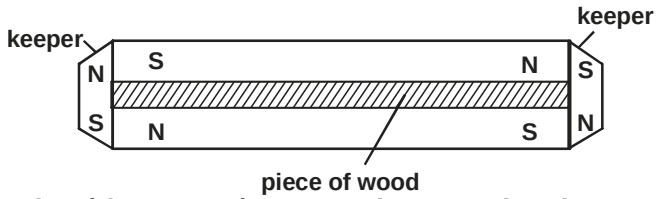


- correction direction of two reflected rays
- final angle of reflection = 60º

2. The leaf divergence increases ✓
Like charges (-ve) repel ✓

3. a) Topping is adding distilled water in the lead acid accumulator so that the plates are submerged ✓
b) It has a higher e.m.f compared to nickel iron type. It is less expensive than nickel iron type ***any one*** ✓

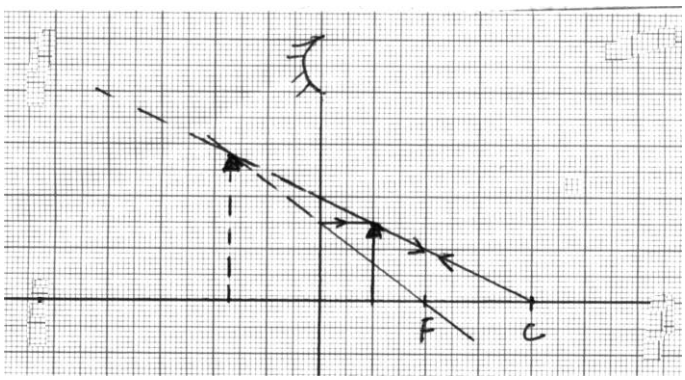
4. a)



Unlike poles of the magnets facing same direction and one keeper at each end ✓

b) The keeper in contact with a South pole of the magnet acquires a North pole while that in contact with a North pole acquires aSouth pole so that the dipoles in the magnet and the keepers form complete loops hence dipoles retain their orientation ✓

5. a)



Two correct ways ✓✓
virtual image 17mm from mirror (±2mm)

b) i) Both are virtual images ✓
ii) Used as shaving mirror / used by dentists to examine the teeth ✓

6. Y and X-intercepts = $\frac{1}{f}$

$\frac{1}{f} = 10 \times 10^{-2}$ ✓

$\frac{1}{f} = 0.1$

$f = \frac{1}{0.1} = 10\text{cm}$ ✓

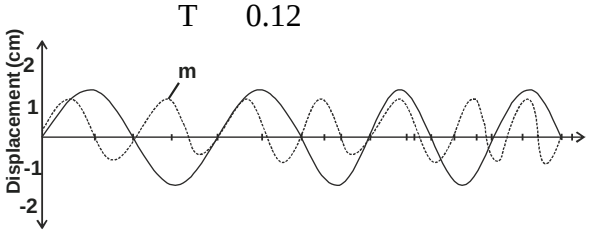
7. The soft iron core becomes magnetised and concentrates its magnetic field in the coil and this increases the force on the coil

8. When excess current flows through the circuit, increased magnetic power makes the soft iron core to attract the soft iron armature ✓ thus opening the switch current flow ✓

9. a) $T = \frac{0.42S}{3.5 \text{ cycles}} = 0.12$ ✓

$f = \frac{1}{T} = \frac{1}{0.12} = 8.33\text{Hz}$ ✓

b)



10.

Sound wave	***Light wave***
- longitudinal wave	- transverse wave
- travels at speed lower than $3.0 \times 10^8 ms^{-1}$	- travels at $3.0 \times 10^8 ms$
	- electromagnetic wave

any two correct pairs ✓✓

11. a) Capacitors are used in
- rectification smoothing circuits
- tuning circuits
- camera flash
- reduction of sparking in induction coil contact

any one 1

b) i) $\frac{2 \times 8}{2 + 8} = \frac{16}{10} = 1.6\mu F$

$1.6 + 3.2 = 4.8\mu F$ ✓

$C_T = \frac{5 \times 4.8}{5 + 4.8}$ ✓ $= \frac{24}{9.8} = 2.45 \times 10^{-6} F$ ✓

ii) $Q = CV$

$= 2.45 \times 10^{-6} \times 12 = 2.94 \times 10^{-5} C$ ✓

charge on $3.2\mu F = {}^2/_3 \times 2.94 \times 10^{-5}$

$= 1.96 \times 10^{-5} C$

iii) p.d on $5mF = \frac{Q}{C} = \frac{2.94 \times 10^{-5}}{5 \times 10^{-6}} = 5.88$volts

iv) energy $= \frac{1}{2} CV^2$

$= ½ \times 2 \times 10^{-6} \times 6.12^2$

$= 3.75 \times 10^{-5} J$

13. a) Threshold wavelength is the maximum wavelength beyond which no photoelectric emission will occur

b) Slope $= \frac{h}{e}$

$\frac{1.75 - 0}{(9 - 4.5)} = \frac{1.75}{4.5 \times 10^{14}} = \frac{h}{1.6 \times 10^{-19}}$

$4.5 \times 10^{14} h = 2.8 \times 10^{-19}$

$h = \frac{2.8 \times 10^{-19}}{4.5 \times 10^{14}} = 6.22 \times 10^{-34} Js$

c) $hf = Ø + K.E_{max}$

$6.22 \times 10^{34} \times 1.9 \times 10^{15} = 4.83 \times 1.6 \times 10^{-19} + K.E_{max}$

$11.82 \times 10^{-19} = 7.73 \times 10^{-19} + K.E$ max.

$KE_{max} = 11.82 \times 10^{-19} - 7.73 \times 10^{-19}$

$= 4.09 \times 10^{-19} J$

d) i) Ultra violet light dislodges electrons from the cathode which are attracted by the anode hence the current flows through the circuit ✓

ii) Increasing the intensity of UV light leads to more electrons being dislodged from the cathode hence more current is recorded by the milliameter✓

14. a) Radioactivity is the spontaneous disintegration of a radioactive substance to achieve stability ✓

b) P is Beta particle ✓

Q is Gamma rays ✓

R is Alpha particle ✓

c) No of half lifes $= \frac{120}{20} = 6$ half lifes

$x \times ½ \times ½ \times ½ \times ½ \times ½ \times ½ = \frac{1}{64} x$

remaining $= \frac{1}{64}$ of original sample ✓

half life = 58.0 seconds ✓

e) i) A is mica window ✓ ½
B is anode ✓ ½

ii) To absorb secondary ions

f) $^{238}_{92}X \xrightarrow{^{4}_{2}He} {}^{a}_{b}Y$

a = 238 - 4 = 234 ✓ ½
b = 92 - 2 = 90 ✓ ½

15. a) It is the process of changing alternating voltage to direct voltage ✓

b) When P is positive the diodes C and A are forward biased and the current flows through C, resistor A and back to source
When Q is positive, diodes D and B are forward biased and the current flows through Q, D, resistor, B, P and back to the source✓

c) i) Power input = I_p x V_p = 1.5 x 240 = 360 watts ✓

ii) Power output = I_s x $_s$ = 14 x 24 = 336 watts ✓

iii) Power wasted = 360 - 336 = 24watts ✓

iv) Efficiency
= $\frac{\text{power output}}{\text{power input}}$ x 100% ✓
= $\frac{336}{360}$ x 100% = 93.3% ✓

d) Eddy currents
Hysteris
Copper losses
Flux leakage ***any one***

16. a) - mechanical waves require medium for transfer while electromagnetic waves do not
- electromagnetic waves travel at 3.0 x $10^8$$ms^{-1}$ while mechanical waves are slower ***any one correct***

b) Gamma rays, X-rays, ultaviolet, visible light, infra red, radiowaves

c) $\lambda = \frac{V}{f} = \frac{3.0 \times 10^8}{1.5 \times 10^7}$ ✓ = 20m ✓

d) i) The hot cathode emits cathode rays (fast moving electron) which are accelerated towards the target by high voltage; ✓ and they hit metal target producing X-rays; ✓

ii) Increase the accelerating voltage ✓

e) i) X- plates deflect the spot / beam horizontally ✓

ii) Grid regulates the intensity of the beam of electrons ✓

17. a) Object distance = u

i) Image distance = 4u
u + 4u = 5u = 100 ✓
u = 20cm
Image distance = 4u - 4 x 20 = 80cm ✓

ii) $\frac{1}{f} = \frac{1}{20} + \frac{1}{80}$
$\frac{1}{f} \times 80f = \frac{1}{20} \times 80f + \frac{1}{80} \times 80f$
80 = 4f + f
80 = 5f
16cm = f ✓

b) Total magnification = $\frac{hI_2}{h_o} = \frac{5}{1} = 5$

Or

$$\left(\frac{\text{Dist of I fromA}}{\text{Dist of O fromA}}\right) x \left(\frac{\text{Distof } I_2 \text{ fromE}}{\text{Distof } I_2 \text{ fromE}}\right)$$

Total magnificat = $\left(\frac{60mm}{30mm}\right) x \left(\frac{38mm}{15mm}\right)$ = 2 x 2.53

= 5.07 ✓

c) Kilowatt hour is the electrical energy spent in 1 hour at the rate of 1000Js^{-1}✓

d) I = $\frac{P}{V} = \frac{0.1 \times 1000000}{5000}$ = 20A

BUSIA COUNTY JOINT EVALUATION
PHYSICS
Paper 3
July/August 2015
MARKING SCHEME

1. a) L = 150cm (student value) ***1mk***
d = 0.75mm ***1mk***
b) X = 2.7cm (student value) ***1mk***
c) N = 28 1mk
k) Table

Number of turns n, remaining	26	23	20	17	14
Distance, h_2 (cm)	3.8	3.0	2.5	2.0	1.7
Distance, h_1 (cm)	6.0	4.5	3.9	3.2	2.6
Extension, $e = h_2 - h_1$ (cm)	2.2	1.5	1.4	1.2	0.9

1mk
±0.2 (2mks)
±0.2 (2mks)
1mk

m) I. slope = $\frac{1.9 - 0.85}{25 - 14}$ ✓1

$= \frac{1.05}{11}$ ✓1 = 0.09545 ✓1

II. $\ell = \frac{Gx}{d}n$

$\frac{Gx}{d}$ = slope

$\frac{G \times 2.7}{0.75} = 0.09545$ ✓1

$G = \frac{0.0945 \times 0.75}{2.7} = 0.0265$ ✓1

2. a) E = 1.75V ✓1
c) I = 0.04A ✓1
V = 1.7V ✓1

$r = \frac{1.75 - 1.7}{0.04} = 1.25\Omega$✓1

$X = \frac{1.7}{0.04} = 42.5\Omega$✓1

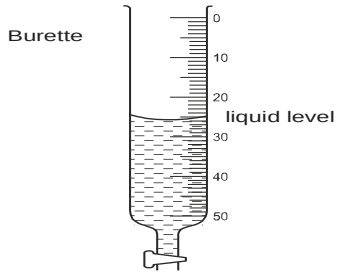
Length, L (cm)	100	80	60	40	20	0
Voltage, V (v)	0.09	0.10	0.12	0.14	0.18	0.20
Current, I (A)	0.2	0.2	0.3	0.5	1.0	1.7
V^2 (v^2)	0.04	0.04	0.09	0.25	1.00	2.89
$R = \frac{V}{I}(\Omega)$	0.4500	0.5000	0.4000	0.2800	0.1800	0.1176

i) At L = 20cm R = 0.18
gradient at R = 0.18
Tangent ✓1
Slope = $\frac{1.45 - 0.25}{0.15 - 0.23}$ ✓1
= -15 ✓1
j) Power ✓1

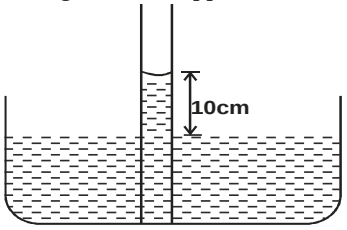
GEM SUB-COUNTY JOINT EVALUATION EXAMS 2015
Kenya Certificate of Secondary Education
PHYSICS
Paper 1
(Theory)
July/August 2015
Time: 2 Hours

SECTION A : (25 Marks)
Answer all questions

1. Figure 1 below shows a burette containing a liquid up to the level marked on the figure. 20 drops of the liquid are now run out of the burette. If each drop has a volume of 1.1ml. Mark on the figure the new level of the liquid in the burette. (2 marks)



2. Figure 2 below shows a glass tube dipped in water inside a trough. The cross sectional area of the tube is $2cm^2$.



Determine the adhesive force between water and glass. (Take density of water = $1000kgm^{-3}$, acceleration due to gravity = $10ms^{-2}$) (3 marks)

3. Figure 3 below shows a velocity-time graph for a body.

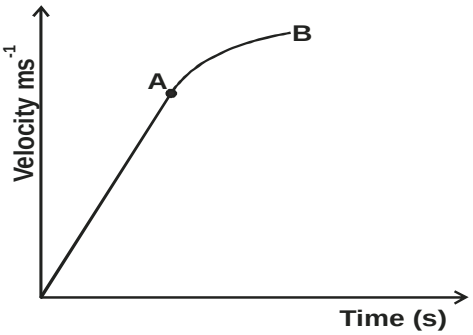
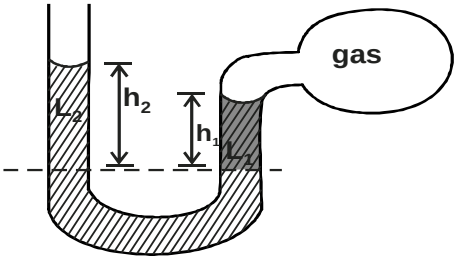


Fig 3

Describe the motion of the body between A and B. (1 mark)

4. Give a reason why mercury is preferred for use in a thermometer. (1 mark)

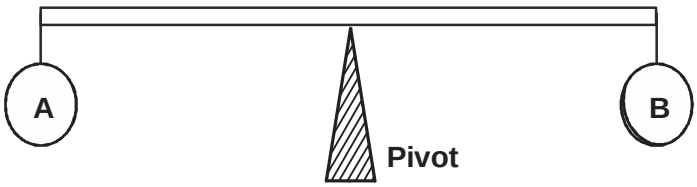
5. Figure 4 shows a U-tube connected to gas supply containing liquids L_1 and L_2 of densities $1.8gcm^{-3}$ and $0.8gcm^{-3}$ respectively in equilibrium.



Given that h_1 = 8cm, h_2 = 10cm and atmospheric pressure is 1.02 x 10^5Pa. Determine the gas pressure. (3 marks)

6. Explain why gases have larger intermolecular distances than solids. (1 mark)

7. Figure 5 below shows two balloons containing two different gases suspended on a rod. The set up is in equilibrium.

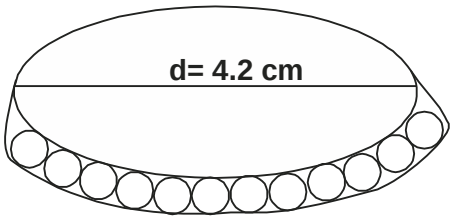


When the set up is moved in hot sun the system tips to the right.

a) Compare expansivity of the gases A and B. (1 mark)

b) Explain your answer to (a) above. (2 marks)

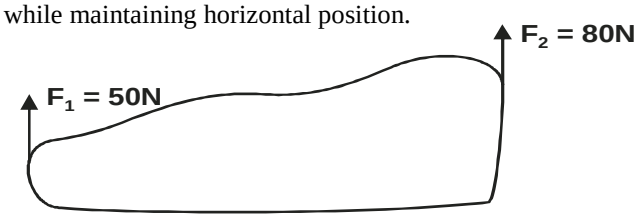
8. Figure 6 below shows an oil patch formed on water surface laced with lycopodium powder.



Given that the patch was from one drop of oil whose volume was 31.42mm^3. Determine the size of one molecule of the oil. (3 marks)

9. State one similarity between "moment of force about a point" and "work done" (1 mark)

10. Figure 7 below shows a log of wood 2m long lying on a flat ground. Two forces F_1 and F_2 applied at the ends of the log will just lift the log while maintaining horizontal position.



Determine :

a) the weight of the log (1 mark)

b) the perpendicular distance from the centre of gravity of the log to force F_2 (2 marks)

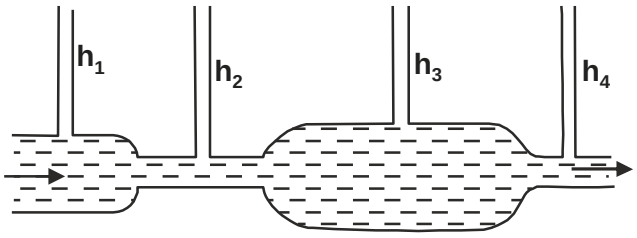
11. The table below shows the results carried out to study properties of a spring.

Force, N	0	10	20	30	40	50
Extension, cm	0	2	4	6	10	18

a) In the space below, sketch a graph of extension against load. (1 mark)

b) Determine the elastic constant of the spring. (2 marks)

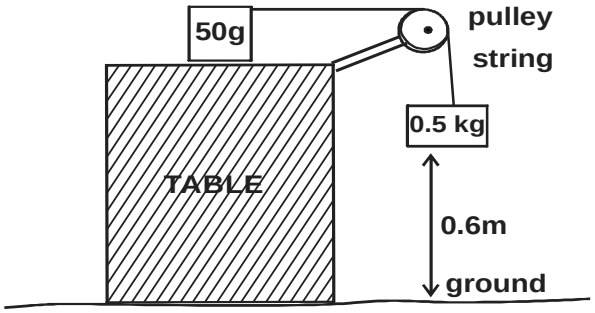
12. Figure 8 below shows a tube of varying cross-sectional area fitted with narrow tubes of uniform cross-sectional areas h_1, h_2, h_3 and h_4 represent the heights of water column as the water flows in the tube at varied speeds. Arrange the heights h_1, h_2, h_3 and h_4 in increasing order starting with the lowest. (1 mark)



SECTION B : (55 Marks)
Answer all questions.

13. a) On a certain planet a simple pendulum of length 0.5m oscillates with a frequency of 1.25Hz. If the mass of the body suspended on the body is 50g.
Determine :
i) the acceleration of gravity on the planet (2 marks)
ii) the weight of the body on the planet (2 marks)

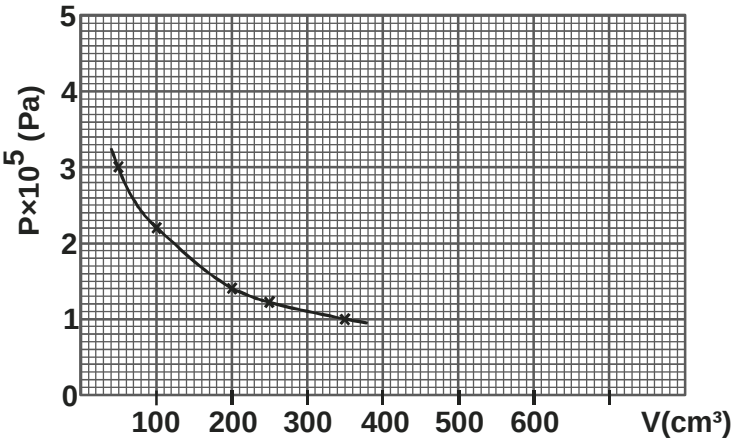
b) Figure 9 below shows two connected bodies of masses 0.5kg and 50g joined by a light inextensible string passing over a smooth pulley. When released, the 0.5kg mass moves a distance of 0.6m before coming to rest. The coefficient of friction between the 50g mass and the table is 0.3



i) Determine :
I. the tension on the string. (2 marks)
II. the acceleration of the 0.5kg mass. (2 marks)
ii) Find the velocity of the 0.5kg mass just before hitting the ground. (3 marks)

14. a) State two factors that must be kept constant for a gas to obey Boyle's law. (2 marks)

b) An air bubble rises from the bottom of a pond 20m deep until it reaches the top of the pond. The graph below shows variation of pressure exerted on the bubble with volume of the bubble.



i) From the graph, determine the pressure exerted on the bubble and volume of bubble at
I. the bottom of the pond (2 marks)
II. the top of the pond (2 marks)
ii) Explain the shape of the graph. (2 marks)
iii) Determine the atmospheric pressure at the place of the experiment. (2 marks)
iv) Sketch in the space below the graph of pressure against reciprocal of pressure for the bubble. (2 marks)

15. a) Apart from the definitions, distinguish between temperature and heat. (1 mark)

b) Figure 10(a) below shows variation of volume of water and temperature as water is heated from 0°C to 40°C

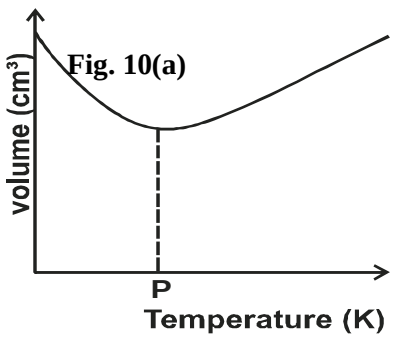
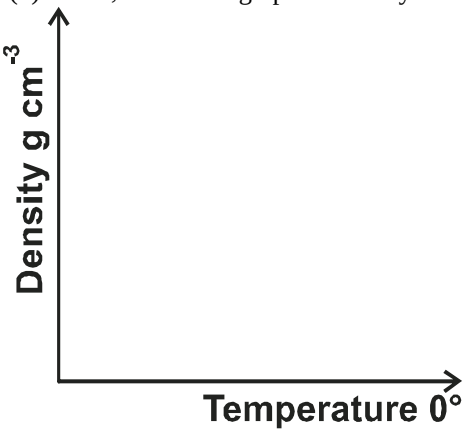


Fig. 10(a)

i) State the value of P (2 marks)

ii) In figure 10(b) below, sketch the graph of density of water against temperature upto 10°C. (1 mark)



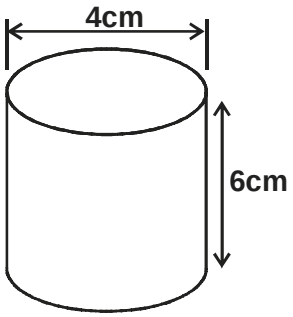
iii) A heater rated 300W was used to heat the water from 0°C to 40°C. If the heating took 5 minutes
Determine :

I. the heat supplied by the heater. (3 marks)

II. the heat capacity of the water. (3 marks)

III. the mass of the water (specific heat capacity of water is $4.2KJkg^{-1}k^{-1}$) (3 marks)

16. Figure 11 below shows a cylinder of mass 300g.



Kerosene of density $800kgm^{-3}$ is poured into the cylinder and the cylinder is made to float on liquid L. It is found that the cylinder sinks with half its height sunk in liquid L. Kerosene rises in the cylinder to a height of 5cm.
Determine :

a) the weight of the empty cylinder. (3 marks)

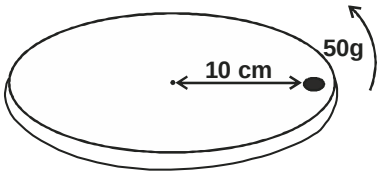
b) theupthrust experienced on the cylinder and its contents. (4 marks)

c) the density of liquid L (3 marks)

17.

a) State what provides centripetal force for an electron moving round the nucleus. (1 mark)

b) Figure 12 below shows a turn table on which a mass of 50g is placed 10cm from the centre.



Frictional force between the 50g mass and the turn table is 0.4N. When the turntable is made to rotate with angular velocity of ω $rads^{-1}$ the mass must starts to slide off.

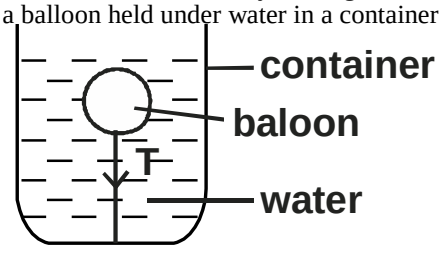
i) Determine the :

I. angular velocity ω (3 marks)

II. time taken to make one complete revolution (3 marks)

ii) On the figure draw a path that would be taken by the 50g mass if the turntable suddenly came to a stop. (1 mark)

c) Figure 13 below shows a balloon held under water in a container by a string tied to the bottom of the container.

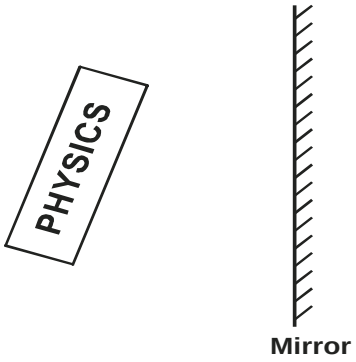


Explain the change in the value of the tension T, as the water gets heated. (3 marks)

GEM SUB-COUNTY JOINT EVALUATION EXAMS 2015
Kenya Certificate of Secondary Education
232/2
PHYSICS
Paper 2
(Theory)
July/August 2015

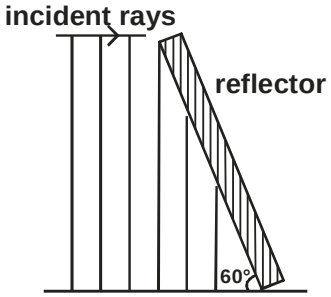
SECTION A : (25 Marks)
Answer all questions

1. Figure 1 below shows a plane mirror and the word PHYSICS written on its front.



On the same diagram, write down the appearance of the word after reflection on the mirror. (2 marks)

2. Figure 2 below shows plane waves incident on a plane reflector inclined at 60°C to the horizontal.

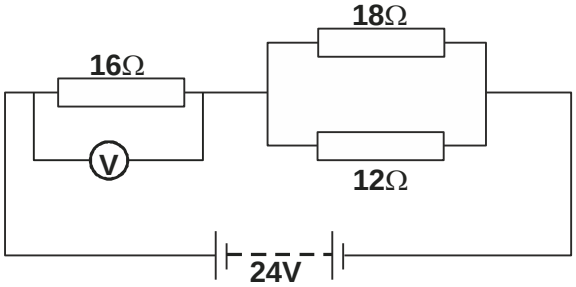


Complete the diagram to show reflected waves. (1 mark)

3. For an echo to be heard, the minimum distance between the obstacle and the observer must be 17m.
If the minimum time for hearing an echo is 0.1 seconds. Determine the speed of sound in air. (2 marks)

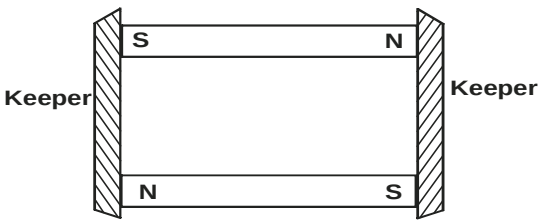
4. Figure 3 below shows three resistors and a p.d of 24V across the resistors.
Determine the reading of the voltmeter V. (2 marks)

Fig 3



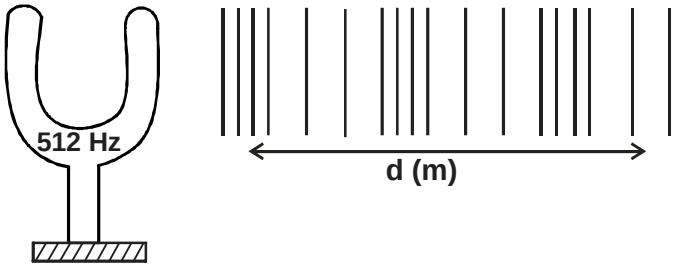
5. It is advisable to top up acid level of an accumulator with distilled water and not acid. Give a reason for this. (1 mark)

6. Figure 4 below shows how magnets are stored with keepers at the end.



Explain how this method help to maintain magnetism for a longer time. (2 marks)

7. Figure 5 below shows a tuning fork producing waves. The wave fronts are as in the diagram.



If the speed of sound in air is $330ms^{-1}$. Determine the value of d. (3 marks)

8. State Lenz's law of electromagnetic induction. (1 mark)

9. The table below shows some electrical appliances to be used in a house. The electrical rating for each appliance is shown.

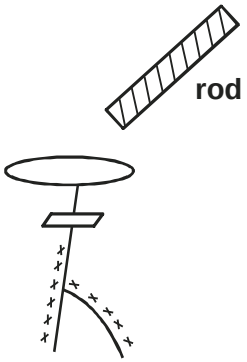
Appliance	Voltage (V)	Power (W)
TV	240	300
Iron box	240	750
Electric kettle	240	2000

a) Determine the resistance of the coil of the TV set. (2 marks)

b) Determine the appropriate current of each fuse used in the house. (2 marks)

10. Name one electromagnetic wave whose energy is higher than that of visible light. (1 mark)

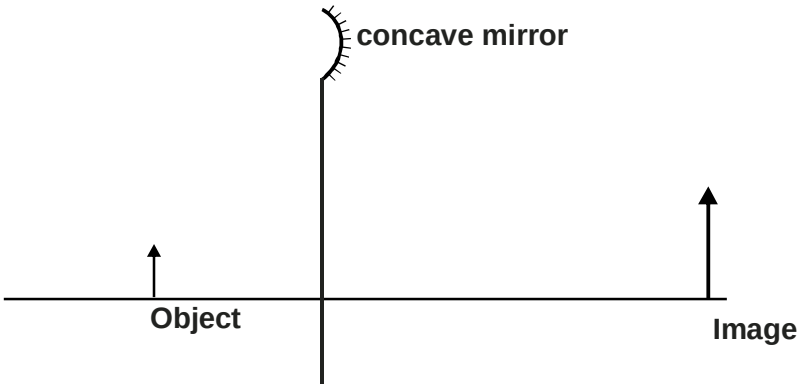
11. Figure 6 below shows a highly negatively charged rod moved slowly towards the cap of a positively charged electroscope.



Explain why the leaf initially drops and then starts to increase in divergence again. (2 marks)

12. Uranium U 234 decays to Polonium P 218 by emitting alpha particles. Determine the number of alpha particles emitted. (1 mark)

13. Figure 7 below shows an object and its image on a concave mirror. It is drawn to a scale of 1 : 10



Using a ray from the object, determine

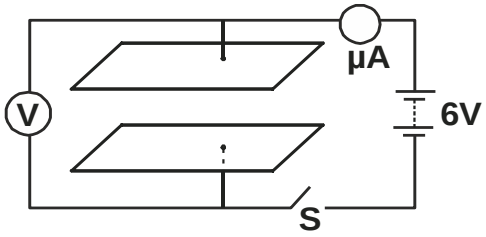
a) the position of the principal focus. (2 marks)

b) the focal length of the mirror (1 mark)

SECTION B : (55 Marks)

Answer all questions

14. a) Figure 8 below shows two parallel plate capacitors connected to a battery. Initially the switch S is open.



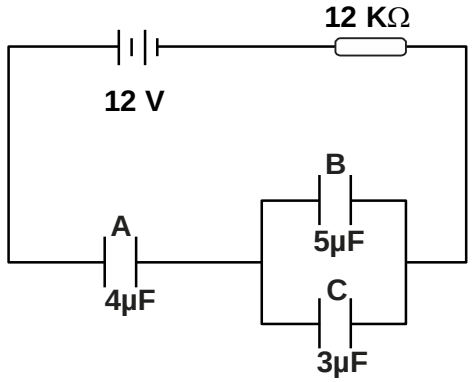
The switch is now closed and left for a few seconds.

i) In the space below sketch a graph of current reading with time from time the switch is closed. (2 marks)

ii) Determine the reading of V after a long time. (1 mark)

iii) How does the capacitance of the plates change when the plates are moved further apart. (1 mark)

b) Figure 9 below shows an electrical circuit with three capacitors A, B and C. and a resistor of value 12K□ and a p.d of 12V across the capacitors.



Determine :

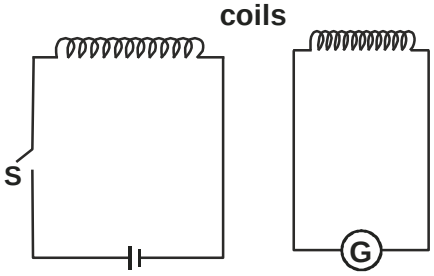
i) the current flowing in the system. (2 marks)

ii) the total capacitance of the capacitors. (3 marks)

iii) the total charge stored in the capacitors. (3 marks)

iv) The time needed to fully charge the capacitors. (2 marks)

15. a) Figure 10 below shows the circuits close to each other.



When the switch is closed, the galvanometer shows a reading and then returns to zero.

i) Explain the observation (2 marks)

ii) Give one adjustment that can be done to the arrangement so that

I. the galvanometer gives a bigger deflection in the same direction. (1 mark)

II. the galvanometer deflects in opposite direction when the switch is closed. (1 mark)

b) In an X-ray tube, the electrons are accelerated by ap.d of 24000V. Assuming that 2% of energy produced is converted to X-rays. Determine the :

i) energy of the X-rays produced. (3 marks)

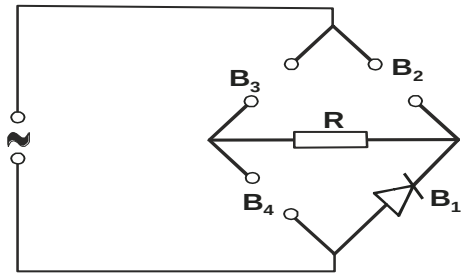
ii) frequency of X-rays produced (take planks constant h = 6.6 x 10^{-34}Js and charge on an electron e= 1.6 x 10^{-19}C) (3 marks)

16. a) Define :

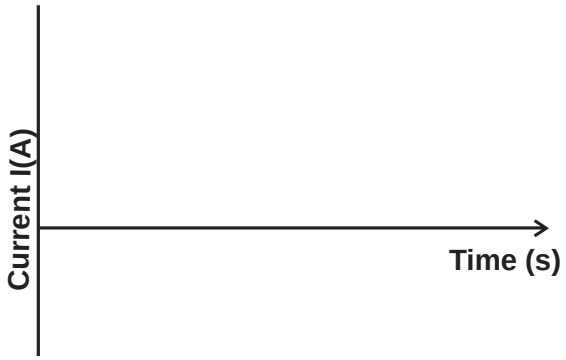
i) an extrinsic semiconductor (1 mark)

ii) doping in semi-conduction. (1 mark)

b) Figure 11 below shows four pieces of a device used in full wave rectification.

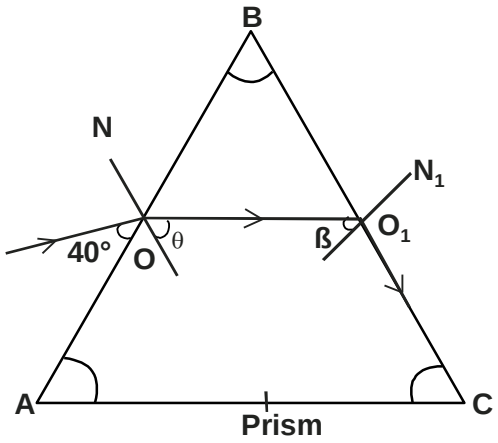


i) Name the devices B_1, B_2, B_3 and B_4 (1 mark)
ii) Complete the diagram by showing the correct directions of B_2, B_3 and B_4 (2 marks)
iii) Use an arrow to show the direction of current flow through R. (1 mark)
iv) Sketch the output current as would be observed on the screen of a CRO fixed between C and D in the space below. (1 mark)



c) Name a device that can be used to improve on the nature of the output current. (1 mark)

17. a) Figure 12 below shows a path of a ray of light through a glass prism. The refractive index of glass is 1.52 and the rays makes an angle of 40° with the prism.



ON and O^1N^1 are normals to the prism at the faces AB and BC respectively. If the speed of light in air is 3 x $10^8 ms^{-1}$.Determine :

i) the speed of light in glass (3 marks)
ii) the angles marked
I. angle θ (3 marks)
II. angleβ (3 marks)

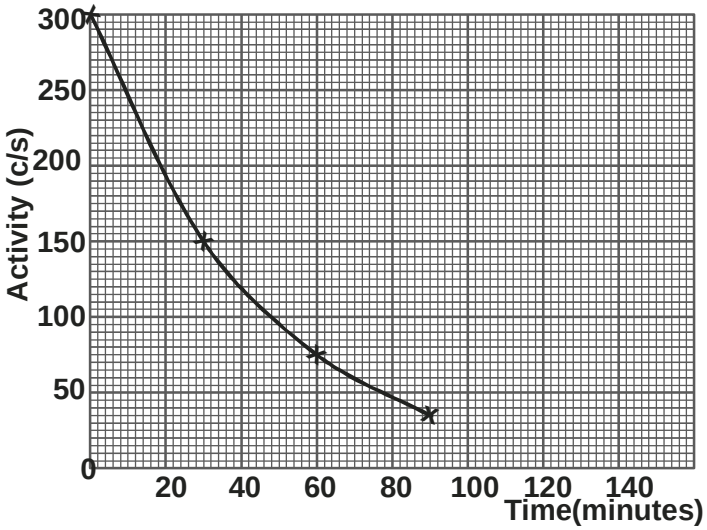
b) An object forms a virtual image three times the size of the object. If the object is placed 10cm from the lens. Determine :
i) the image distance from lens. (3 marks)
ii) the focal length of the lens (2 marks)

18. a) State the function of the grid of a cathode ray oscilloscope (CRO) (2 marks)
b) State what is observed on the screen of a CRO when :

i) low voltage alternating current is connected to the time base and the y-gain switched off. (1 mark)

ii) a high voltage ac is connected to the y-gain and the time base is switched off. (1 mark)

c) The graph shows the activity versus time for a sample of radioactive material.



Use the graph to determine :

i) the half life of the sample (2 marks)

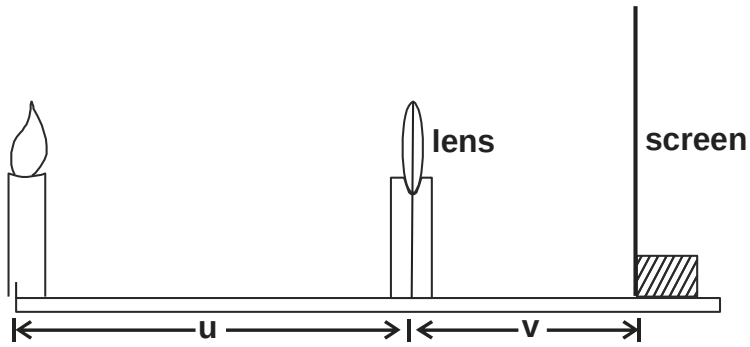
ii) the number of half lifes needed for the activity to reduce from 300C/S to 37.5CS^{-1} (3 marks)

GEM SUB-COUNTY JOINT EVALUATION EXAMS 2015
232/3
PHYSICS
Paper 3
(Practical)
July/August 2015

1. You are provided with the following apparatus :
- a biconvex lens labelled A
- a candle
- a lens holder
- a metre rule
- a piece of plasticine

Proceed as follows

a) Arrange the candle, lens, screen and metre rule as shown. Ensure that the flame of the candle is at the same level as the centre of the lens, L. This may be done by raising the candle with a piece of plasticine as it gets shorter.



b) With the lens placed 20cm from the candle, adjust the position of the screen till a sharp image of the candle is formed on it . Read and record the value of V.

c) Increase U in steps of 5cm and obtain the corresponding values of V. Complete the table.

U (cm)	20	25	30	35	40	45	50
V (cm)							
$\frac{U}{V}$							

(8 marks)

d) i) Plot a graph of object distance, u (y-axis) against the ratio $^{U}/_{V}$ (5 marks)

ii) Determine the slope, S of the graph. (2 marks)

iii) Find the value of u intercept. (1 mark)

iv) Compare the value of S and that of u intercept. (1 mark)

e) i) Move the screen till it is 80cm from the candle.

ii) Starting from very near the screen, move the lens slowly towards the candle and note the two positions P and R where sharp images of the candle are obtained on the screen. Measure d, the distance between P and R.

d = ... (1 mark)

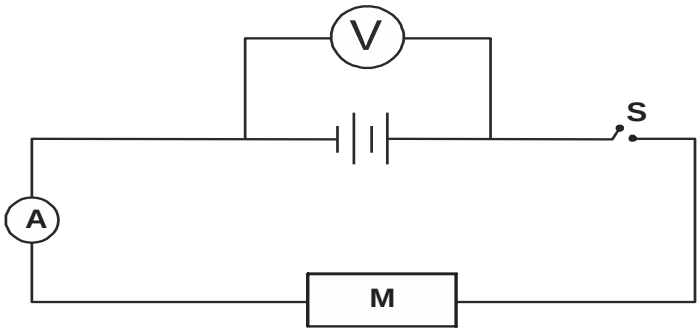
iii) Calculate the quantity Z from (2 marks)

$Z = \frac{80^2 - d^2}{320}$

2. You are provided with the following apparatus :
- two dry cells
- a cell holder
- ammeter
- voltmeter
- Eight connecting wires each with crocodile clip at one end
- six 10 ohm carbon resistors
- a switch

Proceed as follows :

a) Set up the apparatus as shown in figure 4 below. M is one of the 10 ohm carbon resistors.



b) With the switch S open, record the reading E_o of the voltmeter. (1 mark)

c) Now remove the voltmeter. Close the switch and record in table 2 the current I flowing in the circuit. Open the switch S.

d) Remove the resistor M. Using carbon resistors provided, make suitable combinations of the resistors to obtain effective resistance R shown in the table 2. For each value of R, record the current I flowing in the circuit. Complete the table. (Resistors should be arranged in parallel)

R (ohms)	10.0	5.0	3.3	2.25	2.0	1.7
I (Amperes)						
$\frac{I}{A}(A^{-})$						

e) Plot a graph of $^1/_I$ (y-axis) against R. (5 marks)

f) Determine the slope of the graph M. (2 marks)

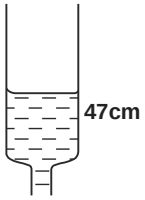
g) Evaluate the value of the constants. (1 mark)

i) $K = \frac{1}{M}$

ii) $P = \frac{E_o K}{4r}$ where r is the value of the R axis intercept. (4 marks)

GEM SUB-COUNTY FORM 4 JOINT EVALUATION
PHYSICS
Paper 1
July/August 2015
MARKING SCHEME

1. $1.1 \times 20 = 22cm^3$ ✓
New level = 25 + 22
= 47cm mark



2. Adhesive force
= wt of water in tube = pv ✓
$= 2 \times 10 \times 10^{-6} \times 1000 \times 10$ ✓
= 20N ✓

3. Body moves with decreasing acceleration ✓

4. Has uniform expansion ✓

5. $P_A + h_2p_2g = p_g + h_1p_1g$ ✓
$1.02 \times 10^5 + 0.12 \times 800 \times 10$
$= P_g + 0.08 \times 1800 \times 10$
$102000 + 960 = p_g + 15168$
$p_g = 1.014 \times 10^5 Pa$ ✓

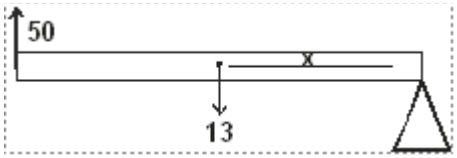
6. Because intermolecular forces in gases are weaker than in solids ✓

7. a) A
b) Expands more than B ✓ at same temp change hence higher upthrust in A than in B ✓

8. $V = 31.42mm^3$
$A = {}^{22}/_{7} \times 21 \times 21$
$= 22 \times 3 \times 21$
$= 1366mm^2$
$t = \frac{V}{A} = \frac{31.42}{1386} = 2.23 \times 10^{-3}mm$

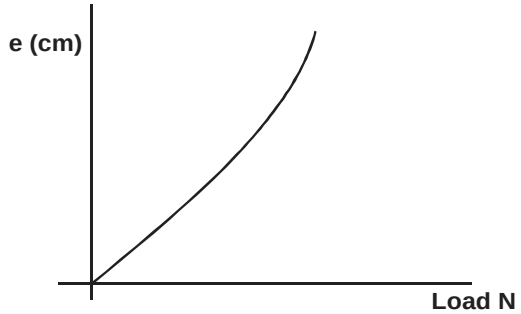
9. Both are a product of force and distance ✓

10. a) W = 80 + 50 ✓
= 130N ✓
b) $F_1d_1 = F_2d_2$ ✓
Taking moments about F_2



$50 \times 2 = 130x$
$x = \frac{100}{130}$
= 0.77m from F_2 ✓

11. a)



b) $K = \frac{F}{e} = \frac{30 - 0}{6 - 0}$ ✓

$= 5Nm^{-1}$ ✓

12. $h_4 h_2 h_1 h_4$ ✓

13. a) i) $T = 2\pi\sqrt{\frac{l}{g}}$

$T^2 = \frac{4\pi^2 l}{g} \Rightarrow 0.64 = \frac{4(3.142)^2 \times 0.5}{g}$

$g = \frac{4(3.142)^2 \times 0.5}{0.64} = 30.85Nkg^{-1}$

ii) $W = mg$

$= \frac{50}{1000} \times 30.85$

$= 1.54N$ for the 50g mass

b)

i) I. $T - Fr = 0.05a$

$T - 0.3 \times 0.05 \times 10 = 0.05a$

$T - 0.15 = 0.05a$

$a = \frac{T - 0.15}{0.05}$

$= 8.8ms^{-2}$

ii) $v^2 - u^2 = 2as$

$v^2 - (0)^2 = 2 \times 8.8 \times 0.6$

$v^2 = 10.56$

$v = \sqrt{10.56}$

14. a) Temperature ✓

Mass of gas ✓

b) i) I. $3 \times 10^5 Pa$ (from graph) ✓✓

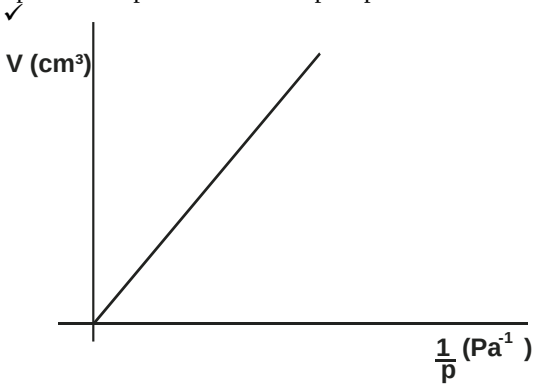
II) $1 \times 10^5 Pa$ (from graph) ✓✓

ii) As bubble rises the total pressure exerted on the bubble reduces ✓ since PV is constant, increase in pressure corresponds to decrease in volume ✓

iii) Atmospheric pressure = pressure at the top of pond ✓

$= 1 \times 10^5 Pa$ ✓

iv)



Axes correctly labelled with units ✓

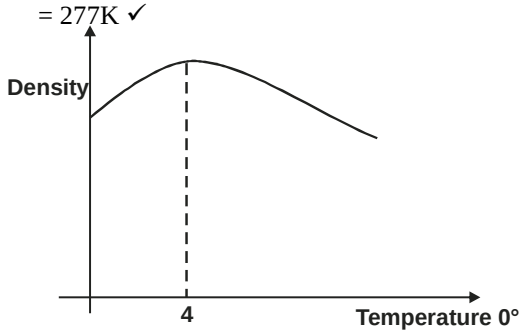
Straight line through the origin ✓

15. a) Temperature is measured in Kelvins while heat is measured in Joules ✓

b) i) $4^oC + 273$ ✓

$= 277K$ ✓

ii)



correct shape with maximum at 4°C

iii) **I.** Q = Pt
= 300 x 5 x 30 ✓
= 45000J ✓

II. Q = CΔθ✓
45000 = C(40 - 0)
C = 45000
40 ✓
= 1125JK^{-1}✓

III. e = MC ✓
m = c = 1125 = 0.267kg
c 4200

16. a) W = mg ✓
= 300 x 10
1000
= 3N ✓

b) wt of kerosene = v ρ g ✓
= 3.142 x 2 x 2 x 5 x 10^{-6} x 800 x 10
= 0.5N ✓

upthrust = 3 + 0.5 ✓
= 3.5N ✓

c) upthrust = wt of L displaced ✓
3.5 = v ρ g
3.5 = 3.142 x 2 x 2 x 3 x 10^{-6} x ρ x 10

$$\rho = \frac{3.5}{3.142 \times 2 \times 2 \times 3 \times 10 \times 10^{-6}}$$

$$= \frac{3.5}{3.77 \times 10^{-4}} \checkmark$$

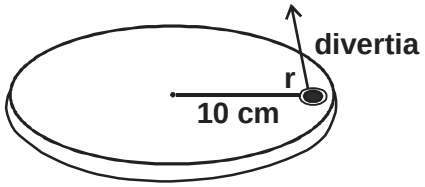
$$= 0.93 \times 10^{4}$$
$$= 9300 kgm^{-3} \checkmark$$

17. a) Electrostatic force of attraction between the electrons and the nucleus ✓

b) i) I. $F = mw^2r$
$w^2 = F = 0.4$
$mr 0.05 \times 0.1$
$w^2 = 800$
$w = \sqrt{800} = 20\sqrt{2}$ = rads^{-1}

II. $T = \frac{2\pi}{w} \checkmark = \frac{2 \times 3.142}{20\sqrt{2}} \checkmark = \frac{0.3142}{\sqrt{2}}$

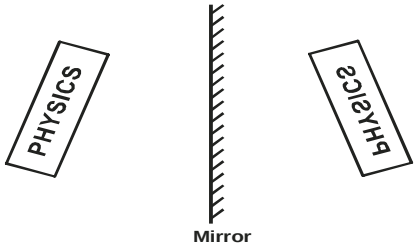
ii)



c) The value of T increases ✓
Increase in temperature makes the balloon to expand ✓
This increases the upthrust on the balloon and hence T ✓

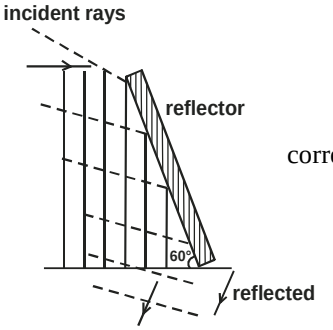
GEM SUB-COUNTY FORM 4 JOINT EVALUATION
PHYSICS
Paper 2
July/August 2015
MARKING SCHEME

1.



same inversion of letters ✓
same distance from mirror as object ✓

2.



correct direction ✓

3. $V = \frac{2d}{E} = \frac{2 \times 17}{0.1}$ ✓
$= 340ms^{-1}$✓

4. $R_T = 16 + \frac{18 \times 12}{30} = 23.2\Omega$✓
$I = \frac{V}{R} = \frac{24}{23.2}$
$V = 1R$
$= \frac{24}{23.2} \times 16$
$= 16.56$ ✓

5. Distilled water regulates the concentration while acid only increases concentration of the accumulator ✓

6. Keepers being magnetic materials become magnetised by induction ✓ . This maintains direction of dipoles enhancing attraction ✓

7. $V = f\lambda$
$\lambda = \frac{V}{f} = \frac{330}{512} = 0.645m$
$d = 2.5\lambda$
$= 2.5 \times 0.645$
$= 1.611m$ ✓

8. The direction of induced e.m.f is such as to oppose the current causing it ✓

9. a) $P = \frac{V^2}{R} \Rightarrow R = \frac{V^2}{P}$
$= \frac{(240)^2}{300}$ ✓
$= 192\Omega$✓

b) $P = VI$
$I = \frac{P}{V} = \frac{300}{240} = 1.25A$ TV needs fuse of 1A
$\frac{750}{240} = 3.13A$ } iron box needs fuse of 3A
$\frac{2000}{240} = 8.33A$ } electric kettle needs fuse of 8A

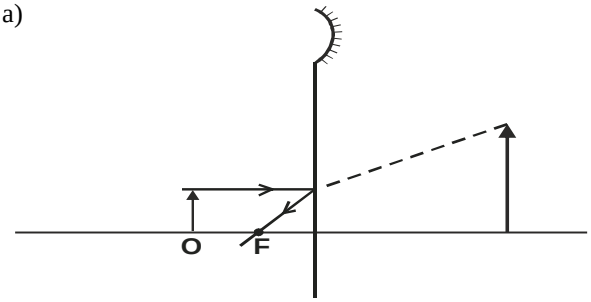
10. UV
gamma
X-ray
UV***any one***

11. As rod moves towards electroscope negative charge are repelled from cap to leaf causing reduction in divergence ✓
Further induction of negative charges on leaf neutralises all negative leaving cap and leaf without negative charge hence increase in divergence ✓

12. 34 - 18 = 4n ✓
16 = 4n ⇒ n = 16 = 4 alpha particles ✓

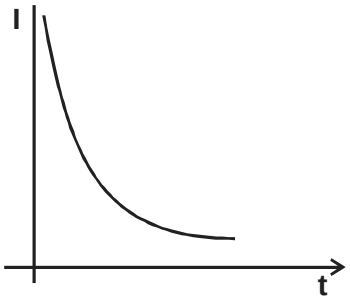
$$U^{234} \longrightarrow P_0^{218} + n\,\alpha_2^4 \qquad 4$$

13. a)



b) $\frac{P}{f}$ = 0.8 x 10
= 8cm ✓

14. a) i)



shape of curve ✓
axes labelled ✓

ii) 6V ✓
iii) capacitance reduces ✓

b) i) $I = \frac{V}{R}$
$= \frac{12}{12000}$ ✓
= 0.001A ✓

b) ii) $\frac{I}{C} = \frac{1}{4} + \frac{1}{8}$
$C = \frac{4 \times 8}{4 + 8} = \frac{32}{12}$ = 2.6mF

iii) Q = CV
= 2.67 x 10^{-6} x 12
= 3.2 x 10^{-5}C

iv) Q = It

$t = \frac{Q}{I} = \frac{3.2 \times 10^{-5}}{1 \times 10^{-3}}$

= 3.2 x 10^{-2}
0.032 sec ✓

15. a) i) When current flows, the change in current in the dc coil causes a flux which links with the coil in 2nd circuit thus an e.m.f is induced ✓
When closed, no more change in flux in dc hence no induced e.m.f ✓

ii) I. Increasing turns in primary coil using more cells in the primary coil
II. Reversing terminals of the battery ✓

b) X-ray energy = $\frac{2}{100}$ x ev ✓
= 2 x 1.6 x 10^{-19} x 24000
= 768 x 10^{-19}ev ✓
1ev = 1.6 x 10^{-19}J

X-ray energy = 768J ✓

ii) $E = hf$

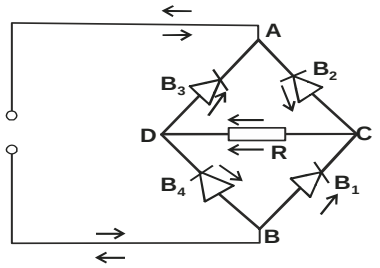
$f = \frac{E}{h} = \frac{768}{6.6 \times 10^{-34}} = 116 \times 10^{34}$

$= 1.16 \times 10^{32}$Hz ✓

16. a) This is a semi-conductor whose conductivity is enhanced through doping ✓

b) Doping is the introduction of an impurity to a semi-conductor to enhance its conductivity ✓

c) i) Diodes ✓

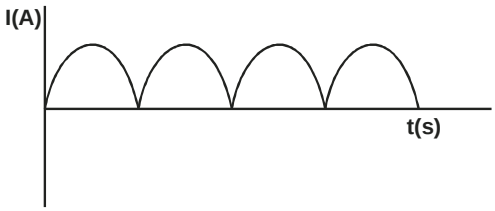


ii) Correct direction of B3 ✓

Correct direction of B2 and B4 ✓

iii) Direction of current is from C to D ✓

iv)



c) Capacitor

17. a)

i) $1.52 = \frac{V_A}{V_{prism}} = \frac{3.0 \times 0^8}{V_p}$

$V_p = \frac{3 \times 10^8}{1.52} = 1.97 \times 10^8 ms^{-1}$

ii) $\sin 50 = 1.52$

$\sin\theta$

$\sin\theta = \frac{\sin 50}{1.52}$

$\theta = \sin^{-1}\frac{\sin 50}{1.52}$

iii) $\sin\beta = \frac{1}{1.52}$

$b = \sin^{-1}\frac{1}{1.52}$

=

b) $\frac{v}{u} = 3$ ✓

but u = 10

v = 3u = 3 x 10

= 30cm ✓

$m = \frac{v}{f} - 1$

$3 = \frac{30}{f} = 1$

f - 1 ✓

$\frac{30}{f} = 4$

$f = \frac{30}{4} = 7.5$cm ✓

18. a) Grid controls brightness of the screen by limiting the number of electrons reaching the screen by repulsion ✓

b) i) A dark spot is seen moving to and from on the horizontal of the screen ✓

ii) A dark line is formed vertically along the screen ✓

c) i) Half life = time corresponding to activity of $\frac{310}{2}$ = 150 which is 30 minutes

ii) $300 \xrightarrow{t½} 150 \xrightarrow{t½} 75 \xrightarrow{t½} 37.5$

these are 3 half lives ✓

GEM SUB-COUNTY FORM 4 JOINT EVALUATION
PHYSICS
Paper 3
July/August 2015
MARKING SCHEME

1. c)

U (cm)	20	25	30	35	40	45	50
V (cm)	28.0	24.0	22.0	19.5	18.5	18.3	17.4
$\frac{U}{V}$	0.7142	1.042	1.364	1.786	2.162	2.459	2.8736

8mks

d) i) Graph
For f = 10cm

u	20	25	30	35	40	45	50
v	19.5	15.8	15.5	14.3	13.3	12.3	12.1

d = 68.7 - 68.5
= 0.2cm

ii) slope, S = $\frac{\Delta u}{\Delta^u/v}$

$= \frac{(38 - 15)\text{cm}}{(2 - 0.35)}$

= 13.94cm

iii) $^u/v$ intercept = 10cm

iv) Equal to or almost equal or difference is 3.94cm

e) ii) d = 67.8 - 67.5
= 0.3cm

iii) $z = \frac{80^2 - d^2}{320}$

$= \frac{80^2 - 0.3^2}{320}$

$= 19.99\text{cm}^2$

2. b) E_o = 3.0 volts 1mk

d)

R (ohms)	10.0	5.0	3.3	2.25	2.0	1.7
I (Amperes)	0.30	0.60	0.91	1.33	1.50	1.76
$\frac{I}{A}(A^-)$	3.33	1.67	1.10	0.75	0.67	0.57

f) Slope M = $\frac{2.5 - 1.25}{7.6 - 3.8}$

$= \frac{1.25}{3.8}$

$= 0.3289\text{A}^{-1}\Omega^{-1}$

g) i) $K = \frac{1}{0.3289} = 3.04\Omega\text{A}$ or 3.04V ***1mk***

ii) $P = \frac{3.0 \times 3.04}{4 \times 0.05}$

$= 45.6\Omega^3\text{A}^2$

or $45.6\text{V}^2\Omega$ ***4mks***

KAJIADO COUNTY JOINT EXAMINATION
Kenya Certificate of Secondary Education
232/1
PHYSICS
Paper 1
July / August 2015

SECTION A (25 marks)
Answer ALL the questions in the spaces provided.

1. A density bottle was used to measure the density of liquid L and the following were the measurements taken
- Mass of empty bottle = 26g
- Mass of bottle filled with alcohol (of density 800kig/m³) = 66g
- Mass of bottle filled with liquid L - 86g

Find the density of liquid L. (3 marks)

2. A Spring extends by 0.7cm when a mass of 420g is hang on it on earth. By what length would the spring extend if the same set up was taken to the moon where the gravitational intensity is one-sixth of that one earth.
Take gravitational field intensity on surface of Earth g, 10N/kg (3 marks)

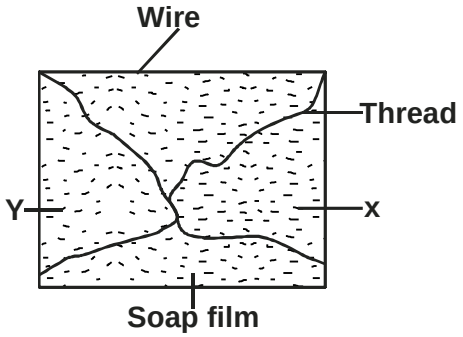
3. A candle is lit and placed on a level bench. State and explain the changes in the stability on the candle as it continues to burn. (2 marks)

4. Two table tennis balls are at the same level while suspended from threads a short distance apart. A steam of air is blown between the balls in a horizontal direction. State and explain the observation made. (2 marks)

5. A car of mass 800kg moves on a circular track of radius 20m. The force of friction between the tyres and the tarmac is 4800N. Determine the maximum speed at which the car can be driven on the track without skidding. (3 marks)

6. The diagram below shows a rectangular wire with loose thread tied in it and dipped in a soap solution to form a film.

Fig 1.0

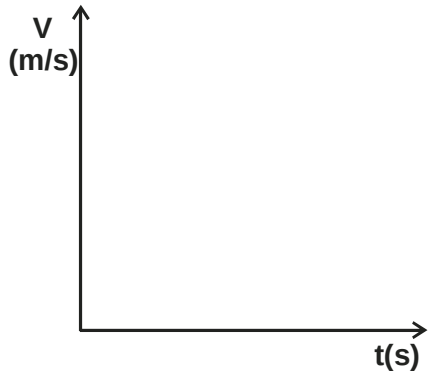


Draw a diagram showing what will be observed when the film is broken at points X and Y. (1 mark)

7. Explain why a glass container with thick glass walls is more likely to crack than one with a thin wall when very hot liquid is poured on to them. (2 marks)

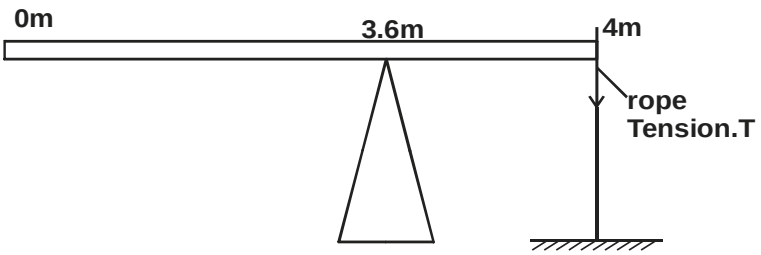
8. On the axes provided in the figure 2.0 below. Sketch a graph of velocity (V) against time (t) for uniformly accelerated motion given that when t = 0, V is greater than zero. (1 mark)

Fig 2.0



9. A uniform rod of length 4m and mass of 4kg is pivoted at 3.6m mark. The rod is held horizontal with a vertical rope at the 4m mark, as shown in the figure 3.0 below.

Fig 3.0



Calculate the tension, T in the rope (Take g = 10N/kg) (3 marks)

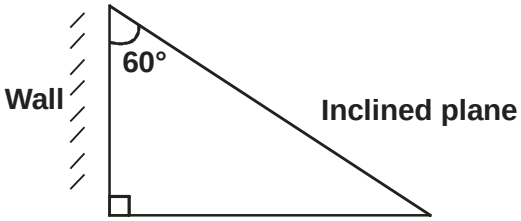
10. When graphite particles are suspended in water and observed through a microscope, they are seen to move in a random motion. Explain. (1 mark)

11. Explain why a glass of water cools more when ice at 0°C is added to it than when equal mass of water at 0°C is added to it. (1 mark)

12. Explain why it is necessary to add a little flour to the water when boiling it to cook ugali. (1 mark)

13. A plane is inclined against a wall as shown in the figure 4.0 below.

Fig 4.0



Calculate the Velocity Ratio of the inclined plane. (2 marks)

SECTION B (55 marks)

Answer all questions in this section

14. a) Explain why it is advisable to use a pressure cooker for cooking at high altitudes. (2 marks)

b) Water of mass 6kg initially at 25°C is heated in an electric kettle rated 6.0Kw. The water is heated until it boils at 100°C. (Take specific heat capacity of water 4200Jkg^{-1}k^{-1}, heat capacity of the kettle 450J/k, specific latent heat of vaporisation of water = 2.3×10^6 J/kg)

Determine

i) Heat absorbed by the water. (2 marks)

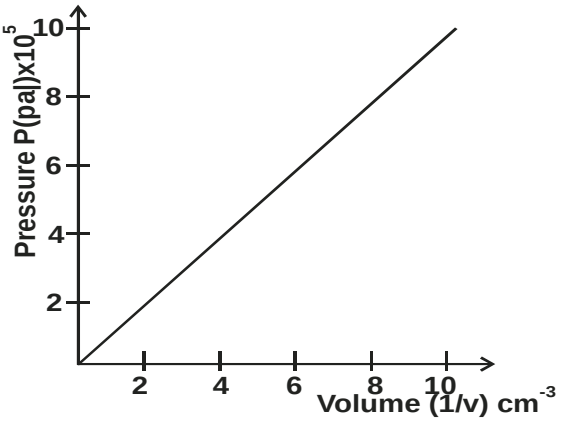
ii) Heat absorbed by the electric kettle. (2 marks)

iii) Time taken for the water to boil. (3 marks)

iv) How much longer it will take to boil away all the water? (3 marks)

15. A student performed an experiment to study the relationship between pressure and volume of a gas enclosed in a vessel. Temperature was kept constant throughout the experiment. The results obtained were plotted and the graph below obtained.

Fig 5.0



a) State the law of the student was investigating. (1 mark)

b) Given that p = $\frac{R}{V}$ use your graph to obtain R. (3 marks)

c) A small metal sphere is released to fall through a long column of water held in a vertical tube. Explain why the sphere finally acquires a steady velocity. (2 marks)

d) A target of mass 1.05kg hangs from a tree by a long light string. An arrow of mass 100g is shot towards the target with a velocity of 10m/s and embeds itself in the target.

Determine:

i) the velocity of the target and the arrow just after collision. (2 marks)

ii) the maximum height reached by the target after the impact. (3 marks)

16. a) State the law of floatation. (1 mark)

b) A rectangular block of cross-sectional area 0.08m² is immersed in a liquid of density 1200kg/m³. The top and the lower surfaces are 80cm and 200cm below the surface of the liquid respectively.

i) What is the downward force on the top of the block? (3 marks)

ii) Calculate the upthrust on the block. (3 marks)

c) A block of glass of mass 0.25kg floats in mercury of density $1.36 \times 10^4 kg/m^3$. What volume of the glass lies under the surface of mercury? (3 marks)

d) The weight of cube in air is 0.25N. When immersed in water, it weighs 0.44N and when in oil weighs 0.46N. Calculate the relative density of the oil. (3 marks)

17. a) State Newton's first law of motion. (1 mark)

b) A bus of mass 5,000kg and a car of mass 1200kg are both travelling on a dual carriage way at the same velocity. If both drivers apply the same breaking force. State with reason which one will come to stop first. (2 marks)

c) A driver driving a car of mass 1200kg at a constant speed of 72km/h is flagged down by a traffic police officer 145m away. It takes him 2 seconds to react to the police signal and brings the car to rest by applying a constant breaking force in 10 seconds. Determine.

i) The minimum stopping distance. (3 marks)

ii) State whether it will hit the traffic police officer or not. (1 mark)

18. a) The figure 6.0 below represents a hydraulic brake.

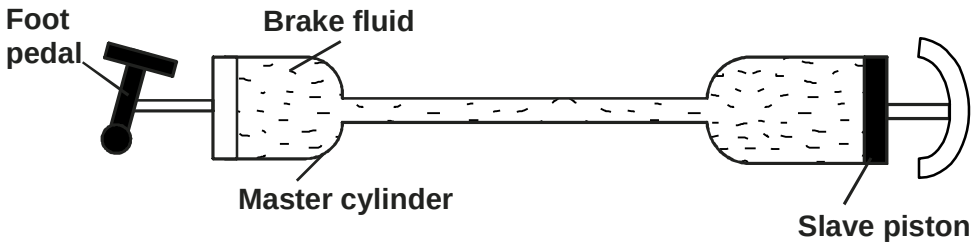


Fig 6.0

A force of 20N is applied on the foot pedal connected to a piston of area $0.0005m^2$ and this causes a stopping force of 5000N. Calculate

i) The pressure in the master cylinder. (3 marks)

ii) The area of the slave piston. (3 marks)

iii) The velocity ratio (3 marks)

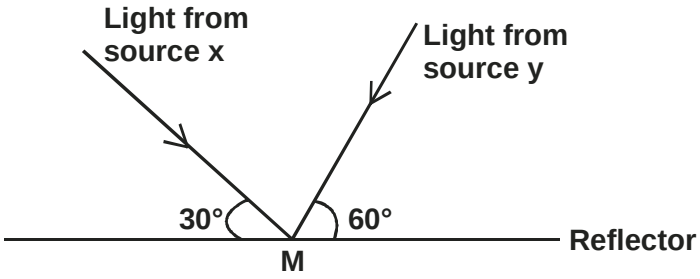
b) A box of mass 500g has dimension 10m × 5m × 3m. Determine the maximum pressure exerted by the box on a flat surface. (Take g = 10N/kg) (3 marks)

KAJIADO COUNTY JOINT EXAMINATION
Kenya Certificate of Secondary Education
232/2
PHYSICS
Paper 2
July/August 2015

SECTION A (25 marks)
Answer ALL questions in this paper

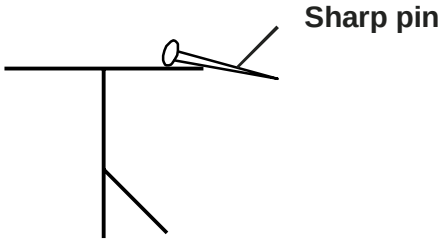
1. A ray from a source X makes an angle of 30° with a plane reflector and a ray from a source Y makes an angle of 60° to the same reflector at the same point M as shown below. Find the angle through which the reflector at the same point M as shown below. Find the angle through which the reflector must be rotated about M such that the ray from the source Y falls on the source X. (3 marks)

Fig 1.0



2. The figure 2.0 below shows a sharp pin fixed on a cap of the electroscope. The electroscope is highly charged and then left for sometime.

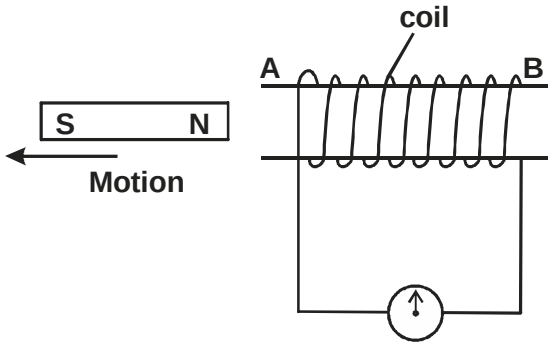
Fig 2.0



Explain why the leaf collapses. (2 marks)

3. The figure 3.0 below shows a coil and a magnet being removed from the coil.

Fig 3.0



a) State the polarity gained at end B. (1 mark)
b) Indicate the direction of flow of current on the coil. (1 mark)

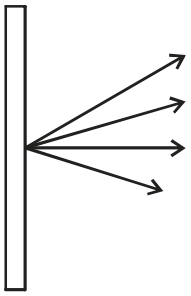
4. Below is part of radioactive decay series of Uranium 238.

$$^{238}_{92}U \xrightarrow{a} {}^{234}_{90} \xrightarrow{b} {}^{234}_{91}Pa \xrightarrow{C} {}^{239}_{92}U \rightarrow {}^{230}_{90}Th$$

Identify isotopes from series above. (1 mark)

5. The figure 4.0 below shows the cloud chamber tracks of a certain radioactive emission.

Fig 4.0



State three properties of the radioactive emission producing the tracks shown in the figure above. (3 marks)

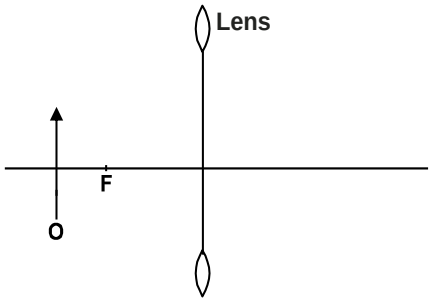
6. State what happens to the depletion layer when

a) A diode is forward biased. (1 mark)

b) A diode is reverse biased. (1 mark)

7. The diagram in the figure 5.0 below shows an object O placed infront of a converging lens.

Fig 5.0

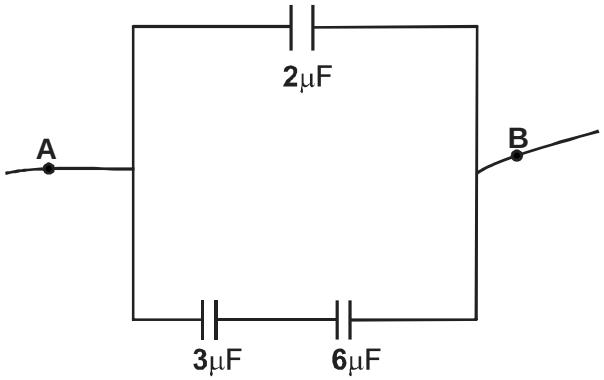


Using ray diagram determine the position of the image. (3 marks)

8. Explain why the cathode of a CRO is coated with oxides of metals such as Barium and Strontium (2 marks)

9. Why is repulsion the surest way of testing for polarity of a magnet? (1 mark)

10. Find the combined capacitance between points A and B of the arrangement shown in the figure 6.0 below. (2 marks)



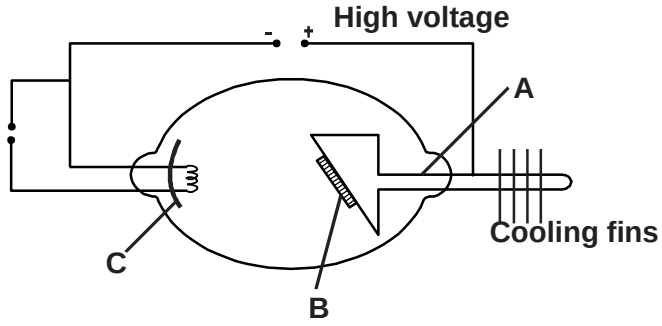
11. Give one reason why sound is not classified as an electromagnetic wave. (1 mark)
12. State how polarization is reduced in a simple cell. (1 mark)
13. Explain why it is not advisable to use a 10A fuse for a hair drier rated 2.5Kw, 240V. (2 marks)

SECTION B (55 marks)

Answer ALL questions from this section.

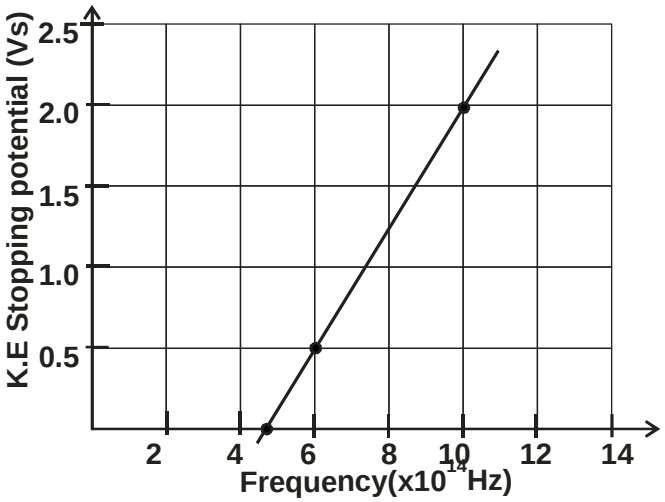
14. The figure 7.0 below shows the construction and circuit of the modern physics X-ray tube.

Fig 7.0



a) Indicate on the diagram the path of the x-ray beam. (1 mark)
b) Name the part marked C and state its function (2 marks)
c) Name the metal used in parts A and B and state why they are suitable for use in the tube. (4 marks)
d) Why are cooling fins necessary? (1 mark)
e) Form four students performed an experiment in photoelectric effect and drew the graph below from the data collected.

Fig 8.0



From the graph determine
i) threshold frequency. (1 mark)
ii) Planks constant . (Take charge on an electron, e = 1.6×10^{-19}C) (3 marks)

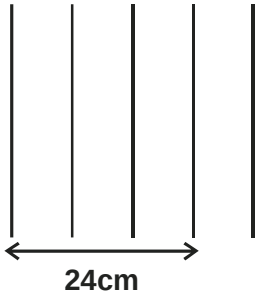
15. a) State ohm's law. (1 mark)
b) A wire was connected to a battery and it was found that the energy converted to heat was 30J when 20 coulombs of charge flowed through the wire in 5 seconds

Calculate
i) The p.d. between the ends of the wire. (2 marks)
ii) The current flowing through the wire. (2 marks)
iii) The resistance of the wire. (2 marks)
iv) The power developed in the wire. (2 marks)

c) Two resistors whose resistance are R and 5Ω are connected in series to a battery of 24V and internal resistance of 1Ω. If the current in the circuit is 3A. Find the value of R. (3 marks)

16. a) A person standing behind a wall hears a bell ringing although he cannot see the bell. What property of sound enables him to hear the sound? (1 mark)
b) The figure 9.0 below is a sketch of ripples caused by a vibrator in a ripple tank whose frequency is 50Hz.

Fig 9.0



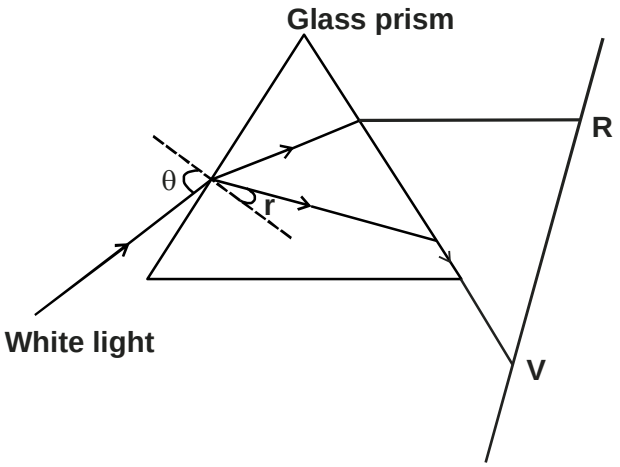
Using the above information, determine the speed of the wave motion. (3 marks)
c) The speed of sound in air determined on a warm day is 330m/s. Explain any difference you would expect in the results if the measurement is done on a cold day. (2 marks)
d) In an experiment to determine the speed of sound, an observer stood in front of a high wall at a distance of 80m. He clapped two boards together at such a rate that each clap coincided with the echo from the wall. A second observer noted a time of 9.5 seconds starting with first clap and ending with the 21st clap.
i) Calculate the speed of sound under these conditions. (3 marks)
ii) Describe one probable source of error in this experiment. (1 mark)
iii) State one way in which sound wave differ from light waves. (1 mark)

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

b) The primary coil of a transformer has 1200turns and the secondary coil has 60 turns. The transformer is connected to a 240V a.c source.
Determine
i) The output voltage. (2 marks)
ii) The output current when the primary coil has a current of 0.5A (Assume there is no energy losses) (3 marks)
iii) One of the primary ways in which power is lost in transformers is through eddy currents. State how eddy currents can be minimized. (1 mark)
c) Determine the cost of using an electric iron rated 1500W, for a total of 30 hours given that the cost of electricity per kwh is kshs 8. (3 marks)

18. The figure 10.0 below shows a ray of white light dispersed in a triangular prism. The speed of violet light in the prism in 1.88×10^8m/s.

Fig 10.0

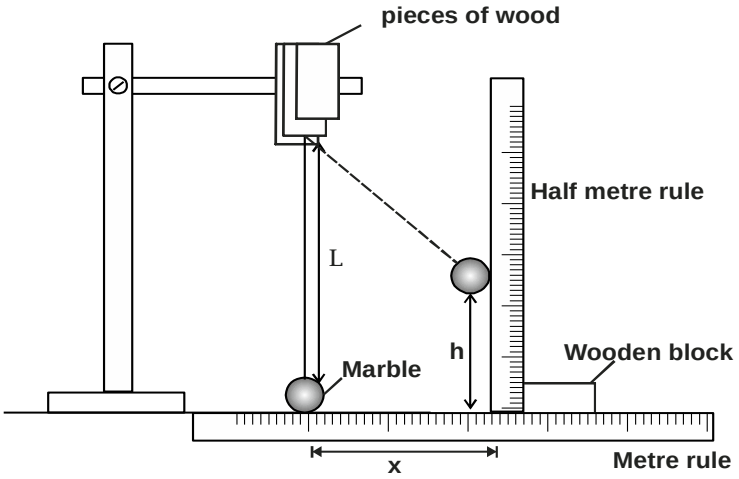


a) Explain how glass disperses white light into red and violet bands. (1 mark)
b) Determine the refractive index of the prism material for light (take speed of light in vacuum = 3×10^8m/s (2 marks)
c) Show on the figure the critical angle C for violet light and determine its value. (3 marks)
d) Given that r =21.5° determine the angle θ (3 marks)
e) On the same figure, sketch the part of red light after white light strikes the prism if the prism was replaced by another of similar shape but lower refractive index. (Use a dotted line for the answer) (1 mark)

KAJIADO COUNTY JOINT EXAMINATION
Kenya Certificate of Secondary Education
232/3
PHYSICS
Paper 3
July/August 2015

1. You are provided with
- A marble with a piece of thread attached.
- Two wooden blocks
- A clamp, stand and boss
- A metre rule
- ½ metre rule attached to a wooden block.
- 2 pieces of cellotape
- a stop watch.

a) Fix the thread between the two wooden blocks and fasten in the clamp. Adjust the thread so that the length L shown in the figure is 50cm.
b) Fix the metre rule horizontally to the bench using the cellotape provided.
c) Adjust the clamp so that the marble is next to the end of the metre rule as shown.



i) Displace the marble by a horizontal distance x = 20cm and measure the corresponding vertical displacement
h = ... cm. (1 mark)
ii) Repeat the experiment to find h for each of the following values of x and complete the table.

x (cm)	h (cm)	x^2 (cm^2)	x^2 /h (cm)
20			
25			
30			
35			
40			
45			

d) Plot a graph of x^2/h against h starting the x^2 / h axis from 50cm and h axis scale from zero. Draw the line of best fit through the points. (5 marks)
e) Determine the slope of the graph. (3 marks)
f) From the graph find the value of x^2/h when h = 0 (1 mark)
g) Rinse the clamp slightly without changing the length L so that the marble is free to swing. Displace the marble through a horizontal distance of about 10cm and set it free to swing.
h) Determine the period for one complete oscillation by timing 20 oscillations.
Time for 20 oscillations = ... (1 mark)
Period T = ... (1 mark)
i) Calculate the value of P from the following equation. $T = 2\pi\sqrt{\frac{p}{g}}$ where g = 10m/s² (3 marks)

2.

Part A

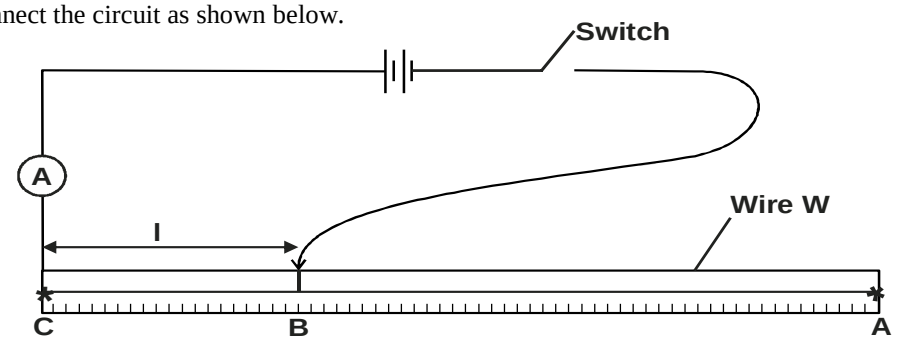
1. You are provided with the following apparatus.

- An ammeter.
- A resistance wire about 1m long.
- 3 dry cells.
- A cell holder
- A micrometer screw gauge
- 5 connecting wires
- A switch
- A voltmetre

Proceed as follows.

a) Measure the voltage E across the three cells connect in series without any other component.
E = ... V (1 mark)

b) Connect the circuit as shown below.



NB- Switch off the circuit whenever no readings are being taken

ii) Adjust the length BC of the wire to 0.7m using the crocodile clip. Switch on the current and record the ammeter reading. Calculate the reciprocal and enter in the table below.

iii) Repeat the experiment for other values of L and fill the table.

Length BC (m)	0.7	0.6	0.5	0.4	0.3	0.2
Current I(A)						

(4 marks)

c) i) Plot a graph of $\frac{1}{I}$ against L. (4 marks)

ii) Determine the slope of the graph. (2 marks)

d) i) Measure the diameter of the resistance wire using a micrometer screw gauge. (1 mark)
d = ...mm
d = ...m

ii) Determine the cross-sectional area A of the wire (1 mark)
A = ...

e) The equation relating I and E is given by

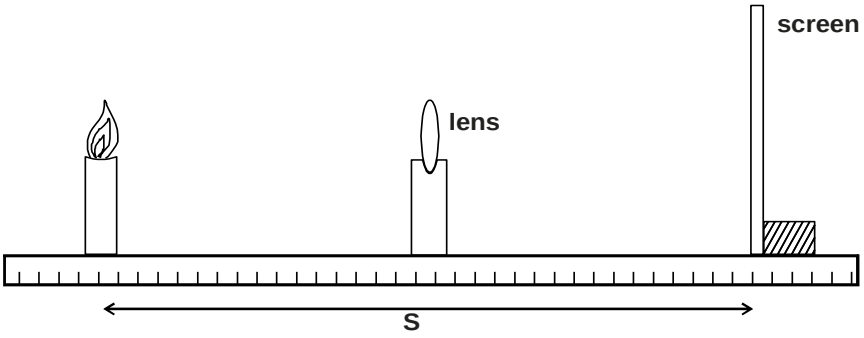
$$\frac{1}{I} = \frac{KL}{AE} + \frac{Q}{E}$$

Determine the value of K and Q. (2 marks)

PART B

- You are provided with the following.
- A lens are a lens holder.
- A candle stick
- A screen
- A metre rule.

a) Set up the apparatus as shown in the figure such that S = 55cm



- Adjust the position of the lens to obtain a sharp enlarged image of the candle.
- Measure the distance U_1 between the candle and the lens.
- Without changing the position of the candle and the screen, move the lens to obtain a sharp diminished image of the candle.
- Measure the distance U_2 between the candle and the lens.
- Record the values of U_1 and U_2in the table below.

b) Repeat the procedure in (a) above for S = 45cm. Complete the table. (2 marks)

S(cm)	U_1(cm)	U_2(cm)	$d = U_2 - U_1$ (cm)
55			
45			

c) Given that $f = \frac{S^2 - d^2}{45}$ where f is the focal length of the lens, determine the average value of the focal length f. (3 marks)

KAJIADO COUNTY JOINT EXAMINATION
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PHYSICS
Paper - 232/1
July/August - 2015

MARKING SCHEME

SECTION A

1. Vol of d-bottle $= \dfrac{40g}{0.8g/cm^3} = 50cm^3$

d of liquid L $= \dfrac{(86-26)g}{50cm^3} = 1.2gcm^{-3}$

2. F = k.e. $\dfrac{4.2N}{0.7cm} = k$

$k = 6N/cm$

On the moon, F = ke $= \dfrac{1}{6} \times 10 \times \dfrac{420}{1000}$

$\therefore F = 0.7N$

0.7N = 6N/cm × e

e = 0.7N = 0.117cm
6N/cm

3.- Candle becomes more stable ✓*1*
C.O.g is lowered ✓*1*

4. The tennis balls move closer to each other. ✓*1*
Velocity of air between the balls increases hence reduce pressure. ✓*1*

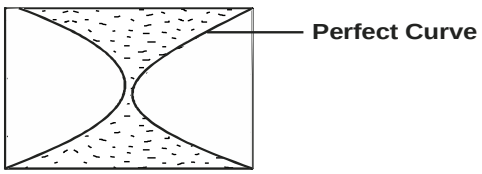
5. $F = \dfrac{MV^2}{r}$

$V = \sqrt{\dfrac{Fr}{m}}$

$= \sqrt{\dfrac{4800 \times 20}{800}}$

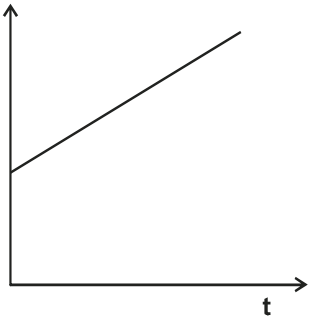
$= 10.95ms^{-1}$

6.



7. Glass is a poor conductor of heat. ✓*1*
Unequal expansion makes the glass to break. ✓*1*

8.



9. Clockwise moments = Anticlockwise moments. ✓*1*

W × 1.6 = T × 0.4

40 × 1.6 = T × 0.4 ✓*1*

T = $\frac{40 \times 1.6}{0.4}$ = 160N ✓1

10. The graphite particle are hit by the unseen water molecules which are in random motion. ✓1

11. Ice requires latent to melt it, but water at 0°C does not require the latent heat ✓1

12. The flour acts as an impurity hence raises the boiling point of the water. ✓1

13. V.R. = $\frac{1}{\sin 30°}$ = 2 ✓1

SECTION B

14. a) At high altitude, pressure is ✓1 low, so boiling point is low. The pressure cooker increases pressure inside it which raises the boiling point. ✓1

b) i) $Q = MC\Delta t$ ✓1
$= 6 \times 4200 \times 75$
$= 1890000$ J ✓1

ii) $Q = C\theta$
$= 450 \times 75$ ✓1
$= 337500$ J ✓1

iii) $Pt = MC_W\Delta\theta + C\Delta\theta$ ✓1
$6000t = (6 \times 4200 \times 75) + (450 \times 75)$ ✓1
$6000t = 1923750$

$t = \frac{1923750}{6000} = 320.625$ seconds ✓1

iv) $ML_V = pt$ ✓1
$6 \times 2.3 \times 10^6 = 6000t$ ✓1

$t = \frac{6 \times 2.3 \times 10^6}{6000} = 2.3 \times 10^3$ seconds ✓1

15. a) Pressure of a fixed mass a gas is inversely proportional to its volume provided the temperature is kept constant. ✓1

b) R = slope ✓1

$$= \frac{(10-0)\times 10^5}{(10-0)} = 1.0\times 10^6$$

c) As the sphere accelerates down the column, the viscous drag on its increases ✓1 . Finally the sum of upthrust and viscous drag equals the weight of the sphere. The net force on the sphere is zero ✓1

d) i) $m_1v_1 = m_2v_2 = V(m_1 + m_2)$ ✓1
$(0.1 \times 10) + 0 = V(0.1 + 1.5)$
$V = 0.625\ ms^{-1}$ ✓1

ii) P.E = K. E
$10h = \frac{1}{2} \times 0.625^2$ ✓1
$h = 0.039$m (or 3.9cm) ✓1

16. a) A floating body displaces its own weight of the fluid in which it is floating. ✓1

b) i) Pressure at the top of block
$= h\rho g$
$= 1200 \times 0.8 \times 10$
$= 9600$ Pa ✓1

Force on the top of block
$= PA$
$= 9600 \times 0.08$
$= 768$ N ✓1

ii)U $= \rho v g$ ✓1
$= 1200 \times (0.08 \times 1.2) \times 10$ ✓1
$= 1152$ N ✓1

OR
$F_{bottom} - F_{top} = U$
$= 1920 - 768$
$= 1152$N

c) $U = \rho vg$ ✓1
$2.5 = 13600 \times v \times 10$ ✓1
$v = \frac{2.5}{13600 \times 10} = 1.84 \times 10^{-5} m^3$

d) R.D = $\frac{U_{oil}}{U_{water}} = \frac{0.06}{0.04} = 1.5$ ✓1

17. a) A body remains in a state of rest or uniform motion in a straight line unless acted upon by an external force. ✓1

b) The car stops first. ✓1
Car has a lower momentum compared to the bus. ✓1

c) $U = 20ms^{-1}$ $V = 0\ ms^{-1}$ $t = 10s$

i) $a = \frac{v - u}{t} = \frac{-20}{10}$

$a = -2ms^{-2}$
$V^2 = U^2 + 2as$ ✓1
$0 = 20^2 + (2x - 2 \times s)$
$- 400 = -4s$
$s = 100m$ ✓1

ii) The policeman will not be hit (car stops 145 - 100)m away from policeman. ✓1

18. a) i) $$P = \frac{F}{A} = \frac{20}{0.0005} = 4.0 \times 10^4\ N/m^2$$

ii) $$P = \frac{F}{A} \quad A = \frac{F}{P} = \frac{5000}{4 \times 10^4} = 0.125 m^2$$

iii) $$V.R = \frac{\pi R^2}{\pi r^2} = \frac{0.125}{0.0005} = 250$$

b) W = 5N
Smallest area of box = $(5 \times 3)m^3$

$$P = \frac{F}{A}$$

$$P = \frac{5N}{15m^2} = 0.33Nm^{-2}$$

KAJIADO COUNTY JOINT EXAMINATION
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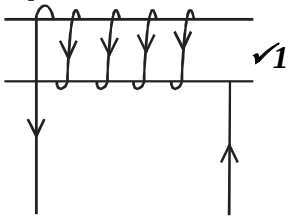
MARKING SCHEME

1. When mirror rotates by angle x, the reflected ray rotates by 2x
$2x = 30°$
$x = 15°$ in anticlockwise direction

2. Charges concentrate ***1*** on the sharp end of the pin resulting into net reduction of charges on the leaf making it collapse.

3. a) North pole.

b)  ✓***1***

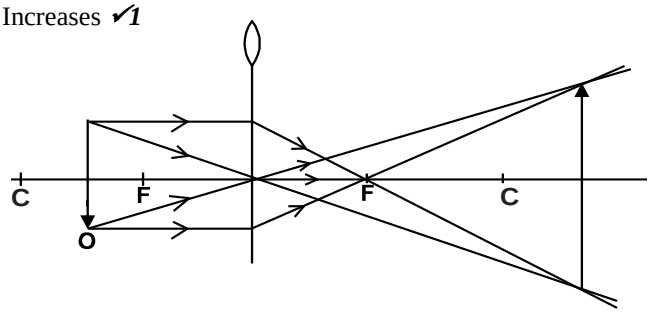
✓***½***

4. $^{238}_{92}U$ *and* $^{239}_{92}U$ $^{234}_{90}Th$ *and* $^{236}_{90}Th$

5.- Cause heavy ionisation.
Short range.
Massive, hence their path cannot be easily changed. ***1 mark each.***

6. a) Reduces ✓***1***
b) Increases ✓***1***

7.



8. They have low work ✓***1*** function hence electrons can be ejected at low temperatures. ✓***1***

9. Attraction can occur between two unlike poles or between a magnet P a magnetic material but repulsion ONLY occurs between 2 like poles of a magnet. ✓***1***

10. $\frac{1}{6}+\frac{1}{3}=\frac{3}{6}$ $C_S = 2\mu F$

$C_T = 2+2 = 4\mu F$

11.- Sound does not travel at the speed of light (3×10^8m/s)
- Not a transverse wave.
- Not affected by electric and magnetic field. ***any 1 - 1mark***

13. P = V I = 2500 = 10.41A ✓***1***
I 240
Not suitable, ✓***1*** fuse used must be slightly higher than 10.41A

14.
a) X - rays must be reflected from B. ✓***1***
b) Cathode ✓***1*** - to emit electrons and focus them to the anode. ✓***1***
c) A - copper ✓***1*** good conductor heat ✓***1***
B - tungsten ✓***1*** /molybdenum - has high melting point. ✓***1***
d) To enhance cooling of the copper anode. ✓***1***
e) i) $f_o = 4.5 \times 10^{14}$Hz ✓***1***

ii)

$$\frac{h}{e} = m$$

$$h = me$$

$$= \frac{2.0 - 0.5}{(10-6)\times 10^{14}} \times 1.6 \times 10^{-19}$$

$$= 3.75 \times 10^{-15} \times 1.6 \times 10^{-19}$$

$$= 6 \times 10^{-34}\, Js$$

15. a) Current passing through a metallic conductor is directly proportional to the p.d. across it provided temp and other physical conditions are kept constant. ✓***1***

b)

i) $V = \frac{E}{Q} = \frac{30}{20} = 1.5V$

ii) $Q = It$

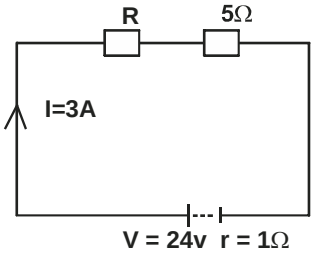
$$I = \frac{Q}{t} = \frac{20}{5} = 4A$$

iii) $V = IR \quad R = \frac{1.5}{4} = 0.375\Omega$

iv) $P = VI$

$$= 1.5 \times 4 = 6W$$

c)



V = IR ✓***1***
24 = 3(6 + R) ✓***1***
24 = 18 + 3R
R = 2Ω ✓***1***

16. a) Diffraction ✓***1***

b) l = $\frac{24}{3}$ = 8cm
v = fλ
= 50 × $^{8}/_{100}$ ✓***1***
= 4 m/s ✓***1***

c) The speed will be lower because of low temperature ✓***1***

d) i) V = n × 2d

= $\frac{20 \times 2 \times 80}{9.5}$
= 336.8 m/s

ii) The time for the 20 claps might not be accurate. ✓***1***
iii) Requires a material medium to travel through. ✓

17. a) The direction of the induced e.m.f is such that the induced current which it causes to flow produces a magnetic effect that opposes the change producing it. ✓***1***

b) i)

$$\frac{V_S}{V_P} = \frac{N_S}{N_P}$$

$$\frac{60}{1200} = \frac{V_S}{240}$$

$$V_S = 12V$$

ii) Power Input = Power Output

VI = Power Output ✓1
240 × 0.5 = 12 × I ✓1
I = 10A ✓1

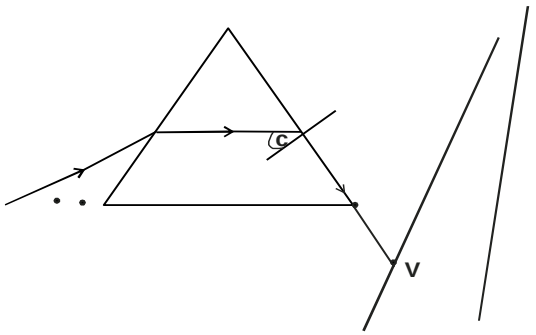
iii)- To laminate core ✓1

c) E = Pt
E = 1.5 × 30 = 45kwh ✓1
Cost = (45 × 8)sh ✓1
= Shs 360 ✓1

18. a) Red and violet light travel at different velocities in glass leading to separation.

b) R = $\frac{C}{Vel\ in\ prism} = \frac{3\times10^8}{1.88\times10^8} = 1.6$

c)



$n = \frac{1}{Sin\,C}$

$Sin\,C = \frac{1}{n} = \frac{1}{1.6} = 0.625$ ✓1

$C = 38.68°$ ✓1

d)

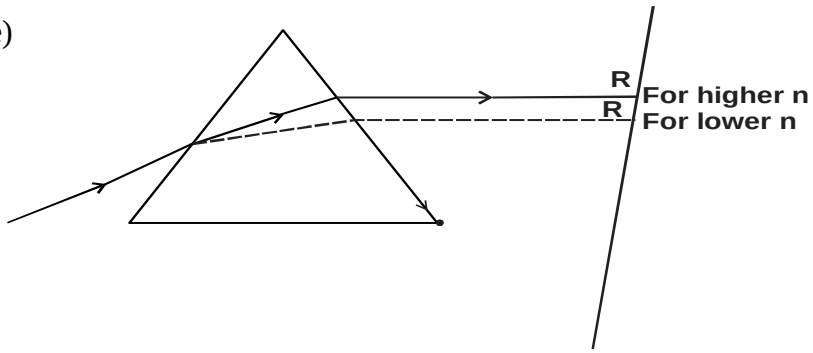
$n = \frac{Sin\theta}{Sinr}$

$1.6 = \frac{Sin\theta}{Sin21.5}$

$Sin\theta = Sin21.5 \times 1.6$

$\theta = 35.9°$

e)



KAJIADO COUNTY JOINT EXAMINATION

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PHYSICS
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MARKING SCHEME

1. c (ii)

X (cm)	h (cm)	x² (cm²)	
20	4	400	100.00
25	7	625	89.29
30	10	900	90.00
35	14.5	1225	84.48
40	20	1600	80.00
45	28	2025	72.32

e) Slope $= \frac{10}{-10} = -1$ (see graph)

f) $\frac{x^2}{h}$ = 100cm (when h = o)

h) Time for 20 oscillations = 28.5 seconds ✓1

Period T $= \frac{28.5}{20} = 1.425s$ ✓1

i) $T = 2\pi\sqrt{\frac{p}{g}}$

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

$\therefore P = \frac{gT^2}{4\pi^2} = \frac{10 \times 1.425^5}{4 \times 3.14^2}$

$P = 0.51M$

GRAPH

2. a) E = 4.5 v ✓1

b (iii)

Length BC (m)	0.7	0.6	0.5	0.4	0.3	0.2
Current I (A)	0.34	0.36	0.4	0.44	0.54	0.64
	2.94	2.78	2.5	2.27	1.85	1.56

d) d = 0.36mm
= 0.0036 M
$A = \pi r^2 = \pi \times 0.0018^2$
$= 1.018 \times 10^{-5} m^2$ ✓1

e)

$$m = \frac{K}{AE}$$

$$3.05 = \frac{k}{1.018\times10^{5}\times4.5}$$

$$k = 1.7\times10^{-4}$$

$$\frac{Q}{E} = Y - \text{intercept}$$

$$Q = 0.9\times4.5$$

$$Q = 4.05$$

PART B

b)

S(cm)	U_1(cm)	(U_2cm)	(d=U_2-U_1cm)
55	13	41	28
45	14	29.5	15.5

c)

$$f = \frac{55^2 - 28^2}{45}$$

$$f = 49.8$$

$$f = \frac{45^2 - 15.5^2}{45}$$

$$f = 39.66$$

$$Average\ f = \frac{49.8 + 39.66}{2} = 44.7cm$$

KENYENYA DISTRICT JOINT EVALUATION TESTS (KDJET)
Kenya Certificate of Secondary Education
232/1
PHYSICS
Paper 1
July/August 2015

SECTION A (25 marks)
Answer ALL the questions in the spaces provided.

1. Figure 1 shows a section of a vernier calliper scale.

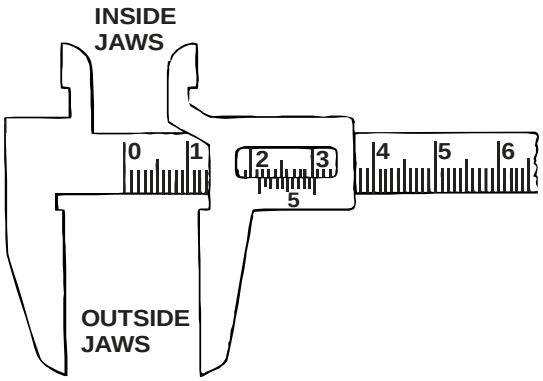


Fig 1

State the reading of the diameter being measured. (1 mark)

2. A man has $2m^3$ of concrete delivered to his home and he needed to carry it down in a wheel barrow. If each barrow load weighs 2500N, how many trips will he have to make? (2 marks)
(Density of concrete = $3000kgm^{-3}$)

3. Figure 2 shows an instrument used to measure atmospheric pressure.

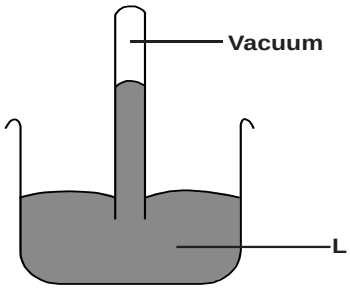


Fig 2

a) Name the instrument. (1 mark)
b) Name the liquid marked L. (1 mark)

4. A motor car is uniformly retarded and brought to rest from a speed of 108 km/h in 15 sec. Find its acceleration. (2 marks)

5. Figure 3 shows two spheres made of wax each of mass 0.10kg held in a liquid by strings A and B.

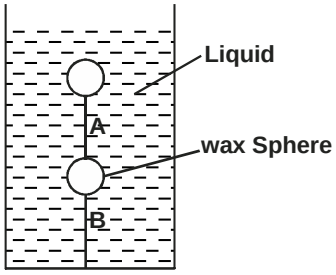


Fig 3

If the upthrust on each sphere is 1.05N, determine the tension in each string. ($g = 10ms^{-2}$) (2 marks)

6. Fig 4 shows a ball being whirled in a vertical plane

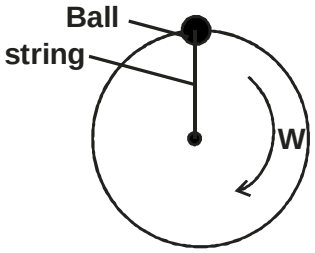
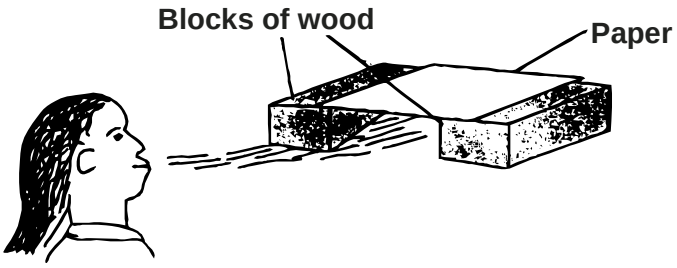


Fig 4

Sketch on the figure the path followed by the ball if the string cuts when the ball is in the position shown in the figure. (1 mark)

7. A girl blew air along the horizontal plane below the paper as shown in figure 5.

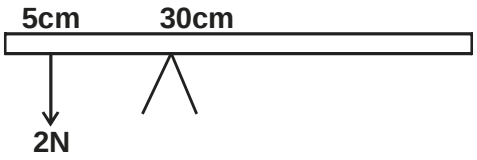
Fig 5



State and explain what would be observed. (2 marks)

8. Fig 6 shows a uniform metre rule pivoted at the 30cm mark. It is balanced by a weight of 2N suspended at the 5cm mark.

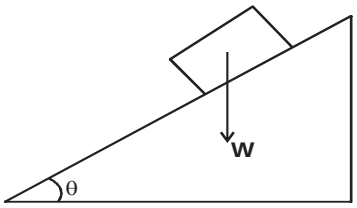
Fig 6



Determine the weight of the metre rule. (2 marks)

9. Fig 7 shows a brick placed on a plane inclined at an angle θ to the horizontal. The weight W of the brick is shown.

Fig 7



a) On the same diagram show with arrows the other two forces acting on the brick and name them (1 mark)
b) State how each of the two forces named in (a) above is affected when angle θ is reduced. (1 mark)

10. Fig 8 shows a flask filled with water. The flask is fitted with a cork through which a tube is inserted. When the flask is cooled, the water level rises slightly, then falls steadily.

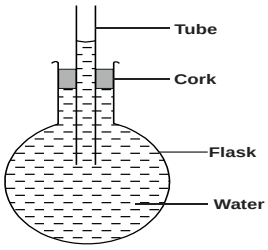
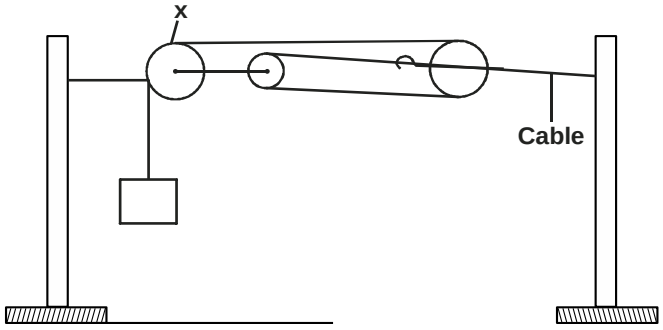


Fig 8

Explain this observation. (2 marks)

11. Fig 9 shows the use of pulleys in holding a cable taut.

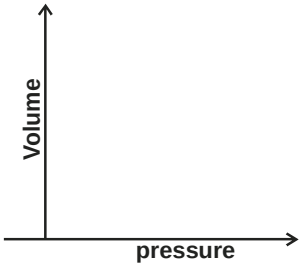
Fig 9



a) What is the purpose of pulley X? (1 mark)
b) How do the pulleys used serve the purpose of the arrangement? (2 marks)

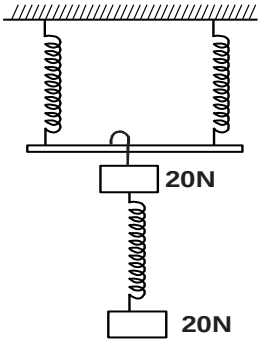
12. On the set of axes below show how the volume of an ideal gas varies with pressure. (1 mark)

Fig 10



13. The three springs shown in Fig 11 are identical and have negligible weight. The extension produced on the system of springs is 20cm

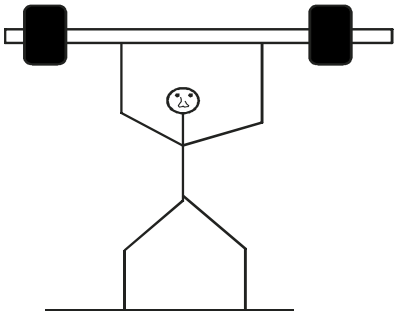
Fig 11



Determine the constant on each spring. (2 marks)

14. Figure 12 shows an athlete lifting weights while standing with the feet apart.

Fig 12



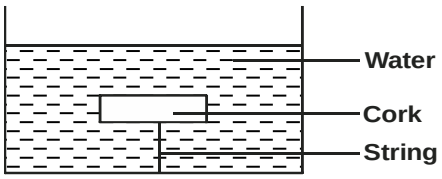
Explain why standing with the feet apart improves the athlete's stability. (1 mark)

SECTION B : 55 marks

15. State the law of floatation. (1 mark)

b) Figure 13 shows a piece of cork held with a light thread attached to the bottom of a beaker. The beaker is filled with water.

Fig 13

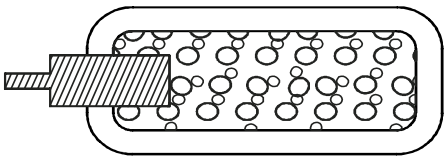


i) Indicate and label on the diagram the forces acting on the cork. (3 marks)
ii) Write an expression showing the relationship between the forces. (1 mark)

c) A solid displaces 8.5cm³ of liquid when floating on a certain liquid and 11.5cm³ when fully submerged with liquid. The density of solid in 0.8g/cm³, determine:-
i) Upthrust on the solid when floating. (3 marks)
ii) Density of the liquid. (2 marks)

16. a) Carbon dioxide is used to make fizzy drinks. It is stored in high pressure in cast iron cylinder. Figure 14 represents the particles in a cylinder of carbon dioxide.

Fig 14



i) Describe how particles of carbon dioxide exert pressure. (3 marks)
ii) The temperature of the gas in the cylinder is increased.

I. What effect does this have on the movement of the carbon dioxide particles? (1 mark)
II. Explain how this affects the pressure exerted by the g as. (1 mark)
III. The gas cylinder are painted black. Explain why gas cylinder should not be stored outside in the direct sunlight. (2 marks)

b) A weather balloon contains $100m^3$ of helium when atmospheric pressure is 90Kpa. If the atmosphere pressure changes to 100Kpa, calculate the new volume. (3 marks)

c) A boy wants to rescue someone who has fallen through ice pond. Would it be safe to walk or crawl across the ice towards him? Explain. (2 marks)

17. The speed of a train, hauled by a locomotive varies as shown below as it travels between two stations along a straight horizontal track.

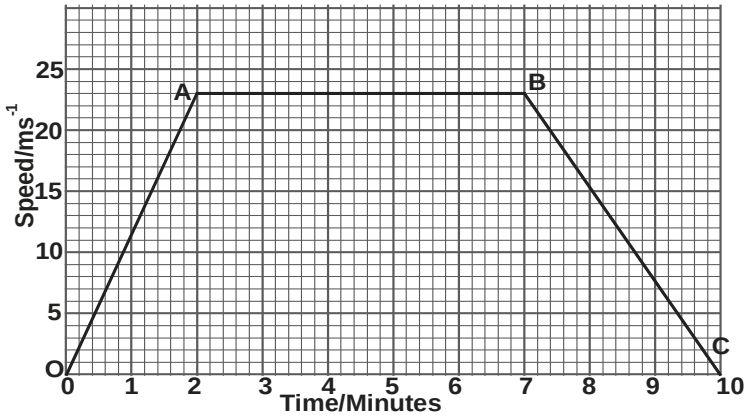


Fig 15

a) Use the graph to determine:
i) the maximum speed of the train. (1 mark)
ii) The acceleration of the train during the first 2mins of the journey. (2 marks)
iii) The time during which the train is slowing down. (2 marks)
iv) The total distance, in metres, between the two stations. (4 marks)
v) The average speed in ms^{-1} of the train. (3 marks)

18. a) Define specific latent heat of vaporization. (1 mark)
b) In an experiment to determine the specific latent heat of vaporization of a liquid using an electrical method, the amount of heat, Q, required to vapourise a given mass, m, of a liquid were recorded as shown in table.

$Q(J) \times 10^3$	3.0	4.0	5.0	6.0	7.0	8.0
$M(kg) \times 10^{-3}$	4.0	6.4	8.8	11.2	13.6	16.0

i) On the grid provided plot a graph of Q(y - axis) against m. (5 marks)
ii) From the graph, determine the specific latent heat of vaporization of the liquid. (3 marks)
iii) Suggest a reason why the graph does not pass through the origin. (1 mark)
iv) Write a possible equation of this graph. (1 mark)

c) Calculate the amount of heat required to melt 30g of ice that 0°C.
(Latent heat of fusion of ice is 3.34×10^5 jKg^{-1})
Give your answer correct to two decimal places. (3 marks)

19. a) Define the angular velocity. (1 mark)
b) The figure 16 shows an object of mass 0.2kg whirled in a vertical circle of radius 0.5m at uniform speed of 5m/s.

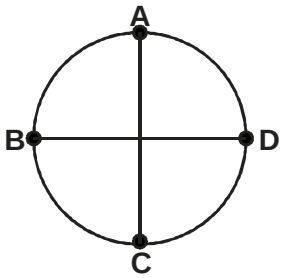


Fig 16

Determine the tension in the string at
i) Position A. (3 marks)
ii) Position B (3 marks)

iii) At what point is the string likely to cut. Explain. (2 marks)

KENYENYA DISTRICT JOINT EVALUATION TESTS (KDJET)
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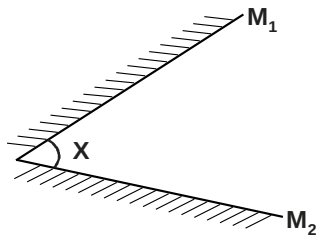
232/2
PHYSICS
Paper 2
July/August 2015

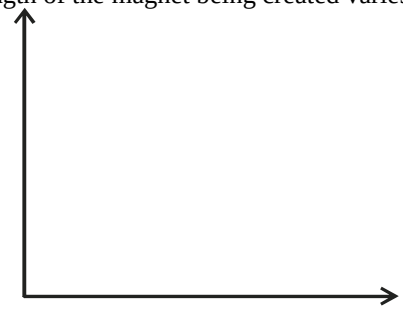
SECTION A (25 marks)
Answer ALL questions in this paper

1. The figure below shows two plane mirrors inclined at an angle X from each other. A viewer counts a total of seven images from looking directly from each of the object O. Determine the value of X. (3 marks)

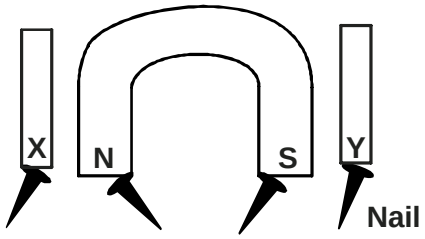


2. State two conditions necessary for the occurrence of an annular eclipse. (2 marks)

3. A ferromagnetic material is being magnetised by single stroking method. On the axes provided, sketch a graph to show how the strength of the magnet being created varies with number of strokes. (1 mark)

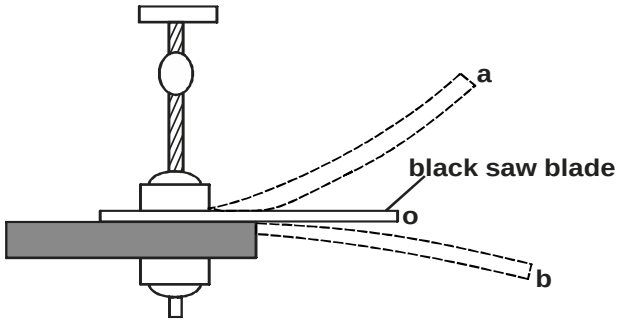


4. The figure below shows a horse-shoed magnet whose poles are labelled and two other magnets near it. Iron nails are attracted to the lower ends of the magnets as shown.



Identify poles marked X and Y. (1 mark)

5. The figure below shows a hack-saw blade clamped horizontally on a bench and the free end is made to vibrate about the rest position.



The movement o → a → o → b → o→ a → o→ b takes 0.7seconds
Determine the frequency of vibration of the blade. (3 marks)

6. How many electric iron boxes rated 1000W could be safely connected to a 240V mains circuit fitted with a 13A fuse? (2 marks)

7. When radiations were released into a cloud chamber, short thick tracks were observed. State with reasons, the type of radiation that was detected. (2 marks)

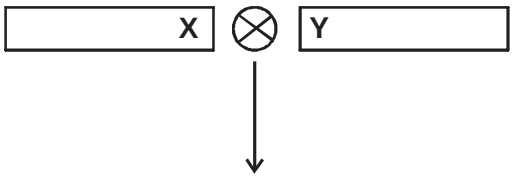
8. a) State one advantage of an alkaline cell over a lead-acid cell. (1 mark)

b) Give a reason why it is necessary to leave the caps of the cells open when charging an accumulator. (1 mark)

9. A lady holds a large concave mirror of focal length 1.8m from her face. State two characteristics of her image in the mirror. (2 marks)

10. State why convex mirrors are used for rear view mirror in vehicles. (1 mark)

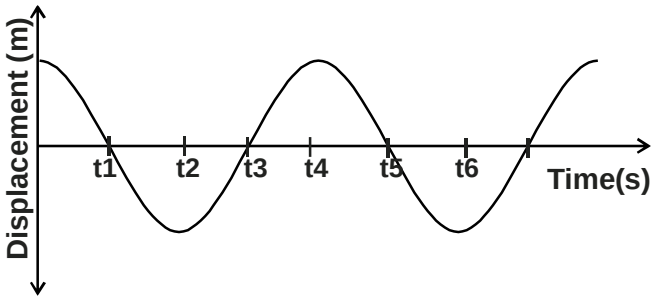
11. The figure below shows a conducting carrying current placed in the magnetic field and moves in the direction shown



Identify the polarities X and Y. (2 marks)

12. Sound is a longitudinal pressure wave. Explain this statement. (2 marks)

13. The figure below shows a waver profile for a wave whose frequency is $2H_Z$

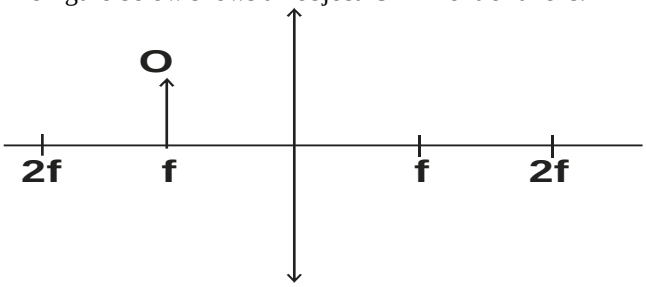


Determine the value of $t_{3(s)}$ (2 marks)

SECTION B - 55 marks

14. a)When does a convex lens form a virtual image. (1 mark)

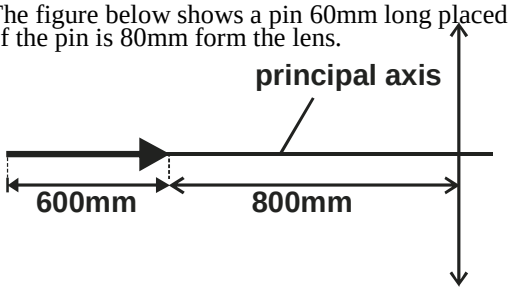
b) i)The figure below shows an object 'O' in front of a lens.



By drawing appropriate rays, on the same figure, state the position of the image formed. (3 marks)

ii) Explain the adjustment you would make on the position of the object above in order to obtain a real magnified image. (2 marks)

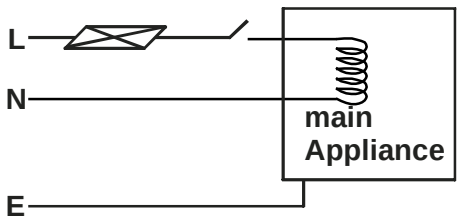
c) The figure below shows a pin 60mm long placed a long the principal axis of a lens of focal length 50mm. The near end of the pin is 80mm form the lens.



Determine the length of the image. (4 marks)

d) State what is meant by accommodation as applied to the human eye. (1 mark)

15. a) Figure below shows a modern mains appliance.



i) State the purpose of lead E. (1 mark)

ii) Explain why the fuse is connected to the live wire. (2 marks)

b) Why is mains electricity transmitted through alternating circuit? (1 mark)

c) A heater is rated 3kW, 240V. The fuses available are marked 10A, 13A and 20A. Which fuse is most suitable? (3 marks)

d) A 2kW electric heater is used for 10 hrs. Calculate the cost of electricity if its costs Kshs 30 per unit. (3 marks)

16. a) Consider the table below for electromagnetic waves.

Radiation	Production	Detection	Application
Radio waves	A	Aerials	B
	Thermal vibration of atoms of hot bodies.	C	D

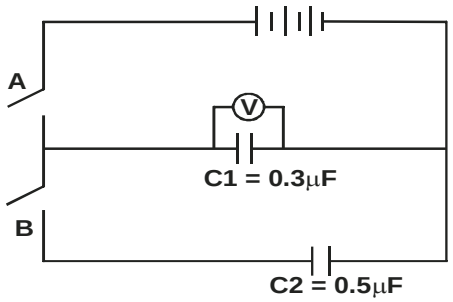
i) Fill in the spaces labelled A, B, C & D (4 marks)

ii) State one similarity between ultraviolet rays and gamma rays in terms of their dangers. (1 mark)

b) Distinguish between thermionic emission and photoelectric effect (1 mark)

c) Explain the term work function of a metal surface, stating how it affect photoelectric emission. (2 marks)

17. The figure below shows a circuit where a battery of emf 4.5V, switches A and B, two capacitors $C_1 = 0.3\mu F$ and $C_2 = 0.5\mu F$ and a voltmeter are connected.



a) Determine the charge on - C_1 when switch A is closed and B is open. (3 marks)

b) What is the effective capacitance C_T when both switches A and B are closed ? (2 marks)

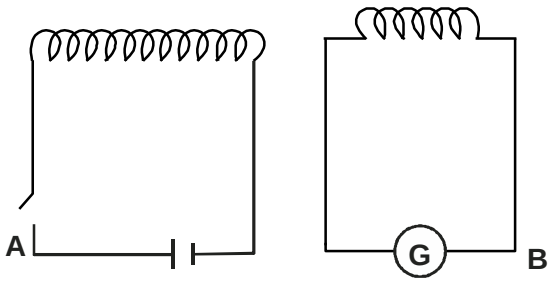
c) State what is observed on the voltmeter when

i) Switch A is closed and B is open. (1 mark)

ii) Switch A is closed and open, and B is closed. (1 mark)

iii) Explain the observations made in c(ii) above. (2 marks)

18. a) The figure below shows two circuits close to each other.



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 then returns to zero. Explain these observations. (4 marks)

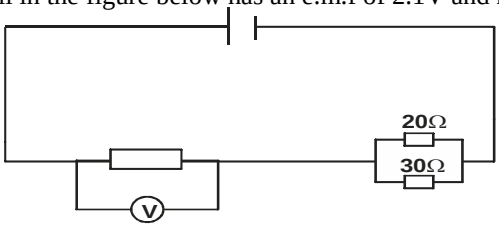
b) A transformer is designed to supply a current of 12A at a p.d. of 80V. The inlet cable is to be connected to an a.c. mains of 240V. The efficiency of this transformer is 80%.

Calculate

i) Current in the transformer. (2 marks)

ii) The power supplied to the transfer. (3 marks)

19.a) The cell in the figure below has an e.m.f of 2.1V and negligible internal resistance.



Determine:

i) Total resistance in the circuit. (2 marks)

ii) Current in the circuit. (1 mark)

iii) The reading of the voltmeter. (2 marks)

b) i) Explain how x-rays produced. (1 mark)

ii) State one similarity and one difference between cathode rays and x-rays. (2 marks)

KENYENYA DISTRICT JOINT EVALUATION TESTS (KDJET)
Kenya Certificate of Secondary Education
232/3
PHYSICS
Paper 3
July/August 2015

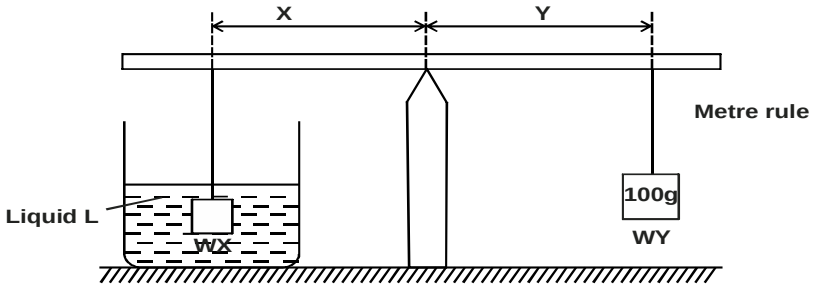
1. You are provided with
- Liquid L in a 500ml beaker.
- Two identical cylindrical 100g masses (2with hooks)
- Two pieces of thread (about 15cm long)
- A metre rule
- A knife edge
- A vernier callipers.

Procedure

a) Determine the volume of one of the masses using the apparatus provided, its diameter ___ cm
Height ..... cm
Volume = ...m^3 (4 marks)

b) i) Determine the centre of Gravity, 'G' of the metre rule and record it G = ... cm (1 mark)

ii) I. Arrange the apparatus as shown in the diagram I, such that X = 5cm from the pivot with the 100g mass completely immersed in liquid L hang the other 100g mass from the metre rule and adjust its position until the system is in equilibrium as shown in the diagram below.



Repeat the procedure above for the following values of X and fill the table.
NB: During each experiment ensure that the position of the pivot does not change.

X (cm)	5	10	15	20	25	30
Y (cm)						

II. Plot a graph of Y against X. (5 marks)
III. Determine the slope, S, of the graph. (2 marks)
IV. The slope S is given by the equation.

$$S = \frac{wx}{wy}$$

Where W_X is the apparent weight of the mass in a liquid L, and W_Y is the actual weight. Calculate the value of W_X and theupthrust, U.

W_X ..... N (1 mark)
U ..... N (1 mark)

V. If mass of the liquid $= \frac{U}{g}$. hence determine the density e of the liquid L. (3 marks)

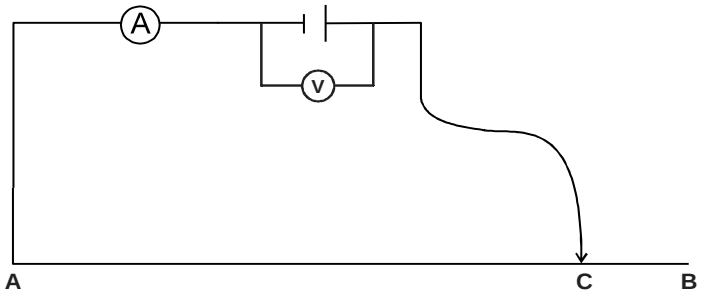
Question TWO

Part A

You are provided with the following
- One cell and a cell holder.
- One ammeter ($0 \rightarrow 1A$)
- One voltmeter ($0 \rightarrow 3.0V$)
- 9 connecting wires
- Four crocodile clips
- One metre long nichrome wire mounted on a scale.

Procedure

a) i) Connect the apparatus as shown in the circuit diagram.



AB is the nichrome wire mounted on 100cm scale.
NB: leave the crocodile clip next to the cell unconnected. This clip should be disconnected when no readings are being taken.

ii) Adjust the length AC of the wire to 80cm using the crocodile clip at C.
iii) Connect the crocodile clip next to the cell and record the voltmeter and ammeter reading.
iv) Repeat the procedure for other lengths AC as shown on the table of value below.

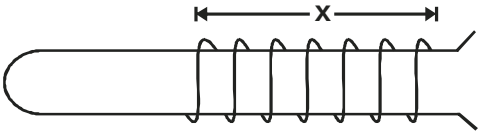
Length AC (cm)	80	70	60	50	40	30
p.d (V)						
Current (A)						

b) i) Using the grid provided plot graph of p.d. across the cell against the current. (5 marks)
ii) I. Calculate the slope of the graph. (3 marks)
II. What is the significance of the slope in I above. (1 mark)
iii) I. Determine the intercept of the graph on p.d. axis. (1 mark)
II. What is the significance of intercept value in(iii)(I) above. (1 mark)

Part B

You are provided with the following
- Copper wire of length 30cm
- Test-tube of diameter 1.5cm (ordinary)
- Metre - rule

Procedure
By using the wire provided make 20 closely packed turns around the said ordinary test-tube as shown.



a) Measure the length X = ... cm (1 mark)
b) Use the result 'X' to determine the thickness (d) of the wire. (1 mark)
c) Given that the volume of the wire $V = \frac{1}{4}\pi d^2 L$ determine the volume (V) of the wire if L = 50cm. (3 marks)

KENYENYA DISTRICT JOINT EVALUATION TESTS (KDJET)
Kenya Certificate of Secondary Education
PHYSICS
Paper - 232/1
July/August - 2015

MARKING SCHEME

1. Diameter 2.1 + 5 × 0.01 = 2.15cm ✓*1*
correct unit

2. Mass = ρ × v = 3000 × 2 = 6000kg
Weight = mg = 6000 × 10 = 60000N

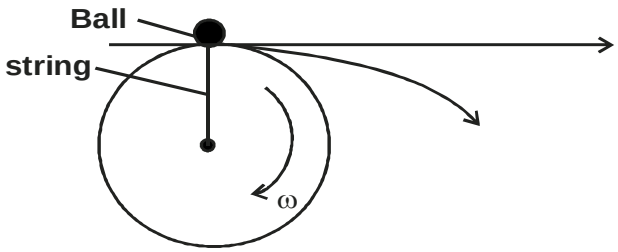
Trips = $\frac{60,000}{2500}$ ✓*1* = 24 ✓*1*

3. a) Barometer ***;***
b) Mercury ***;***

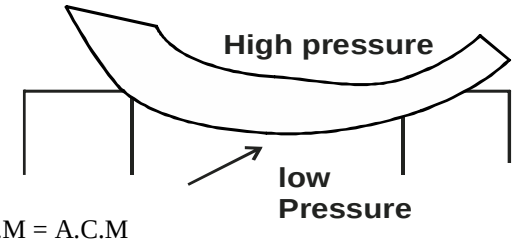
4. Vel = $\frac{108 \times 1000}{3600}$ = $30ms^{-1}$
U = $30ms^{-1}$; v = $0ms^{-1}$, t = 15 sec.
V = u + at
o = 30 + a × 15 ✓*1*
a = $-2ms^{-2}$ ✓*1*
(penalise any other formula not used)

5. Tension in A $T_A = U_A$ - mg
= 1.05 - 1.0N = 0.05N
Tension in B T_B
= tension due to A + tension due to B
= 0.05 + 0.05
= 0.10N

6.



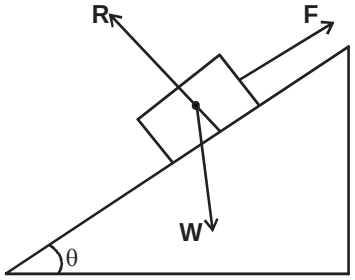
7.



8. C.M = A.C.M

$$W \times \frac{20}{100} = 2 \times \frac{25}{100}$$
$$W = 2.5N$$

9.



a) R - Reaction force ⊥ar to surface ✓½
F - Friction force // to surface ✓½

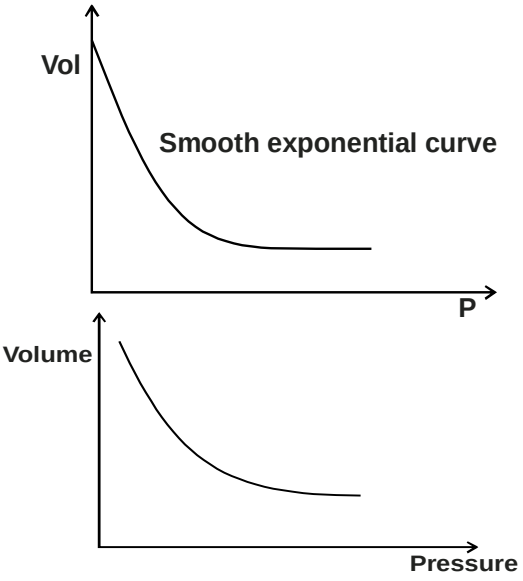
b) When θ reduces, R increases (approaching W) and F reduces ✓½

10. When the flask is cooled it contract / volume reduces but due to poor conductivity of glass as both cooled the contraction of water is greater than that of glass.

11. a) It changes the direction of force.

b) Pulleys allow the length of the cable to change with temperature while preventing sagging and maintaining constant tension.

12.



13.

$$F = K.e$$

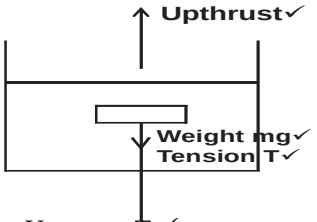
$$K = \frac{F}{e}$$

$$= \frac{20N}{10cm} = 2N/cm$$

14. Standing with feet apart increases stability by lowering COG (increases base area) ✓1

15. a) A floating body displaces its own weight of the fluid in which it floats ✓1

b) i)



ii) U = mg + T ✓

c) i) Upthrust
= weight of solid ✓
= ρvg
=800 kg/m³×(1.15 × 10^{-6})m³×10N/kg✓
= 0.092 ✓

ii) Weight of liquid displaced = upthrust
ρg = 0.092

$$\Rightarrow \rho = \frac{0.092}{(8.5\times10^{-6})\times10}$$

= 1000kg/m³

16.

- The particles are in continuous motion. They strike the walls of the container and get a change in momentum
- The rate of change in momentum produces force on the walls.
- The force acts on cross-sectional area and produce pressure on the walls.
- Particle move faster.
- The rate of change in momentum (force) is increased hence pressure increases

– Dull surfaces are good absorbers of heat. The cylinders may absorb a lot of heat and even explode.

b) $V_1 = 100cm^3$ $P_1 = 90Kpa$ $P_2 = 100Kpa$ $V_2 = ?$

$P_1V_1 = P_2V_2$

$V_2 = \frac{P_1V_1}{P_2} = \frac{90 \times 100}{100}$

$= 90cm^3$

c) Crawl : - The area of the boy in contact would be greater hence less pressure will be exerted when crawling.

17.

i) Maximum speed = $24ms^{-1}$

ii) v = u + at

t = 2 × 60 sec = 120Sec

U = $0ms^{-1}$

V = $24ms^{-1}$

24 = 0 + a × 120 ✓1

a = 24/120 = $0.2ms^{-2}$

$\frac{0.092}{(8.5 \times 10^{-6}) \times 10}$

iii) 3 min or 3 × 60 = 180 sec. ✓1

iv) Distance

= area under the graph ✓1

= ½ (5 × 60 + 10 × 60) × 24 ✓1

= 900 × 24 / 2

= 10800 m ✓1

v) Average speed

= total distance ✓1 / total time

= 10800 ✓1 / 60 × 10

= $18ms^{-1}$ ✓1

18. a) Heat required to convert a unit mass of a substance at its boiling point into vapour.

b) i) Appropriate scale ✓1

- Labelling axes ✓1
- Straight line ✓1
- Plotting of points 5 - 6 ✓✓2

3 - 4 ✓1

ii) $Gradient = \frac{(8-3) \times 10^3}{(16-4) \times 10^{-3}}$

$= (4.16 \text{ to } 4.2) \times 10^5 \, Jkg^{-1} (unit\ mark)$

iii) Heat losses / energy losses.

iv) Heat Q = mL + h (h-heat lost)

c) Heat required

= mL

= $0.03 \times 3.34 \times 10^5$J

= 1.00×10^4J or 1.002×10^4J

19. Rate of change of angular displacement with time

b) i) $T_A = \frac{MV^2}{r} - mg$

$= \frac{0.2 \times 5 \times 5}{0.5} - 2$

$= 8N$

ii) $T_B = \frac{mv^2}{r}$

$= \frac{0.2 \times 25}{0.5}$

$= 10N$

c) At c✓1 where tension in maximum

KENYENYA DISTRICT JOINT EVALUATION TESTS (KDJET)
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Paper - 232/2
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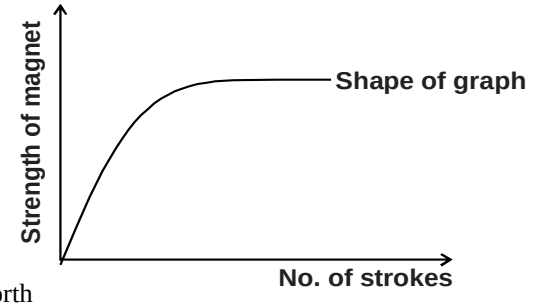
MARKING SCHEME

1. Let the angle be *x*

$$\frac{360}{x} - 1 = 7$$
$$8x = 360$$
$$x = 45°$$

2. The moon must be between the earth and sun ✓*1*
The moon must be at its furthest point from the earth's surface. ✓*1*

3.



4. X - North
Y - North

5. One cycle = a →a = 4 spaces
each space = $\frac{0.7}{7}$ = 0.1 second
T = 0.1 × 4 = 0.4 second ✓*1*

$$f = \frac{1}{T} \quad \checkmark 1$$
$$= \frac{1}{0.4} = 2.5H_z$$

6. Let the number of iron box be x

x × 1000 = IV

$$x = \frac{13 \times 240}{1000}$$
$$= 3.12$$
$$3 iron\ boxes$$

7. Alpha radiations ✓*1* - short range with intense ionisation hence thick tracks ✓*1*

8. a) large amount of current can be drawn.
- Portable
- They require less maintenance. ***any 2*** ✓*1*

b)- Allow hydrogen and oxygen gases produced at the electrodes to escape.

9. Magnified
Spright.

10. Gives a wide field of view.
Always produce an upright image. ***any 1*** ✓*1*

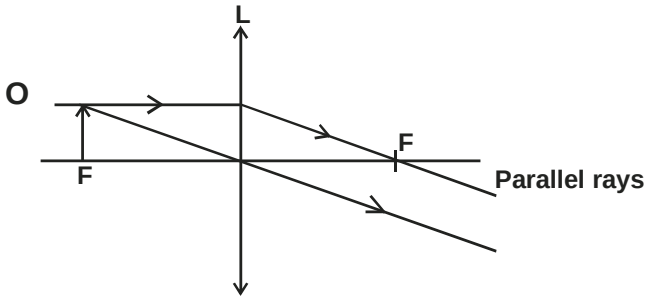
11. X - North ✓*1*
Y - South ✓*1*

12. Sound waves move in a to and fro motion parallel to the direction of the wave motion in a medium.

13. f = 2Hz
T = $\frac{1}{f}$
= ½ = 0.5 ✓*1*
t_3 = ¾ × 0.5
= 0.37 seconds ✓*1*

14. a) When the object is placed within the focal plane / between F and P.

b) i)



at infirmity. ✓*1*

ii) Move O between I and 2F. ✓*1*
Move screen beyond 2 F ✓*1*

c)

$$\frac{1}{u}+\frac{1}{v}=\frac{1}{f}$$

$$\frac{1}{v}=\frac{1}{50}-\frac{1}{80}=\frac{3}{400}$$

$$v=\frac{400}{3}$$

$$u=80+60=140$$

$$\frac{1}{v}=\frac{9}{700}$$

$$v=\frac{700}{9}$$

$$\therefore \text{length of image} = \frac{400}{3}-\frac{700}{9}$$

$$=55.56mm$$

d) The process of the eye being adjusted to focus objects at various distances. ✓*1*

15.a)

i) Provides a safe route for the current in case the live wire touches the casing of the appliance. ✓*1*

ii) The wire is at maximum potential ✓*1* . When there is a power surge in the wire, the fuse melts before the other wires, breaking the circuit. ✓*1*

b) A.C. is easier to be stepped up and stepped down with little or no power loss due to the heating effect. ✓*1*

c) P = 3kW, V = 240V

$$I=\frac{P}{V}$$

$$=\frac{3000}{240}$$

$$=12.5A$$

∴ 13A is suitable ✓*1*

d) Let the number of units be X.

x = 2 KW × 10 hrs ✓*1*
Cost = 20 × 30 ✓*1*
= Kshs 600 ✓*1*

16. a) i)
A - oscillating electric circuit ✓*1*
B - communication ✓*1*
C - heat sensor / photographic film / semi conductor
D - imaging / medical diagnosis

ii) Causes cancer.

b) Thermionic - ejection of electrons by thermal agitation.
Photoelectric - ejection of electrons by radiations of sufficient wavelength falling on a metal surface.

c) W_O - minimum energy required to dislodged an electron from the surface of clean metallic surface. ✓*1*
The larger the W_O the fewer the number of electrons emitted. ✓*1*

17. a) charge on $C_1 = C_1V$ ✓*1*
= 0.3 × 4.5
= 1.3μc (micro columb) ✓*1*
= 1.35×10^{-6}C ✓*1*

b) $C_T = C_1 + C_2$
= 0.3 + 0.5 ✓1
= 0.8μF (mircofarals)
= 8.0×10^{-7}F ✓1

c) i) voltmeter reads 4.5V
ii) P.d. registered on the voltmeter drops to less than 4.5V
iii) the drop of p.d. in (ii) is because of the charge initially stored on C_1 is distributed to C_2. Since the value of C_1 and C_2 remain constant when the charge Q reduces the p..d V reduces.

18. a)
- When the switch is closed, flux in coil A grows and links the other inducing e.m.f. ✓1
- When I is steady, no flux change and hence no deflection. ✓1
- When switch is opened, the flux collapses even in the coil B inducing emf in the opposite direction. ✓1
- When I is steadily, no flux change and hence no deflection. ✓1

b) i) $\frac{I_P \times 240}{12 \times 80} \times 100 = 80$

$I_P = 3.2A$

ii) $P = I_P V_P$ ✓1
= 3.2 × 240 ✓1
= 768W ✓1

19. i) $\frac{1}{R} = \frac{1}{20} + \frac{1}{30} = \frac{1}{12}$

$R = 12$

Total resistance = 10 + 12 = 22Ω ✓1

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

$= \frac{2.1}{22} = 0.095A$ ✓1

iii) V = IR
= 10 × 0.095 ✓1
= 0.95 V ✓1

b) i) When fast moving cathode rays / electrons are suddenly stopped by a metal target. ✓1
ii) Similarity - causes fluorescent screen to glow.
Difference - Cathode ray is negatively charged.
x - rays have no charge.

KENYENYA DISTRICT JOINT EVALUATION TESTS (KDJET)
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PHYSICS
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MARKING SCHEME

1. a)

$$V = \pi r^2 h$$
$$= 3.142 \times \left(\frac{2.5}{2}\right)^2 \times 2.3$$
$$= 11.29 cm^3$$
$$= 1.129 \times 10^{-5} m^3$$

b) i) G = 50.0 ± 0.5 cm

ii) I.

X(cm)	5.0	10.0	15.0	20.0	25.0	30.0
Y(cm)	4.0 ✓	9.0 ✓	13.1 ✓	17.5 ✓	22.5 ✓	26.5 ✓

Each ✓½ mark allow ± 0.1

II. Refer graph.

III.
$$S = \frac{\Delta y}{\Delta x}$$
$$= \frac{26.5 - 13.1}{30.0 - 15.0}$$
$$= \frac{13.4}{15}$$
$$= 0.89$$

IV.
$$W_X = SW_X$$
$$= 0.89 \times 1$$
$$= 0.89N$$
$$U = W_Y - W_X$$
$$= 1.0 - 0.89$$
$$= 0.11N$$

Upthrust (U) = weight of liquid displaced
Mass of liquid

$$L = \frac{U}{g} = \frac{0.11}{10}$$
$$= 0.011kg$$
$$e = \frac{m}{v} = \frac{0.011}{1.129 \times 10^{-5}}$$
$$= \frac{1.1 \times 10^{-2}}{1.129 \times 10^{-5}}$$
$$= 9.74 \times 10^2 kgm^{-3}$$

Question 2
PART A

Length AC (cm)	80	70	60	50	40	30
P.d. (V)	2.7	2.65	2.6	2.55	2.5	2.45
Current (A)	0.1	0.125	0.155	0.175	0.2	0.25

NB: Each correct value of v and A award ½ mark

b) i) Graph of p.d. (v) against current (A) - refer the graph.

ii) I. Slope

$$= \frac{\Delta V}{\Delta I}$$

$$= \frac{2.4 - 2.8}{(0.08 - 0.24)} = \frac{0.4}{0.16}$$

$$= -2.5\Omega$$

II. Slope is the internal resistance of the cell.

iii) I. Intercept = 3.0 ± 0.2

II. Intercept is the emf of the cell.

PART B

a) x = 1.6cm

b) Thickness = $\frac{1.6}{20}$

= 0.08cm

c) v = ¼ × 3.142 × $(0.08)^2$ × 50

= 0.25136cm^3

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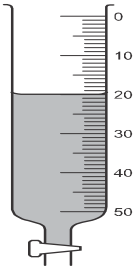
PHYSICS
PAPER 1
(THEORY)
TIME: 2 HRS

1. Figure 1 shows a burette containing some liquid after 8g of the liquid was drained out. If the level of the liquid was initially at $10cm^3$ mark, determine the density of the liquid. (2 marks)



2. State one advantage of alcohol thermometer over mercury thermometer. (1 mark)

3. In an experiment to demonstrate Brownian motion, smoke was placed in an air cell and observed under a microscope. State and explain the nature of the observed motion of the smoke particles. (2 marks)

4. The figure 2 below shows a uniform rule AB of length 1.0m and weight 1.2N. The system is in equilibrium.

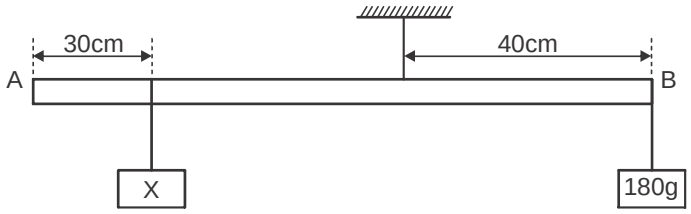


Fig 2

Determine the weight of X. (3marks)

5. The figure 3 below shows a solid cone standing on a horizontal surface. The cone is in unstable equilibrium.

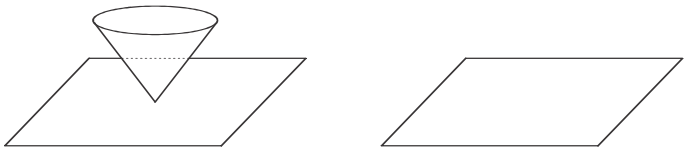
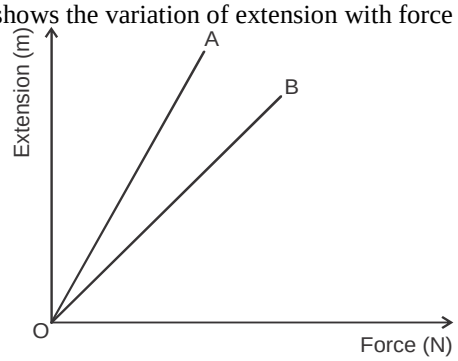


Fig 3

On the horizontal space provided, sketch the cone in neutral equilibrium. (1 mark)

6. The sketches in figure 4 shows the variation of extension with force for springs A and B.



Given that the spring A and B are of equal lengths, state any two factors that can be used to explain the difference in the graphs. (2 marks)

7. The figure 4 below shows water drops on two surfaces. In (a) the glass surface is smeared with wax while in (b) the glass surface is clean.

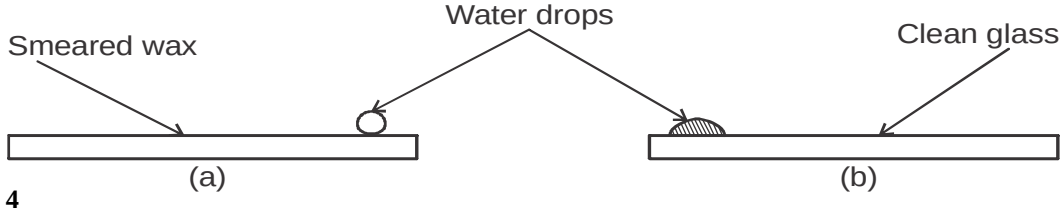


Fig 4

Explain the difference in shapes of the drops. (2 marks)

8. An external force applied to a ball of mass 160g increases its velocity from 25cm/s to 275cm/s in 10 seconds. Calculate the force applied. (3 marks)

9. The figure 5 below shows a model of a spray gun. When air is blown in the direction shown, a spray is observed. Explain this observation. (2 marks)

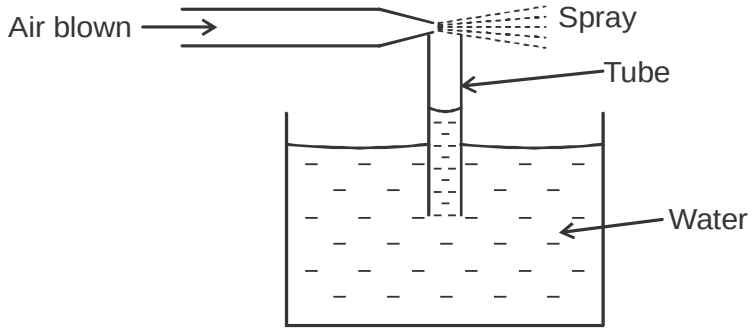


Fig 5

10. A wooden bench and a metal bench are both left in the sun for a long time. Explain why the metal bench feels hotter to touch. (2 marks)

11. The figure 6 below shows a metal sphere of mass 2kg moving along a smooth horizontal surface PQ, with a steady speed of $4ms^{-1}$.

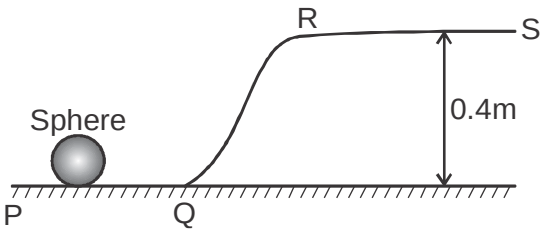


Fig 6

a) Explain why the speed of the sphere decreases as it moves up along QR. (1 mark)

b) If the sphere reaches R with a speed of $1.0ms^{-1}$, calculate the change in its K.E from Q to R. (2 marks)

12. A column of glycerine 8.20m high, a column of sea water 10.08m high, column of mercury 0.76m high and a column of fresh water 10.34m high exert the same pressure at the bottom of the container. Given that the pressure exerted by a fluid is given by P = h g, arrange these liquid in decreasing order of their densities. (2 marks)

SECTION B (55 MARKS)

13. a) State two factors on which the linear speed of a body moving in a circular motion depends on. (2 marks)

b) Explain why bodies is circular motion undergo acceleration even when their speed is constant. (1 mark)

c) A motorcycle is travelling at a constant speed of $72kmh^{-1}$ around a circular track of radius 150m.

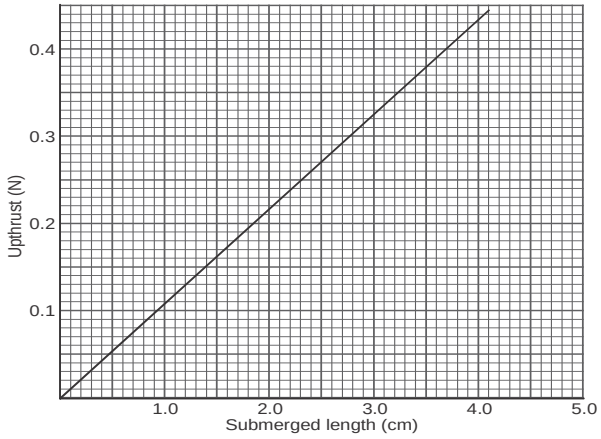
i) Determine its centripetal acceleration. (2 marks)

ii) How long does the cyclist take to complete one full cycle of the track? (2 marks)

d) A person of mass 50kg is on a swing which has a speed of $10ms^{-1}$ at the lowest point of its motion. The ropes of the swing are 2.5m long, Find the tension of the ropes. (*Take g = 10ms^{-2}*) (3 marks)

14. a) Explain why objects float higher in salty water than in fresh water. (2 marks)

b) In an experiment to determine the density of a liquid, a uniform metal cylinder of cross-sectional area $6.2cm^2$ and length 4.5cm was hang from a spring balance and lowered gradually into the liquid. The upthrust was determined for various submerged lengths. The results obtained are shown on the graph in the figure.

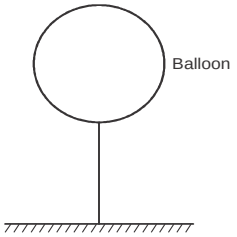


Using the graph, determine:

i) the value of the upthrust when the cylinder is fully submerged. (2 marks)

ii) the density of the liquid. (2 marks)

c) The mass of the fabric of a large balloon is 100kg. The balloon is inflated with 200cm^3 of helium. The balloon is attached to a cable fixed to the ground as shown. (***Density of air and helium are 1.25kg/m^3 and 0.2kg/m^3 respectively***)



i) Indicate all the forces acting on the system. (1 mark)

ii) If the system is at equilibrium, write an equation relating the three forces in (i) above. (2 marks)

iii) Calculate the upthrust on the balloon. (3 marks)

15. a) A ball is thrown vertically upwards from the ground. It rises up to the highest point and then returns to the ground.Taking the upward velocity to be positive, sketch the velocity -time graph for the motion. (3 marks)

b) A bullet is fired from a gun at a velocity of 10m/s. It strikes the tree, perpendicularly and penetrates deeply. If it stops just as it emerges through the other side of the tree,

i) Calculate the average retardation if the tree is 2m thick. (3 marks)

ii) Time taken by the bullet in the tree. (3 marks)

c) The figure (a) below shows a distance -time graph of a motion of a body.

In the figure (b), sketch the corresponding velocity-time graph for the same motion. (1 mark)

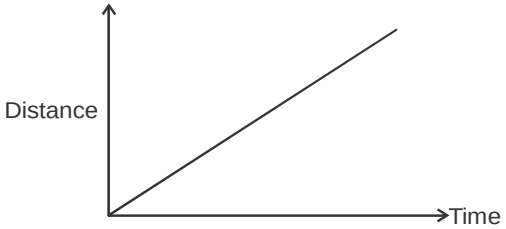


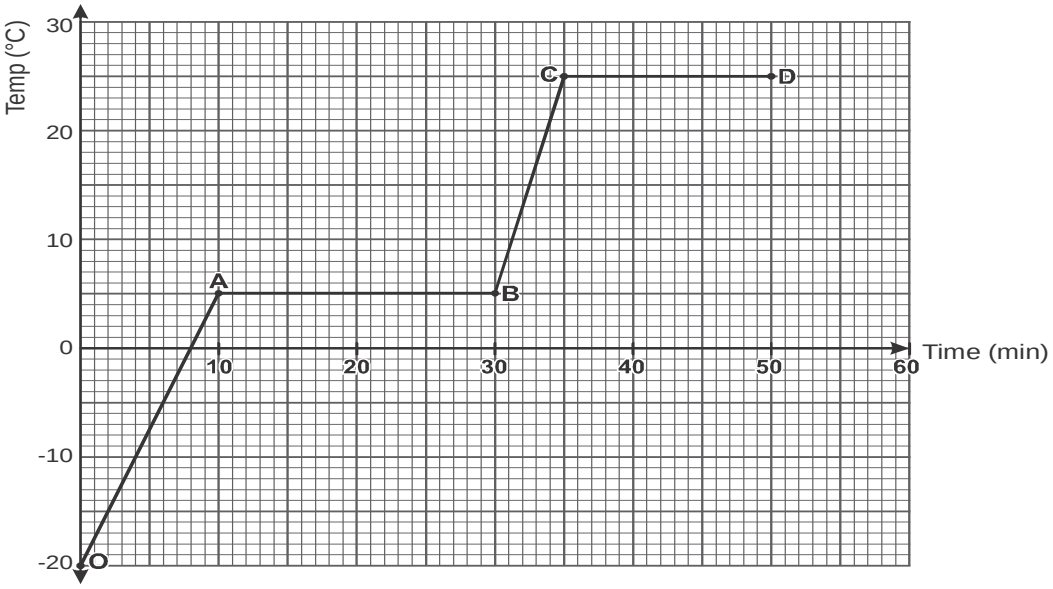
Fig (a)

Fig (b)

16. a) Define the term specific heat capacity of a substance. (1 mark)

b) An immersion heater rated at 180W is placed in a liquid of mass 2kg. When the heater is switched on for 7.5 minutes and the temperature of the liquid rises by 40°C. Determine the specific heat capacity of the liquid. (3 marks)

c) The graph below shows how temperature of a 40kg of a substance varied with time as it was heated steadily by electrical means. The heating coil carried a current of 16A at a potential difference of 22V.



i) What is happening to the substance at AB? (1 mark)

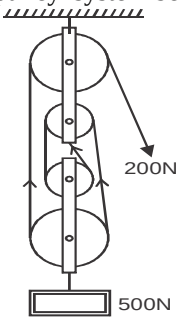
ii) Determine the specific heat capacity of the substance in solid state. (2 marks)

iii) Determine the latent heat of fusion of the substance . (2 marks)

d) Give a reason why the hand feels cold if a little ether is poured on it. (1 mark)

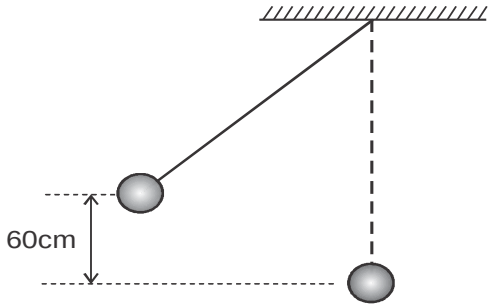
e) A 200g mass of copper was heated to 100°C and then transferred to a lagged copper calorimeter of mass 5g containing 125g of water at 30°C. Calculate the final temperature of water. (***Specific heat capacity of copper = 400J/KgK, water = 4200J/KgK***) (3 marks)

17. a) The figure below shows a pulley system being used to raise a load.



Given that the size of the load is 500N and the effort applied is 200N, calculate the efficiency of the machine.(3 marks)

b) A pendulum bob is raised to a height of 60cm above its lowest point and made to swing as shown in the figure.



Determine the velocity of the mass at the height where kinetic energy is equal to the potential energy. (3 marks)

e) Jacky whose mass is 75kg runs up a flight of stairs each 12cm high in 12 seconds. Given that the acceleration due to gravity is $10ms^{-2}$, calculate the power he develops. (2 marks)

d) Explain why a body moving in horizontal circular motion does not work. (2 marks)

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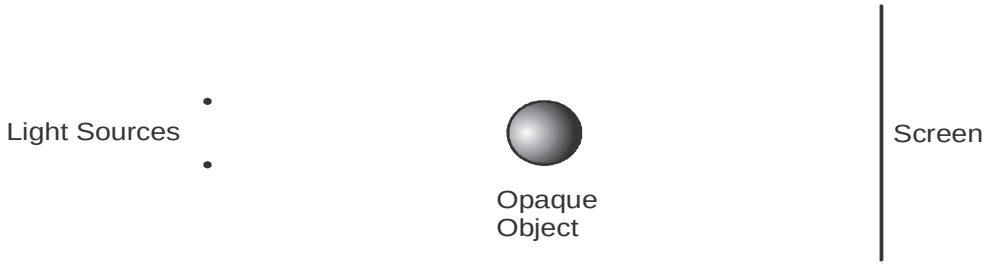
PHYSICS
PAPER 2
(THEORY)
TIME: 2 HRS

SECTION A (25 MARKS)
Attempt ALL the questions in this section.

1. The figure below shows two point sources of light with an opaque object placed between them and the screen.

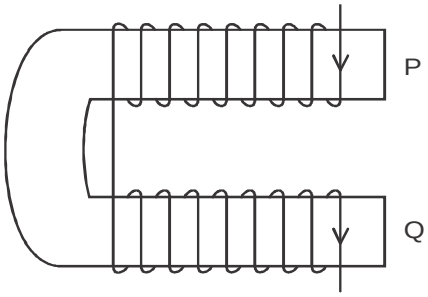


Complete the diagram to show the nature of the shadows formed. Label the shadows. (2 marks)

2. A leaf electroscope A is charged and placed on the bench. Another uncharged leaf electroscope B is placed on the same bench and moved close to A until the caps touch. State and explain the observations made on the leaves of A and B. (2 marks)

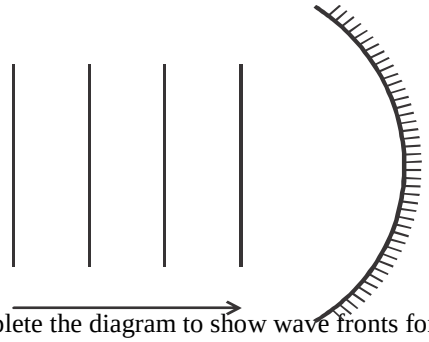
3. The plates of a simple cell are connected through a touch bulb and then dipped into dilute sulphuric acid on a beaker. The bulb lights brightly for a short time. State two possible causes of this. (2 marks)

4. The figure below shows a diagram of a current -carrying wire wound on a U-shaped soft iron.



Draw the magnetic field pattern around P and Q. (2 marks)

5. The figure below shows wave fronts approaching a concave sphere.



Complete the diagram to show wave fronts formed after striking the surface. Show how focal point of the surface is located. (2 marks)

6. State with a reason the effect of the X-rays produced in an X-ray tube, when the pd across the tube is increased. (2 marks)

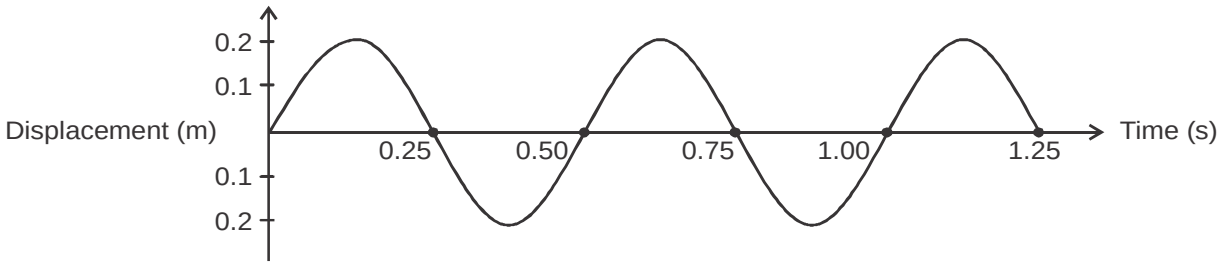
7. A nuclear reaction is represented by the following equation.

$$^{a}_{92}X \longrightarrow {}^{234}_{b}Y + \text{Alpha particle}$$

Determine the values of a and b. (2 marks)

8. An unmagnetised steel rod is clamped facing north-south direction and then hammered repeatedly for sometime. When tested, it is found to be magnetised. Explain this observation. (2 marks)

9. The figure below shows how the displacement varies with time for a certain wave.

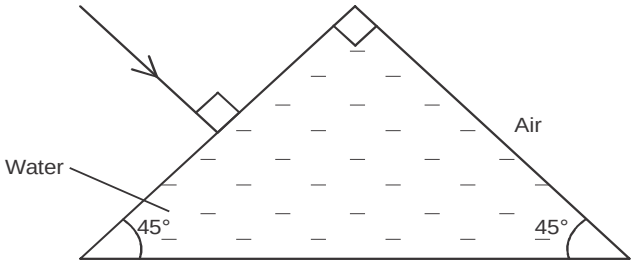


Determine the frequency of the curve. (3 marks)

10. A boy standing in front of a cliff blows a whistle and hears the echo after 0.5 seconds. He then moves 17 metres further away from the cliff and blows the whistle again. He now hears the echo 0.6 seconds. Determine the speed of the sound. (3 marks)

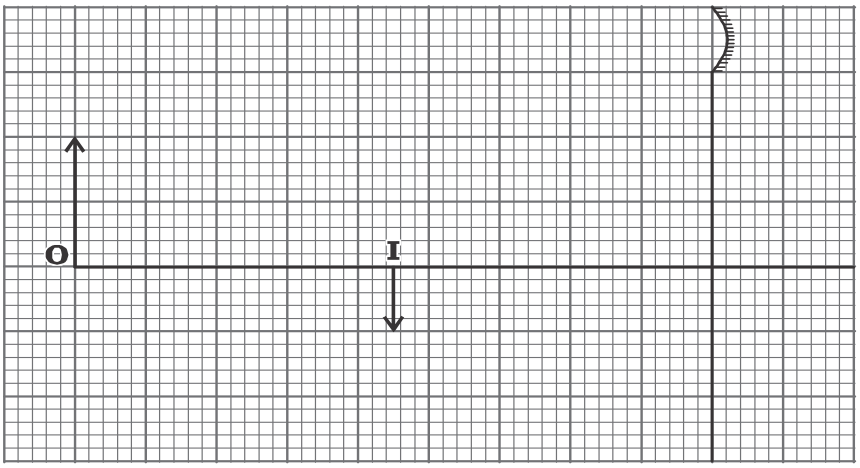
11. Explain briefly how a P-type semiconductor is made. (1 mark)

12. The figure below shows a ray of light incident in the face of a water prism.



Sketch the path of the ray of light as it passes through the prism. Critical angle for water is 49°. (1 mark)

13. The figure below shows an object O infrontof a concave mirror and its image, I, formed after reflection.



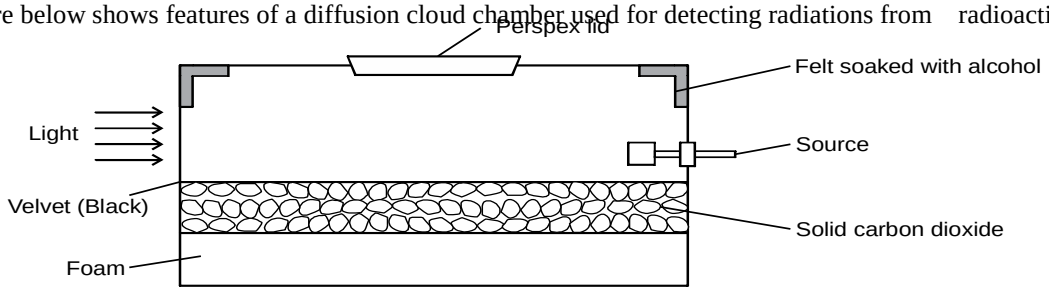
On the same diagram draw appropriate ray(s) to locate the principal focus F, of the mirror. (1 mark)

SECTION B (55 MARKS)
Attempt ALL the questions in this section

14. a)
i) Explain why carbon -14 $^{14}_{6}C$ is radioactive while Carbon -12 $^{12}_{6}C$ is not. (1 mark)

ii) A radioactive isotope showed a count rate of 82 counts per second initially. After a time of 210 seconds, the count rate dropped to 19 counts per second. The average background count remained constant at 10 counts per second. What is the half life of the material? (3 marks)

b) The figure below shows features of a diffusion cloud chamber used for detecting radiations from radioactive source.



Explain how the chambers works when a radioactive particle is introduced at the source. (2 marks)

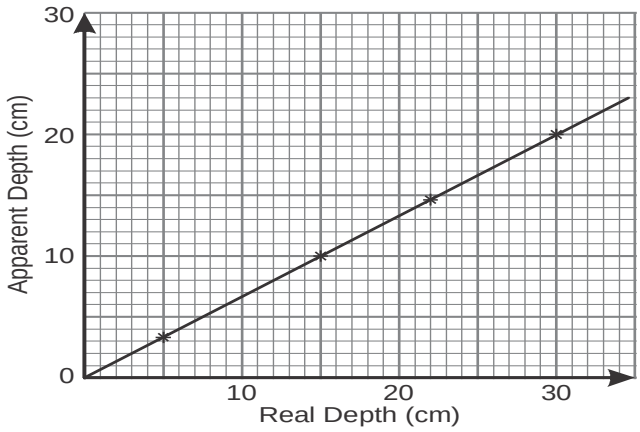
c) i) What is the purpose of solid carbon dioxide? (1 mark)

ii) State one advantage of the cloud chamber over a GM tube as a detector of radioactive radiations. (1 mark)

d) The initial mass of a radioactive substance is 20g. The substance has a half -life of 5 years. Determine the mass remaining after 20 years. (3 marks)

15. a) State Snell's law of refraction. (1 mark)

b) In an experiment to determine the refractive index of a liquid, the liquid was poured into a measuring cylinder, a pin was placed at the bottom of the cylinder and another pin was used to locate the apparent position of the first pin. The values of real and apparent depth were used to plot a graph in the figure below.

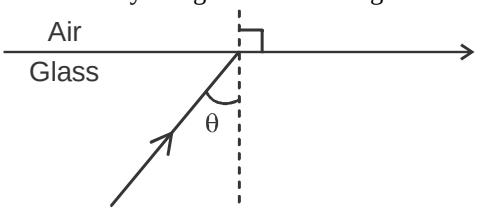


i) From the graph determine the refractive index of the liquid. (3 marks)

ii) Given that the velocity of light in vacuum is 3.0×10^8 m/s what would be the velocity of light in the liquid above. (2 marks)

c) State two conditions necessary for total internal reflection to occur. (2 marks)

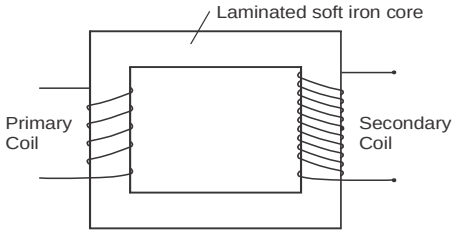
d) The figure below shows a ray of light incidents on glass-air interface.



Given that the refractive index of glass is 1.48, determine the value of θ. (3 marks)

16. a) State Faraday's law of electromagnetic induction. (1 mark)

b) The figure below shows a simple transformer. Study it and answer the questions that follow.



i) Explain why the core is a continuous loop. (1 mark)

ii) Give a reason as to why the core is laminated. (1 mark)

iii) State and explain which coils are thicker. (2 marks)

c) State one difference and one similarity between a step up transformer and an induction coil. (2 marks)

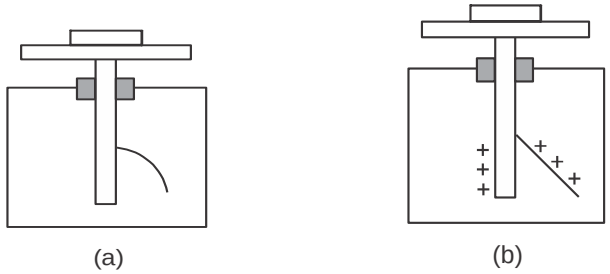
d) State two advantages of the use of alternating voltage for the transmission of electrical energy. (2 marks)

e) The following table shows electrical appliances to be used in a house. The electrical rating for each appliances is shown. The following fuses are available 5A, 15A, 30A and 45A.

Appliances	**Appliances**	**Power (W)**
TV	250	300
Iron box	250	750
Electrical kettle	250	2000

Determine which one of the fuses is suitable for the house (2 marks)

17. The figure below shows ultraviolet radiation striking polished zinc plates placed on negatively and positively charged gold leaf electroscopes respectively.

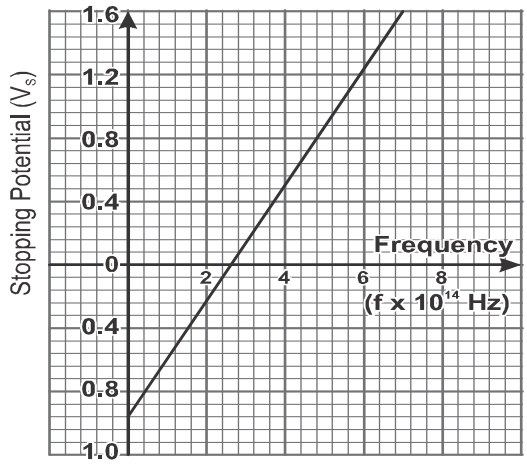


(a) (b)

a) Explain why the leaf collapses in fig (a) but does not collapse in fig (b). (3 marks)

b) State two factors which determine the speed of photoelectrons emitted by a metal surface. (2 marks)

c) In an experiment to find the relationship between frequency of radiation and kinetic energy of photoelectrons in a photoelectric device the following graph was obtained.



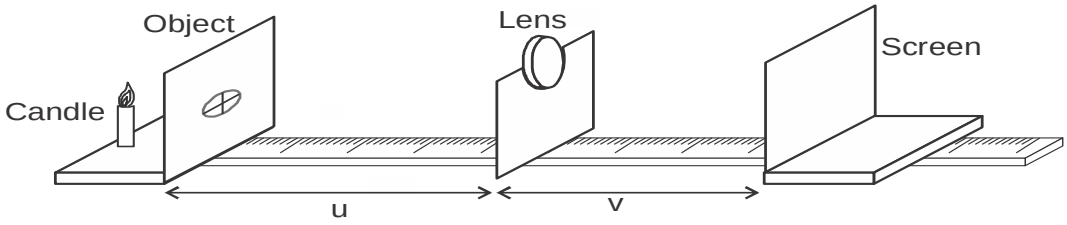
Use the graph to answer the following questions:

i) Determine the threshold frequency. (1 mark)

ii) Find the Planck's constant h (take the charge of an electron, e, to be 1.6 x 10^{-19}C) (3 marks)

iii) Calculate the work function of the metal in joules. (3 marks)

18. The figure below shows an object placed infront of a thin lens. The focal length of the lens is 10cm. The screen is adjusted until an image which is magnified 5 times is obtained.



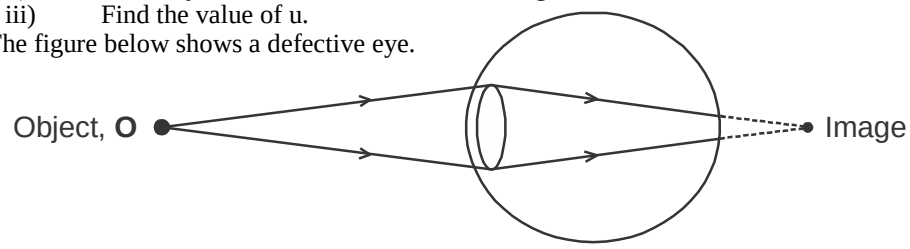
From the information:

a) i) Which type of lens was used in the experiment. (1 mark)

ii) State any other characteristics of the image formed. (1 marks)

iii) Find the value of u. (3 marks)

b) The figure below shows a defective eye.



i) State the cause of the defect. (1 mark)

ii) What type of lens is used to correct the defect? (1 mark)

iii) State two similarities between an eye and a camera. (2 marks)

c) Give one feature that makes parabolic mirrors suitable for use as car head light. (1 mark)

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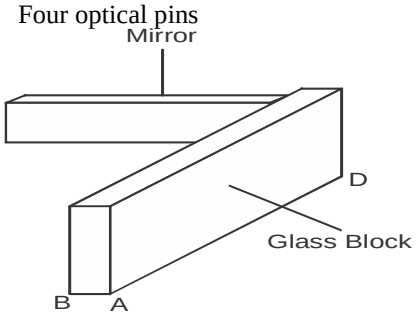
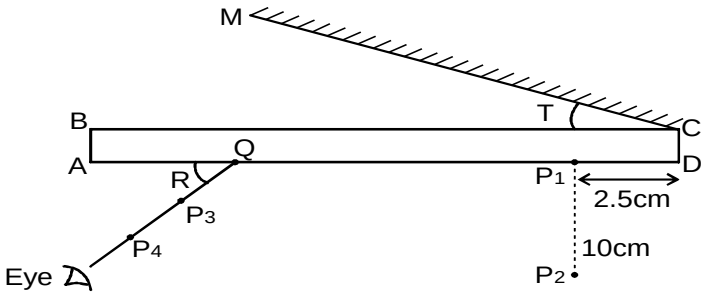
PHYSICS
PAPER 3 (PRACTICAL)
TIME: 2½ HRS

QUESTION 1

a) You are provided with the following apparatus:
- Plane mirror
- Rectangular glass block
- Soft board
- Plain paper
- Four optical pins





i) With the glass block standing on one of its longer edges as shown in fig 1(a), trace its outline to obtain ABCD as shown in fig 1(b).
ii) Draw the line MC at an angle T = 10°.
iii) Fix pins P_1, 2.5cm from point D and another pin P_2, 10cm from pin P_1 as shown in fig 1(b). The pins must be left at these positions throughout the experiment
iv) Replace the glass block and using a small piece of plasticine, hold the plane mirror vertically along CM, behind the glass block.
v) Insert pins P_3 and P_4 such that they are in straight line with the images of P_1 and P_2 as seen through the glass block after reflection from the plane mirror.
vi) Draw a line joining P_3P_4 to meet the block at Q.
vii) Measure and record the value of angle R.
viii) Repeat steps (ii- vii) to obtain other values of R when T is at angles 15°, 20°, 25°, 30° and 35° and record the results in the table below.

T	10°	15°	20°	25°	30°	35°
R(°)						

(6 marks)

ix) Plot a graph of R against T. (5 marks)
x) Determine the value of T_o of T when R = 0. (1 mark)
xi) Determine the value of n in the given equation. (2 marks)

$$n = \frac{1}{Sin(90^0 - T_0)}$$

Question 1(b)

You are provided with the following apparatus:
- Candle
- Screen
- A meter rule
- Convex lens and lens holder

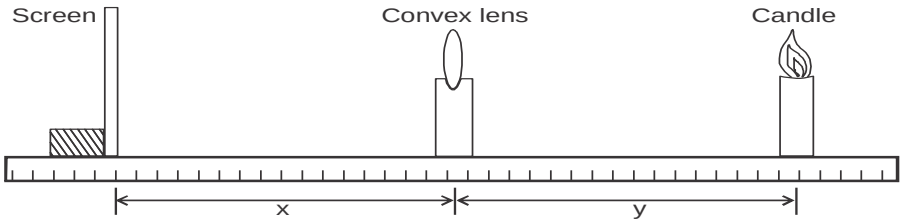


Fig 2

i) Set up the apparatus as shown in fig 2.

ii) Set the object distance y =25cm. By adjusting the position of the screen, obtain a sharp image of the candle. Record the value of image distance X.
Repeat the procedure for y = 35cm.

iii) Complete the table below. (3 marks)

y cm	25	35
x cm		
(x + y) cm		
$(xy)cm^2$		

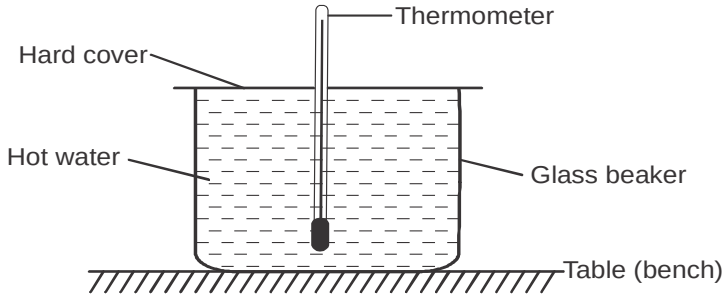
iv) Calculate the average value of f using the equation $f = \frac{xy}{x + y}$ (2 marks)

Q2. You are provided with the following apparatus.

- Hot water source
- Glass beaker ($200cm^3$), diameter about 5.0cm
- Thermometer (0- 100°C)
- Stop watch
- Plastic measuring cylinder (100ml)
- Hard cover plate with hole to fit thermometer

i) Measure and record the room temperature.

θ_R= ..... (1 mark)



ii) Measure exactly 150ml of the hot water using the measuring cylinder. Quickly transfer the water into the glass beaker and cover it with the hard board plate. Place the beaker on a wooden table and insert the thermometer through the hole on the cover.

iii) Measure and record the temperature θ of the cooling water after every two minutes for at least 20 minutes. Stir gently using the thermometer before every temperature reading. Record the values of temperature θ in the table below.
(4 marks)

Time, t (min)								
Temperature θ(°C)								

iv) Plot a graph of θ against time t(min). (5 marks)

v) On the drawn curve, construct as accurately as possible, five tangents at temperatures of 80°C, 75°C, 70°C, 65°C, and 60°C. Find the slope of each and record the value in the table below.

Time θ(°C)	80	75	70	65	60
$(\theta - \theta_R)$ °C					
Slope of tangent $(\theta/_t)$					

(5 marks)

vi) For every tangent find the difference between temperature θ and room temperature θ_R (see the table above)

vii) Plot a graph of slope $\theta/_t$ of tangents against temperature difference. $(\theta - \theta_R)$ (3 marks)

viii) Find the slope of the graph. (2 marks)

KERICHO SUB-COUNTY JOINT EVALUATION 2015

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MARKING SCHEME

PHYSICS (232/1)

1. $d = {}^{m}/_{v}$

$v = (20 - 10)cm^3 = 10cm^3$

$d = {}^{8}/_{10}$

$= 0.8g/cm^3$

2. Alcohol measures as low temperatures as -115°C while mercury is on -39°C.

3. -Continuous random motion

- air particles move in continous random motion colliding with the smoke particles.

4. Clockwise moments = anticlockwise moments

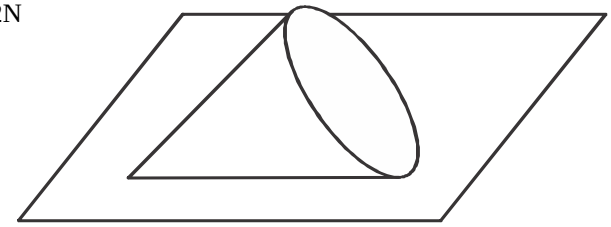
$1.8 \times 40 = (1.2 \times 10) + (x \times 30)$

$72 - 12 = 30x$

$x = {}^{60}/_{30}$

$= 2N$

5.



i) Different diameter of coils

ii) Different materials of wires

7. In (a) cohesive force of water is stronger than adhesive force while in (b) adhesive force between glass and water is stronger than cohesive force of water.

8. $F = ma$

$a = \frac{2.75 - 0.25}{10}$

$= 0.25m/s^2$

$F = 0.16 \times 0.25$

$= 0.04N$

9. Fast moving air at the top of tube reduces the pressure. The atmospheric pressure which is greater than the reduced pressure causes the water to rise up the tube.

10. Metals absorbs more heat energy than wood.

11. a) i) Frictional force as it hits the hill.

ii) Momentum force is used to raise the potential energy of the sphere by 0.4m vertically upwards.

b) Change in energy = Mgh

$= 2 \times 10 \times 0.4 = 8j$

12. Mercury, glycerine, sea water, fresh water

2mks for correct order. No mark for wrong order.

13. a) -angular velocity

- radius of the path/distances of objects from centre of rotation.

b) Direction changes constantly hence velocity changes.

c) i) $a = \frac{V^2}{r} = \frac{20 \times 20}{150}$

$= 2.667m/s^2$

ii) $t = \frac{\text{distance}}{\text{speed}}$

$= \frac{2\pi \times 150}{20}$

$= 47.12$ seconds

d) let T = tension in the rope

$W = 500N$

Net force = $T - 500$

$T - 500 = \frac{mv^2}{r}$

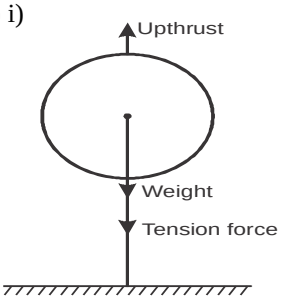
$T = \frac{50 \times (10m/s)^2}{2.5} + 500$

$= 2500N$

14. a) Salty water is denser than fresh water hence offering high upthrust force.

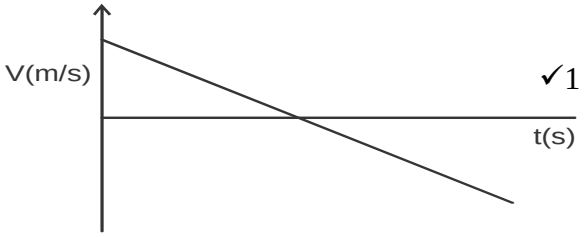
b) i) Upthrust (from graph) = 0.49N
Mass of liquid displaced M
= 0.049kg = 49g
Volume of liquid displaced,
V = 6.2 x 4.5
= 27.9cm^3
Density = $^{m}/_{v}$ = $^{49}/_{27.9}$
= 1.756g/cm^3

c) i)



ii) Upthrust = weight + Tension force
iii) U = ρVg = 1.25 x 200 x 10 = 2500N

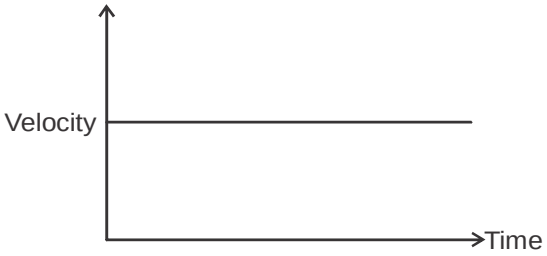
15. a)



✓1

b) i) $V^2 - u^2 = 2as$ ✓1
$a^2 = -25m/s^2$ ✓1
Retardation = 25m/s^2✓1
ii) t = V - U ✓1
a
= 0.4s ✓1

c)



✓1

16. a) It is the quantity of heat energy required to raise the temperature of a unit mass of substance by 1°C or 1 Kelvin.

b) Q = McΔT
c = Q = 180 x 7.5 x 60
MΔT 2 x 40
= 1012.5J/Kg/k

c) I = 16A
V = 22V
i) Melting

ii) ΔT = 25K
c = Q
MΔDT
= Power x t
40 x 25
= 16 x 22 x 10 x 60
40 x 25
= 211.2 Jkg^{-1}k^{-1}

d) ether absorb heat from hand

e) $M_C = 200g$

Let final temperature be T

Change in temperature of copper = (100 -T)

Change in temperature of calorimeter and water = (T - 30)

Heat lost = Heat gained

0.2 x 400 x (100 -T) = 0.015 x 400 x (T - 30) + 0.125 x 4200 x (T - 30)

80 (100 - T) = 6T - 180 + 525T - 15750 - 80T - 6T - 525T = -180 - 15750 - 8000

611T = 23930

$T = \frac{23930}{611}$

= 39.165°C

17. a) $Eff = \frac{M.A}{V.R} \times 100\% = \frac{500}{200} \div VR$

$= \frac{2.5}{4} \times 100\% = 62.5\%$

b) K.E = P.E at $\frac{60}{2}$ = 30cm Mgh ü

Mgh = 0.3 x 10 x 6 = 18J

K. E = ½mv^2

18 = ½ x 6 x V^2

$V^2 = \frac{18}{3}$

V = √6 =

c) Power = $\frac{W}{tt} = \frac{f \times d}{12} = \frac{750 \times 12 \times 5}{}$

= 37.5 watts

d) Work = distance x force but in horizontal circular motion distance /displacement = 0.

∴ W = 0 x force = 0

KERICHO SUB-COUNTY JOINT EVALUATION 2015

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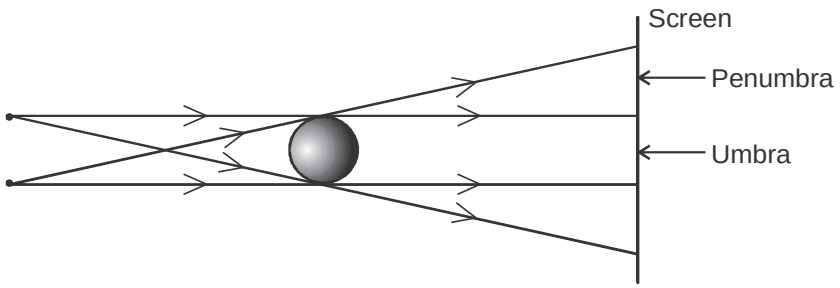
MARKING SCHEME

PHYSICS (232/2)

Paper 2

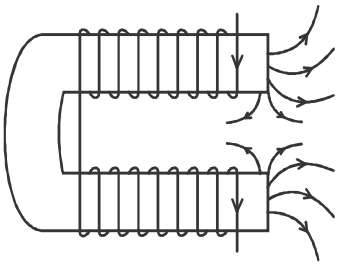
1.



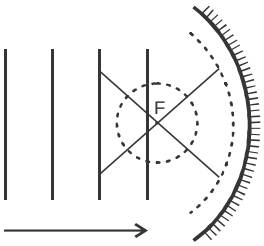
2. Leaf divergence of A reduce while that of B increases to the same level /degree.
The two electroscope have to be the same potential, some charge will flow to neutralise the charge or the charged electroscope.

3. Polarisation
Local action 1

4.



5.



6. Hard X -rays are produced/
Penetrating power of the x-rays increases

7. a = 234 + 4 = 238 ✓
b = 92 - 2 = 90 ✓

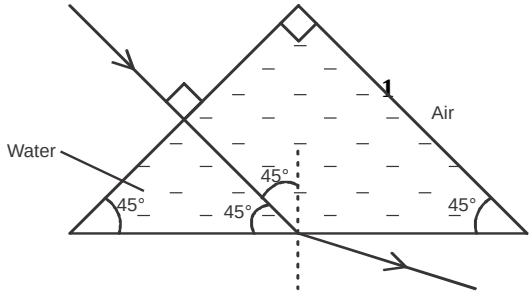
8. In unmagnetised state, the domains are haphazardly arranged.
When tapped in the earth's magnetic field, the domains are aligned in the north-south direction.

9. Period T = 0.50 sec✓
$f = {}^{1}/_{T}$
$= {}^{1}/_{0.5}$ ✓
= 2Hz ✓

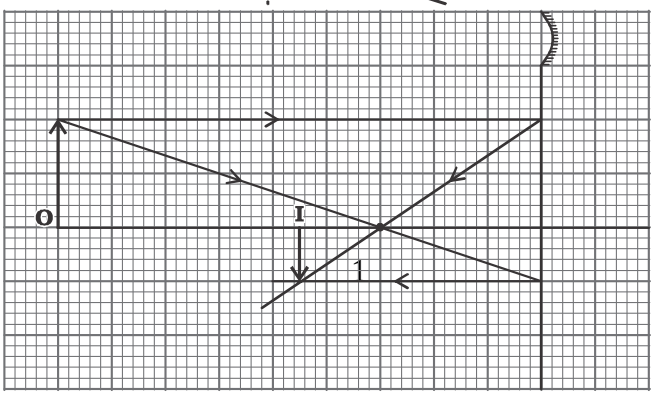
10. If d is the distance between cliff observer
the $V = \frac{2d}{} = \frac{2d}{}$ ✓½
also $V = \frac{2(d+ 17)}{} = \frac{2(d + 17)}{}$ ✓½
t^2 0.6
$\therefore \frac{2d}{0.5} = \frac{2(d+ 17)}{0.6}$ ✓
$0.6 \times 4d = 2d + 34$
$0.4d = 34$
$= \frac{34}{0.4} = 85m$
hence $V = \frac{2 \times 85}{0.5} = \frac{170}{0.5}$
= 340m/s

11. P-type semiconductor is made by dopping with group III elements such as Boron ✓

12.



13.



1 **4.** a) Carbon 14 has higher neutron-proton ration compared to carbon 12

b) The radioactive particle causes ionization✓ of the air in the chamber.
The ions act a surfaces for condensation of the saturated alcohol vapour, producing traces of the particle. ✓

c) i) Solid Carbon (IV) oxide is to lower the temperature in the chambers.
ii) The traces are observable with the naked eye while the GM is not.

d) m = $\frac{1}{2^n}$ m; ✓

$= \frac{1}{2^4} \times 20$ ✓

$= \frac{20}{16}$

= 1.25g ✓

OR

20g $\xrightarrow{5yrs}$ 10g $\xrightarrow{5yrs}$ 5g $\xrightarrow{5yrs}$ 2.5g $\xrightarrow{}$ 1.25g ✓3

15. a) Snell's law: The ratio of the sine of the angle of incidence to the sine of the angle of refraction is a constant for a given pair of media.

b) i) $n = \frac{\text{real depth}}{\text{apparent depth}}$

Slope of graph $= \frac{\text{Change in apparent depth}}{\text{Change in real depth}}$

$= \frac{20}{30}$

$= \frac{2}{3}$

$\therefore n = \frac{1}{\text{Slope}} = \frac{1}{\frac{3}{2}} = \frac{2}{3} = 1.5$

ii) $n = \frac{\text{Velocity in vacuum}}{\text{velocity in liquid}}$

$1.5 = \frac{30 \times 10^8 \text{m/s}}{\text{velocity in liquid}}$

Velocity in liquid $= \frac{3.0 \times 10^8 \text{ m/s}}{1.5}$

$= 2.0 \times 10^8 \text{m/s}$

c) Light ray moves from an optically dense medium into an optically less dense medium.
The critical angle must be exceeded.

d) $n = \frac{1}{\sin C} = \frac{1}{\sin \theta}$ ✓

$\sin \theta = \frac{1}{n}$

$= \frac{1}{1.48}$ ✓

$= 0.6757$

$\theta = \text{Sin}^{-1}\ 0.6857$

$= 42.5$ ✓

16. a) The magnitude of the induced emf in a coil is directly proportionto the rate of change of magnetic flux linked with the coil.

b) i) Core is continuous so as to maintain closed loops of the magnetic circuits /lines of force.

ii) In order to reduce eddy currents

iii) Primary coil

Reason: -Carries a higher current

c) Difference - step up use ac, induction use d.c

Similarity - mutual inductance/both step up voltage

d) Can be stepped up .or stepped -down

Can also be converted to dc

e) Total power = 300 + 750 + 2000

= 3050W

P = VI

3050 = 250 x I

$I = \frac{3050}{250}$

= 12.2 ✓

Suitable fuse is 15A ✓

17.a) U.V light dislodges electrons from zinc plate. ✓

Electrons are repelled by the negatively charged electroscope.✓

This lowers the excess charge on leaf leading to collapse.

In figure (b) UV light dislodges electrons from zinc plate positivelycharged electroscope will re-attract ✓the electrons are kept keeps the charge constant.

b) i) - frequency of incident light

- workfunction of the surface

c) i) 2.5×10^{14} Hz ✓

ii) gradient = $m = \frac{1.6 - 0.0}{(7.0 - 2.5) \times 10^{14}}$ ✓

$= 2.8125 \times 10^{-18}$

$\frac{h}{e} = m$ ✓

$h = m \times e$

$= 2.8125 \times 10^{-15} \times 1.6 \times 10^{-19}$

$= 4.5 \times 10^{-3}$Js ✓

d) iii)

$W_o = hf_o$✓

$= 45 \times 10^{-34} \times 2.5 \times 10^{-14}$Hz ✓

$= 1.125 \times 10^{-19}$J ✓

18. a) i) Convex (lens) ✓

ii) -real

- inverted

iii) $m = {}^{V}/_{U}$✓

$s = {}^{V}/_{U}$

$v = 5u$

$\frac{1}{f} = \frac{1}{5u} + \frac{1}{u}$ ✓

$+\frac{1}{10} = \frac{1 + 5}{5u}$

$\frac{1}{10} = \frac{6}{5u}$

$5u = 6 \times 10$

$u = \frac{60}{5} = 121$m ✓

b) eye ball too long/ focal length of eye lens is too short

ii) Concave lens/divergence lens

iii) Both use convex lens

Both form real inverted image

c) Produce parallel beam of light

NYAKACH SUB-COUNTY JOINT EXAMINATION
Kenya Certificate of Secondary Education
232/1
PHYSICS
Paper 1
July / August 2015

SECTION A (25 marks)
Answer ALL the questions in the spaces provided.

1. Figure 1 shows the reading on a burette after 55 drops of a liquid have been used.

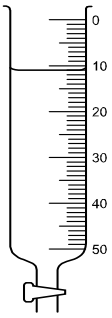


Fig 1

If the initial reading was at 0cm mark, determine the volume of one drop of the liquid in SI units. (2 marks)

2. A small drop of oil has a volume of $5 \times 10^{-8}m^3$. When it is put on the surface of some clean water, it forms a circular film of $0.1m^2$ in area; what is the size the a molecule oil. (2 marks)

3. State how a lubricant reduces friction in the bearing of moving part of a machine. (1 mark)

4. Figure 2 below shows a thin thread tied on the surface of water in trough.

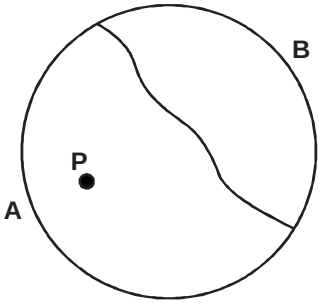
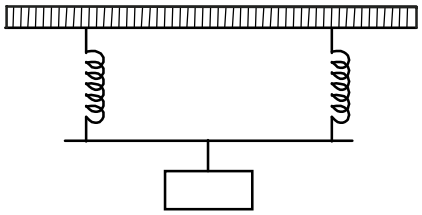


Fig 2

When small drops of soapy water was dropped at point P, the thread curved towards side B. Explain? (2 marks)

5. Two identical springs of spring constant 3N/cm are used to support a load of 30N as shown in figure 3. Determine the extension of each spring. (3 marks)

Fig 3



6. State the modification introduced in the modern buses so as to enhance stability. (1 mark)

7. On a certain day when the temperature is 37°C, the pressure in an open gas jar is 640mm of mercury. The jar is then sealed and cooled to the temperature of 17°C. Calculate the final pressure. (3 marks)

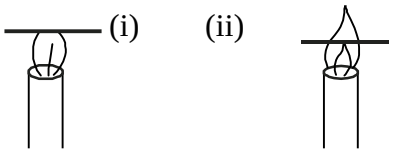
8. Two table Tennis balls are in the same level while suspended from threads a short distance apart. A stream of air is blown between the balls in a horizontal direction. Explain what happens to the balls. (2 marks)

9. **a)** Define force from Newton's laws. (1 mark)

b) Calculate force acting on a person of mass 50kg who is jumping from a height of 5m and on landing he is brought to rest in one tenth of a second. (2 marks)

10. When a Bunsen Burner is lit below a wire, it is noted that the flame initially burns below the gauze as shown in figure 4(i), after sometime, the flame burns below as well as above the gauze as shown in figure 4(ii)

Fig 4



Explain this observation. (2 marks)

11. A car of mass 800g is initially moving at $25ms^{-1}$. Calculate the force needed to bring the car to rest over a distance of 20m. (3 marks)

12. A screw advances 1mm when the screw is turned through two revolutions. What is the pitch of the screw? (1 mark)

SECTION B - 55 marks

13. a) Define the specific latent heat of fusion of a solid. (1 mark)

b) An electric kettle with a 2.0kw heating element has a heat capacity of $400jk^{-1}$. 1.0kg of water at 20°C is placed in the kettle. The kettle is switches on and it is found that 13 minutes later the mass of water in it is 0.5kg. Ignoring heat losses ; calculate

i) Total heat supplied. (2 marks)

ii) Heat used for the kettle. (2 marks)

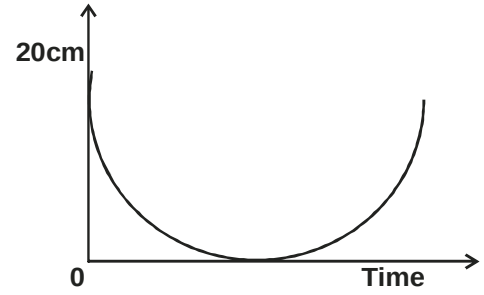
iii) Heat used to raise temperature of 1kg of water from 20°C to 100°C. (2 marks)

iv) Heat to change water at 100°C to steam at 100°C. (2 marks)

v) The specific latent heat of vaporisation of water. (2 marks)

14. a) Figure 5 below shows height - time graph for a pendulum of 120g swinging on a thread 1.0m long.

Fig 5

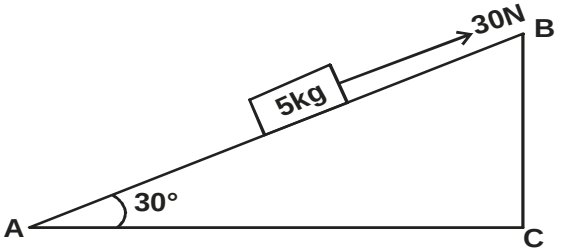


i) Determine the maximum velocity during the swing. (2 marks)

ii) Use the information to explain the principle of conservation of energy. (2 marks)

b) Figure 6 below shows a block of 5kg pulled up with a force of 30N through an inclined plane at 30°

Fig 6



If the surface has a co-efficient of 0.4m find:

i) Frictional force. (3 marks)

ii) Acceleration of the block. (2 marks)

iii) Given that the distances AB = l and BC = h, show that the velocity ratio of the incline is equal to 2.0. (3 marks)

15. a) State the law of floatation. (1 mark)

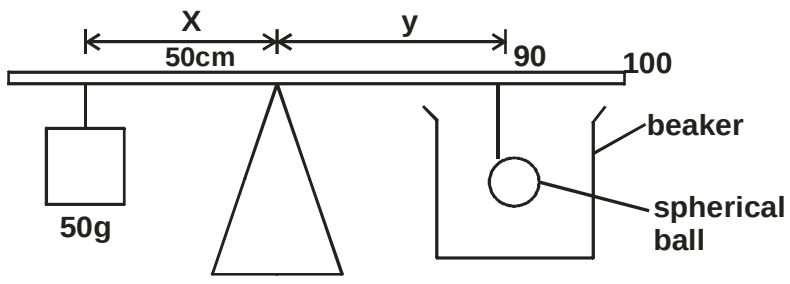
b) You are provided with the following

- Test-tube
- Some sand
- Spatula
- Measuring cylinder with water
- Spring balance

Using diagrams describe an experiment to verify law of floatation. (5 marks)

c) Figure 7 below shows a set up for a demonstration to determine density of oil.

Fig 7



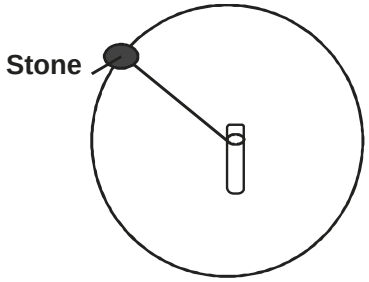
During the experiment, the distance Y = 40cm and maintained. It was observed that when the sphere was suspended in empty beaker the distance x = 20cm

When the sphere was submerged in oil in the beaker the distance x = 16.0cm
(Volume of sphere = 160cm³)

Determine:
i) Weight of sphere in air. (2 marks)
ii) Density of oil (2 marks)

16. a) Figure 8 below shows a stone whirled in a horizontal circle.

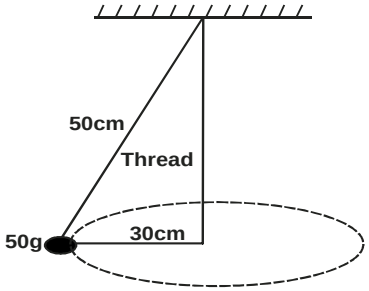
Fig 8



Use the information to distinguish between angular velocity and linear speed of the stone. (1 mark)

b) Figure 9 below shows a stone of mass 50g whirled using a thread of length 50cm at 5Hz to produce a cone of base radius 30cm below.

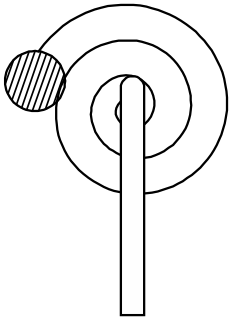
Fig 9



i) tension on the thread. (3 marks)
ii) the centripetal force maintaining the frequency of 5Hz. (2 marks)
iii) the angular velocity of the rotation. (2 marks)

c) Figure 10 below shows a small mass tied at the end of a thread and whirled to help wind the thread as a stick.

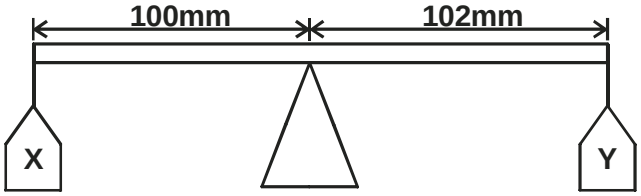
Fig 10



It was observed that the linear speed of the mass increased as the length of thread reduced. Explain. (2 marks)

17. Figure 11 shows a defective beam balance with unequal arms. The beam balances with no masses in the pans X and Y.

Fig 11



a) i)Suggest why this could be possible. (2 marks)
ii) If a mass of 300g is placed in pan Y, Calculate the mass which must be placed in pan X to restore the balance.(2 marks)

b) An object put on a beam balance gives the same reading no matter where it is on the Earth's surface, but if it is on a very sensitive spring balance, the reading varies from place. Explain why this is so. (3 marks)

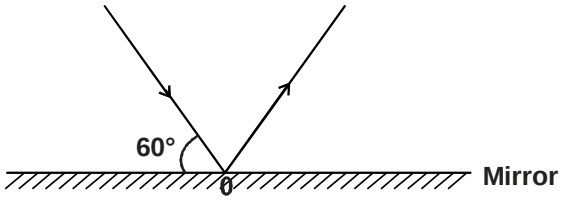
c) Suppose that an object is attached to a spring balance on the Earth's surface and Earth's speed of rotation is gradually increased. What effect, if any, will this have on.
i) the gravitational attraction between the object and the Earth. (2 marks)
ii) the reading of the spring balance. (3 marks)

NYAKACH SUB COUNTY JOINT EXAMINATION
Kenya Certificate of Secondary Education
232/2
PHYSICS
Paper 2
July/August 2015

SECTION A (25 marks)
Answer ALL questions in this paper

1. Figure 1 below shows a ray of light incident on a plane mirror.

Fig 1

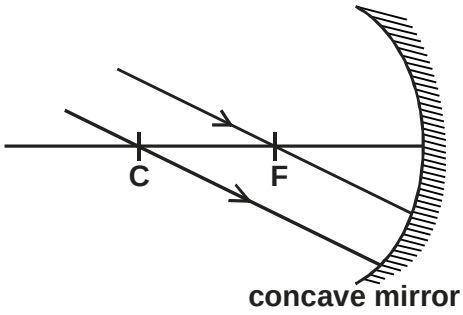


The mirror is rotate through 10° clockwise about point O in an axis perpendicular to plane mirror. Determine the angle between the incident ray and the new reflected ray. (2 marks)

2. When a positively charged body is brought near the cap of a negatively charged electroscope, leaf divergence decreases. Explain this observation. (2 marks)

3. Figure 2 below shows two parallel light rays incident on a concave mirror.

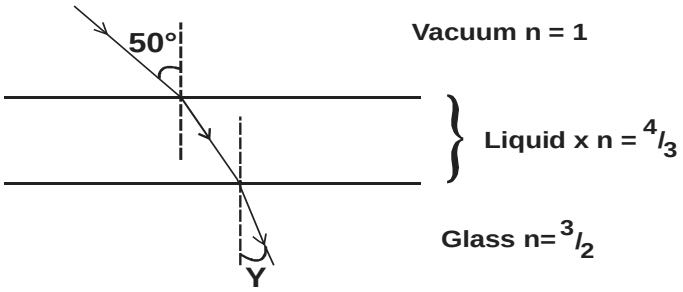
Fig 2



Sketch on the same diagram the path of the rays after striking the mirror and show the image. (2 marks)

4. Figure 3 shows a ray of light travelling through a vacuum enters liquid X at an angle of 50°, travels through and emerges in glass.

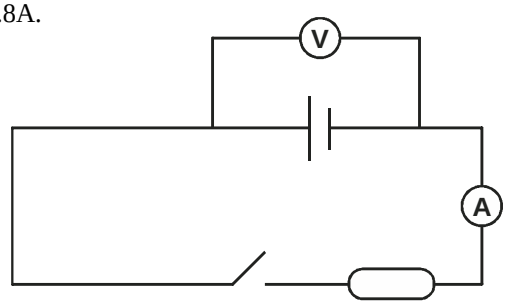
Fig 3



Determine angle Y. (3 marks)

5. Fig 4shows a circuit diagram. The emf of the cell is 1.5V. When the switch is closed, the voltmeter reads 1.3V and the ammeter reads 0.8A.

Fig 4

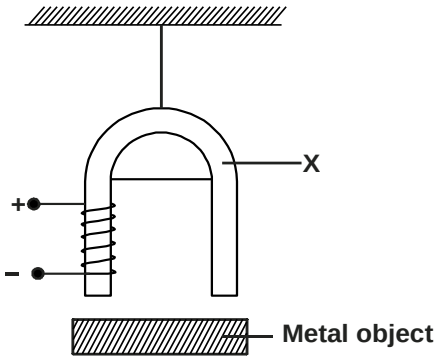


Determine the internal resistance of the cell. (3 marks)

6. A boy standing infront of a cliff blows a whistle and hears the echo after 0.5 seconds. He then moved 17 metres further away from the cliff and blows the whistle again. He now hears the echo after 0.6 seconds. Determine the speed of sound in ai (3 marks)

7. Fig 5 shows an electromagnet made by a student in a laboratory.

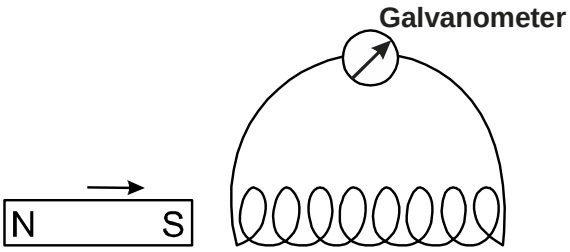
Fig 5



State two changes the student can make so that a heavier iron block could be lifted by the magnet. (2 marks)

8. An electric heater is rated 1kW, 240V. If the element is connected to 240V mains supply for 10 minutes, determine the amount of heat dissipated. (2 marks)
9. Name an electromagnetic radiation with highest energy photons. (1 mark)
10. State why soft iron is used as a transformer core. (1 mark)
11. State one cause of power losses in long distance transmission cables. (1 mark)
12. State Faraday's Law of electromagnetic induction. (1 mark)
13. Figure 6 shows a coil connected to a sensitive galvanometer.

Fig 6



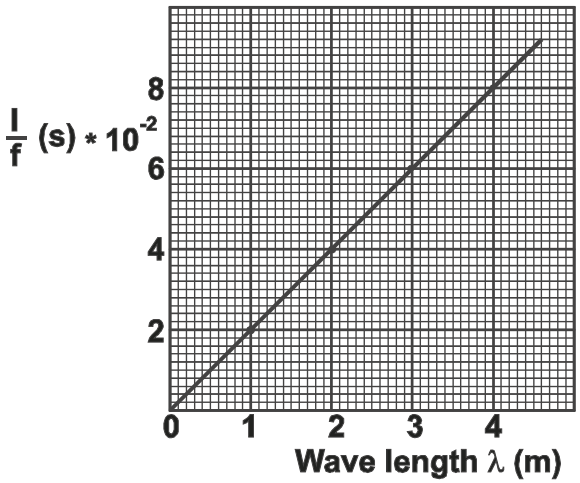
When the magnet is suddenly moved towards the coil in the direction shown, the galvanometer shows a deflection. Explain. (2 marks)

SECTION B : 55 marks

Answer ALL the questions in the spaces provided.

14. Figure 7 below shows a graph of values of reciprocal of frequency and corresponding values of wavelength for waves transmitted in a certain medium

Fig 7

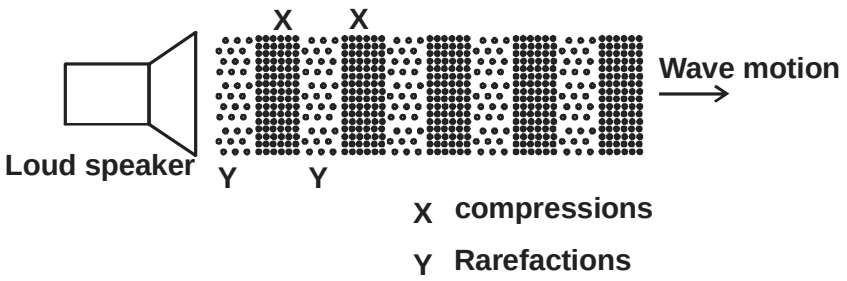


i) Using the wave equation, give the equation of the graph. (1 mark)
ii) Use the graph to determine the velocity of the waves. (3 marks)

b) A radio transmitter produces waves of frequency 1.5×10^{8}Hz. Determine the wavelength of the signal (C = 3.0×10^{8}m/s) (3 marks)

c) Figure 8 shows a loudspeaker producing sound waves in air.

Fig 8



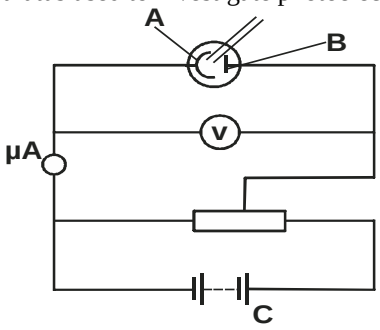
i) Explain how compression and rarefactions are formed. (2 marks)
ii) Show on the diagram the wavelength of the wave. (1 mark)
iii) The wavelength of the waves produced is 0.4m. Determine the frequency of the waves if the speed of sound in air is 330m/s. (2 marks)

15.

a) i) You are provided with a highly polished zinc plate, electroscope, a source of U.V rays and a material for charging the electroscope. Determine how you can use these apparatus to demonstrate photoelectric effect. (3 marks)
ii) State how the apparatus in a(i) above can be used to determine the nature of photoemission taking place. (1 mark)

b) Figure 9 shows an apparatus used to investigate photoelectric effect.

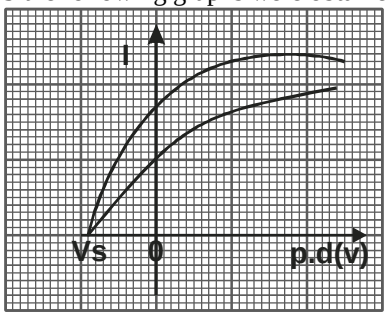
Fig 9.



i) Label the parts A and B. (2 marks)
ii) State the function of C (1 mark)

c) Using the apparatus in fig 9 the following graphs were obtained.

Fig 10



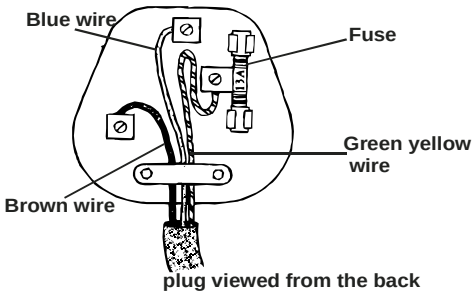
Describe the experiment using the apparatus to give the graph. (3 marks)

d) A photo sensitive cathode of work function 2.1 eV is illustrated with a radiation of wavelength 4.5×10^{-7}. Determine the stopping potential for the cathode. Speed of light C = 3.0×10^{8}m/s,
1 eV = 1.6×10^{-19} j, h = 6.6×10^{-34}Js. (2 marks)

16. a) Give a reason why the earth pin on a three pin plug is longer than the other two pins. (1 mark)

b) Fig 11, a three pin plug wired by a student and connected to an appliance rated 1000W, 240V.

Fig 11



State two mistakes made by the student in the wiring. (2 marks)

c) Fig 12 shows a section of a house wiring.

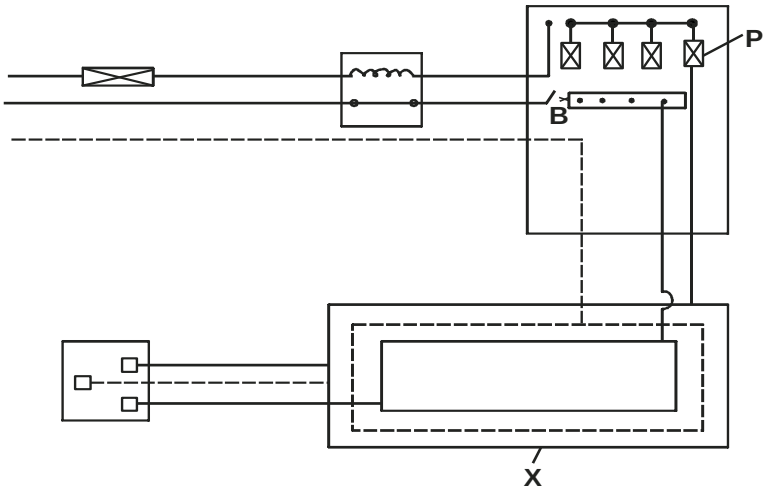


Fig 12.

i) Name
The circuit labelled X ..... . (1 mark)
The terminals A and B. (2 marks)

ii) i) State the function of P in the circuit. (1 mark)
ii)Give a reason why P is on A but not B. (1 mark)

iii) Explain why earthing is necessary in such a circuit. (1 mark)

17. a) The element thorium $^{234}_{90}Th$ is radioactive. It decays by emitting Beta particles determine the number of the protons and neutrons in nucleus formed when a thorium atom emit a beta particle. (2 marks)

b) Figure 13. Shows a source of beta particles and a detector being used to check the thickness of paper in a paper mill.

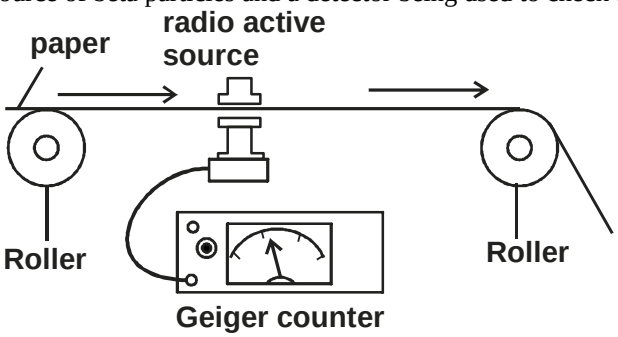


Fig 13

i) Explain how the device works. (3 marks)

ii) Explain why beta particles are used instead of alpha particles or gamma rays. (2 marks)

iii) The graph in fig 14 shows variation in activity of a sample of a radioactive material.

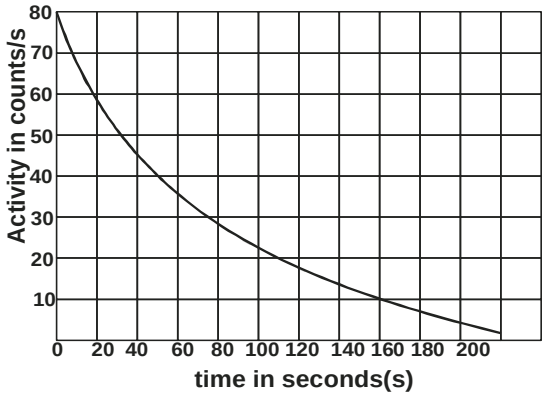


Fig 14

Use the graph to determine the half life of the sample (3 marks)

18. a) Fig 15 shows two parallel conductors P and Q carrying current in the same direction.

Fig 15

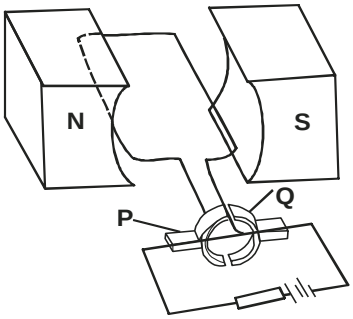
On the same figure;

i) sketch the magnetic field pattern (1 mark)

ii) Indicate the force F due to the current on the conductor (1 mark)

b) Fig 16 shows a simple electric motor. Study the figure and answer the questions that follow.

Fig 16



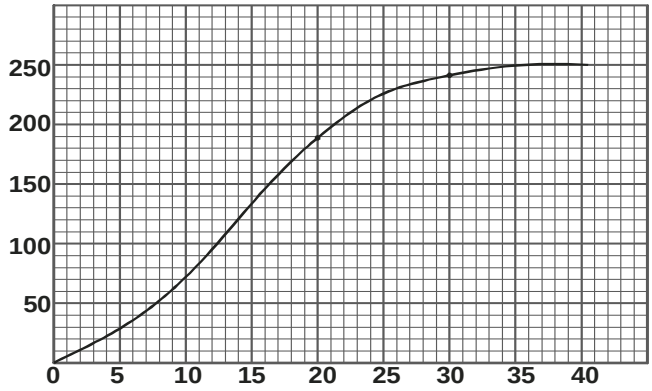
i) Indicate on the diagram the direction of rotation of the coil. (1 mark)

ii) Explain how the motor works specifying clearly the functions of the parts P and Q. (3 marks)

iii) State one way by which the speed of this motor can be increased. (1 mark)

c) The graph in figure 17 was obtained in an experiment to determine the strength of an electromagnet.

Fig 17.



i) Use domain theory to explain the nature of the curve. (3 marks)

ii) Sketch on the same axes, the curve that would be obtained using a lower current. (1 mark)

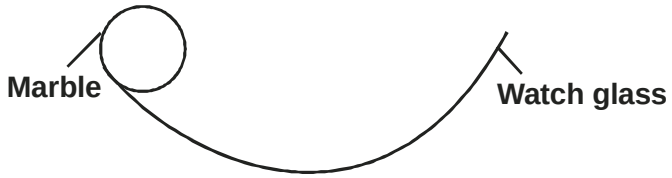
NYAKACH SUB COUNTY JOINT EXAMINATION
Kenya Certificate of Secondary Education
232/3
PHYSICS
Paper 3
July/August 2015

1. You are provided with the following.
- A watch glass
- A small piece of plasticine
- A marble
- A stop watch
- A vernier callipers
- An electronic balance
- A burette
- A plane mirror.

a) Record the mass m of the marble. (1 mark)

m = ...

b) Place the watch glass flat on the table with a small piece of plasticine to fix it firmly to the bench at the point it touches! Release the marble from one end of the watch glass and time ten complete oscillation with a stop watch. Repeat this three times.



Fill and complete the table below. (2 mark)

	Time for 10 oscillations	Periodic time T(S)
1		
2		
3		

c) Measure the diameter of the marble using vernier callipers and hence determine its volume.

I. Diameter ..... (1 mark)

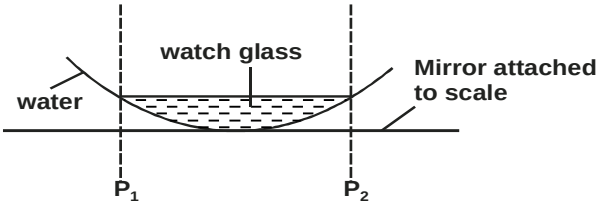
II. Volume given $V = \frac{4}{3}\pi r^3$ (2 marks)

d) Calculate the radius of curvature of the watch glass R given.
Where r is the radius of the marble.
Take g = 9.8m/s and π = 3.142 $R - V = \frac{5gT^2}{7(2\pi)^2}$ (2 marks)

e) i) Clean the watch glass carefully. Place the mirror horizontally on the bench and put the watch glass on it so that the centre of the watch glass lies above the millimetere scale.

ii) Fill the burette with water. Run a little water out of the burette into a beaker to make sure its running smoothly. Then move the burette over the watch glass and lower its tap to a few centimeters above the watch glass.

iii) Record the burette reading V_O ; and then run 1.5cm³ of water into the watch glass.
V_O= .....
Again record the new burette reading V_1
V_1= .....
Mark two positions (P_1 and P_2) of the extreme sides of the pool of water in the watch glass against the scale attached to the mirror as is shown below.



iv) Run in more water from the burette in steps of 1.5cm³, each time recording the burette reading and the corresponding positions of the edges of the pool of water P_1 and P_2 in each case. Take a total of 7 readings.

	1	2	3	4	5	6	7
Burette reading (V) cm³							
P_1 cm							
P_2 cm							
d = (P2 - P1)cm							
V=cm³							
d4							

(5 marks)

Where d - is the diameter of pool of water in each case.
V - is the corresponding volume of water in the watch glass.

f) On the grid provided, plot a graph of d^4 against V (x - axis) (4 marks)

g) Determine the slope of the graph S. (2 marks)

h) Determine radius of curvature R of the watch glass given. (1 mark)

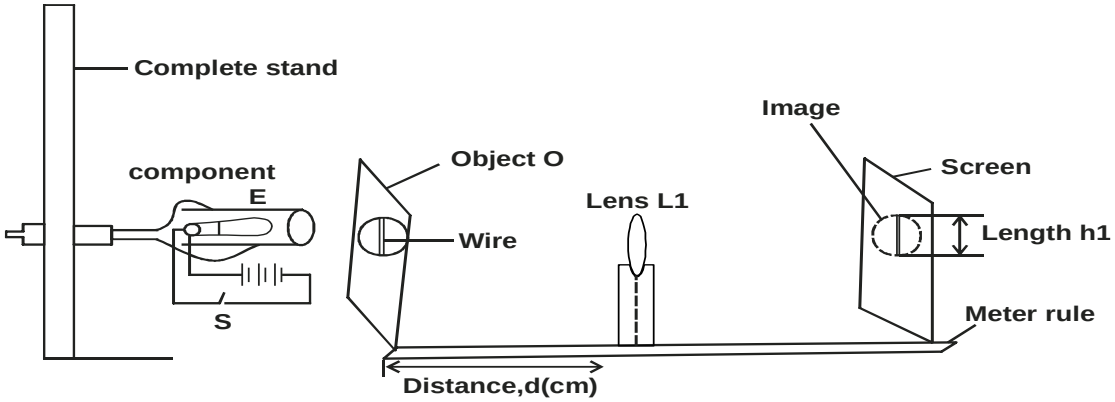
Question 2 - Part A

You are provided with the following:

- Component E
- Convex lens on a lens holder - labelled L_1
- Concave lens on a lens holder - labelled L_2
- One meter rule
- One white screen.
- One complete stand.
- Object labelled O
- Complete mathematical set.

Proceed as follows:

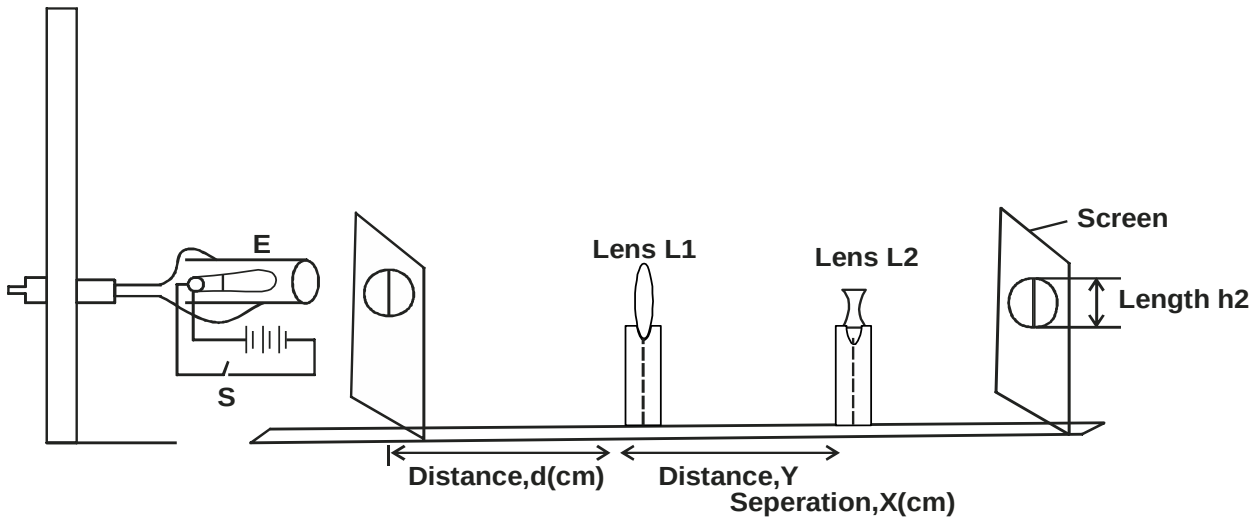
a) Arrange the apparatus as shown in figure - below:



b) Place the lens L_1 such that its distance from the object O is 25cm. Close the switch S and adjust the position of the screen until a sharp image of the wire is formed on the screen.

c) Using a pair of divider measure and record the length h_1 of the image of the wire on the screen.
height h_1 = ... cm

d) Open the switch S and interpose the lens L_2 between lens L_1 and the screen as shown in figure below:
(When this is done the image disappears)



e) With d still equal to 25cm, adjust the positions of the lens L_2 and the screen until a sharp image of the wire is formed on the screen. Record the new length of the image of the wire as h_2.

f) Repeat the experiment for the distances
d = 30, 35, 40, 45 and 50cm. Record your results in table ____. Hence complete the table. (7 marks)

g)

	Distance between lens L1 and object, d(cm)	Distance of separation between L_1 and L_2 (xcm)	Length, h_1, (cm)	Length, h_1 (cm)	Length, h_2(cm)	Length, h_2(cm)	$\frac{h_1}{h_2}$
25							
30							
35							
40							
45							
50							

g) On the grid provided, plot the graph of $\frac{h_1}{h_2}$(y-axis) against distance x. (4 marks)

h) Determine the slope S of the graph. (2 marks)

i) If the graph obeys the equation Ks = 1 where K is a constant for lens L_2, determine the value of K. (2 marks)

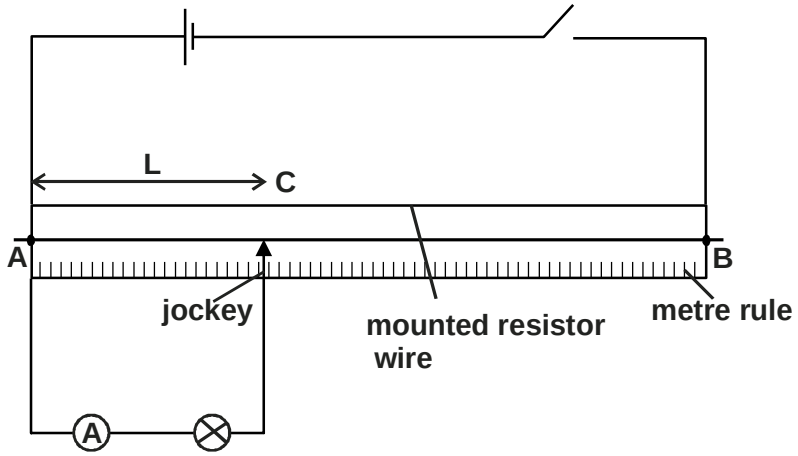
PART B

You are provided with the following

- An ammeter
- Two dry cells.
- A mounted resistance wire.
- Connecting wires.
- A torch bulb in a bulb holder.
- A cell holder
- A switch
- A jockey / a crocodile clip.

Proceed as follows.

i) With a bulb and an ammeter connected in series as shown in circuit diagram below, complete the circuit and record the ammeter readings I_1, I_2 and I_3 for the corresponding values of lengths.



L_1 = 30cm, I_1 = ... (½ mark)

L_2 = 50cm, I_2 = ... (½ mark)

L_3 = 70cm, I_3 = ... (½ mark)

k) Given that V = Ls where V is the p.d. across the length AC of the wire, S is a constant S = 0.3. Determine the potential differences V_1, V_2 and V_3 across the length AC of wires for lengths L_1 and L_2 and L_3 in (i) above.

V_1= ..... (½ mark)

V_2= ..... (½ mark)

V_3= ..... (½ mark)

l) Compute the average value of the Resistance R of the bulb (2 marks)

R_1= ..... (½ mark)

R_2= ..... (½ mark)

R_3= ..... (½ mark)

Average R

NYAKACH SUB COUNTY JOINT EXAMINATION
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MARKING SCHEME

1. Volume of 55 drops
= 11.0 - 0.0 = 11.0cm³ ✔*1*
Volume of 1 drop = $\frac{11.0}{55.0} = 0.2cm^3$
$= 2.0 \times 10^{-7}m^3$ ✔*1*

2. V = πr²h $\quad \therefore h = \frac{v}{\pi r^2} = \frac{5 \times 10^{-8} m^3}{0.1m^2}$
$= 5.0 \times 10^{-7} m$

3. By going between two moving parts so that the parts slid on oil instead of each other. ✔*1*
4.- Soapy water lowers surface tension thus breaking it. ✔*1*
- The tension on side B pulls the thread towards it. ✔*1*

5. Weight on each spring is
$F = Ke$
$\therefore e = \frac{F}{k} = \frac{15N}{3N/cm}$
$e = 5cm$

6. Luggage/load compartment is put under the seats. ✔*1* OR do not have carriers on top of the Bus. ✔*1*

7. $\frac{P_1}{T_1} = \frac{P_2}{T_2}$
$\frac{640}{310} = \frac{P_2}{290}$
$\therefore P_2 = 598.71mmHg$

8. The balls move towards each other. ✔*1*
Increase in velocity reduces the pressure between the balls hence atmospheric pressure pushes the balls towards each other. ✔

9 **a)** Force acting on an object is the rate of change of its momentum. ✔*1*
b) Landing velocity

$\sqrt{2gh} = \sqrt{2 \times 10 \times 5} = 10ms^{-1}$
$F = Momentum\ change$
$= \frac{50 \times 10}{\frac{1}{10}}$
$= 5000N$

10. In fig 4(i), Gauze conducts heat away, temperature above it is lower than the ignition temperature of the gas.
In fig 4(ii) gauze is hotter than ignition temperature of the gas hence the gas lights.

11.
$U = 25ms^{-1}, V = 0, S = 20m, a = ?$
$V^2 = U^2 + 2as$
$a = \frac{-U^2}{2S} = \frac{-625}{40} = 15.63ms^{-2}$
$F = ma = 800kg \times 15ms^{-2}$
$= 1250N$

12.
$$Pitch = \frac{1mm}{2\,\mathrm{Re}\,v} = 0.5$$

SECTION B - 55 marks

13. a) The specific latent heat of fusion of a solid is the heat required to convert unit mass of it, at its melting point, into liquid at the same temperature ✓1

b) i) Total heat supplied = 200 × 13 × 60 ✓1
= 1.56×10^6J ✓1

ii) Heat used for kettle = CΔθ
= 400 × (100 - 20) ✓1
= 32000J
= 0.032×10^6J ✓1

iii) Heat used to raise temperature of 1kg of water from 20°C to 100°C
= MCΔθ = 1 × 4200 × (100 - 20) ✓1
= 0.336×10^6 J ✓1

iv) Heat to change water at 100°C to steam at 100°C
=$1.56 \times 10^6 - (0.032 \times 10^6 + 0.336 \times 10^6)$ J ✓1
= 1.192×10^6J ✓1

v) Since mass of water changed to steam
= 1.0 - 0.5 kg then

$$L_f = \frac{1.192 \times 10^6}{0.5} = 2.38 \times 10^6 \, Jkg^{-1}$$

14. a) i) PE = mgh
PE = K.E
mgh = ½ mv² ✓1

$$v = \sqrt{2gh}$$
$$= \sqrt{2 \times 10 \times \tfrac{2}{10}}$$
$$= 2ms^{-1}$$

ii) At a height of 20cm the bob has max P.E.
As the height reduces P.E reduces but velocity increases thus K.E also increases. ✓1 As P.E. reduces K.E. increases turns there is energy conversion from PE to KE and the sum is constant. ✓1

b) i) Fr = mMg sin 30 ✓1
= 0.4 × 5 × 10 × 0.5
= 10 N ✓1

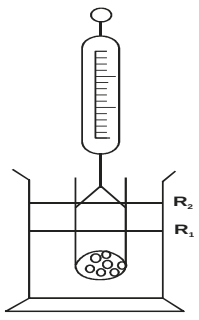
ii) 30N - 10N = 5a ✓1

$$a = \frac{20}{5}$$
$$= 4ms^{-2}$$

iii) V.R
$$= \frac{Effort\ distance}{load\ distance} = \frac{L}{L\ Sin\theta}$$
$$= \frac{1}{Sin\theta} = \frac{1}{Sin30} = 2$$

15.a) Floating body displaces its own weight in a fluid it is placed. ✓1

b)



- Pour some water in measuring cylinder and note the level R_1
- Using the spatula to float test tube , using sand in water in the measuring cylinder and note the new level R_2
- W_1, weight of displaced water.
- Remove test tube wipe and weigh it at content using spring balance, W_2
- $W_2 = W_1$

c) i) Weight of sphere in air.

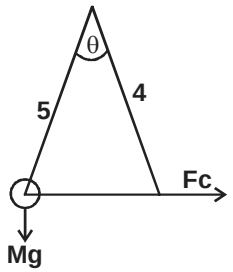
$$W \times \frac{40}{100} = \frac{50}{100} \times 20 \times 10$$
$$W = 25N$$

ii) $50 \times 16 = (250 - m)40$

$$\frac{800}{40} = 250 - m$$
$$20 - 250 = -m$$
$$m = 230$$
$$But\ D = \frac{m}{V} = \frac{230}{100} = 1.4375 gcm^{-3}$$

1 **6. a)** Angular velocity : Uniform velocity required to maintain the stone in the circular path while linear speed is the tangential horizontal speed the stone will move with if the string cuts. ***✓1***

b)



i)

$$Cos\theta = \frac{3}{4} = 0.75$$
$$\therefore T = mgCos\theta$$
$$= \left(\frac{50}{1000} \times 10\right) \times 0.75$$
$$= 0.375N$$

ii) $F_C = MgSin\theta$

$$= \left(\frac{50}{1000} \times 10\right) \times \frac{3}{5}$$
$$= 0.3N$$

iii) $W = 2\pi f = 10 prads^{-1}$ ***✓1*** $= 31.42$ rad s^{-1} ***✓1***

c) From $F_C = \frac{MV^2}{r}$,

reducing length (r) increases centripetal force ***✓1*** turns increasing linear speed (V^2) ***✓1***

17.

a) i) The balance pan X has greater mass than balance P and Y ✓*1*
OR the beam is not uniform ✓*1*

ii) $100 \times x = 300 \times 102$ ✓*1*

$x = \frac{300 \times 102}{100}$

$= 300g$ ✓*1*

b) The extension of a spring balance depends on gravitational force and this varies over the earth's surface. ✓*1*
With a beam balance the force acting on both arms on equal masses remains the same. ✓*1*

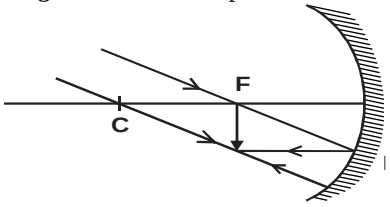
c) i) The gravitational attraction will not change and depends only on the mass and its distance from the centre of the Earth. ✓
ii) The spring balance would read less. ✓*1*
With increasing speed of rotation of the Earth, more gravitational force is needed to provide the centripetal force. ✓*1*
The object's weight, which is the difference between the total gravitational force and the centripetal force is therefore less. ✓*1*

NYAKACH SUB COUNTY JOINT EXAMINATION
Kenya Certificate of Secondary Education
PHYSICS
Paper - 232/2
July/August - 2015
MARKING SCHEME

1. Now angle of incidence = 30 + 10 = 40° ***;***
Angle between the incident ray and new reflected ray = 40 × 2 = 80°***;***

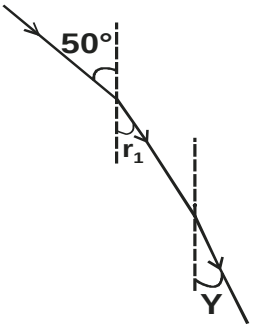
2. Electrons are attracted from the leaf and the plate to the cap ***;***
Change of the leaf and plate decreases ***;***

3.



Both rays correctly reflected ***;***
Diminished image of F ***;***

4.



$Sin\, r_1 = \frac{3Sin50}{4};$

$Sin\, r_1 = \frac{3}{4} \times \frac{3}{2} = \frac{9}{8};$

$Sin\, y$

$y = 30.71°;$

5. E = V + Ir
1.5 = 1.3 + 0.8r
r = 0.25Ω

6.

$\frac{2d}{0.5} = \frac{2d + 34}{0.6}$

$d = 85m;$

$Y = \frac{2 \times 85}{0.5};$

$= 340m/s;$

7. Increase current***;***
Winding the coil on both ends of x such that they become unlike poles ***;***

8. Energy = power × time
= 1000 × 10 × 60***;***
= 6.0×10^5 J***;***

9. Gamma rays***;***

10. Easy to demagnetise the magnetise*;*
11. Resistance of the cables *;*
12. Induced emf in a circuit is directly proportional to the rate of change of magnetic flux or field lines linked with the circuit*;*
13. Movement of the magnet cause a change in magnetic flux in the cell*;*

14. a) i) $v = f\lambda$

$$\frac{1}{f} = \frac{\lambda}{v};$$

ii) Slope $= \frac{4\times10^{-2}}{2}$

Velocity = $\frac{1}{Slope} = \frac{2\times100}{4} = 50m/s$

b) $V = f\lambda \quad \lambda = \frac{v}{f}$

$= 1.5\times10^{8} \qquad = 0.5m$

3.0×10^{8}

c) i) Compression - particles of air are clear than normal creating a region of high pressure *;*
Rarefaction - Particles of air are further apart than normal creating a region of low pressure*;*

ii) Length occupied by one compression and rarefaction (λ)
see diagram for indication

ii) $f = \frac{v}{\lambda} = \frac{330}{0.4} = 825Hz$

15.
a) i)
- Fix the zinc plate on the cap of the electroscope and charge the electroscope negatively*;*
- Illuminate the zinc plate with U.V rays and observe what happens to the leaf diagrams*;*
- leaf of the electroscope fall rapidly an indication that the plate and the leaf are losing the negative charge by photoelectric emission *;*

ii) Leaf divergence decrease rapidly when the illuminated zinc plate is negative and not effect on leaf divergence when the plate is positively charged.

b) i) A - cathode; B - Anode*;*
ii) To provide p.d. between the anode and the cathode *;*

c) Positive and potential is increased gradually and corresponding current recorded. Terminals of the battery are reversed and negative anode potential increase in steps until current falls to zero*;*
A graph of current I against pd is plotted *;*
Procedure above is repeated with the same radiation at a lower intensity *;*

d) $V_2 = \frac{h_C}{e\lambda} - \frac{w}{e}$

$$= \frac{6.6\times10^{-34}\times3.0\times10^{8}}{1.6\times10^{-19}\times4.5\times10^{-7}} - \frac{1.6\times10^{-19}\times21}{1.6\times10^{-19}};$$

$$= 0.65;$$

16.a) It opens the socket blind for the other two pins *;*

b) All the three wires connected to wrong pins*;*
Fuse rating should be 5A*;*
Cable not correctly gripped *;*

c) i) Ring main *;*
A - live *;* B - Neutral

ii) I. To guard against excessive currents*;*
II. To ensure that P breaks the circuit and appliance does not remain live*;*

iii) To guard against electric shocks*;*

17. a) Atomic number = 91*;*
Number of neutrons = 234 - 91 = 133*;*

b) i)- Thicker paper - lower countrate registered*;*
- Thinner paper - higher countrateregistered *;*
- Uniform thickness - constant countrate*;*

ii) α particles would be stopped by paper*;*

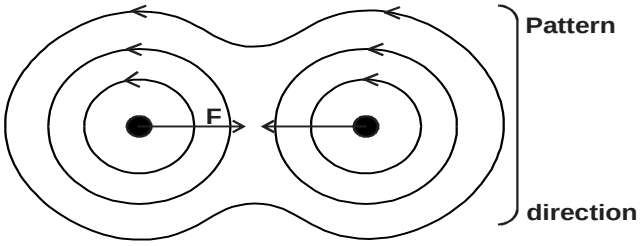
Gamma rays are not affected by thickness of paper*;*

iii) Indication on the graph *;*
Original activity and activity at half life*;*

-

$$t_{\frac{1}{2}} = 50 \pm 1;$$

18. a) i)



ii) Direction of F indicated;

b) i) Anticlockwise direction *;*

ii) A current flows in the coil a magnetic field is created around it*;*

- Interaction between the magnetic field due to current and that due to the permanent magnet creates equal and opposite forces on the coil making it to turn*;*
- A ensures that current in the coil is maintained in one direction
- P conducts current to Q through the coil and out of Q *;*

iii) Increase the number of cells *;*

c) i) Alignment of domains increase as number of turns increase *;* magnetic saturation is attained *;* when all domains are aligned *;*

ii) The same curve lower than the one drawn and a longer time to reach magnetic saturation *;* see graph.

NYAKACH SUB COUNTY JOINT EXAMINATION

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Paper - 232/3

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MARKING SCHEME

1. a) Read students value atleast to 1dp ***1 mark***

b) Average value of T = 0.7 sec. ***1 mark***

c) I. Diameter = 1.72cm ***1 mark***

II. Correct substitution - ***1 mark***
Evaluation for - ***1 mark***
Correct Answer - ***1 mark***

d) Correction substitution - ***1 mark***
Correct evaluation / answer - ***1 mark***

e)

	1	2	3	4	5	6	7
Burette reading (V) cm^3	**Use students value correct to 1.dp**						
P_1 cm							
P_2 cm							
d = (P2 - P1)cm	4.4	4.6	5.2	5.4	5.8	6.0	6.2
V=cm^3	1.5	3.0	4.5	6.0	7.5	9.0	10.5
d4	374.8	447.7	731.2	850.3	1131.6	1296	1477.6

Correct d values ½ mk for a mex of C. ***3 marks***
Correct V values ***1 mark***
correct evaluation of d4 ***1 mark***

f) Scale S - ½ mark
Axes 4 - ½ mark
Plotting - ***2 marks***

line - 1 mark

g) Correct substitution ***1 mark***
Correct evaluation ***1 mark***
Range 137 . 9

h) Correct substitution ***½ mark***
Correct evaluation - ½ mark
Range of R = 6.7657 cm

2. PART A

c) Length h_1 =2.7cm

f)

g) Graph **2**

Axes - 1 mark
Scale - 1 mark
Plotting - ½ × 4 = 2 marks
Line - 1 mark
TOTAL = 5 marks

h)

$$Slope, S = \frac{3.1-1.5}{20-44}$$ ✓ interval

✓ substitution

✓ evaluation

$$S = -0.067 cm^{-1}$$

i)

$$K = \frac{1}{S}$$

$$= \frac{1}{-0.067}$$

$$= -14.9$$

$$(-13.5) - (-17.0) cm$$

✓ substitution ½ mark

✓ evaluation ½

✓ accuracy ***1mark***

j) Focal length ***1 mark***

Q. 2 PART B

j) I_1 = 0.125✔½
I_2 = 0.15A ✔½
I_3 = 0.2A ✔½

k) V_1 = 0.9V ✔½
V_2 = 1.5V ✔½
V_3 = 2.1V ✔½

e) R_1 = 7.2Ω ✔½
R_2 = 10Ω ✔½

R_3 = 10.5 ✔½
Average R = 9.2Ω✔½