

# **TOP STUDENT KCSE**

## **PHYSICS PREDICTIONS**

### **(SERIES 1)**

**FOR MARKING SCHEMES**

**AND OTHER SIMILAR  
RESOURCES, CALL/WHATSAPP**

**0746 711 892**

**N/B:DUE TO HIGH COSTS INCURRED  
WHILE COMING UP WITH THIS AND OTHER SIMILAR  
RESOURCES,  
MARKING SCHEMES ARE NOT FREE OF  
CHARGE.  
QUESTIONS ARE FREE**

NAME.....ADM NO.....

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# **TOP STUDENT KCSE PREDICTIONS**

## **SERIES 1 TRIAL 1 PHYSICS PAPER 1**

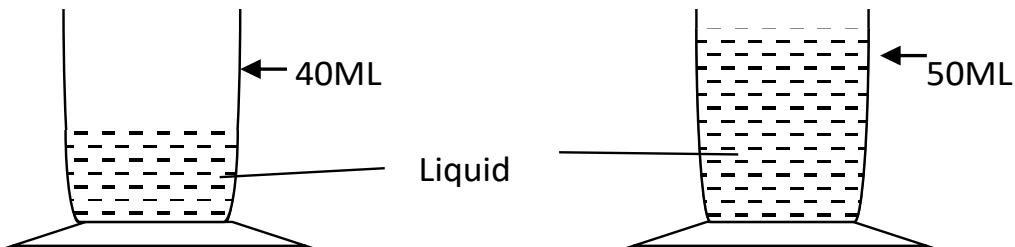
*Kenya Certificate of Secondary Exams*

**TIME: 2 HOURS**

### **SECTION A: 25 MARKS**

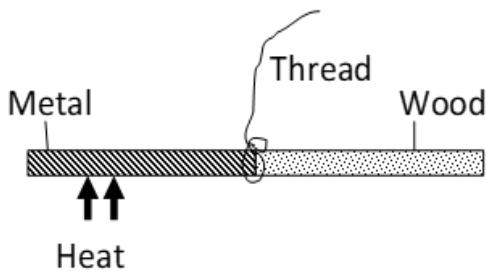
**Answer all questions**

1. A stone of mass 40g was completely immersed in a liquid. The level of liquid are shown in the figure



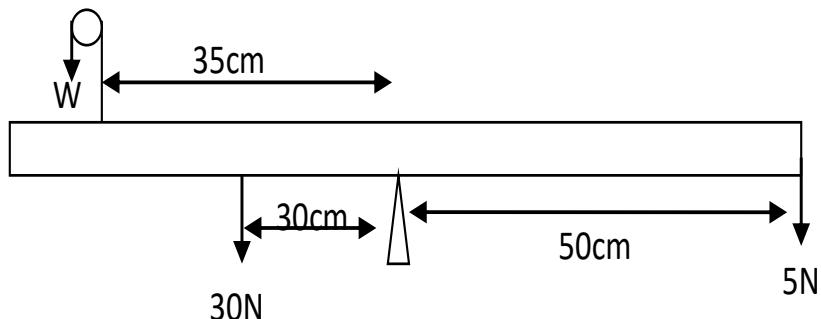
Determine the density of the stone in SI units **(2mks)**

2. The following figure shows a rod made of wood on one end and metal on the other end suspended freely with a piece of thread so that it is in equilibrium.



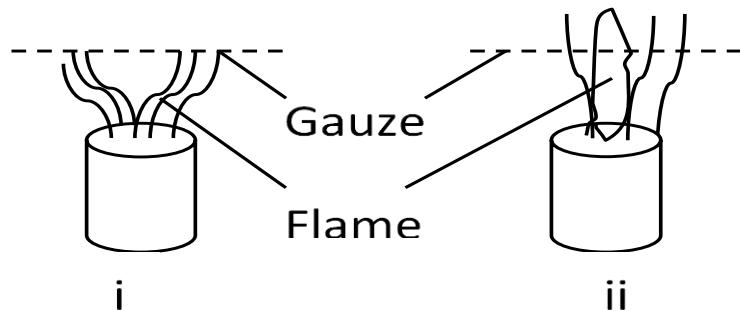
The side made of metal is now heated with a Bunsen flame. State with a reason, the side to which the rod is likely to tilt **(2mks)**

3. Estimate the size of an oil molecule if a drop of oil of volume  $6.0 \times 10^{-10} \text{ m}^3$  forms a patch of 32 on a water surface. **(2mks)**
4. Other than oil patch being monolayer, state any one other assumption in the oil drop experiment. **(1mk)**
5. An immersion heater rated at 180W is placed in a liquid of mass 2kg. When the heater is switched on for 7.5 minutes the temperature of the liquid rises by 400C. Determine the specific heat capacity of the liquid. **(3mks)**
6. Other than temperature state one other factor that affects the surface tension of water. **(1mk)**
7. The figure below shows a uniform bar pivoted at its centre and is at equilibrium.



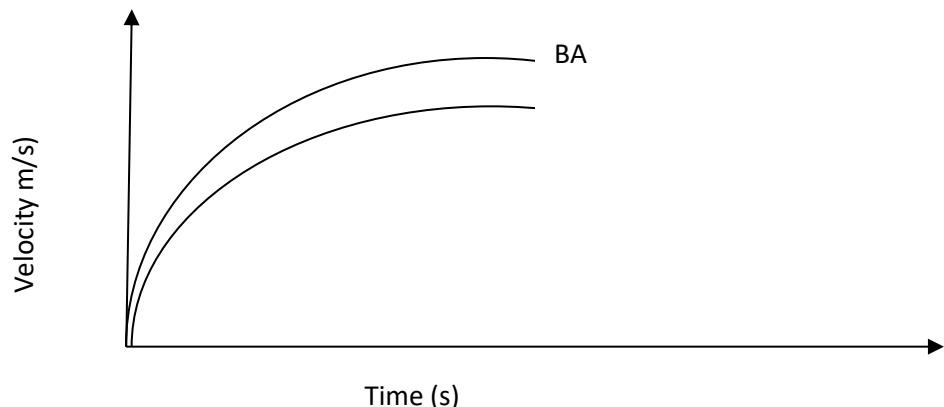
Determine the value of w. **(3mks)**

8. When a Bunsen burner is lit below wire gauze, it is noted the flame initially burns below the gauze as shown in
  - (i) After sometime, the flame burns below as well as above the gauze as shown in



(ii) Explain this observation (2mks)

9. The figure shows the velocity time graph of two identical spheres released from the surfaces of two liquids A and B.

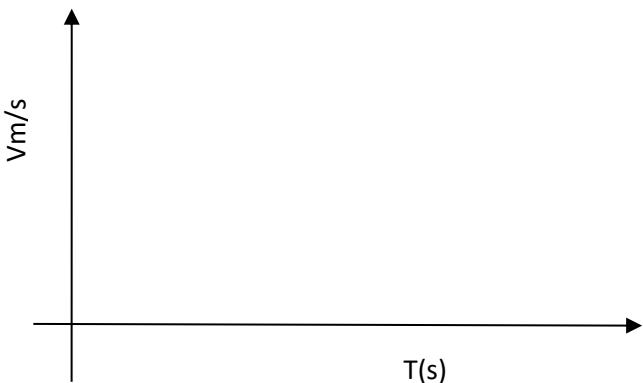


Give a reason why the terminal velocity of the sphere in B is higher than in A. (1mk)

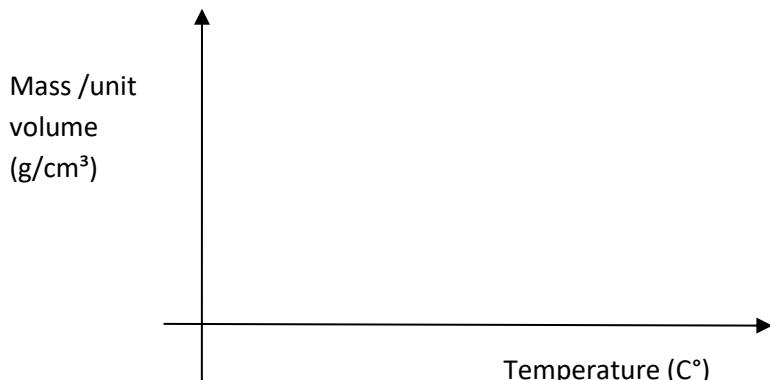
10. A box of mass 500g is dragged along a level ground at a speed of 12m/s. if the force of friction between the box and the floor is 2000N, calculate the power developed. (2mks)

11. State how heat losses by convection and radiation are minimized in a thermos flask. (2mks)

12. On the axes provided sketch a graph of velocity (v) verses time (t) for uniformly accelerated motion given that  $t=0, v$  is greater than zero. (1mk)



13. Sketch on the axes provided a graph to show how mass per unit volume of water varies with temperature when water is heated from  $0^0$  to  $20^0$  (2mks)



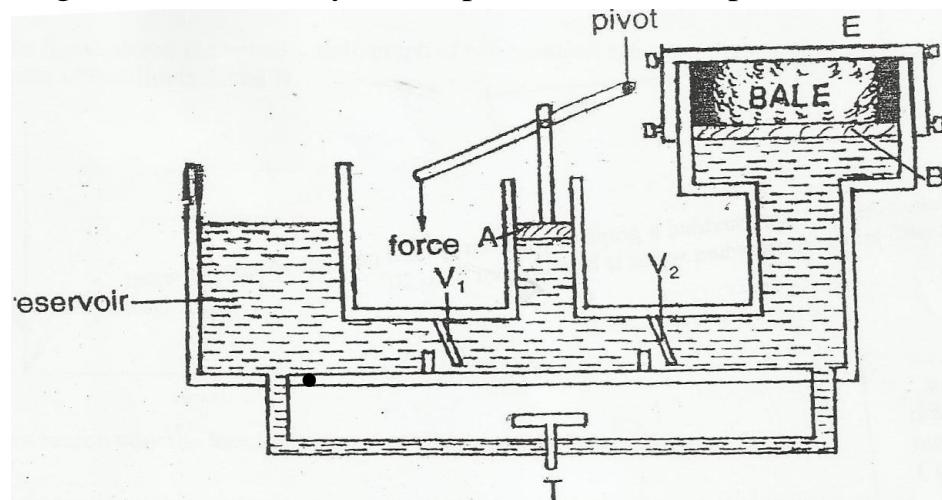
14. State how the velocity of a moving fluid varies with pressure. (1mk)

### **SECTION B (55 MARKS)**

**Answer all questions**

15. (a) When a fountain pen is taken in a high aero plane, it leaks. A ball point pen does not have this problem. Explain how the ball point is able to overcome this problem. (1mk)

**(b)** The fig below shows a hydraulic press used to compress a bale



**(i)** Explain briefly how a force applied on the lever compresses the bale. (4mks)

**(ii)** Given that the area of piston B is  $18\text{cm}^2$  and that of piston A  $3.0\text{cm}^2$ . A force of  $2\text{N}$  is applied to piston A, find the force produced on the larger piston B that compresses the bale. (2mks)

**(c)** A  $180\text{W}$  heater is immersed in a copper calorimeter of mass  $100\text{g}$  containing  $200\text{g}$  of alcohol. When the heater is switched on after  $36$  seconds the temperature of calorimeter and its contents rises by  $12^\circ$ . If S.H.C of water and copper is  $4200\text{J/kgk}$  and  $400\text{j/Kgk}$  respectively.

Determine:

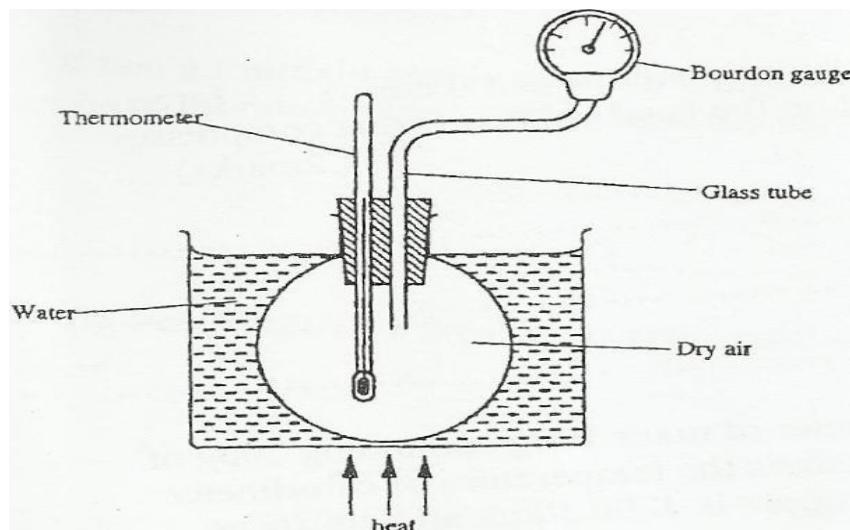
**(i)** Heat lost by the heater (2mks)

**(ii)** Heat gained by calorimeter and alcohol, if the specific heat capacity of alcohol  $C_u$ . (2mks)

**(iii)** The value of specific heat capacity of alcohol (1mk)

16. (a) State the pressure law for an ideal gas

(1mks)



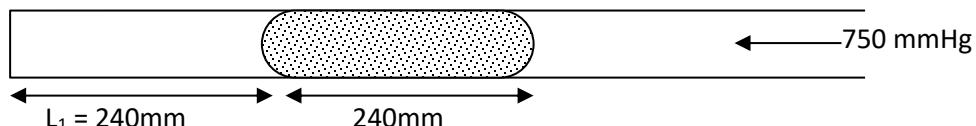
(b) The set up shows an arrangement to determine the relationship between temperature and pressure of a gas constant volume.

(i) Describe how pressure measurements are obtained in the experiment. (3mks)

(ii) Explain how the result form the experiment can be used to determine the relationship between temperature and pressure. (2mks)

(c) A bicycle tire is pumped to a pressure of  $2.2 \times 10^5 \text{ Pa}$  at  $23^\circ\text{C}$ . After a race the pressure is found to be  $2.6 \times 10^5 \text{ Pa}$ . Assuming the volume of the tire did not change, what is the temperature of the air in the tire. (3mks)

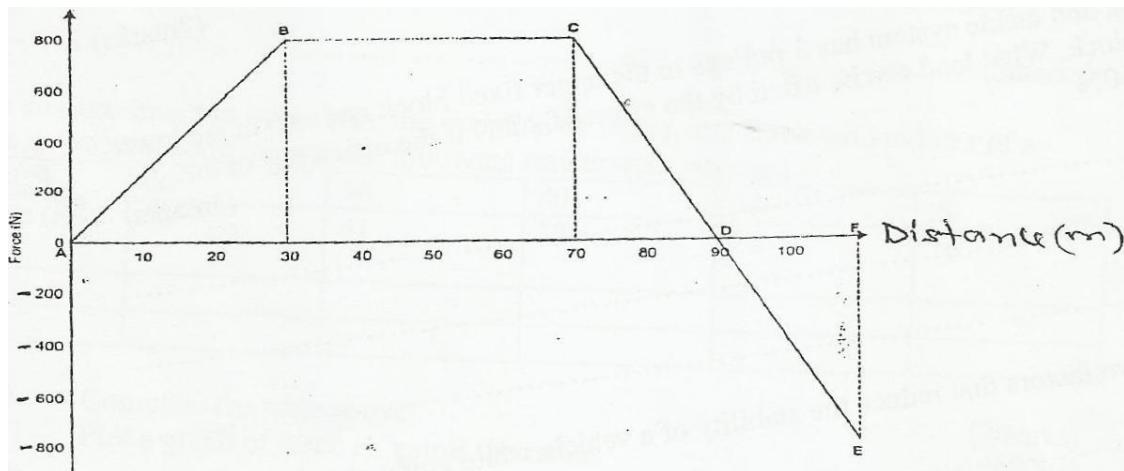
(d) Air is trapped inside a glass tube by a thread of mercury 240 mm long. When the tube is held horizontally the length of the air column is 240mm.



Assuming that the atmospheric pressure is 750mm Hg and the temperature is constant; calculate the length of the air column when the tube is vertical with open end down. (3mks)

**17. (a)** Define the term work (1mk)

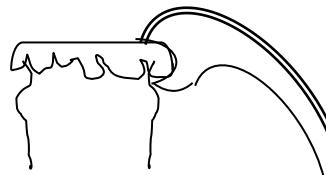
**(b)** The figure shows a force-distance graph for a car towed on a horizontal ground



**(i)** Calculate the total work done (3mks)

**(ii)** If the velocity just before reaching point C is 0.6m/s, calculate the power developed by the agent providing the force at this point. (3mks)

**(c)** The figure below shows a bottle top opener

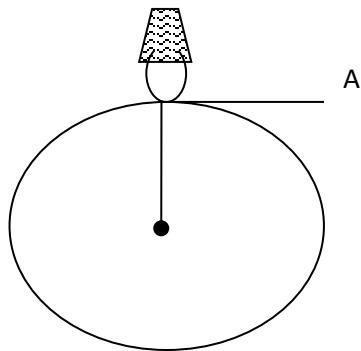


Indicate on the diagram the direction of the load and effort. (2mks)

**(d)** A block and tackle system has 3 pulleys in the upper fixed block and two in the lower movable block. What load can be lifted by the effort of 200N if the efficiency of the system is 60% (3mks)

**18. (a)** State two factors that reduce the stability of a vehicle while going round a banked bend. (2mks)

- (b)** The figure shows a bucket filled with water of mass 5kg tied on a string 2.0 m long being rotated in a vertical circle with a constant speed V m/s.



Calculate the minimum speed the bucket takes to rotate in position A so that the water remains in the bucket. **(3mks)**

- (c)** A car of mass 6000kg is driven round a horizontal curve of radius 250m. if the force of friction between the tyres and the road is 21000N, what is the maximum speed that the car can be driven at on the curve without going off the road. **(3mks)**
- (d)** In an experiment to investigate the variation of centripetal force with radius r of a circle in which a body rotates, the following results were obtained.

Mass(g)	60	50	40	30	20
Radius® cm	50	41	33	24	16
F(N)					
R(m)					

- (i)** Complete the table above **(2mks)**
- (ii)** Plot a graph of force F against the radius **(5mks)**
- (iii)** Given that mass of the body is 100g, use the graph to determine the angular velocity. **(3mks)**
- (e)** State one application of circular motion **(1mk)**

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# **TOP STUDENT KCSE PREDICTIONS**

## **SERIES 1 TRIAL 1 PHYSICS PAPER 2**

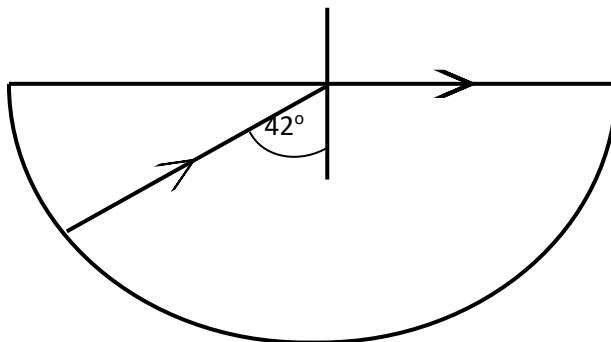
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**TIME: 2 HOURS**

### **SECTION A: (25 MARKS)**

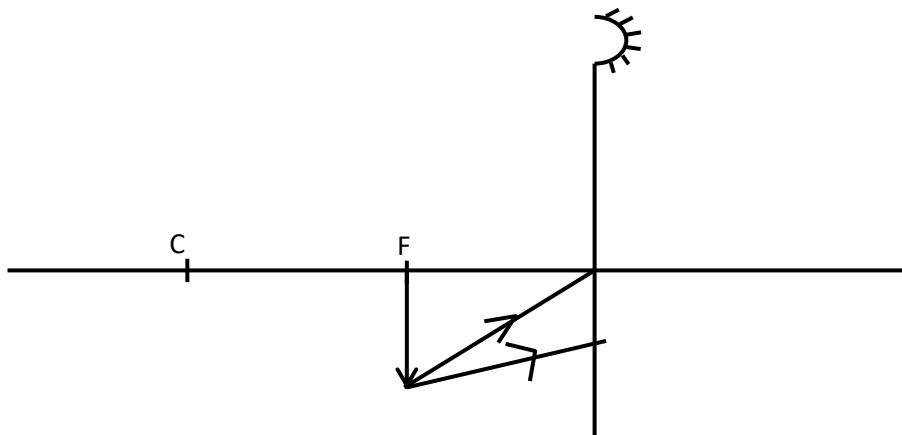
**Answer ALL questions this section in the spaces provided.**

1. What property of light is suggested by the formation of shadows? (1mark)
2. Why are audio recording hall walls covered with soft materials. (1mark)
3. A highly negatively charged rod is gradually brought close to the cap of a positively charged electroscope. It is observed that the leaf collapses initially and then diverges. Explain this observation. (3marks)
4. The figure below shows a ray of light incident on a face of semicircular prism. Determine the refractive index of the glass prism. (3marks)



5. Explain why repulsion is the only sure test for polarity of a magnet. (1mark)
6. State the use of manganese (IV) oxide in a dry cell. (1mark)

7. A lamp of height 6cm stands in front of pin-hole camera at a distance of 24cm from the pin-hole. The camera screen is 8cm from the pinhole. Calculate the height of the image formed on the screen. **(3marks)**
8. A car accumulator is rated 40A1 and is expected to supply a constant current for 120 minutes. Calculate the amount of current delivered. **(2marks)**
9. The figure **below** shows two incident rays on a concave mirror from the top of an object. Complete the ray diagram showing the reflected rays. **(2marks)**

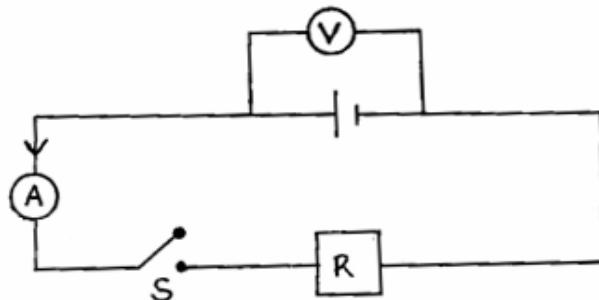


10. An electric bulb rated 40W is operated on 240V mains. Determine the resistance of its filament. **(3marks)**
11. The force on a straight conductor carrying current in a magnetic field can be varied by changing, among others, the magnitude of the current and the magnetic field strength. Name the other factors that can be changed to vary the force. **(2marks)**
- 12.(i) Distinguish between transverse and longitudinal waves. **(1mark)**  
(ii) Give **one** example of a transverse wave and one example of a longitudinal wave. **(2marks)**

## **SECTION B: (55 MARKS)**

**Answer ALL questions this section in the spaces provided.**

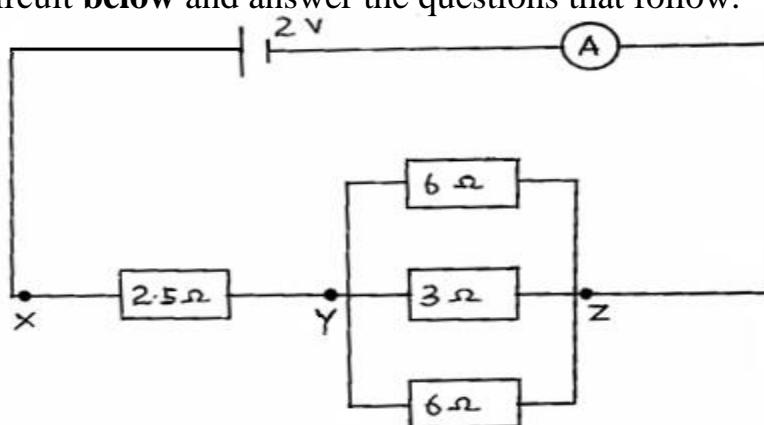
- 13.(a) In an experiment to determine the internal resistance of a cell, the following circuit was used.



It was noted that when S is open, the voltmeter reads 1.5V and when S is closed the voltmeter reads 1.3V and ammeter reads 0.2A.

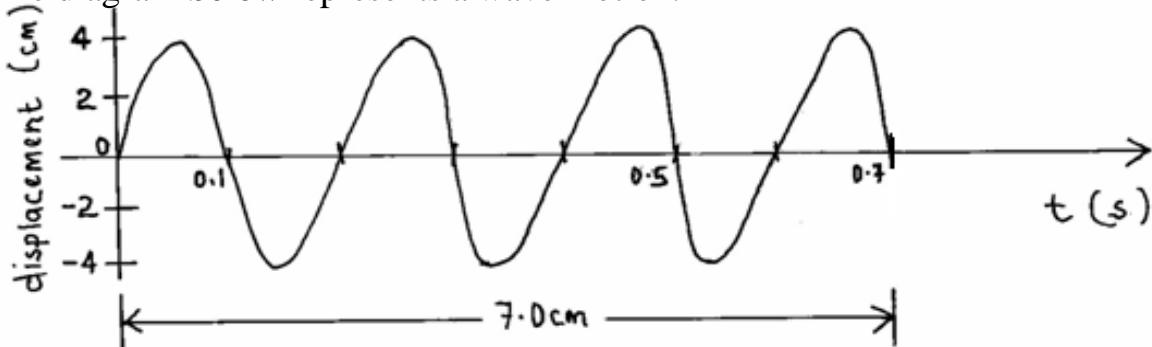
- (i) What is the e.m.f of the cell. (1mark)  
(ii) Determine the lost voltage. (1mark)  
(iii) Find the value of R. (2marks)  
(iv) Find the internal resistance of the cell. (2marks)

(b) Study the circuit **below** and answer the questions that follow.

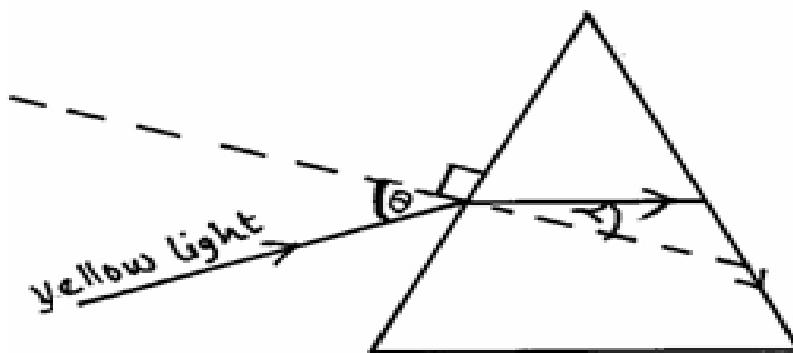


- (i) Determine the effective resistance of the circuit. (2marks)  
(ii) Find the ammeter reading. (2marks)  
(iii) Find the p.d between X and Y. (2marks)  
(iv) State the factors that affect the resistance of a conductor. (3marks)

14. The diagram below represents a wave motion.



- (i) What is the amplitude of the wave in metres. (1mark)
- (ii) How many cycles are made. (1mark)
- (iii) Calculate the wavelength,  $\lambda$ , of the wave. (2marks)
- (iv) Calculate the frequency of the wave. (2marks)
- (v) Calculate the velocity of the wave. (2marks)
- (b)(i) The echo sounder of a ship receives the reflected wave from a sea-bed after 0.2 seconds. What is the depth of the sea bed if the velocity of sound in water is 1450m/s. (3marks)
- (ii) State **two** factors that affect the speed of sound in air. (2marks)
- 15.(a) State **two** conditions necessary for total internal reflection to occur. (2marks)
- (b) Define the term critical angle as used in refraction of light. (1mark)
- (c) The figure **below** shows the path of a ray of light through a glass prism. The speed of yellow light in the prism is  $1.88 \times 10^8$ m/s.

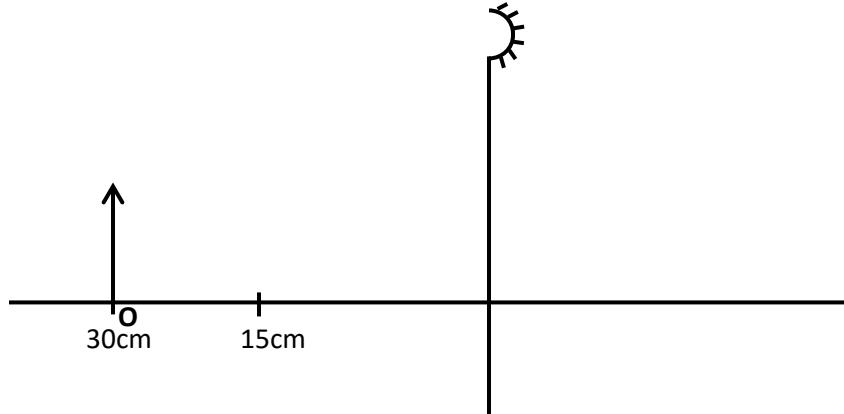


- (i) Determine the refractive index of the prism material for the light (speed of light in vacuum,  $c = 3.0 \times 10^8$ m/s). (3marks)
- (ii) Show on the figure, the critical angle,  $c$ , and determine its value. (4marks)

(iii) Given that  $r = 21.2^\circ$ , determine the angle  $\theta$ . (3marks)

16.(a) State the advantages of using a convex mirror as a driving mirror. (2marks)

(b) The figure below shows an object **O** placed in front of a converging mirror of focal length 15cm.

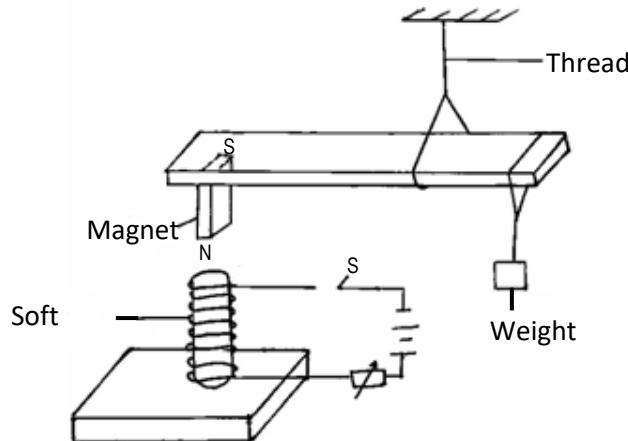


Draw on the figure a ray diagram to locate the image formed. (3marks)

(b) State why parabolic reflection is used in car headlights.

17.(a) State **three** factors that affect the strength of an electromagnet. (3marks)

(b) In the set up below, the suspended metre rule is in equilibrium balanced by the magnet and the weight shown. The iron core is fixed to the bench:



(i) State and explain the effect on the metre rule when the switch S, is closed. (2marks)

(ii) What would be the effect of reversing the battery terminals? (1mark)

- (c) The figure **below** shows two parallel current carrying conductors **A** and **B** placed close to each other. The direction of the current is into the plane of the paper.



On the same figure.

- (i) Sketch the magnetic field pattern. **(1mark)**
- (ii) Indicate the force F due to the current on each conductor. **(1mark)**

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# **TOP STUDENT KCSE PREDICTIONS**

## **SERIES 1 TRIAL 2 PHYSICS PAPER 1**

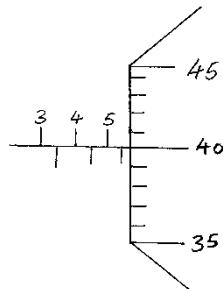
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**TIME: 2 HOURS**

### **SECTION A (25 Marks)**

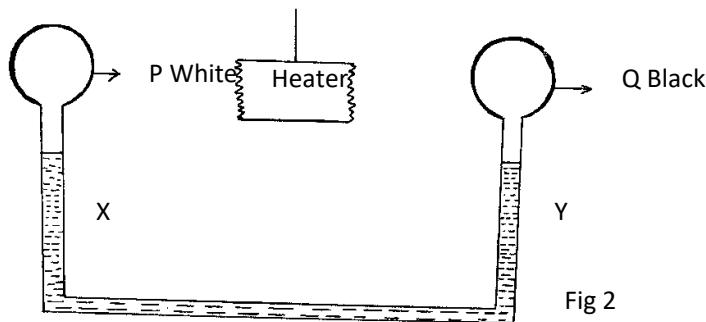
**Answer ALL questions in this section in the spaces provided.**

- Figure 1 shows a micrometer with a negative error of 0.02 mm, used to measure the diameter of a ball bearing.



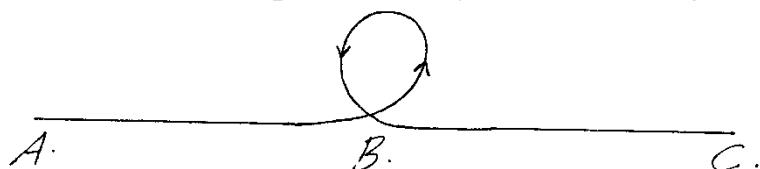
Record the diameter of the ball **(2mks)**

- Explain the washing effects of detergents of soap and why detergents in warm water washes greasy clothes even better **(2mks)**
- State the reasons why concrete beam reinforced with steel does not crack when subjected to changes in temperature **(1mk)**
- The diagram below shows two bulbs P and Q painted white and black



Explain what happens when the heater is turned on? (2mks)

5. The figure below shows the path taken by a fluid flowing from region A to C



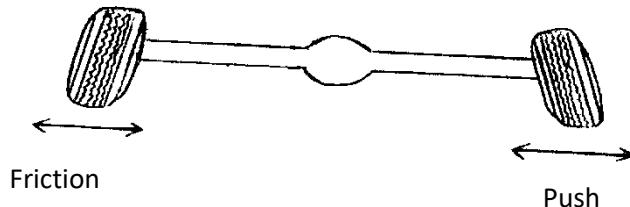
Explain the looping at B (1mk)

6. A car of mass 1000kg traveling at 36km/h is brought to rest over a distance of 20m. Find

- (i)The acceleration (2mks)  
(ii)The breaking force in Newton's (1mk)

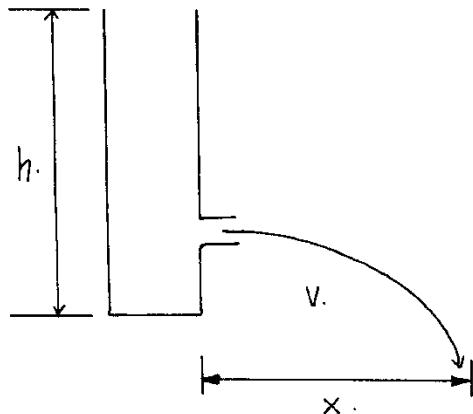
7. A carbon dioxide cylinder contains  $300\text{cm}^3$  of gas at a pressure of  $2.40 \times 10^7 \text{ pa}$ . Atmosphere pressure is  $1.01 \times 10^5 \text{ pa}$ . Calculate the volume of the gas at atmospheric pressure (2mks)

8. The figure below shows a cambered wheels



What is the advantage of these? (1mk)

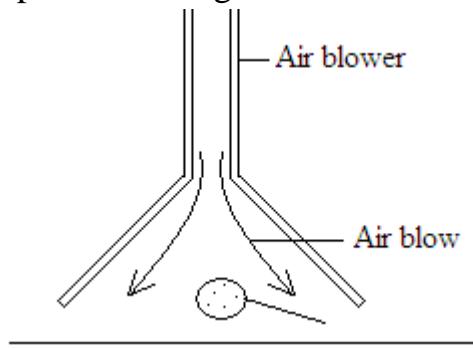
9. The diagram below shows a water tank of height h?



What is the relationship between the velocity  $V$  of the water jet and the height  $h$ ? (1mks)

10. A cylindrical container has a base area of  $150\text{cm}^2$  and is filled with water to a depth of 25cm. Find the pressure due to the column of the water on the base. (2mks)

11. The figure below shows a pith ball being lifted in to a funnel end of a blower.



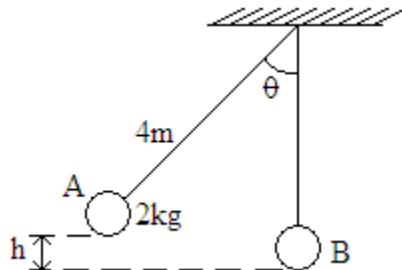
Explain this observation (2 mks)

12. A resultant force  $F$  acts on a body of ' $M$ ' causing an acceleration of  $A_1$  on the body.

When the same force acts on a body of mass  $2m$ , it causes an acceleration of  $A_2$ .

Express  $A_2$  in terms of  $A_1$ . (3 mks)

13. A metal ball suspended vertically with a wire is displaced through an angle  $\theta$  as shown in the diagram below. The body is released from A and swings back to 'B'.



Given that the maximum velocity at the lowest point B is  $2.5 \text{ m/s}$ . Find the height  $h$  from which the ball is released ( $g = 10 \text{ m/s}^2$ ) (3 mks)

## **SECTION B (55 Marks)**

**Answer ALL questions in this section in the spaces provided.**

**14.**

- a. Use simple sketches to show the three states of equilibrium.

Name the states.

(3 mks)

i. -

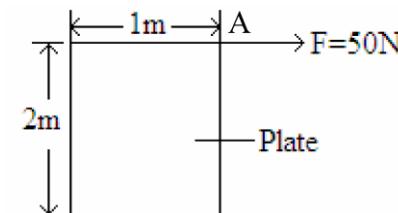
ii. -

iii. -

- b. Define center of gravity of a body. (1 mk)

- c. State two factors affecting stability of body (2 mks)

- d. The figure below shows a metal plate 2 m long, 1m wide and negligible thickness. A horizontal force of 50 N applied at point 'A' Just makes the plate tilt.



Calculate the weight of the plate. (3 mks)

15. (a) State what is meant by the term 'specific latent heat of vaporization' (1mk)

- b) In an experiment to determine the specific latent heat of vaporization of water, steam at  $100^{\circ}\text{C}$  was passed into water contained in a well-lagged copper calorimeter. The following measurements were made;

Mass of calorimeter 50g

Initial mass of water 70g

Final mass of calorimeter + water + condensed steam = 23g

Final temperature of mixture = 30g

(Specific heat capacity of water =  $4,200 \text{ Jkg}^{-1} \text{ K}^{-1}$  specific heat capacity for copper =  $390 \text{ Jkg}^{-1} \text{ K}^{-1}$ )

- (i) Determine the:

I Mass of condensed steam

(2mks)

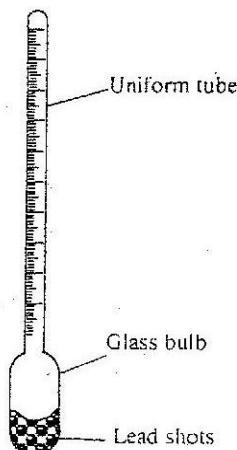
**II Heat gained by the calorimeter and water (3mks)**

**(ii) Given that L is the specific latent heat of vaporization of steam,**

**I) write an expression for the heat given out steam. (1mk)**

**II) Determine the value of L. (3mks)**

16. a) State the Archimedes principle (1mk)  
b) State the law of floating (1 mark)  
(c)The figure below shows a simple hydrometer



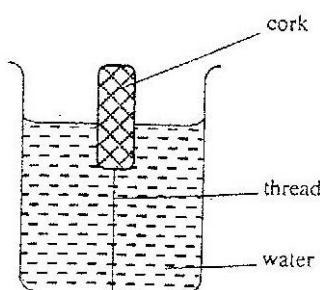
**(i) State the purpose of the lead shots in the glass bulb (1 mark)**

**(ii) How would the hydrometer be made more sensitive? (1 mark)**

**(iii) Describe how the hydrometer is calibrated to measure relative density (2mks)**

**(d) Figure 14 shows a cork floating on water and held to the bottom of the**

**cork beaker by a thin thread.**



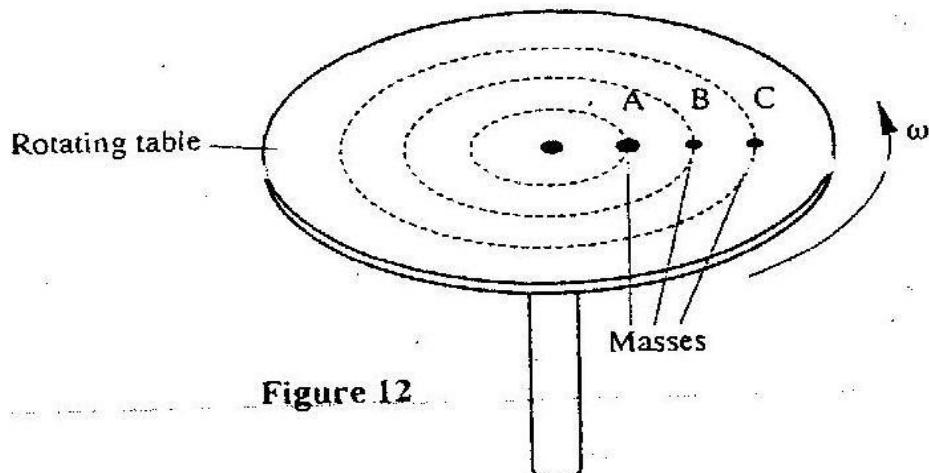
**Figure 14**

**(i) Name all the forces acting on the cork (3marks)**

**(ii) Describe how each of the forces mentioned in (i) above changes when water is added into the beaker until it fills up. (3 marks)**

**17. (a)** State what is meant by centripetal acceleration (1mk)

**(b)** The figure below shows masses, A, B and C placed at different points on a rotating table. The angular velocity,  $\omega$ , of the table can be varied.



- (i)** State two factors that determine whether a particular mass slides off the table or not ( 2 marks)
- (ii)** It is found that the masses slide off at angular velocities  $\omega_A$ ,  $\omega_B$ , and  $\omega_C$  respectively. Arrange the values of  $\omega_A$ ,  $\omega_B$ ,  $\omega_C$  in decreasing order. (1mk)
- (c)** A block of mass 200g is placed on a frictionless rotating table while fixed to the centre of the table by a thin thread. The distance from the centre of the table to the block is 15 cm. If the maximum tension the thread can withstand is 5.6N. Determine the maximum angular velocity the table can attain before the thread cuts. (4 mks)
- d)** A turntable of radius 8cm is rotating at 33 revolutions per second. Determine the linear speed of a point on the circumference of the turntable. (4 marks)
- e)** Define angular velocity. (1 Mark)

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## **TOP STUDENT KCSE PREDICTIONS**

### **SERIES 1 TRIAL 2 PHYSICS PAPER 2**

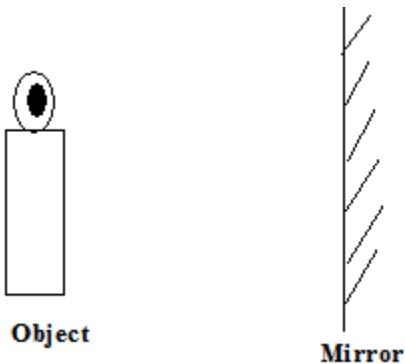
*Kenya Certificate of Secondary Exams*

**TIME: 2 HOURS**

#### **SECTION A (25 Marks)**

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

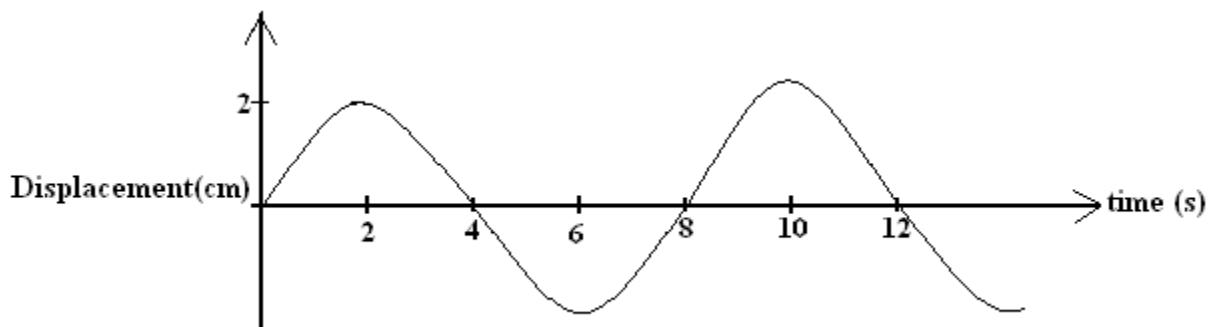
1. Locate the position of the image of the object placed in front of a plane mirror shown below.(2 mks)



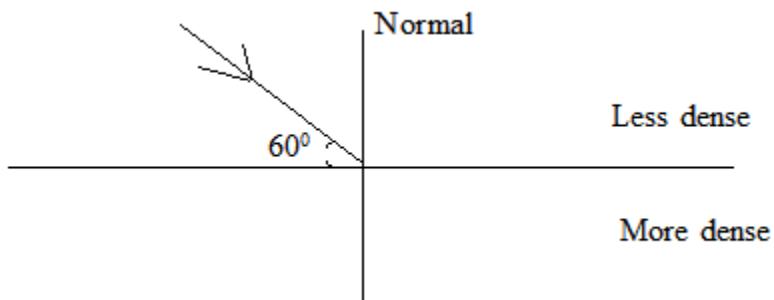
2. Show the magnetic field pattern of the current carrying conductors shown below. (2 mks)



3. State two factors that determine the strength of an electromagnet. (2 mks)
4. State two advantages of using a convex mirror as a driving mirror. (2 mks)
5. State two factors that affects the resistivity of an electrical conductor. (2 mks)
6. The figure below shows a wave in progress.



- Determine the
- a) Amplitude (1 mark)
- b) Frequency (2 marks)
7. The figure below shows light travelling from less dense to more dense medium.



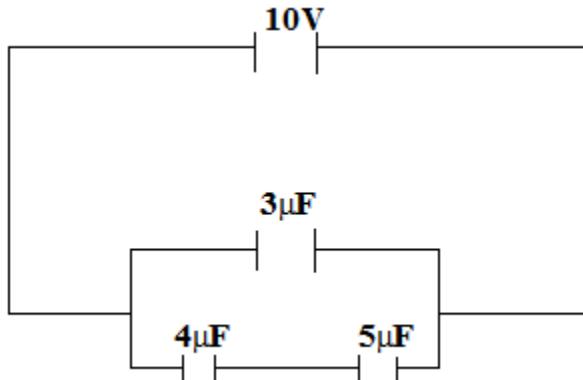
- a) Show the direction of the refracted ray. (1 mark)
- b) If the refractive index of the more dense medium is 1.4, calculate the angle of refraction. (3 marks)
8. A current  $I$ , flowing through a wire of resistance  $R$ , is increased by seven times. Determine the factor by which the rate of heat production was increased. (3 marks)
9. The wavelength of a radio wave is 1km. Determine its frequency if the speed is  $3 \times 10^8 \text{ ms}^{-1}$  (2 marks)
10. State two uses of gold leaf electroscope. (2 marks)
11. Give a reason why soft iron is used as a core of the coil of an electric bell. (1 mark)
12. State two differences between pinhole camera and the human eye. (2 marks)
13. State two types of waves. (2 marks)

## **SECTION B (55 MARKS)**

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

- 14.a) Define the following terms.

- i) Capacitor (1 mark)
- ii) Capacitance (1 mark)
- b) Three capacitors are connected to a 10v battery.

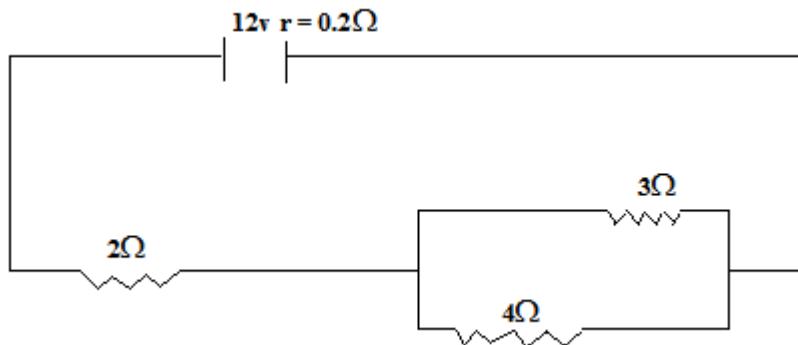


Calculate

- i) the effective capacitance (3 marks)
- ii) the total charge (3 marks)
- c) State three factors that determine the capacitance of a capacitor. (3 marks)

**15.a)** Define a resistor. (1 mark)

**b)** The figure below shows three resistors connected to 12v supply of internal resistance of  $0.2\Omega$ .



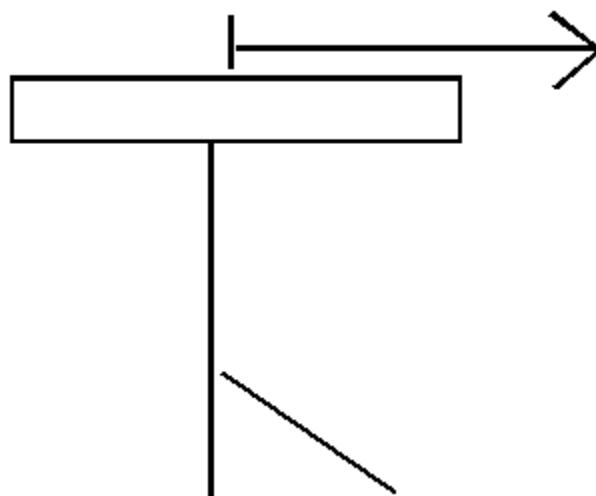
Calculate

- i) the effective resistance. (3 marks)
- ii) the total current in the circuit. (2 marks)
- iii) the current through the  $4\Omega$  resistance. (3 marks)
- c) If the current flows for 2 minutes calculate the total energy dissiparted. (2 marks)
- d) State two applications of resistors in real life situation. (2 marks)

(i)-

(ii)-

- 16.a) Explain briefly how a material acquires a positive charge. (3 marks)
- b) A steel pin is placed on the cap of a highly charge electroscope.



State and explain the observation that will be made on the gold leaf. (2 marks)

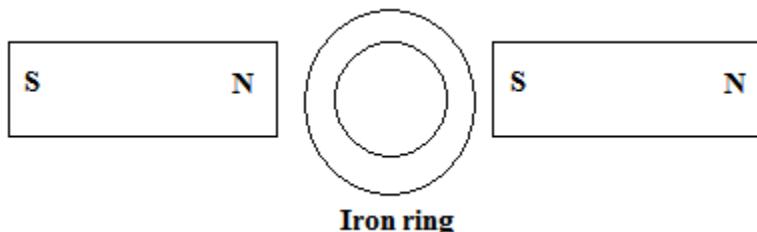
- c) State a reason why a candle flame is blown away when a highly charged metal is brought close to it.

**(2 marks)**

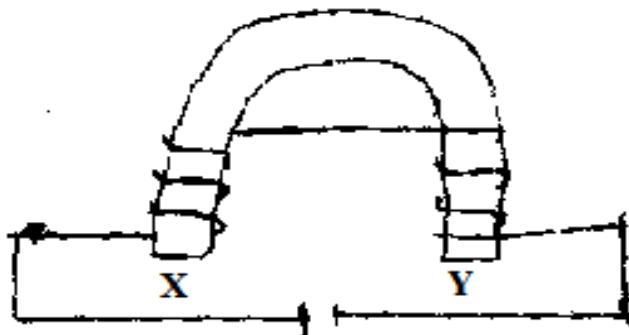
- d)** Explain briefly why it is not advisable to take shelter on a tree when it is raining. **(2 marks)**

- e)** State two dangers of electrostatic charges. **(2 marks)**

- 17.a)** State two methods of magnetisation. **(2 marks)**
- b)** Why is repulsion the surest way of identifying a magnet. **(2 marks)**
- c)** Complete the diagram below to show the magnetic field patterns. **(2 marks)**



- d) i)** The figure below is a U-shaped iron core. Indicate the polarity at X and Y. **(2 marks)**



- ii)** State two applications of such an electromagnet. **(2 marks)**

- 18.a)** A pin is placed at the bottom of a beaker containing a transparent liquid. When viewed from the top the pin appears nearer the surface than it actually is. Explain the observation. **(2 marks)**

- b)** The table below shows the results obtained from such an experiment.

Apparent depth (cm)	2.21	3.68	5.15	6.62	8.09
Real depth cm	3.0	5.0	7.0	9.0	11.0

- i)** Plot a graph of real depth against apparent depth. **(5 marks)**  
**(GRAPH PAPER PROVIDED)**

NAME.....ADM NO.....

SCHOOL.....CLASS.....

DATE.....

# **TOP STUDENT KCSE PREDICTIONS**

## **SERIES 1 TRIAL 3 PHYSICS PAPER 1**

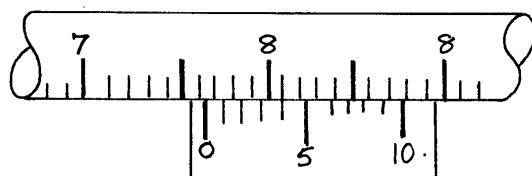
*Kenya Certificate of Secondary Exams*

**TIME: 2 HOURS**

### **SECTION I (30MKS)**

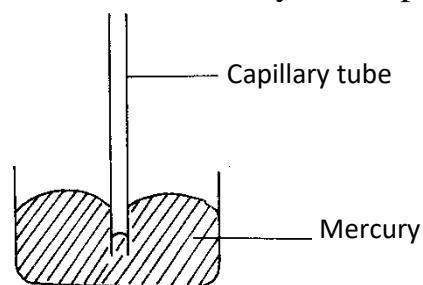
**Answer all questions in the spaces provided**

1. The figure below shows a vernier calipers scale



State the correct reading of scale if the instrument has a zero-error of -0.02cm 2 mks

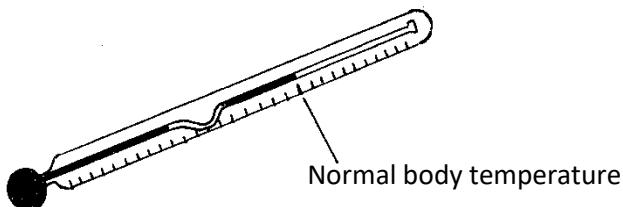
2. The diagram below shows the behaviour of mercury in a capillary tube.



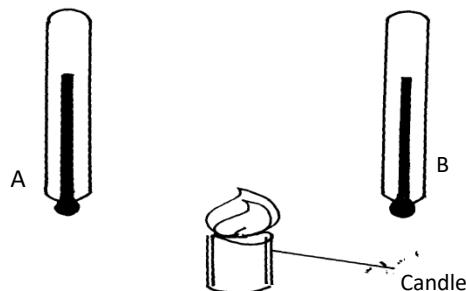
Explain the behaviour

**2mks**

3. In an experiment to estimate the size of a molecule of olive oil, a drop of oil of volume  $0.12\text{cm}^3$  was placed on a clean water surface. The oil spread on a patch of diameter  $6.0 \times 10^6 \text{ mm}^2$ .
- a) Calculate the size of the molecule (3mks)
- b) State an assumption made in the above calculations. (1mk)
4. The figure below shows a clinical thermometer.

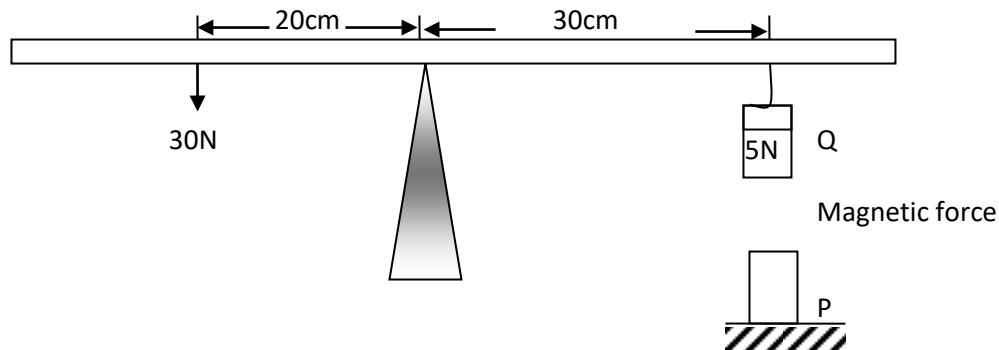


- State the function of the constriction. (1mk)
5. The figure below shows two identical thermometers. Thermometer A has a blackened bulb while thermometer B has a silvery bulb. A candle is placed equidistant between the two thermometers



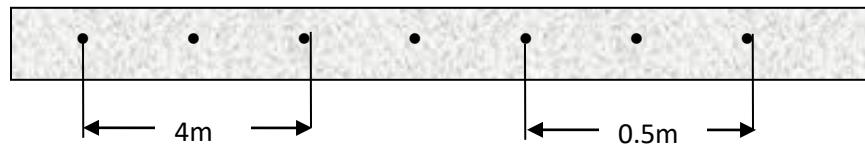
State with a reason the observations made after some time (2mark)

6. A uniform metre rule is balanced at its centre. It is balanced by the 30N, 5N and the magnetic force between **P** and **Q**. **P** is fixed and **Q** has a weight of 5N



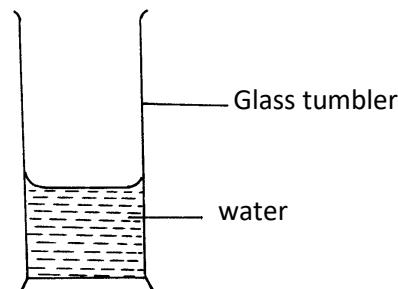
Ignoring the weight of the metre rule, calculate the value of the magnetic force between **Q** and **P**. **(2mks)**

7. The pattern below shows oil leakage on a path at the rate of 10drops per second from a lorry.



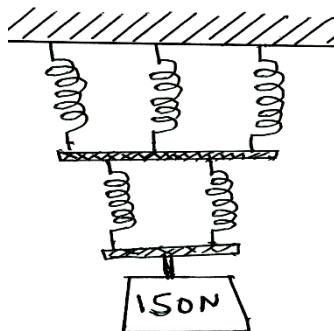
Calculate the acceleration of the lorry **(3mks)**

8. The figure below shows a glass tumbler partly filled with water at room temperature.



Briefly explain what happens to the stability of the tumbler when water is cooled to temperatures below  $0^{\circ}\text{C}$ . **(1mk)**

9. The spiral springs shown in the figure below are identical. Each spring has a spring constant  $K = 300\text{N/m}$ . Each rod weighs  $0.1\text{N}$  and each spring weighs  $0.2\text{N}$ .



- (a) Determine the total extension caused by the  $150\text{N}$  weight. (2marks)
- (b) Apart from length of the spring and nature of material, state one other factor affecting the spring constant. (1mark)
10. A car is brought to rest from a speed of  $30\text{m/s}$  in 2 seconds. If the driver's reaction time is  $0.3\text{s}$ , determine the shortest stopping distance. (3mks)
11. The figure below shows a Bunsen burner.

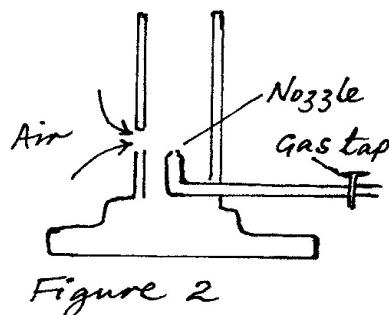


Figure 2

Use the Bernoulli's Principle to explain how air is drawn into the burner when the gas tap is opened. (2mks)

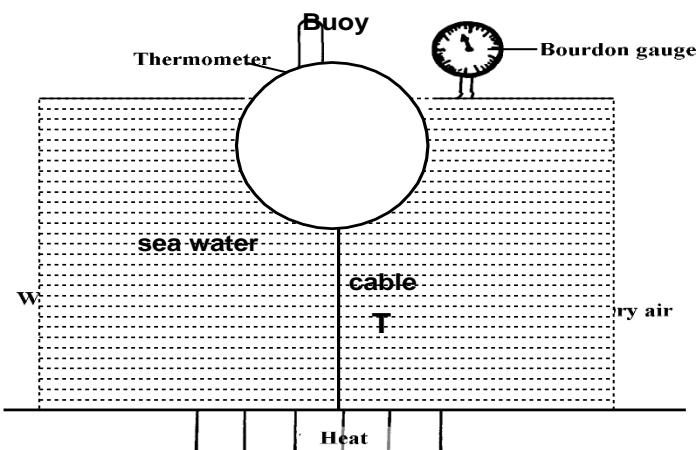
## SECTION II (55 marks)

Answer all the questions

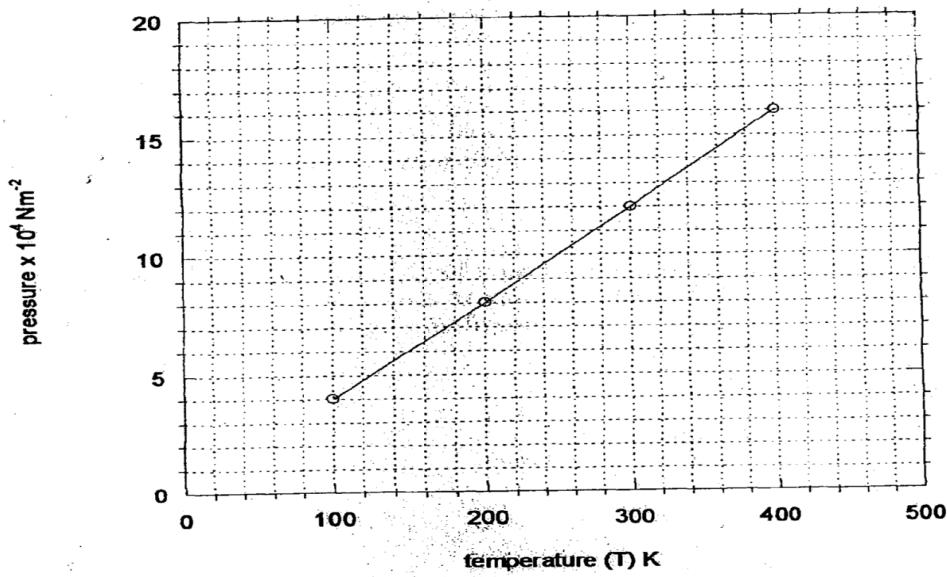
12. a) i) Define Archimedes's Principle. (1 mark)
- ii) An object weighs  $1.04\text{N}$  in air,  $0.64\text{N}$  when fully immersed in water and  $0.72\text{N}$  when fully immersed in a liquid. If the density of water is  $1000 \text{ kg m}^{-3}$ , find the density of the liquid. (3 marks)

- b) i)** Define the law of floatation (1 mark)
- ii)** Give a reason why a steel rod sinks in water while a ship made of steel floats on water. (1 mark)
- iii)** Draw a clearly labelled diagram of a common hydrometer which is suitable for measuring the densities of liquids varying between  $1.0$  and  $1.2 \text{ g cm}^{-3}$ . (2 mks)
- iv)** The figure below shows a buoy, B, of volume  $40$  litres and mass  $10$  kg. It is held in position in sea water of density  $1.04 \text{ g cm}^{-3}$  by a light cable fixed to the bottom so that  $\frac{3}{4}$  of the volume of the buoy is below the surface of the sea water. Determine the tension T in the cable. (2 marks)

**13.** The figure below shows a simple set up for pressure law apparatus:-

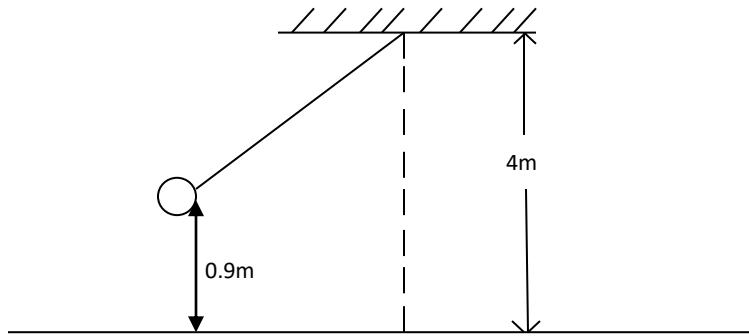


- a)** Describe how the apparatus may be used to verify pressure law (2 marks)
- b)** The graph in the figure below shows the relationship between the pressure and temperature for a fixed mass of an ideal gas at constant volume



- i) Given that the relationship between pressure,  $P$  and temperature,  $T$  in Kelvin is of the form  $P = kT + C$  Where  $k$  and  $C$  are constants, determine from the graph, values of  $k$  and  $C$ . (2 marks)
- ii) Why would it be possible for pressure of the gas to be reduced to zero in practice? (1 mark)
- c) A gas is put into a container of fixed volume at a pressure of  $2.1 \times 10^5$  Nm<sup>-2</sup> and temperature 27°C. The gas is then heated to a temperature of 327°C. Determine the new pressure (2 marks)
- 14. (a)** An electric crane lifts a load of 2000kg through a vertical distance of 3.0m in 6s. Determine:
- i) Work done (1mk)
  - ii) Power developed by the crane (2mks)
  - iii) Efficiency of the crane if it is operated by an electric motor rated 12.5 Kw. (2mks)

- b) A bob of mass 20kg is suspended using a string of 4m from a support and swings through a vertical height of 0.9m as shown below:



Determine:

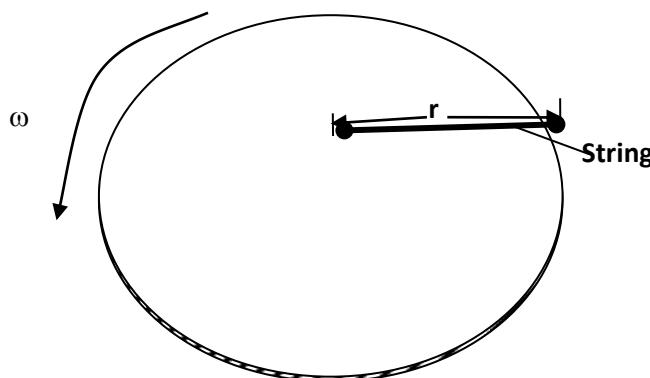
- i) The potential energy of the body at this position. (2mks)
- ii) Speed of the body when passing through the lowest point. (2mks)

15. (a) The moon goes round the earth at constant speed. Explain why it is true to say that the moon is accelerating. (1 mark)

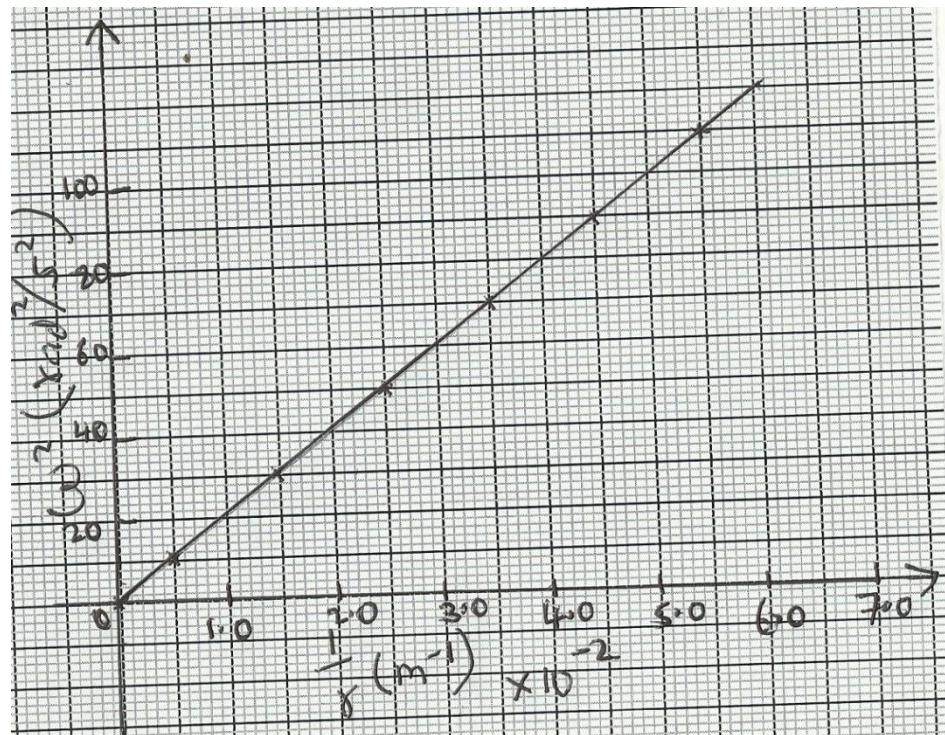
(b) A string of negligible mass has a bucket tied at the end. The string is 60cm long and the bucket has a mass of 45g. The bucket is swung horizontally making 6 revolutions per second. Calculate:

- (i) The angular velocity. (1 mark)
- (ii) The centripetal acceleration. (2 marks)
- (iii) The tension on the string. (2 marks)
- (iv) The linear velocity. (1 mark)

(c) The figure below shows a body of mass;  $m = 200\text{g}$  attached to the centre of a rotating table with a string. The radius of the string was varied and different values of angular velocity recorded. The mass of the body remained constant throughout the experiment.



d) The results obtained for angular velocity and radius were used to plot the following graph;



From the above graph;

(i) Calculate the value of the slope. (2marks)

(ii) If  $\omega^2$  and  $\frac{1}{r}$  are related by the equation;  $\omega^2 = \frac{P}{r} \times \frac{1}{m}$ , find the value of P.

(2marks)

(iii) State the significance of P. (1mark)

16. (a) Define the term specific heat capacity. (1 mark)

(b) A block of metal of mass 150g at 100°C is dropped into a lagged calorimeter of heat capacity 40Jk<sup>-1</sup> containing 100g of water at 25°C. The temperature of the resulting mixture is 34°C. (Specific heat capacity of water = 4200Jkg<sup>-1</sup>). Determine;

- (i) Heat gained by calorimeter. (2 marks)
- (ii) Heat gained by water. (2 marks)
- (iii) Heat lost by the metal block. (1 mark)
- (iv) Specific heat capacity of the metal block. (2 marks)

(c) State two differences between boiling and evaporation. (2mark)

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

(ii) A striker kicks a ball of mass 250g initially at rest with a force of 75N. if the foot was in contact with the ball for 0.10sec. Calculate the take-off velocity of the ball. (2 marks)

(b) A bullet of mass 20g moving at 400 m/s strikes a block of wood of mass 3.5kg initially at rest. The bullet sticks into the block and the two move off together on a horizontal surface, where a frictional retarding force of 4N is acting between the block and surface.

(i) Determine the initial common velocity of bullet and wooden block. (2marks)

(ii) What distance does the block move before coming to rest? (2marks)

NAME.....ADM NO.....

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DATE.....

# **TOP STUDENT KCSE PREDICTIONS**

## **SERIES 1 TRIAL 3 PHYSICS PAPER 2**

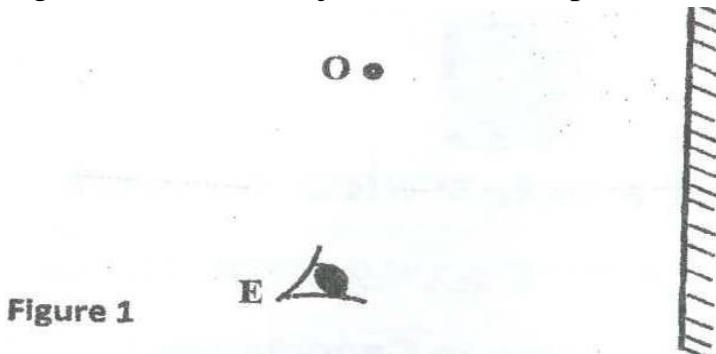
*Kenya Certificate of Secondary Exams*

**TIME: 2 HOURS**

### **SECTION A (25 MARKS)**

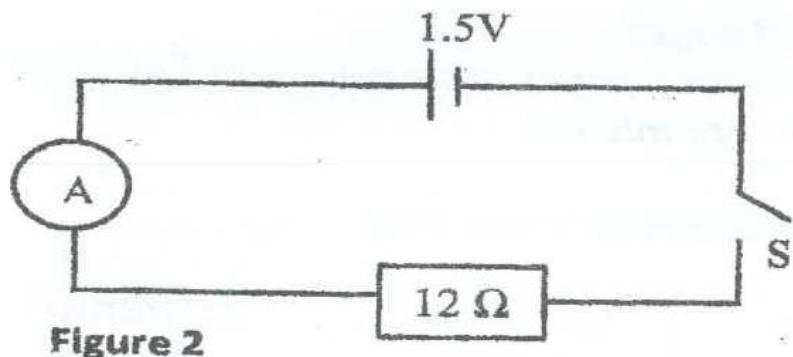
*Answer ALL the questions in this section in the spaces provided after each section*

1. Figure 1 shows an object in front of a plane mirror



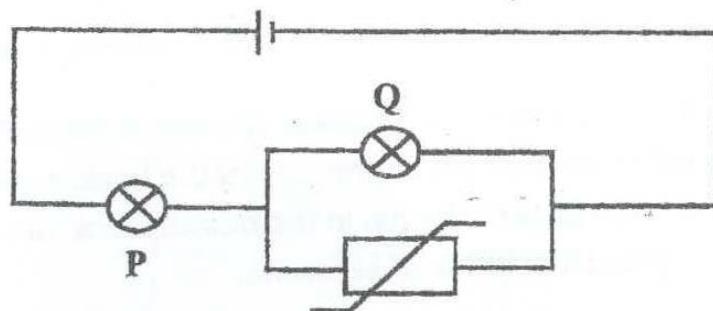
Draw a pair of rays on the diagram above to locate the position of the image I of the object O as seen by the eye, E **(2Marks)**

2. Figure 2 shows an electric circuit in which the ammeter has negligible resistance. When the switch S is closed, the ammeter reads 0.10A. Determine the internal resistance of the cell. **(3marks)**



**Figure 2**

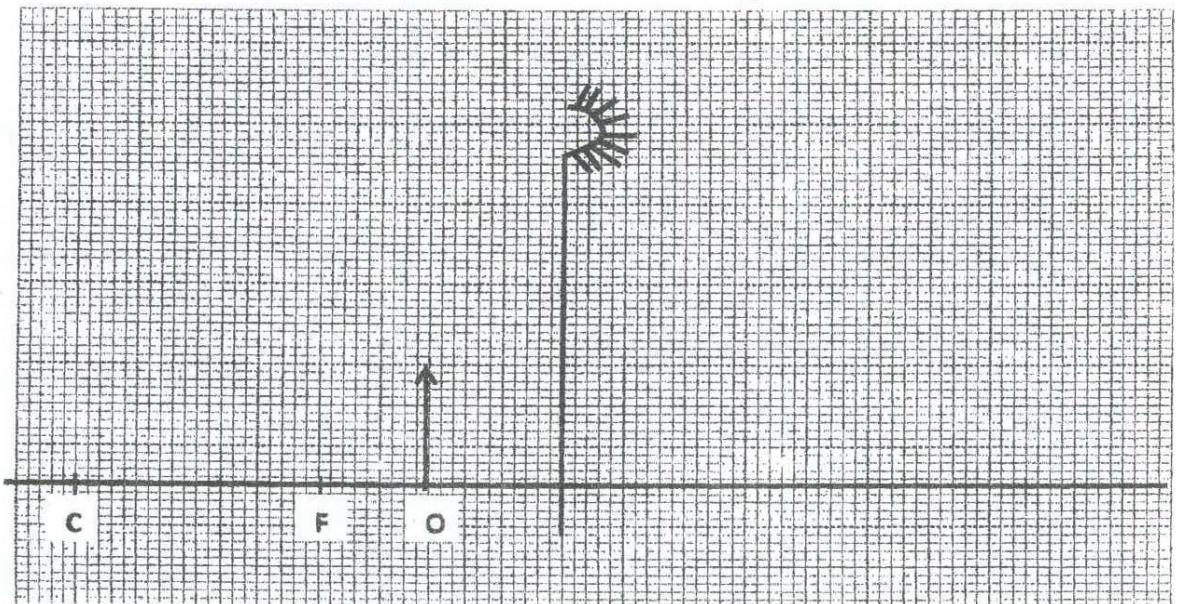
3. A highly positively charged rod is gradually brought close to the cap of negatively charged electroscope, its observed that the leaf initially decreases and then increases. Explain this observation **(2marks)**
4. Figure 3 shows a circuit containing a battery, two identical bulbs P and Q and a thermistor.



**Figure 3**

State and explain what will happen to the brightness of the bulb P when the thermistor is steadily heated. **(2marks)**

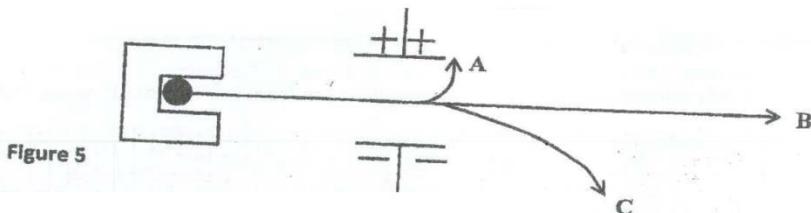
5. A lady holds a concave mirror a short distance from her face as shown in figure 4



**Figure 4**

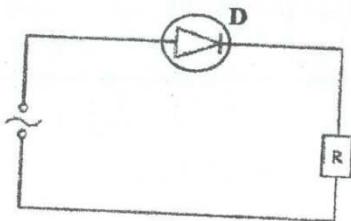
Given that her face represented by object O is as shown on the graph above:

- Draw a ray diagram to show how the image of her face is formed. **(2marks)**
  - State one characteristic of the image formed **(1mark)**
6. A pin is placed at the bottom of a beaker of depth 14.5cm. The beaker is then filled with kerosene. By using another pin on the side of the beaker and observing from the top, the distance of the image of the pin in the beaker is found to 4.5cm from the bottom.  
Determine the refractive index of kerosene. **(2marks)**
7. Figure 5 below shows the paths taken by three radiations A, B and C from a radioactive source through an electric field.



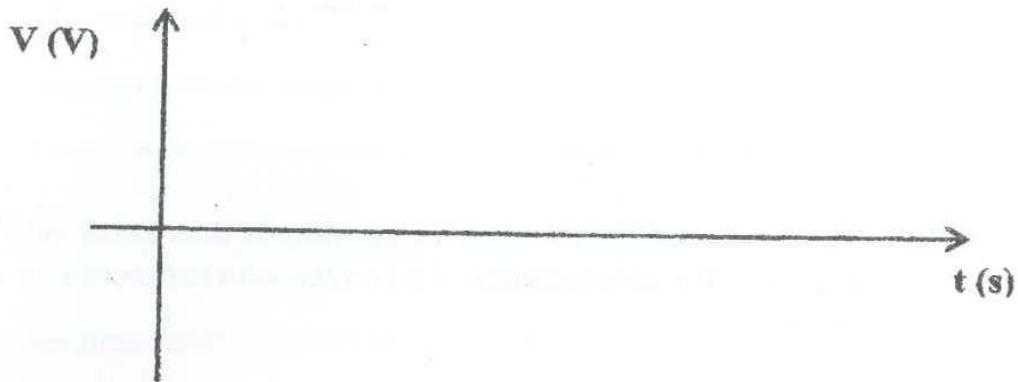
Explain why radiation B is not deviated by the electric field. **(1mark)**

8. Figure 6 shows an alternating current (a.c) connected across a diode D and a resistor R



**Figure 6**

- Show on the diagram where a C.R.O can be connected to display the output voltage. **(1mark)**
- On the axes provided sketch the output as observed on the C.R.O in (a) above **(1mark)**



- The two conducting balls shown in figure 7 are identical and contain the number of excess electrons indicated. The two balls are made to touch. Determine how much charge in coulombs each will have. ( $e=1.6 \times 10^{-19} C$ ) **(2marks)**



**Figure 7**

- In a C.R.O, a wave form given in figure 8 was displayed on the screen. The Y gain was set at 5V/cm and time based calibration is 20milliseconds per cm.

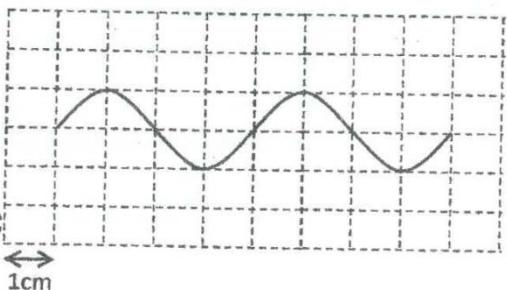


Figure 8 · 1cm

1cm

Determine the frequency f the voltage

(2marks)

11. The conductivity of a metallic conductor decreases with increase in temperature whereas the conductivity of a semiconductor increases with increase in temperature. Explain (2marks)
12. Figure 9 shows the cross section of a conductor held between two bar magnets.



Figure 9

Indicate with an arrow on the diagram the direction in which the conductor should be moved in order to cause current to flow as shown (1mark)

13. Electricity can be dangerous. Safety devices such as fuses are often used in circuits and electrical appliances. Give one other example of an electrical safety device (1mark)

### **SECTION B (55 MARKS)**

*Answer all the questions in this section in the spaces provided after each question*

- 14.a) State one difference between light and sound waves (1mark)
- b) Briefly explain how sound is propagated in the air (1mark)
- c) Figure 10 shows a set up made by a form 2 student at a high School to study an aspect of a wave.

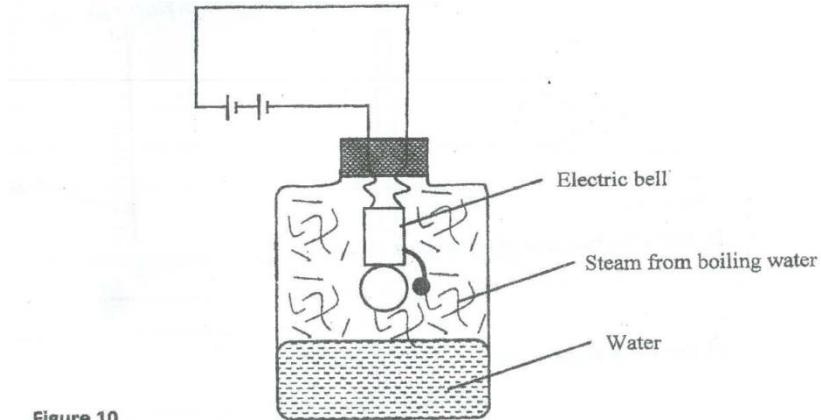
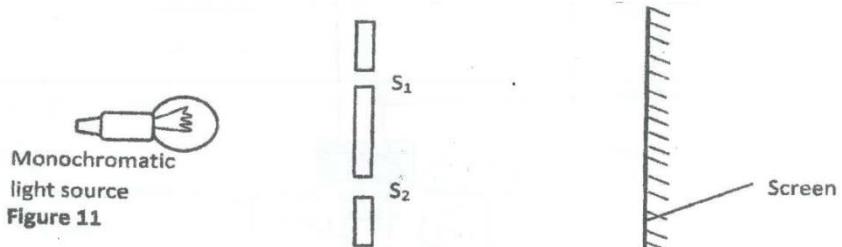


Figure 10

- i. State what happens to the sound from the bell as the bottle and its contents are cooled to  $0^{\circ}\text{C}$  **(1mark)**  
ii. Explain the observation in (i) above **(1mark)**

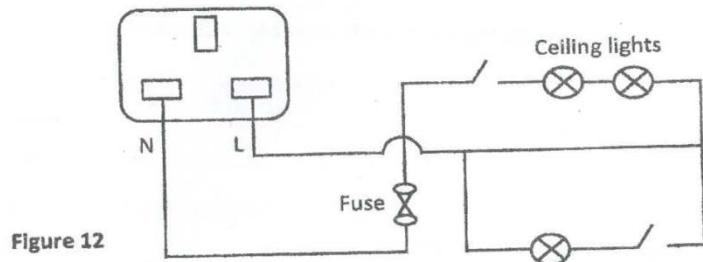
d) A girl standing on a level ground between two high walls claps her hands. She hears an echo from one wall after 0.7s and from other wall 0.2s later. Determine the distance between the two walls (Speed of sound in air= $\text{ms}^{-1}$ ) **(3marks)**

e) In an experiment to observe the interference of light waves, a double slit was placed close to the source of monochromatic light as shown in figure 11.



- i. State the function of the double slit **(1mark)**  
ii. State the observation made on the screen **(1mark)**  
iii. Explain the observation made on the screen **(1mark)**
- 15.a) Give one advantage of transmitting mains electricity as a.c and not as d.c **(1mark)**

b) Figure 12 shows part of a wiring circuit for a house



Correct two faults made in the wiring (2marks)

c) Figure 13 shows a connection to a 3 pin plug

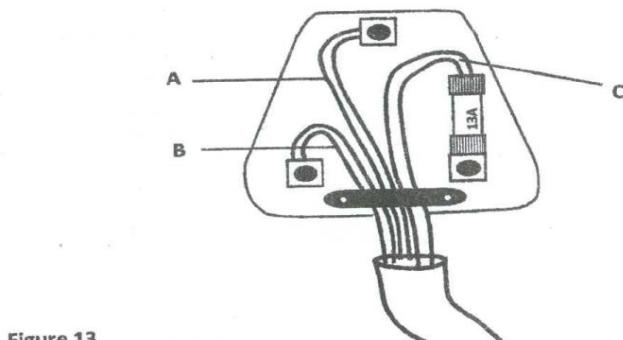


Figure 13

i. State the colours of the leads labelled **A**, **B** and **C** (3marks)

**A** -

**B**-

**C**-

ii. Give reasons why the earth pin is usually longer than the other two pins(1mark)

iii. State the function of the fuse (1mark)

iv. In a house there is a cooker rated 6KW. The main potential is 240V and the fuses available are 35A, 30A, 15A, and 13A. Determine the fuse that would be suitable for the cooker. (3marks)

16.a) Figure 14 shows a photocell. Study it and answer the questions below

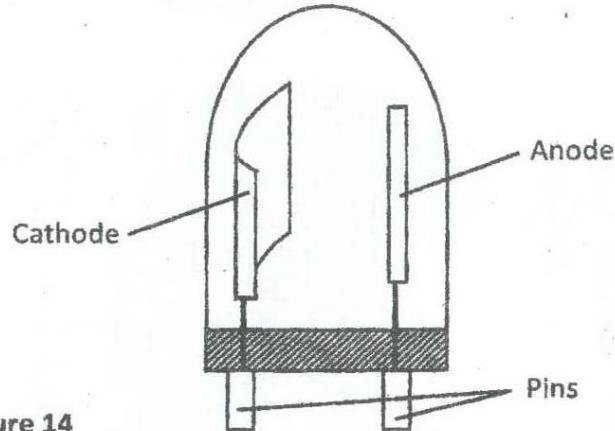


Figure 14

- i. Explain how the photocell works (1mark)
  - ii. State two factors that determines the speed of the photoelectrons emitted by the cathode. (2marks)
  - iii. State one application of the photocell (1mark)
- b) **Figure 15** shows the relation between the stopping potential  $V_s$  and the frequency  $f$  of radiation when a certain metal surface is illuminated with light of different frequencies

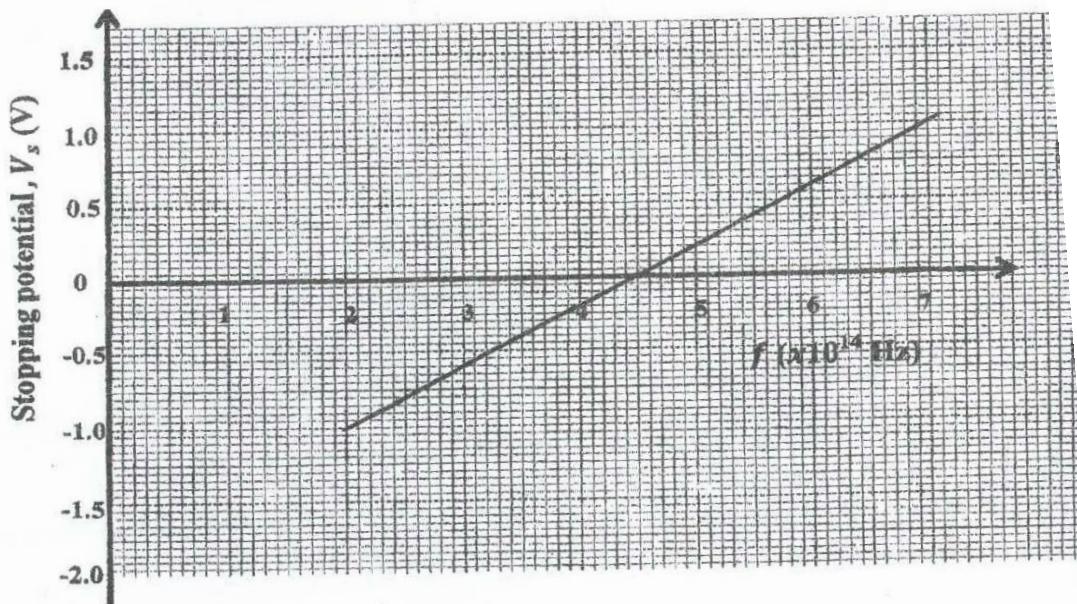
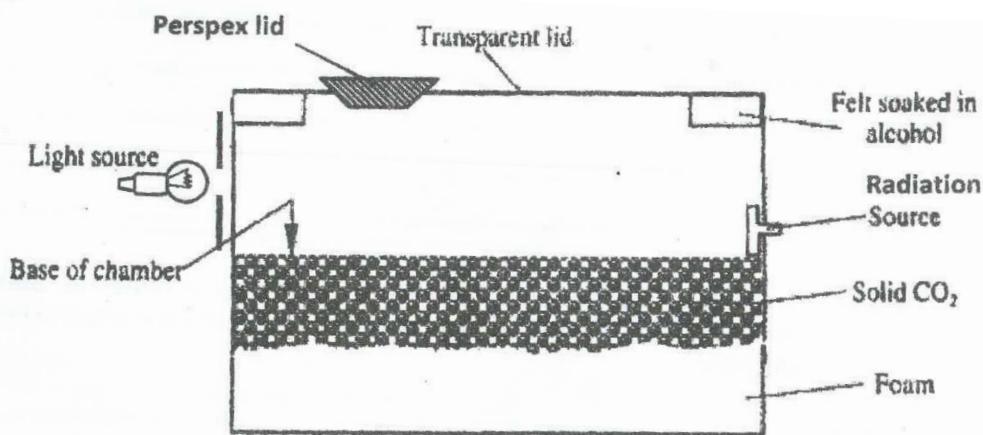


Figure 15

From the graph, determine the:

- i. Threshold frequency  $f$  of the metal surface **(1mark)**
  - ii. Planck's constant,  $h$  **(3marks)**
  - iii. Work function,  $w_0$ , of the metal surface **(2marks)**
- c) Sodium metal has work function of 2.3ev. if it is irradiated with light of frequency  $7.0 \times 10^{14}$  Hz, calculate the maximum kinetic energy for the emitted electrons(change of an electron,  $e = 1.6 \times 10^{-19}$  C, planck's constant,  $h = 6.63 \times 10^{-34}$  Js) **(3marks)**

**17.a)**Figure 16 shows the features of a diffusion cloud chamber used to detect radiations from radioactive sources



**Figure 16**

- i. State the function of the following materials in the chamber **(2marks)**
  - Alcohol
  - Solid CO<sub>2</sub>
- ii. Explain why the base of the chamber is painted black **(1mark)**
- iii. As the chamber continues to detect radiation, the Perspex lid is rubbed frequently with a piece of cloth. Give a reason for this. **(1mark)**
- iv. Explain how the radiations from the radioactive source are detected in the chamber **(2marks)**
- v. A leaf electroscope can also be used as a detector of radiation. State two advantages of the diffusion cloud chamber over the leaf electroscope as a radiation detector **(2marks)**

**b)** When carrying out experiments using radioactive substances, it is observed that a counter connected to the Geiger muller (GM) tube registers some reading even in the absence of the radioactive source

i. State the radiation responsible for the count registered in the absence of the radioactive source **(1mark)**

ii. State any two possible sources of these radiations **(2marks)**

**18.a)** State faraday's law of electromagnetic induction **(1mark)**

**b)** **Figure 17** shows a simplified illustration of an e.m.f. generator

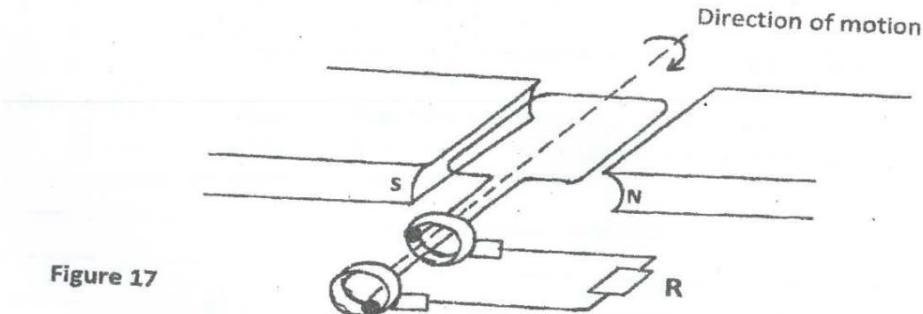
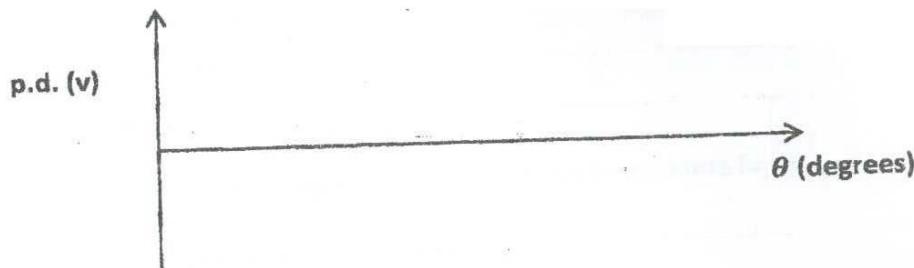


Figure 17

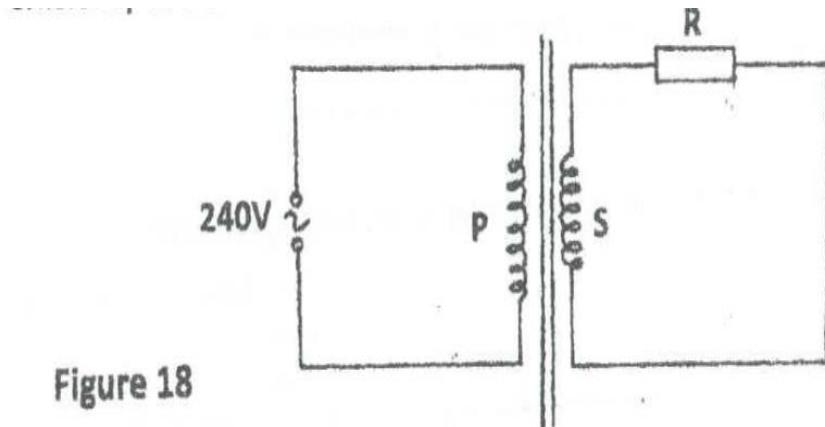
i. Show the direction of induced current through R when the coil is in the position shown in the diagram **(1mark)**

ii. State two ways of increasing the amount of induced current in this set up **(2marks)**

iii. On the axes below, sketch a graph to show how potential difference across R varies with the angle of inclination,  $\theta$ . The coil is initially in the vertical position. **(1mark)**



**c)** **Figure 18** shows a step down transformer connected to a 240V mains socket. The efficiency of the transformer is 60% and a current of 50A flows through P



**Figure 18**

Given that the primary coil has 4000 turns while the secondary coil has 1500 turns, calculate the current through S. **(3marks)**

- d)** State one similarity and one difference between an induction coil and a step up transformer **(2marks)**

Similarity-

Difference-

NAME.....ADM NO.....

SCHOOL.....CLASS.....

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# **TOP STUDENT KCSE PREDICTIONS**

## **SERIES 1 TRIAL 4 PHYSICS PAPER 1**

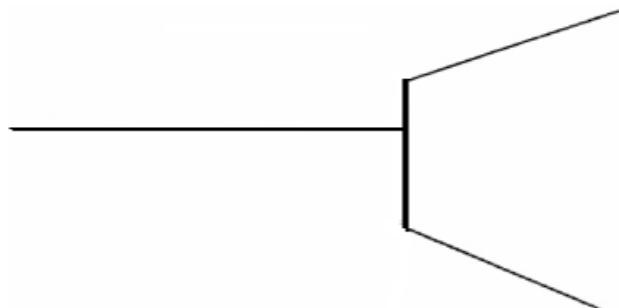
*Kenya Certificate of Secondary Exams*

**TIME: 2 HOURS**

### **SECTION A**

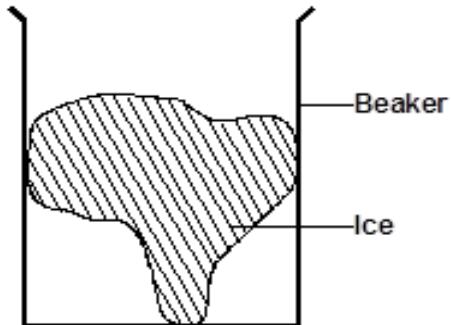
**Answer all questions**

1. The figure below shows part of micrometer screw gauge with 50 divisions on the thimble scale. Complete the diagram to show a reading of 5.73mm. **(2 marks)**



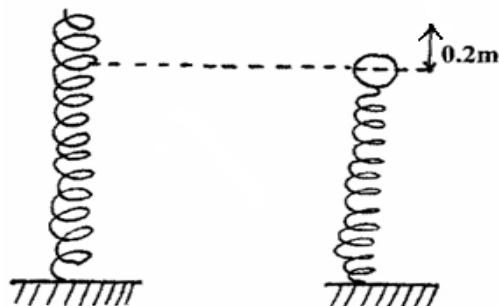
2. A bottle containing a smelling gas is opened at the front bench of a classroom. State the reason why the gas is detected throughout the room. **(1 mark)**

3. The figure below shows beaker containing a block of ice.



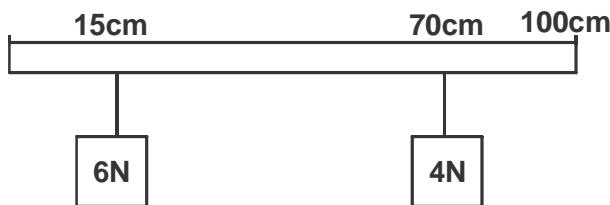
State and explain the change in stability when the ice melts. **(2marks)**

4. An aero plane is moving horizontally through still air at a uniform speed. It is observed that when the speed of the plane is increased, its height above the ground increases. State the reason for this observation. **(2 marks)**
5. A steel ball of mass 0.05kg was placed on top of a spring on a level ground. The spring was then compressed through a distance of 0.2m.



If the spring constant is 15N/m. Calculate the maximum height reached when the spring is released. **(3marks)**

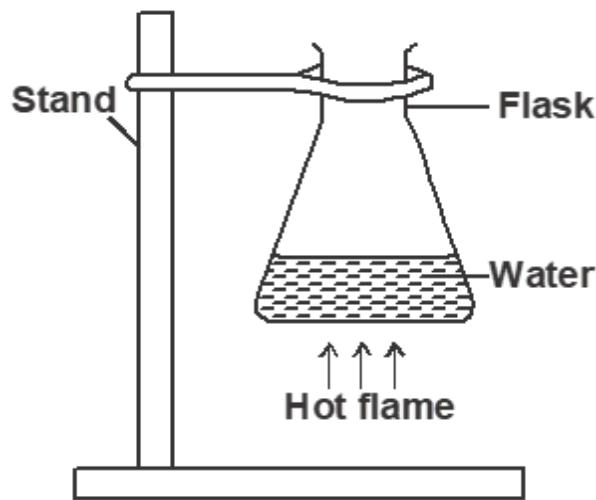
6. The figure below shows a uniform metre rule of weight 3N supporting two weights. The metre rule is pivoted somewhere such that it is horizontally balanced. (Pivot not shown)



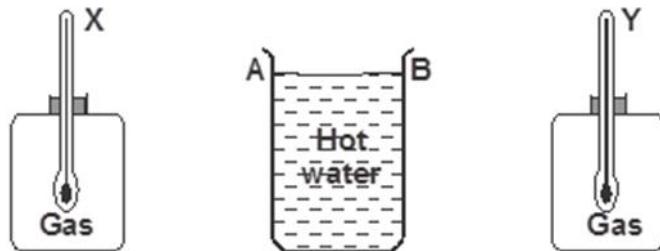
The 6N weight is at 15cm mark while the 4N weight is at 70cm mark. Determine the position of the pivot from zero cm mark. **(3 marks)**

7. State one environmental hazard that may occur when oil spills over a large surface area of the sea. **(1 mark)**

8. The figure shows a flat bottomed flask containing some water. It is heated directly with a very hot flame. Explain why the flask is likely to crack. **(2marks)**



9. The figure below shows a cylindrical container having hot water at 95°C. End A is shiny while end B is dull black. At equal distances from the container is placed two identical gas jars fitted with thermometers X and Y.



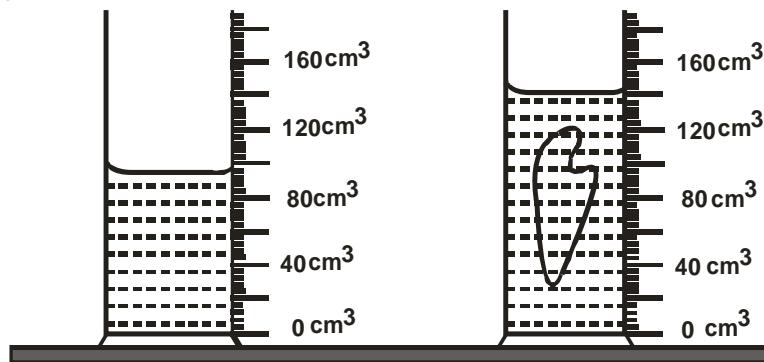
Compare the readings of the two thermometers after two minutes

**(1 mark)**

10. Give a reason for your answer in question 9 above

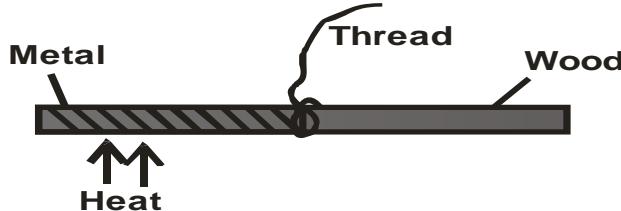
**(1 mark)**

11. The figure below shows the change in volume of water in a measuring cylinder when an irregular solid is immersed in it.



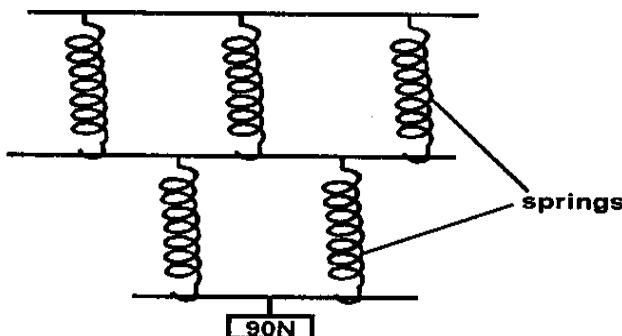
Given that the mass of the solid is 268g, determine the density of the solid in SI units.  
**(3 marks)**

- 12.** The following figure shows a rod made of wood on one end and metal on the other end suspended freely with a piece of thread so that it is in equilibrium.



The side made of metal is now heated with a Bunsen flame. State with a reason, the side to which the rod is likely to tilt  
**(2 marks)**

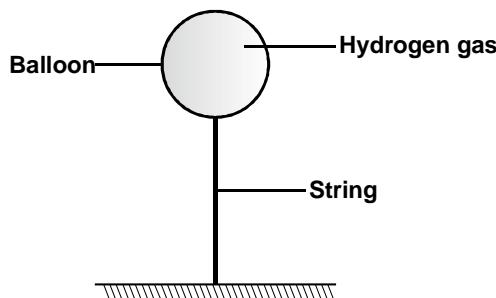
- 13.** The spiral springs shown in the figure below are identical. Each spring has a spring constant,  $k = 300\text{N/m}$



Determine the total extension of the system. (Take the weight of the cross bars to be negligible)  
**(2 marks)**

#### SECTION B: 55marks

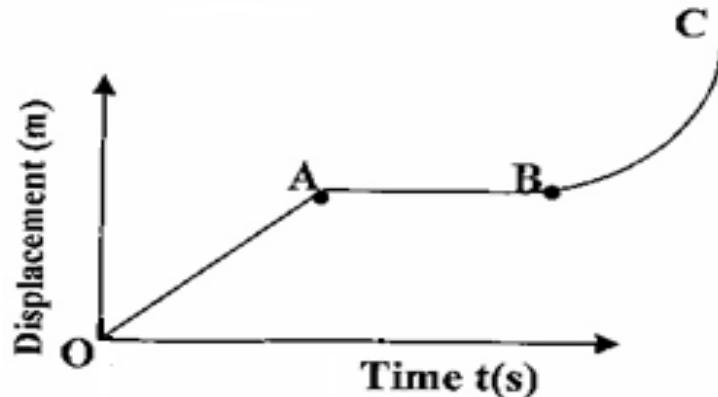
- 14. (a)** State the Archimedes principle.  
**(1 mark)**
- (b)** A rubber envelope of a hydrogen filled balloon having volume of  $2\text{m}^3$  is held in position by a vertical string as shown below.



The mass of the balloon is 1.3kg. Given that density of hydrogen is  $0.1\text{kg/m}^3$  density of air is  $1.3\text{kg/m}^3$ . Calculate

- (i) the total weight of the balloon including the hydrogen gas. (2 marks)
- (ii) the up thrust. (2 marks)
- (iii) the tension in the string. (2 marks)
- (c) A solid weighs 50N in air and 44N when complete immersed in water. Calculate
- (i) Relative density of the solid. (2 marks)
- (ii) Density of the solid. (2 marks)

15.a) The figure below shows a displacement-time graph of the motion of a particle.



Describe the motion of the particle in the region. (3marks)

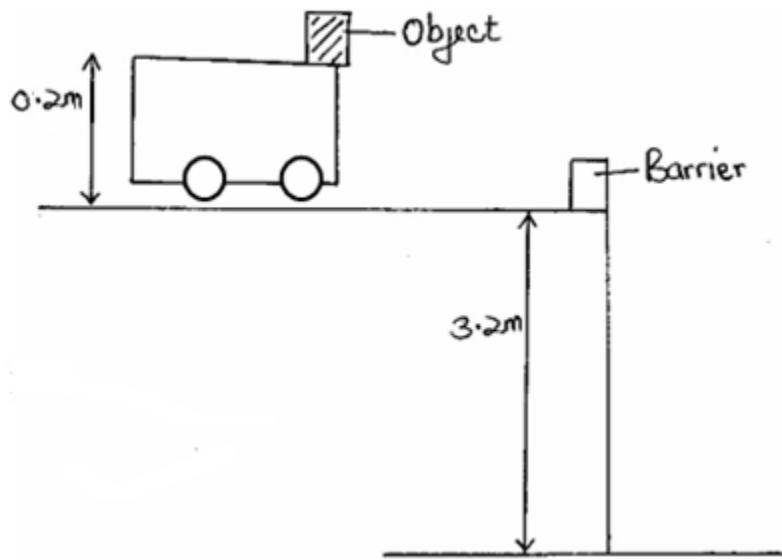
OA-

AB-

BC-

(b) State the Newton's first law of motion. (1 mark)

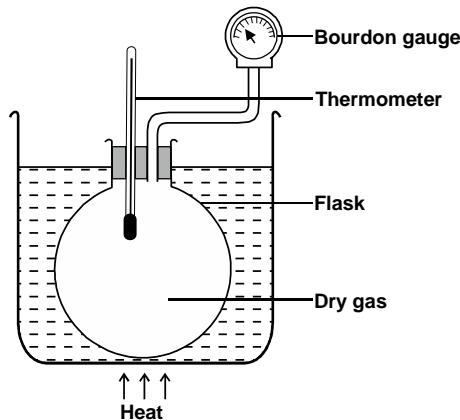
(c) The figure below shows a trolley moving towards a barrier at a constant velocity of 20m/s. Use this information to answer the questions that follows.



- i) Sketch the path followed by the object after the impact (1mark)
- ii) Give a reason why the object on the trolley flies off on impact. (1 mark)
- iii) Determine the time taken by the object to reach the ground. (2 marks)
- iv) Determine the horizontal distance covered by the object from the point of impact to the point where it reached the ground. (2 marks)

**16. a)** What is meant by absolute zero temperature? (1 mark)

**b)** The set up below was used by a group of form three students to verify pressure law.

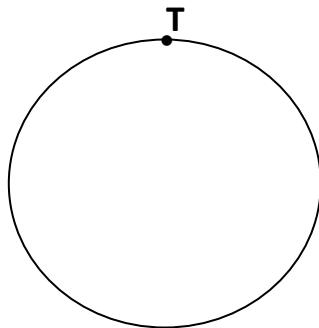


Describe briefly how the set-up can be used to verify pressure law. (4 marks)

c) A  $4.5\text{cm}^3$  bubble released at the bottom of a dam measured  $18\text{cm}^3$  at the surface of the dam. Work out the depth of the dam taking atmospheric pressure to be  $10^5 \text{ Pa}$  and the density of water as  $1\text{g/cm}^3$ . (3marks)

17(a) One of the factors that affect the centripetal force is the mass of the body. State another factor. (1mark)

(b) A mass of  $400\text{g}$  is rotated by a string at a constant speed  $V$  in a vertical circle of radius  $100\text{cm}$ . The tension in the string is  $9.2\text{N}$  which is experienced at point T.

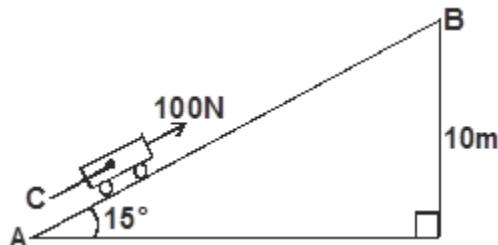


i) Determine the velocity  $V$  of the mass at point T. (3marks)

ii) Determine the tension in the string at the bottom of the circle. (2marks)

(c) State two applications of circular motion. (2marks)

18. The figure below shows an inclined plane, a trolley of mass  $30\text{kg}$  is pulled up a slope by a force of  $100\text{N}$  parallel to the slope. The trolley moves so that the centre of mass C travels from points A to B.



a) What is the work done on the trolley against the gravitational force in moving from A to B? (2marks)

b) Determine the work done by the force in moving the trolley from A to B (2 marks)

c) Determine the efficiency of the system. (3 marks)

d) Determine the mechanical advantage of the system. (3 marks)

19. a) Explain why it is advisable to use a pressure cooker for cooking at high altitudes.

**(1 mark)**

**b)** A block of metal of mass 150g at 100°C is dropped into a lagged calorimeter of heat capacity 40J/K containing 100g of water at 25°C. The temperature of the mixture is 34°C. (specific heat capacity of water = 4200J/kg/K).

Determine:

- (i)** Heat gained by the calorimeter. **(2marks)**
- (ii)** Heat gained by water. **(2marks)**
- (iii)** Specific heat capacity of the metal block. **(3marks)**

NAME.....ADM NO.....

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# **TOP STUDENT KCSE PREDICTIONS**

## **SERIES 1 TRIAL 4 PHYSICS PAPER 2**

*Kenya Certificate of Secondary Exams*

**TIME: 2 HOURS**

### **SECTION A: 25marks**

**Answer all questions**

1. The chart below shows an arrangement of different parts of the electromagnetic spectrum.

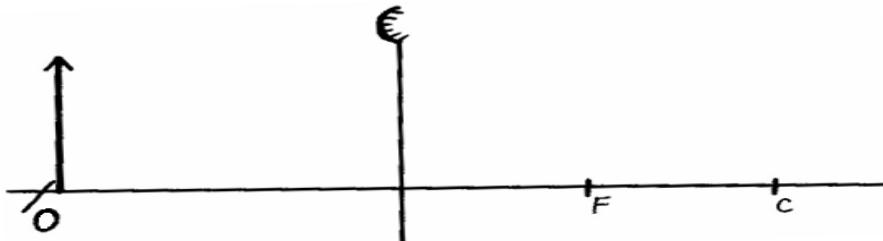
Radio wave	A	Infrared rays	B	Ultra-violet	$\chi$ -Rays
------------	---	---------------	---	--------------	--------------

Name the radiation represented by

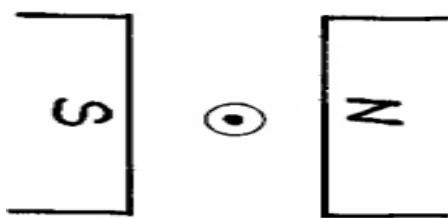
**A** (1mark)

State one use of radiation represented by **B** (1mark)

2. An object O is placed in front of convex mirror as shown in the diagram below. Complete the diagram to locate the position of the image, 1. (3 marks)

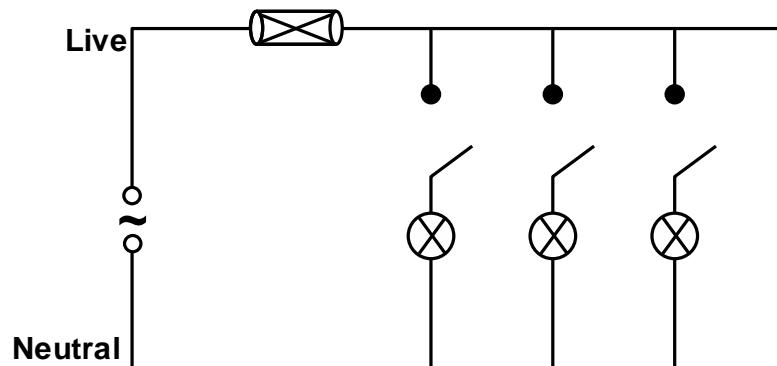


3. The figure below shows a wire carrying current whose direction is out of the paper. The wire is placed in a magnetic field.

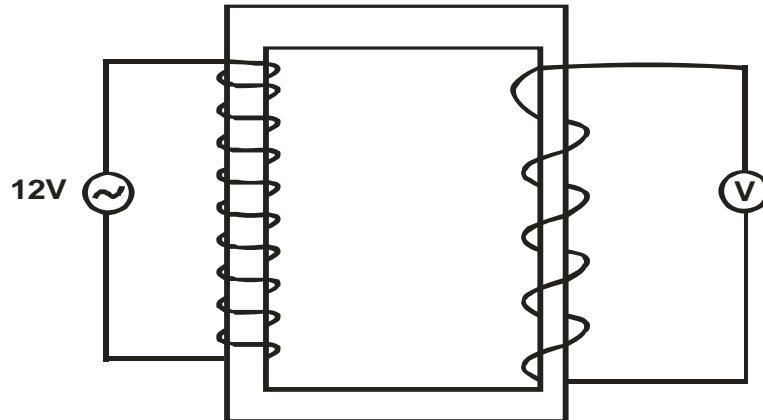


- (a) Indicate on the figure the direction of the force F, acting on the wire. (1 mark)
- (b) State what would be observed on the wire if the direction of the current is reversed. (1 mark)

4. The figure below shows part of the lighting circuit of a house.



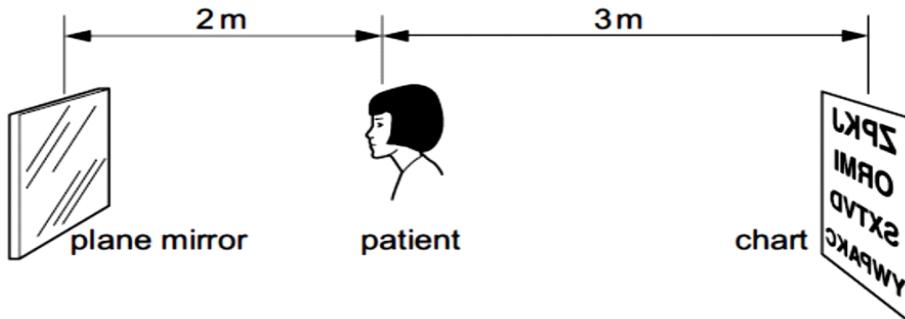
- i) Give a reason why a fuse is included in the circuit. (1 mark)
- ii) If each lamp has a power of 60W at voltage of 240V. Calculate the current through one lamp when it is switched on. (2 marks)
5. Figure 5 below shows a simple transformer connected to a 12v a.c source and an a.c voltmeter.



Determine the reading on the voltmeter.

(2 marks)

6. The diagram shows a patient having her eyes tested. A chart with letters on it is placed behind her and she sees the chart reflected in a plane mirror.



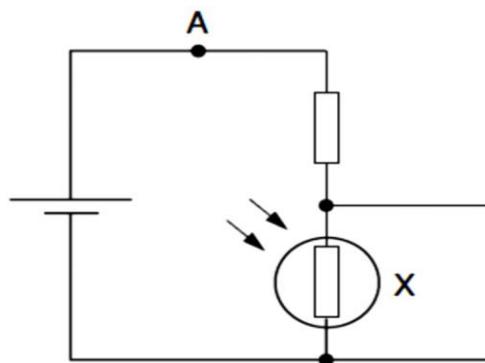
Determine how far away from the patient, the image of the chart is seen.

(2 marks)

7. State Snell's law.

(1 mark)

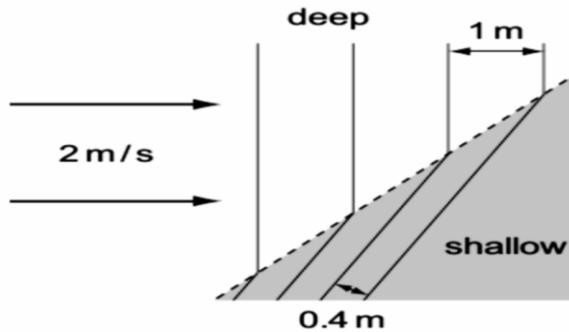
8. The figure below shows an electric circuit.



State and explain how the potential difference across X varies as the light shining on it becomes brighter.

(2marks)

9. Waves pass from deep water to shallow water and refraction occurs.



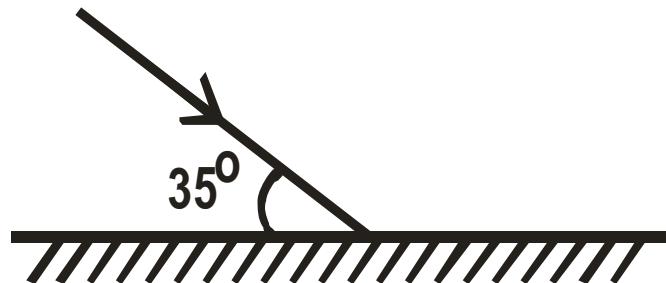
Calculate the speed of the waves in the shallow water

(2 marks)

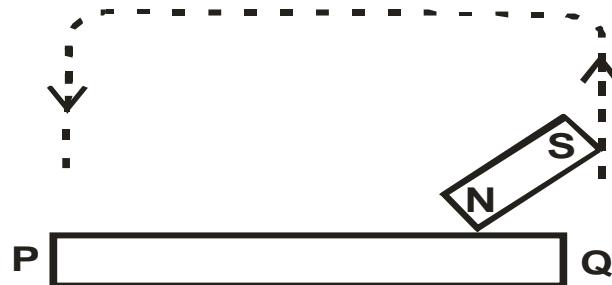
10. The diagram below shows a ray of light striking the plane at  $35^\circ$  as shown below.

State the angle of reflection.

(1 mark)



11. The figure below shows an iron bar being magnetized by stroking it with a magnet.



Indicate on the iron bar the polarity of resulting magnet.

(1 mark)

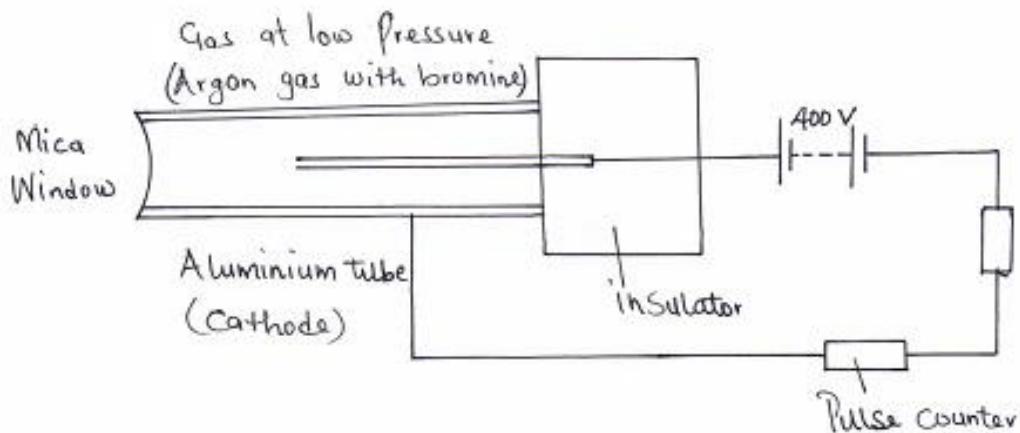
12. An echo sounder of a ship transmits sound waves to the depth of the sea and receives the echo after 2.4 seconds. If the speed of sound in water is  $1600\text{ms}^{-1}$ , determine the depth of the sea. (3 marks)

13. It is observed that when a charged body is brought near the cup of a positively charged electroscope, the divergence of the leaf increases. State the type of charge on the body. (1mark)

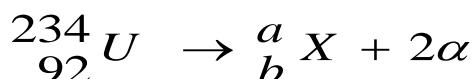
## **SECTION B (55 marks)**

**Answer all questions**

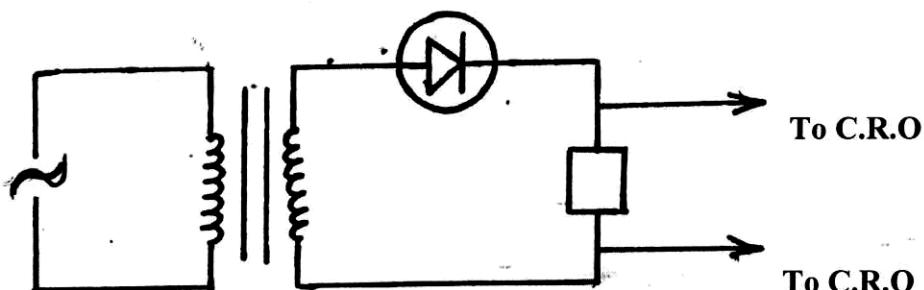
- 14. (a)** The figure below shows a diagram of a Geiger Muller tube connected to a power supply and a pulse counter.



- (i) Why should the argon gas be at low pressure? (1mark)  
(ii) State the purpose of the bromine gas in the tube. (1mark)  
(iii) Suggest one way of increasing the sensitivity of the tube (1mark)  
(iv) Find the value of a and b in the following equation. (2marks)



- b)** The figure below shows a PN junction diode used in a rectifier.

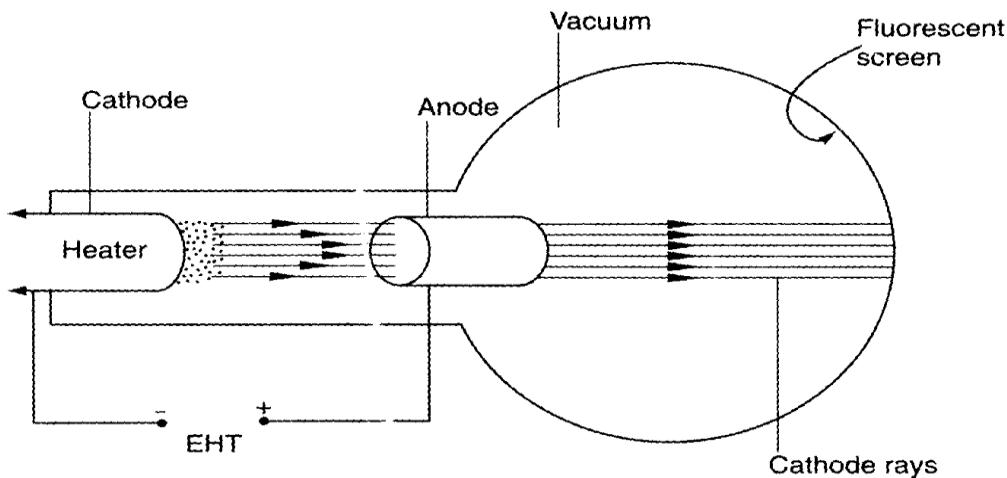


- i) What is an extrinsic semi conductor? (1mark)  
ii) What type of rectification is shown? (1mark)

- iii) Describe how the rectification is achieved (2marks)  
 iv) In the space provided below, sketch the output signal displayed on the CRO during the rectification process. (2marks)



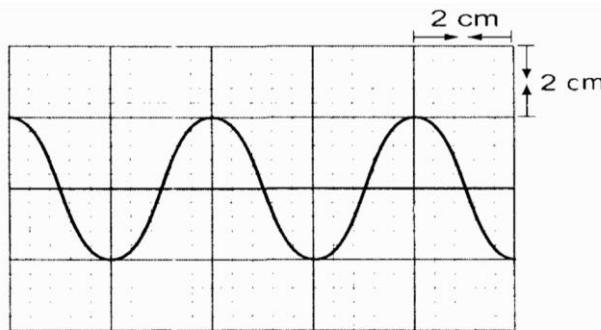
15. The figure below shows a cathode ray tube



- a) State the function of the
- i) Heater (1mark)
  - ii) Extra High Tension (E.H.T.) (1 mark)
- b) State how the intensity of the fluorescence on the screen can be increased. (1 mark)
- c) State the effect of having air in the tube instead of a vacuum (1 mark)
- d) State one properties of cathode rays (1 mark)
- e) Distinguish cathode rays and X-rays (1 mark)
- f) Give one advantages of using a C.R.O instead of a voltmeter in measuring voltages

**(1 mark)**

- g)** The figure below shows an a.c. voltage. If the Y-gain control reads 10V/cm and the time base reads 5 milliseconds/cm



Calculate:

- i)** The frequency of the alternating voltage **(2 marks)**

- ii)** Peak to peak voltage of the alternating voltage **(2 marks)**

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

- (ii)** State why this observation does not occur if the electroscope is positively charged **(1 mark)**

- (iii)** Explain why the leaf of the electroscope does not fall when infra- red radiation is directed onto the zinc plate **( 1 mark)**

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

- (i)** The intensity of incident radiation is increased **(1 mark)**

- (ii)** The frequency of the incident radiation is increased **(1 mark)**

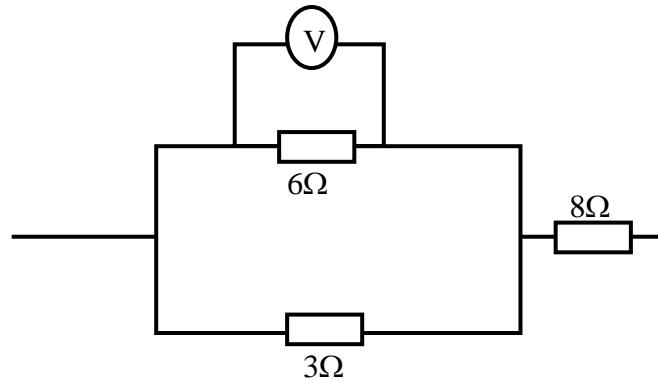
- c)** Light of wavelength  $4.3 \times 10^{-7}$ m is incident on two different metal surfaces, nickel and potassium. (Take speed of light as  $3.0 \times 10^8$  ms<sup>-1</sup> and planks constant h as  $6.63 \times 10^{-34}$ J s).

- (i)** Determine the energy of the incident radiation. **(3 marks)**

- (ii)** If the work function of nickel is  $8.0 \times 10^{-19}$ J and that of potassium is  $3.68 \times 10^{-19}$ J, state with a reason from which of the two metals the given light will eject electrons. **(2 marks)**

- (iii)** Determine the velocity of the emitted electrons from the metal surface in b(ii). (Take the mass of an electron as  $9.1 \times 10^{-31}$  kg). **(2 marks)**

- 17(a)** The figure below shows three resistors as shown.

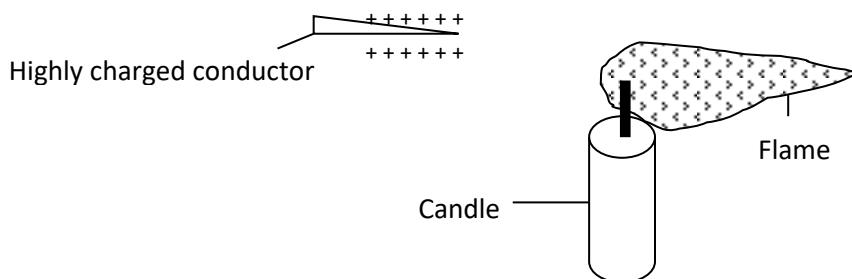


If the voltmeter reads 4V, find the

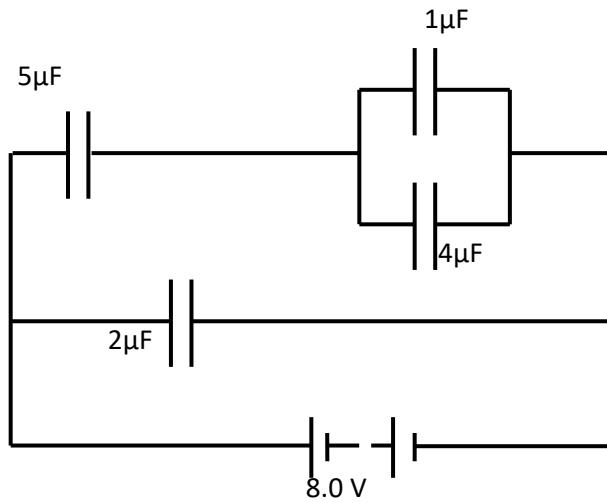
- (i) Effective resistance (3marks)
- (ii) Current through the  $3\Omega$  resistor (2 marks)
- (iii) Potential difference across the  $8\Omega$  resistor if the total voltage in the circuit is 10V (1 mark)
- (c) (i) What is meant by the term “terminal voltage” as used in current electricity? (1mark)

(ii) A cell supplies a current of 2.0A when connected to a  $0.6\Omega$  resistor and 1.5A when the same cell is connected to a  $0.9\Omega$  resistor. Find the e.m.f and the internal resistance of the cell. (3marks)

**18((a))** Give a reason why a candle flame is blown when a highly charged conductor is brought close to it as shown below. (1mark)



- b) State two factors that affect capacitance of a capacitor (2 marks)
- c) The figure below shows  $1\mu F$ ,  $2\mu F$ ,  $4\mu F$  and  $5\mu F$  capacitors connected to a battery.



Determine:

- i) The total capacitance. (3marks)
- ii)The total energy stored by the capacitors. (2marks)
- iii) Voltage across the 4μF capacitor. (2marks)

NAME.....ADM NO.....

SCHOOL.....CLASS.....

DATE.....

# **TOP STUDENT KCSE PREDICTIONS**

## **SERIES 1 TRIAL 5 PHYSICS PAPER 1**

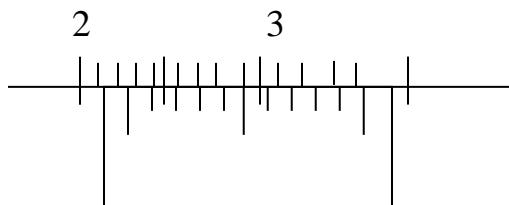
*Kenya Certificate of Secondary Exams*

**TIME: 2 HOURS**

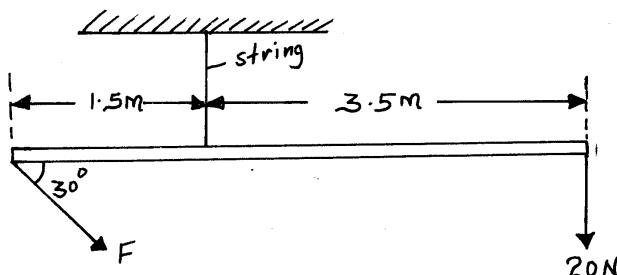
### **SECTION A (25 Marks)**

**Answer all questions**

- Figure below shows part of a scale of a vernier calipers. What is the reading indicated by the scale? **(2 marks)**

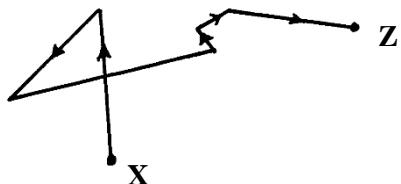


- A horse pipe of internal diameter 4 cm is connected to a sprinkler with 25 holes each of diameter 0.04 cm, the water in the pipe flows at a speed of 5 cm/s. Determine the velocity with which the water leaves the sprinkler. **(3 marks)**
- The figure below shows a uniform bar of weight 8N. It is acted on by two forces as shown. **(3 marks)**

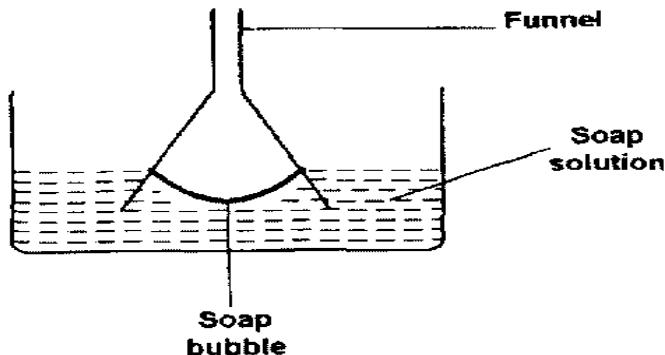


Determine the value of  $F$ . **(3 marks)**

4. The figure below shows a path taken by a gas molecule moving from point x to z



- (a) Explain how this movement can be observed (1 mark)
- (b) State in full, the law of motion that governs movement from x to z (1 mark)
5. a) State one factor that a bimetallic strip relies on for its working (1 mark)
- b) Two objects made of the same material and having the same mass are heated to a temperature of  $35^{\circ}\text{C}$  above that of the atmosphere and then allowed to cool in still air for 30 minutes. State one factor that will determine their final temperature (1 mark)
6. (a) What is surface tension? (1 mark)
- (b) The figure below shows a funnel dipped into a liquid soap solution.



Explain what happens to the soap bubble when the funnel is removed. (2 marks)

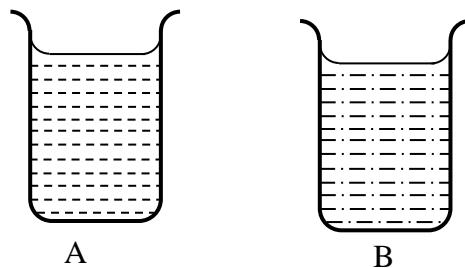
7. A solid displaces  $8.5\text{cm}^3$  of liquid when floating on a certain liquid and  $11.5\text{cm}^3$  when fully submerged in the liquid. The density of the solid is  $0.8\text{g/cm}^3$ , determine upthrust on the solid when it is floating (3 marks)
8. Fifty drops of oil have a volume of  $1.0\text{cm}^3$ . If a drop of oil forms an oil patch of diameter 20cm, determine the size of the oil molecule. (2 marks)
9. In a faulty mercury-in-glass thermometer was found that the mercury level stands at 3 cm mark in the tube at  $0^{\circ}\text{C}$  and 18 cm when in steam above boiling water at

normal atmospheric pressure. Calculate the temperature when the mercury stands at 12 cm mark. **(3 marks)**

- 10.** Give two reasons why mercury is preferred to water in the manufacturing of barometers **(2 marks)**

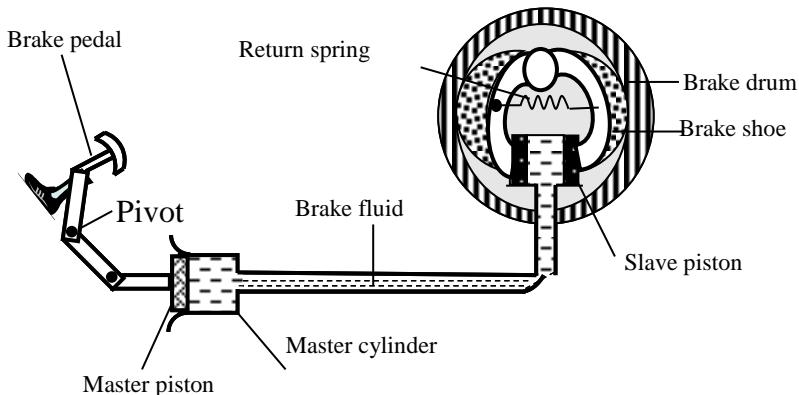
### **SECTION B (55 Marks)**

- 11.(a)** The figure below shows two containers filled with two different liquids to the same height.



It was found that the pressure at the bottom of A is greater than that at B. Explain **(1 mark)**

- (b)** The figure below shows a car braking system. The brake fluid is an oily liquid.



The brake drum rotates with the wheel of the car.

- (i)** Explain how pushing the brake pedal makes the brake rub against the drum. **(4 marks)**
- (ii)** The cross-sectional area of the master piston is  $2.0\text{cm}^2$ . A force of 140N is applied to the master piston.
- (I)** Calculate the pressure created in the brake fluid by the master piston. **(2 marks)**

(II) The cross-sectional area of each slave piston is  $2.8\text{cm}^2$ . Calculate the force exerted on each slave piston by the brake fluid. (2 marks)

(III) The force exerted on the master piston is greater than the force applied by the foot on the brake pedal. Using the principle of moments, explain this. (2 marks)

12. (a) State two factors that affect the magnitude of centripetal force of an object moving along a curved path. (2 marks)

(b) A stone is tied to a light string of length 0.5m. If the stone has a mass of 20g and is swung in a vertical circle with a uniform angular velocity of 6 revolutions per second, determine.

(i) The period T. (2 marks)

(ii) The tension of the string when the stone is at

I. The bottom of the swing. (3 marks)

II. The top of the swing. (2 marks)

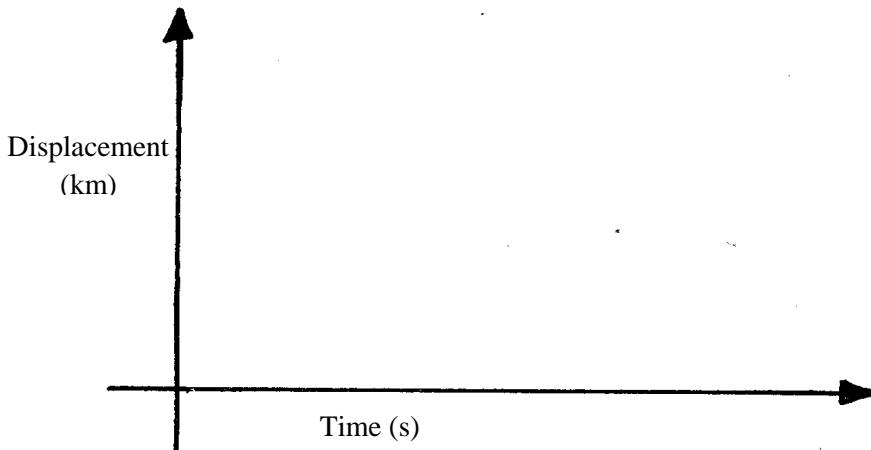
III. The linear velocity. (3 marks)

13.a) Define the term uniform acceleration. (1 mark)

b) A rocket was launched vertically upwards with uniform acceleration of  $100\text{ms}^{-2}$  for 20 seconds. After this the rocket was acted upon only by a constant gravitational force.

(i) Calculate the maximum height reached by the rocket (3 marks)

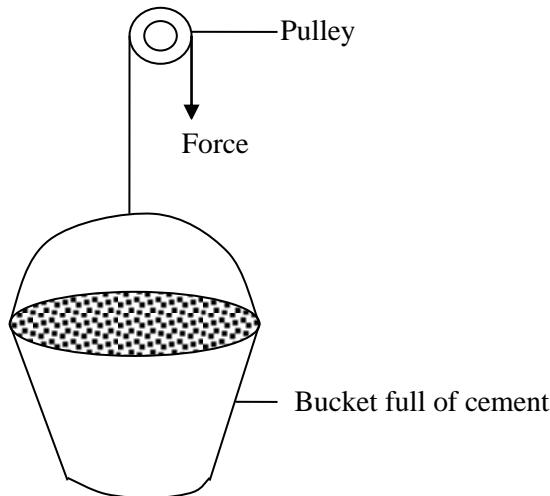
(ii) Draw to scale, on the axes provided below, the displacement – time graph for the motion of the rocket. (2 marks)



(iii) State Newton's second law of motion. (1 mark)

(iv) A car of mass 800Kg is initially moving at a speed of 25m/s. Calculate the constant force required to bring the car to rest over a distance of 20m. (4 marks)

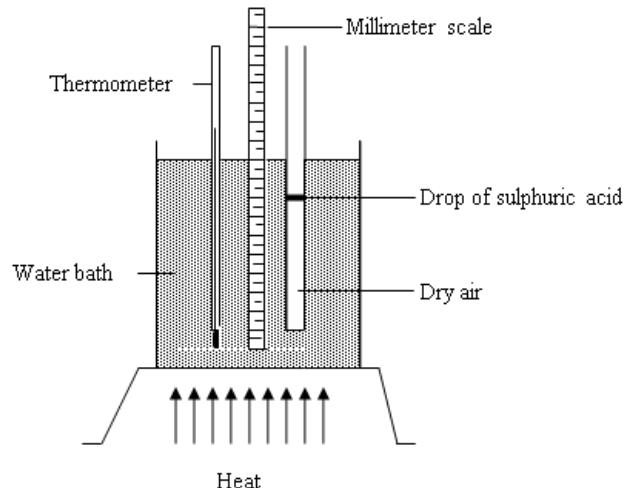
**14.** A worker on a building site raises a bucket full of cement at a slow steady speed using the pulley as shown below.



The weight of the bucket and cement is 200N. The force F exerted by the worker is 210N

1. State why F is bigger than the weight of the bucket and cement. **(1 mark)**
2. The bucket is raised through a height by 4m. Determine the distance through which the worker pulls the rope. **(1 mark)**
3. How much work is done on the bucket and cement? **(2 marks)**
4. State the kind of energy gained by the bucket. **(1 mark)**
5. Determine the total work done by the worker. **(3 marks)**
6. Calculate the efficiency of the machine used by the worker. **(2 marks)**

**15. (a)** The figure below shows a set-up that may be used to verify Charles' law.



- (i) State the measurements that should be taken in the experiment. **(2 marks)**
- (ii) Explain how the measurements taken in (i) above may be used to verify Charles' law. **(2 marks)**
- (iii) A certain mass of hydrogen gas occupies a volume of  $1.6\text{cm}^3$  at a pressure of  $1.5 \times 10^5 \text{ pa}$  and temperature of  $12^\circ\text{C}$ . Determine its volume when the temperature is  $0^\circ\text{C}$  at a pressure of  $1.0 \times 10^5 \text{ pa}$ . **(2 marks)**
- (b) (i) An electric kettle connected to a 250V mains supply draws a current of 4.0A. It contains 1 litre of water with 1 kg of ice, all at  $0^\circ\text{C}$ . Neglecting all heat losses, including heat absorbed by the kettle, find the time taken for all the ice to be just melted. (Take specific latent heat of fusion to be  $3.34 \times 10^5 \text{ J/kg}$  and latent heat of vaporization is  $2.26 \times 10^6 \text{ J/kg}$  Specific heat capacity of water is  $4.2\text{J/g}$ ). **(2 marks)**
- (ii) Determine the time taken until half the contents of the kettle boils away. **(3 marks)**

NAME.....ADM NO.....

SCHOOL.....CLASS.....

DATE.....

# **TOP STUDENT KCSE PREDICTIONS**

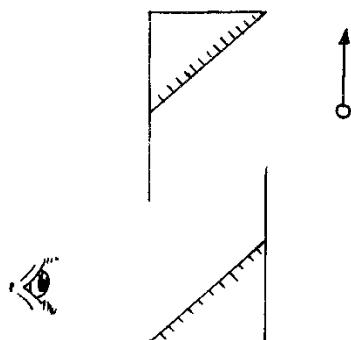
## **SERIES 1 TRIAL 5 PHYSICS PAPER 2**

*Kenya Certificate of Secondary Exams*

**TIME: 2 HOURS**

### **SECTION A (25 MARKS)**

1. a) Distinguish between a real and virtual image **(1 mark)**  
b) Complete the diagram below to show how the object is viewed **(2 marks)**



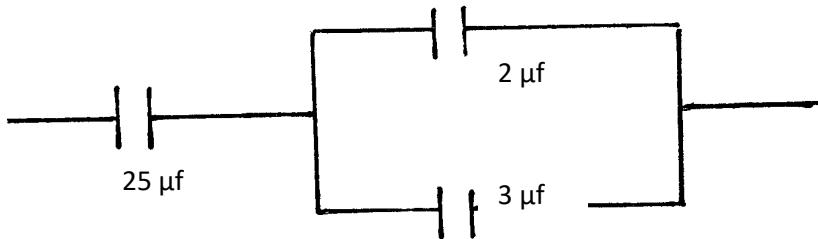
2. A concave mirror has a focal length of 8cm. A real object of length 2cm is placed 12cm from the mirror. Calculate the distance of the image from the mirror. If the length of the image formed is 4cm. **(3 marks)**
3. a) Explain what is meant by soft iron being a soft magnetic material. **(1 mark)**  
(i) How do you make the bell ring only once and not continuously **(1 mark)**

**(ii) Explain**

**(2 marks)**

- 4.** Find the effective capacitance of the following circuit

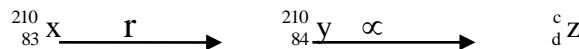
**(2 marks)**



- 5.** State one factor that affects the speed of sound through a solid

**(1 mark)**

- 6.** The following is a part of a radio – active series.



Identify the radiation r, find the values of c and d.

**(3 marks)**

**r -**

**c -**

**d -**

- 7.** A hair drier is rated 2000W, 240V. Determine its resistance.

**(2 marks)**

- 8.** The refractive index of glass is  $\frac{3}{2}$  and that of water is  $\frac{4}{3}$ . Calculate the refractive index of glass with respect to water.

**(2 marks)**

- 9.** State two advantages of an Alkaline battery over a Lead Acid accumulator

- 10.** In an X-Ray machine, give the reasoning behind the following

**a)** Using a concave shaped cathode

**(1 mark)**

**b)** Evacuating the X-Ray Machine

**(1 mark)**

## **SECTION B (55 MARKS)**

**Answer all questions**

- 11.a)** Fig 5 shows plane waves in a ripple tank. The water is deeper in section A & C than in section B.

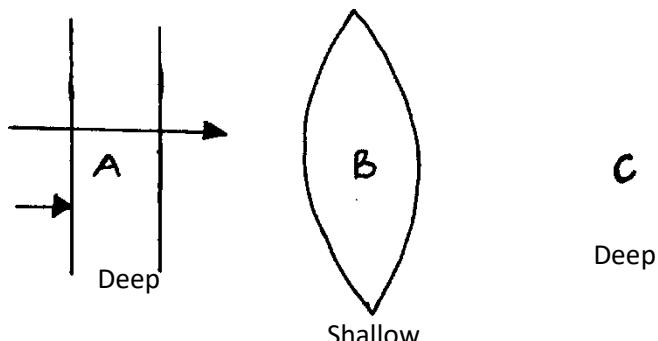
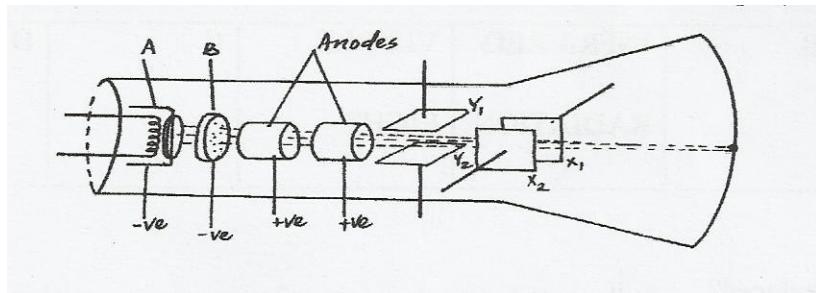


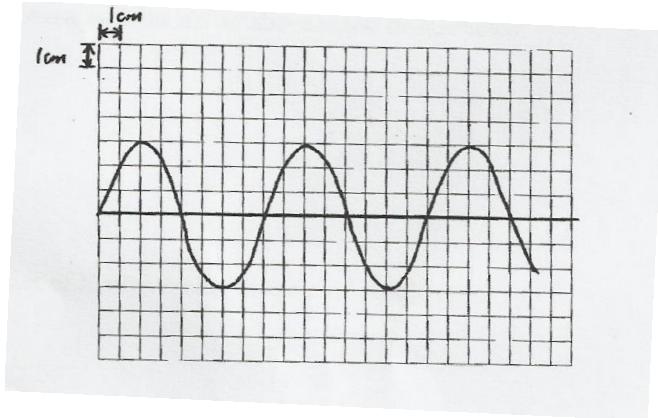
Fig. 5

Draw the waves after passing section B. (2 marks)

- b)** State two conditions necessary for production of interference. (2 marks)
  - c)** A tube of length 36cm is closed at one end. It is resonance with a tuning fork of frequency 256Hz sounded above the open end. Given that the velocity of sound in air is 334m/s determine.
    - i)** The wavelength of the wave generated by the tuning fork (2 marks)
    - ii)** The end correction of the tube (2 marks)
- 12.** Figure 10 below shows the main features of cathode ray oscilloscope (C.R.O)



- a)**
  - (i)** Name the parts labeled A and B. (2 marks)
  - (ii)** State the function of B and briefly outline how it works. (2 marks)
  - (iii)** State two functions of the anodes. (2 marks)
- b)** The output of an a.c generator was connected to the input of the cathode ray oscilloscope whose time base settling was 5 milliseconds per centimetre and the y-gain at 10 volts per centimetre, the figure below shows the waveform displayed on the screen of the C.R.O.



Determine

- (i) The park voltage of the generator. (2 marks)
- (ii) The frequency of the voltage. (2 marks)

**13.(a)** Define doping

(1 mark)

**(b)** Distinguish between a p-type and n-type semi-conductors (2 marks)

**(c)** Give one example of a semi-conductor and one example for a conductor. (2 marks)

**(d)** What is meant by donor impurity in a semiconductor? (1 mark)

**(e)** Why is a capacitor included in a bridge circuit? (1 mark)

**(f)** Sketch the graph for when a load is connected to a CRO, in a bridge circuit where a capacitor has been used. (3 marks)

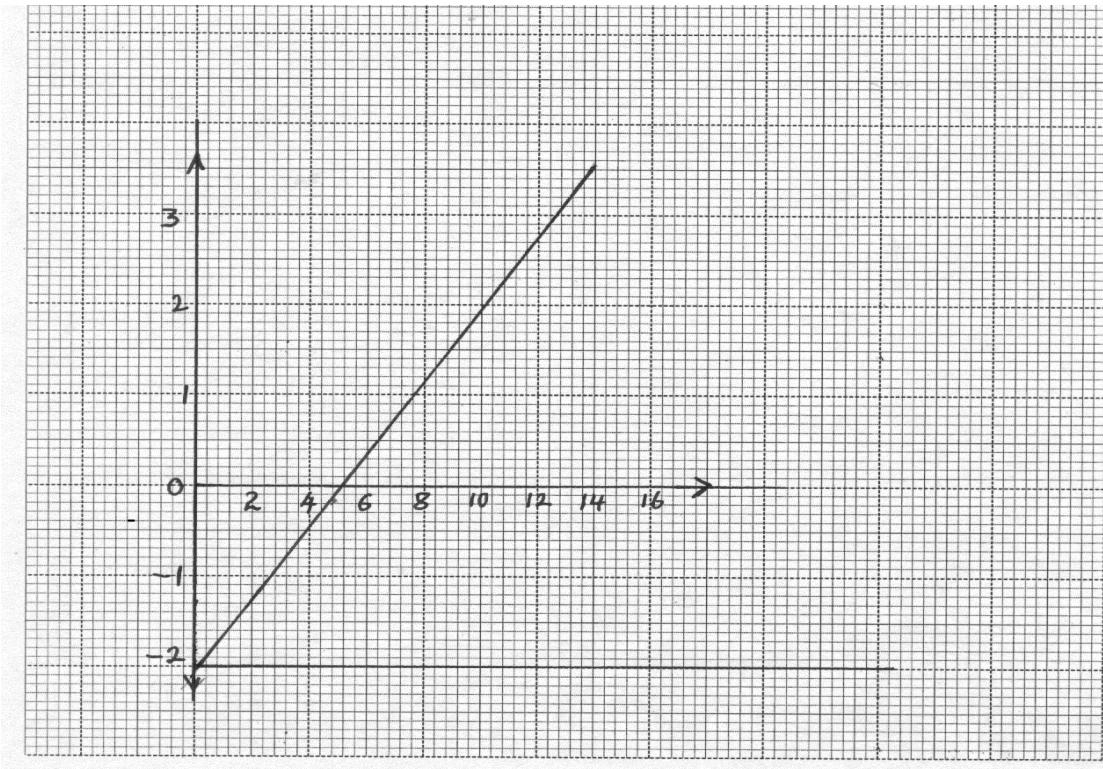
**14.a(i)** What is meant by photoelectric effect? (1 mark)

**(ii)** You are provided with highly polished Zinc Plate, electroscope, source of ultra-violet rays, and materials for charging the electroscope. Draw a setup of the apparatus and show how electric effect may be demonstrated in a laboratory. (2 marks)

**(iii)** Explain how the set up can be used to determine the nature of photoemission taking place. (3 marks)

**(b) (i)** State two factors that affect photo- electric emission. (2 marks)

**(ii)** When a certain photoelectric surface is illuminated with light of different frequencies, the corresponding stopping potential was measured. The graph below shows how frequency ( $f$ ) varies with stopping potentially,  $V_s$ .



Given that  $eVs = hf - \phi$ , determine the values of  $h$  and  $\phi$  from the graph. (5 marks)  
 (electronic charge =  $1.6 \times 10^{-19} C$ )

- 15.a) i)** State two properties of a wire that make it suitable as a fuse. (2 marks)
- ii)** Two fuses of the same length and material may be rated differently. What physical property determines the rating of such fuses? (1 mark)
- b)** Long distance power transmission is done at very high voltages. Explain how this is achieved and why it is necessary to transmit at high voltage (3 marks)
- c)** In most 3 – pin plugs the earth pin is normally longer/ explain why. (1 mark)
- 16. a)** State Lenz's law of electromagnetic induction. (1 mark)
- b)** A transformer with 2000 turns in the primary circuit and 150 turns in the secondary circuit has its primary circuit connected to an 800V a.c source. It is found that when a heater is connected to the secondary circuit, it produced heat at the rate of 1000W. Assuming 100% efficiency, determine the;
- 17.** Voltage in the secondary circuit. (2 marks)
- 18.** Current in the primary circuit. (2 marks)
- 19.** Current in the secondary circuit. (1 mark)
- 20.** State the type of transformer represented above. (1 mark)

NAME.....ADM NO.....

SCHOOL.....CLASS.....

DATE.....

# **TOP STUDENT KCSE PREDICTIONS**

## **SERIES 1 TRIAL 6 PHYSICS PAPER 1**

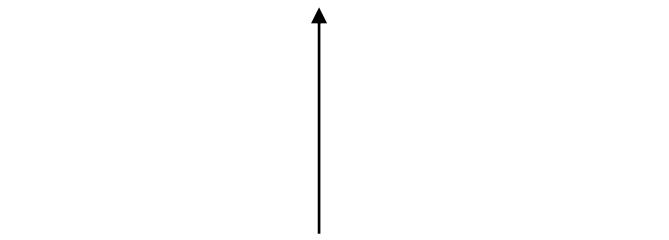
*Kenya Certificate of Secondary Exams*

**TIME: 2 HOURS**

### **SECTION A**

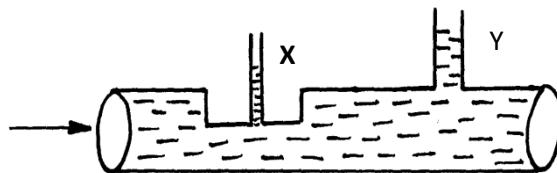
**Answer all questions**

1. State two factors that affect the spring constant of a spring made using a wire of a certain material and a given thickness. **(2mks)**
2. A cart of mass 60kg is pushed along a horizontal path by a horizontal force of 12N and moves with a constant velocity. The force is then increased to 18N. determine
  - (a) The resistance to the motion of the cart. **(1mk)**
  - (b) The acceleration of the cart. **(2mks)**
3. A mass of ice at  $-20^{\circ}\text{C}$  is heated up to  $10^{\circ}\text{C}$  on the axis provided sketch the variation of volume up to  $10^{\circ}\text{C}$ . **(1mk)**

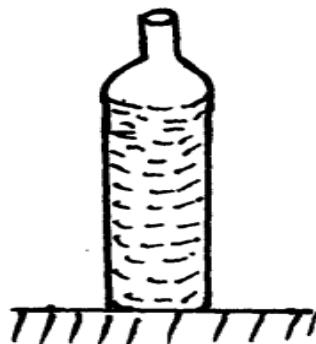


4. Water is pumped through a hose pipe at the rate of 120kg/minute and comes out from the nozzle with a velocity of 20m/s. Calculate the power rating. **(2mks)**

5. A sphere of mass 3kg moving with a velocity of 4m/s collides head on with a stationary of mass 1.5kg and imparts to it a velocity of 3.2m/s. Calculate the velocity of the 3kg sphere after collision. (3mks)
6. In an experiment to determine the diameter  $d$  of an oil patch was measured to be 210mm for an oil drop of radius 0.21mm Determine the size of the oil molecule.( Take  $\pi= 22/7$  ) (3mks)
7. The figure below shows a horizontal tube fitted with two other vertical pipes X and Y. water flows from left to right. Explain why the level of water in tube Y is lower than the level in tube X ( 2mks)



8. Use Kinetic theory of gases to explain pressure law. (2mks)
9. A pin floats on water surface. Other than adding soap and taping the pin, state another method that can be used in the set up to make the pin sink. (1mk)
10. In vacuum flask, the walls enclosing the vacuum are silvered on the inside. State the reason. (1mk)
11. The figure below shows a soda bottle that is full. Explain how the stability of the bottle is affected as the soda is drunk three – quarter way. (2mks)

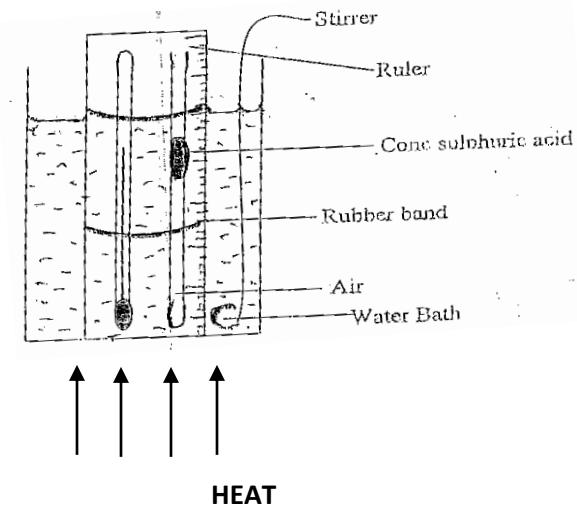


**12.** Explain why deflating the tyres of motor vehicle reduces extent of sinking of the wheel into a soft ground. **(1mk)**

### **SECTION B (55 Marks)**

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

- 13. a)** Define “absolute zero temperature” for an ideal gas **(1 Mark)**  
**b)** Using kinetic theory, explain Boyle’s law for an ideal gas. **(2Marks)**  
**c)** The diagram shows an experiment to investigate the relationship between volume and temperature of a fixed mass of gas at constant pressure.



- i)** Explain the function of;  
    (I) Concentrated sulphuric acid **(1 Mark)**  
    (II) Stirrer **(1 Mark)**  
**ii).** Explain how the set up above can be used to verify Charles law for an ideal gas **(2 Marks)**
- iii.** On the grid below sketch a graph of volume ( $\text{cm}^3$ ) against temperature ( $^{\circ}\text{C}$ ). Mark with letter T the absolute zero temperature. **(2 Marks)**

d) A column of air 20cm long is trapped by mercury thread 6cm long as shown below.

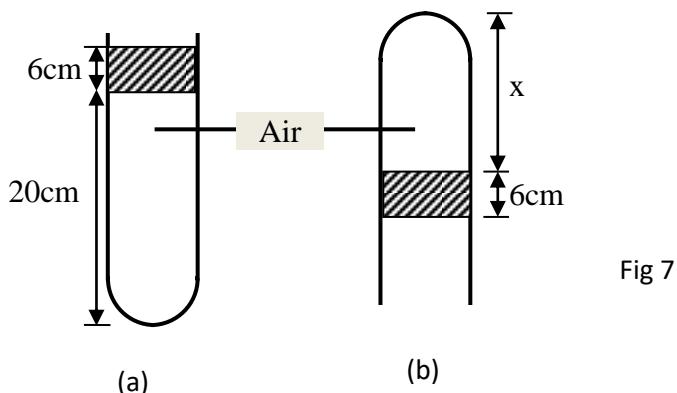
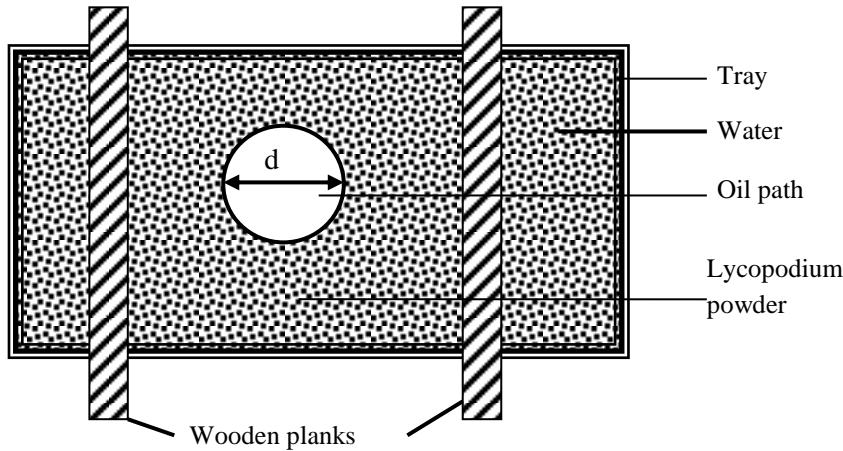


Fig 7

If the same arrangement is now inverted, determine column X in figure b). Take atmospheric pressure as 76cm of mercury. (2Marks)

**14.** The figure 8 below shows an experimental set up for estimating the diameter of an oil molecule.

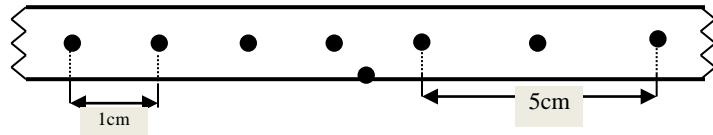
**Figure 8**



- a) Describe how the oil patch is formed (3 Marks)
- b) i) In this experiment the diameter 'd' of the oil patch was measured to be 21cm for an oil drop of radius 0.28mm. Determine the diameter of the oil molecule. (3Marks)
- ii) State any two assumptions made in calculating the diameter of the oil molecule. (2Marks)
- c) What is the role of the lycopodium powder in this experiment? (1Mark)
- d) Describe one method of determining the diameter of an oil drop. (2Marks)

16. The figure 9 below shows the pattern formed on a tape in an experiment to determine the acceleration of a trolley. The frequency of the ticker tape used was 50Hz

**Figure 9**

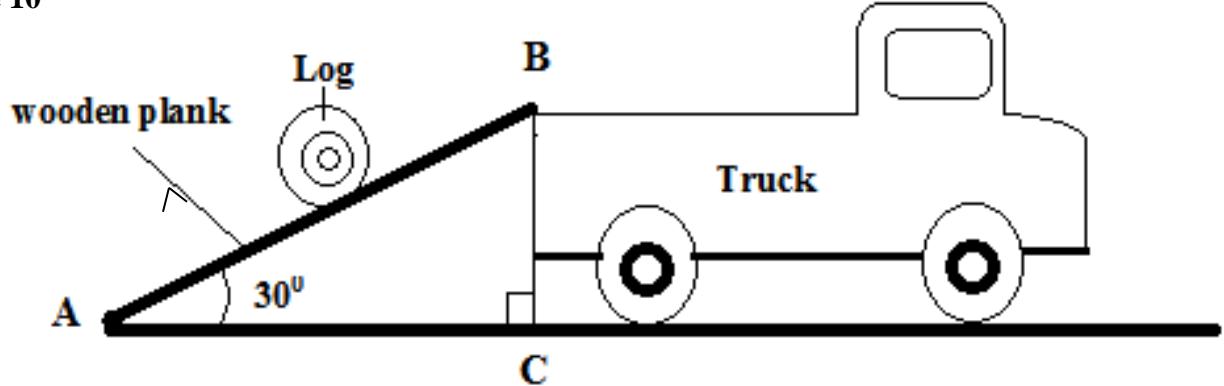


Calculate

- i) The initial velocity of the trolley (2Marks)
  - ii) The final velocity of the trolley (2Marks)
  - iii) The acceleration of the trolley (2Marks)
- b) A gun is fired vertically upwards from the top of an open truck moving horizontally at a uniform velocity of 50m/s. The bullet attains a maximum height of 45m.
- Calculate
- i) The time taken by the bullet to reach the maximum height (3Marks)
  - ii) The distance covered by the truck just before the bullet reaches the level from which it was fired. (3Marks)

17. A man used a wooden plank to lift a wooden log from the ground to a stationary truck as shown in the figure. The wooden plank is inclined at an angle of  $30^{\circ}$  to the ground.

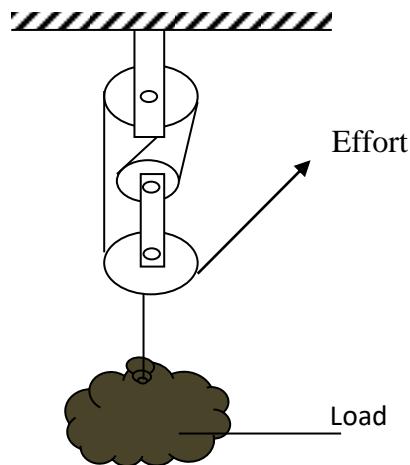
**Figure 10**



- i) Show that the velocity ratio of the system is given as  $V.R = \frac{1}{\sin 30^{\circ}}$  (3Marks)
- ii) Explain why the efficiency of this system cannot be 100%. (1Mark)

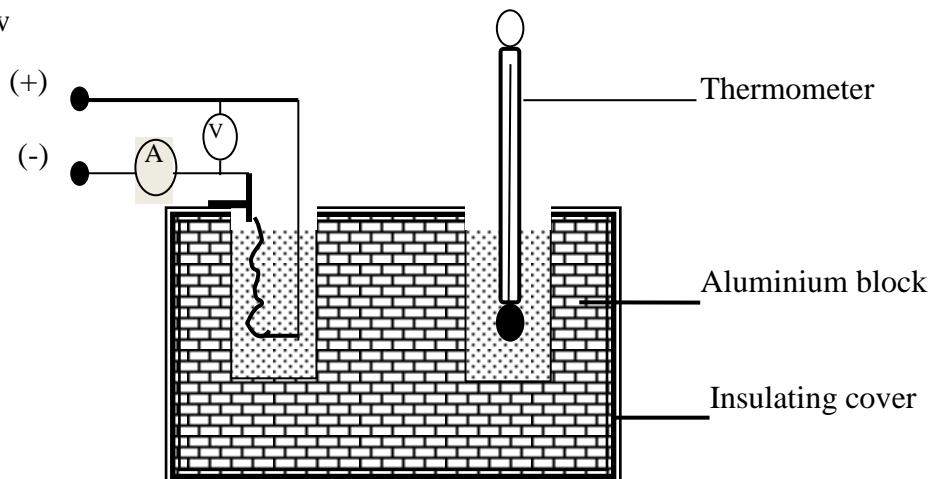
- b) The figure 11 shows a pulley system.

Figure 11

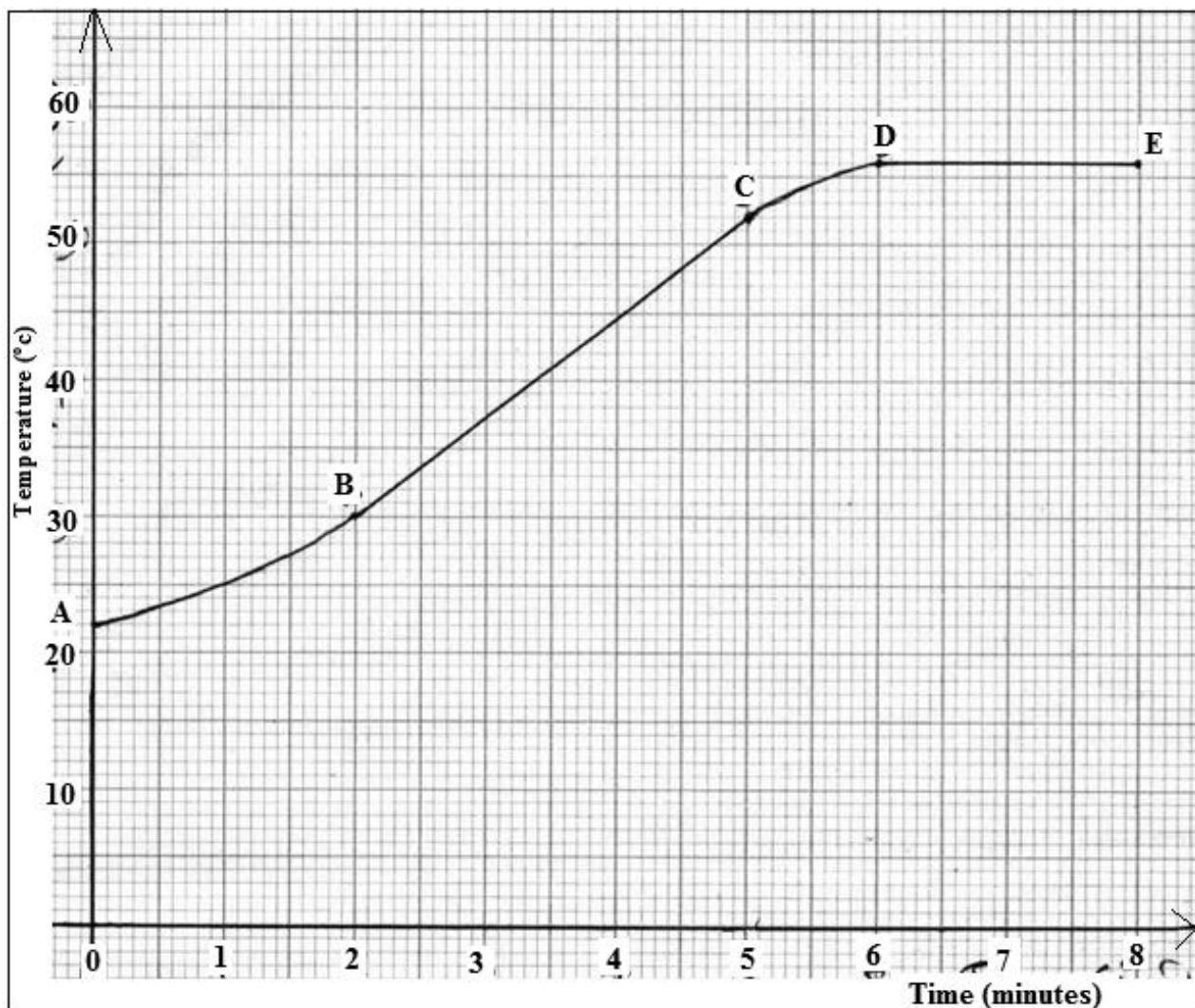


- i) State the velocity ratio of the machine. **(1Mark)**
  - ii) Explain what happens to the mechanical advantage of the machine as the load is increased gradually. **(1Mark)**
  - c) Water falls from a water fall to the bottom. The temperature of the water is found to be higher at the bottom than at the top. State the energy transformation. **(1Mark)**
18. a) Define "specific heat capacity" of a substance **(1Mark)**
- b) In an experiment an aluminium block of mass 2kg was heated using an immersion heater as shown in figure 12 below

Figure 12



The temperature of the block was recorded every minute for exactly five minutes and then the heater was switched off. A graph of temperature in  $^{\circ}\text{C}$  against time in minutes for the experiment is shown below.



**Figure 13**

Study the graph and answer the questions that follow. Suggest why;

- i) The reading in the thermometer rose relatively slowly between point A and B. (1Mark)
- ii) The temperature continued to rise after the water was switched off (1Mark)
- iii) Use the straight portion of the graph (Bto C)to calculate the specific heat capacity of the aluminium given that the voltmeter read 22.00v and ammeter 10A throughout the course of the experiment. Show all the steps you use clearly. (3Marks)
- c) Explain the two reasons why the value calculated in b) iii) will not be accurate. (2Marks)
- d) A temperature scale X has an ice point of  $40^{\circ}$  and a steam point of  $240^{\circ}$ .What is the temperature in  $^{\circ}\text{X}$  when the Celcius temperature is  $50^{\circ}\text{C}$ . (3Marks)

NAME.....ADM NO.....

SCHOOL.....CLASS.....

DATE.....

# TOP STUDENT KCSE PREDICTIONS

## **SERIES 1 TRIAL 6 PHYSICS PAPER 2**

*Kenya Certificate of Secondary Exams*

**TIME: 2 HOURS**

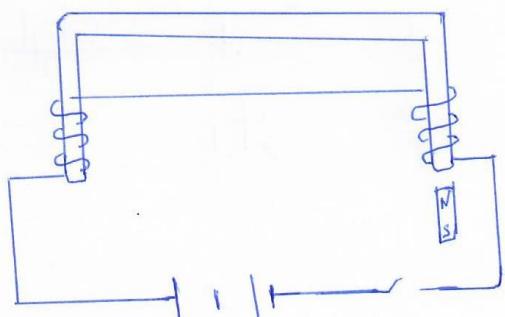
### **SECTION A (25 MKS)**

**Answer all questions**

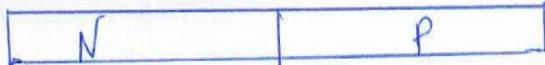
- Determine the angle between incident and reflected ray when mirror below is rotated clockwise by  $10^\circ$ . **(2 mks)**



- Wavelength of wave was 1.33m in air and 1.0m in a medium, determine refractive index of that medium. **(3 mks)**
- Explain what happens to magnet below when circuit is switched on. **(2 mks)**



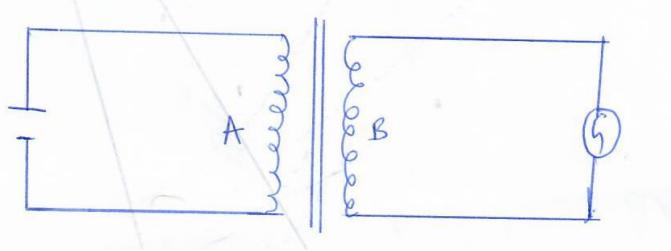
4. Explain why power is transmitted at high voltage. (1 mk)  
 5. Complete diagram below for forward biased diode. (1 mk)



6. A mirror of focal length 9cm forms an image of height 3cm at 6cm behind the mirror but diminished.  
 (a) Identify mirror used. (1 mk)  
 (b) Determine image position. (3 mks)
7. Arrange radiations below in order of decreasing wavelength Red, U.V, infra-red, yellow light. (1 mk)
8. A sample of 64g disintegrates with half life of 5 days. Determine mass decayed after 25 days. (3 mks)
9. A bulb was rated 60w, 240v, what does it mean. (1 mk)
10. State any property of x-rays. (1 mk)
11. Frequency of wave was 50Hz, determine its period. (2 mks)
12. State any application of pulse echo technique. (1 mk)
13. A battery supplies 50Ah for 720 minutes, determine current supplied. (3 mks)

## **SECTION B** (55 MKS)

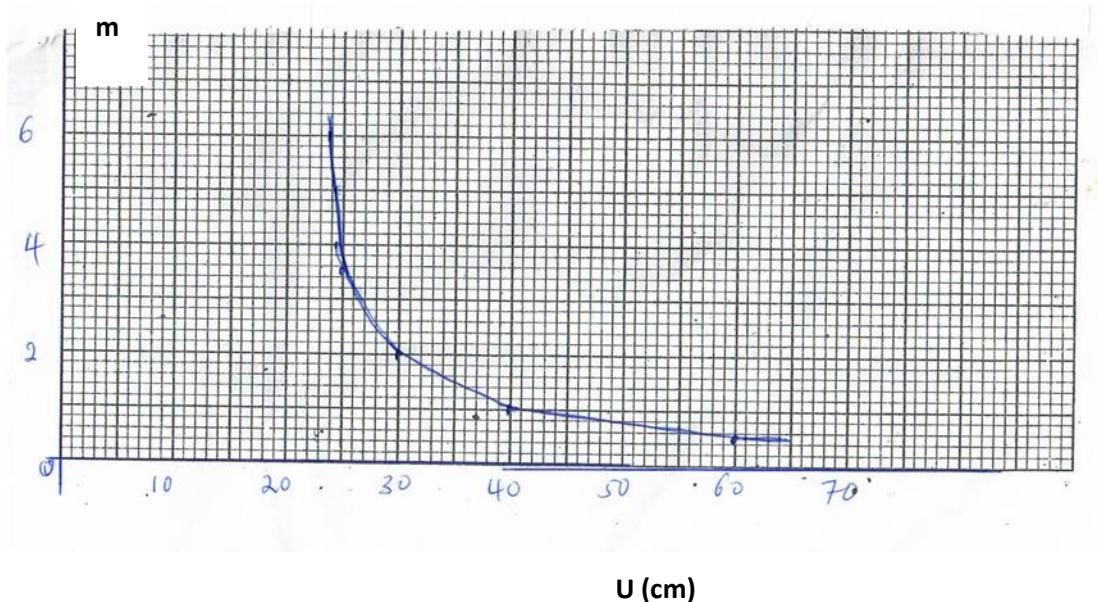
14. Study figure below to answer following questions.



- a) State what happens to Galvanometer when:  
 (i) Switch is closed. (2 mks)  
 (ii) Switch is open (2 mks)
- b) Primary coil of transformer has 2000 turns and secondary has 400 turns. Primary is connected to 240V a.c main supply.  
 (i) Explain how Emf is induced in secondary coil. (2 mks)  
 (ii) Determine secondary voltage. (3 mks)

- (iii) Determine efficiency of transformer if current in primary coil is 0.2A and in secondary coil is 0.80 A. (3 mks)

15. Graph below is a magnification against object distance for lens of focal length 20cm.

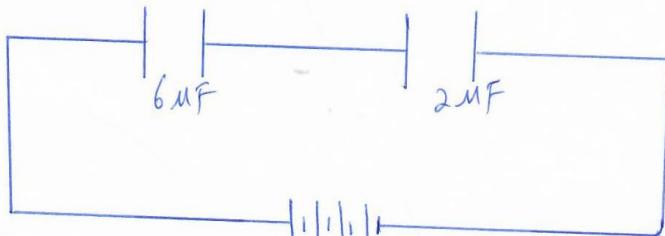


a)

- (i) State effect on image size when object distance is increased from 25cm. (1 mks)
  - (ii) Determine distance between object and lens when image is same size as object. (2 mks)
  - (iii) Determine image distance when object distance is 25cm. (3 mks)
- b) An object is 30cm in front of converging mirror of focal length 15cm. Sketch ray diagram to locate image formed. (3 mks)
- c) State why parabolic reflectors are used in car head lights. (1 mks)

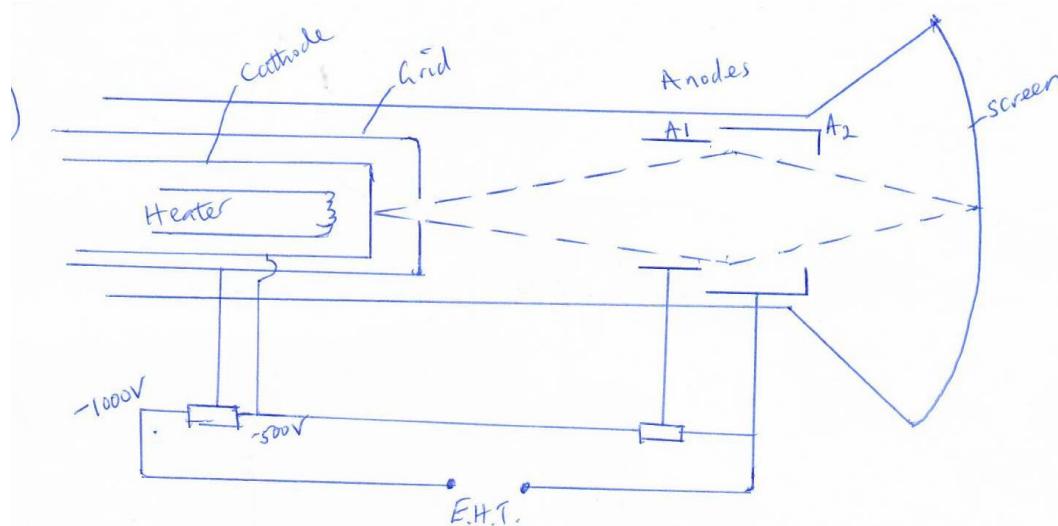
15.

- a) Explain why a positively charged electroscope gets discharged when the cap is touched with a finger. (2 mks)
- b) Use figure below to answer following questions.



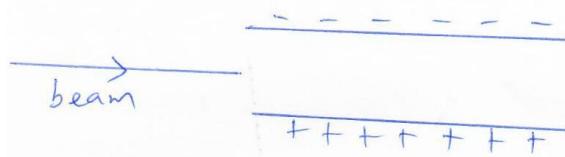
Determine

- i) Effective capacitance in circuit. (3 mks)  
 ii) Quantity of charge in 6UF capacitor. (3 mks)  
 iii) Quantity of charge in 2 UF capacitor. (1 mk)  
 c) Sketch electric field pattern around isolated point charge below. (1 mk)
- 16.** A charge of 300 coulombs flows across conductor of potential difference 12V in 10 seconds.
- a) Determine
- (i) Electrical energy supplied. (3 mks)
  - (ii) Power transmitted. (2 mks)
  - (iii) Show that  $P = IV$  (2 mks)
- b) A lighting circuit in a house has 15 lamps each rated 75w, 240v. Determine whether a fuse rated 4A can be used in circuit when all lamps are put on. (4 mks)



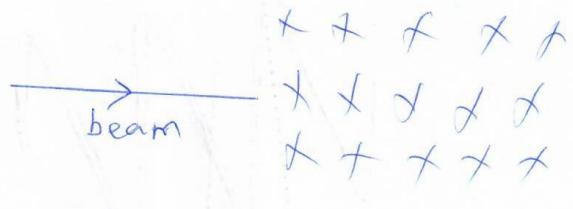
**17.**

- a)
- (i) State how electrons are produced in tube. (1 mk)
  - (ii) State how electron beam is detected. (1 mk)
  - (iii) State function of variable p.d at
    - i) Grid (1 mk)
    - ii) Anode (1 mk)
- b) Show how beam is deflected in
- i) Electric field (1 mk)

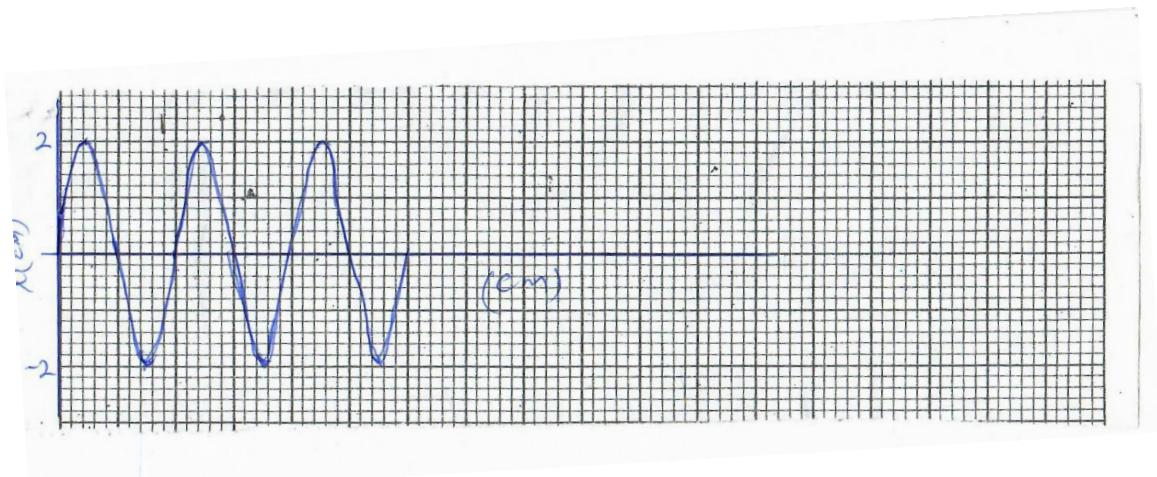


ii) Magnetic field.

(1 mks)



c) Waveform below is obtained from signal applied to y-plate of C.R.O whose time base setting is 2 ms/dv



Dedetermine

(i) Period of signal

(2 mks)

(ii) Frequency of signal

(3 mks)

NAME.....ADM NO.....

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# **TOP STUDENT KCSE PREDICTIONS**

## **SERIES 1 TRIAL 7 PHYSICS PAPER 1**

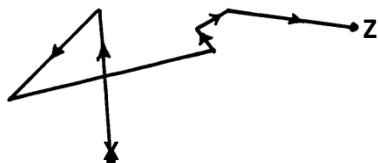
*Kenya Certificate of Secondary Exams*

**TIME: 2 HOURS**

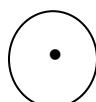
### **SECTION A (25 MARKS)**

**Answer all questions**

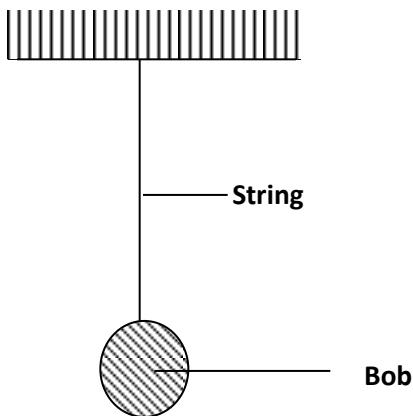
1. State one factor that a bimetallic strip relies on for its working (1mk)
2. The figure below shows a path taken by a gas molecule moving from point x to z



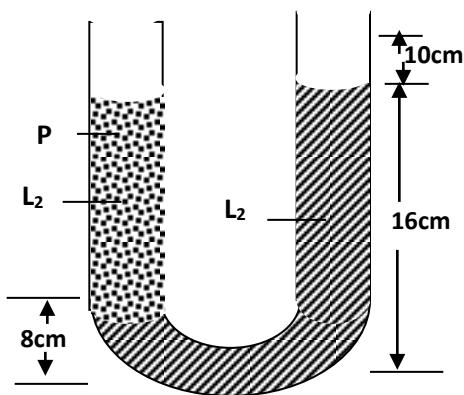
- (a) Explain how this movement can be observed (1mk)
- (b) State in full, the law of motion that governs movement from x to z (1mk)
3. Complete the figure below to show how a single pulley can be arranged to a velocity ratio(V.R) of 2 (2mks)



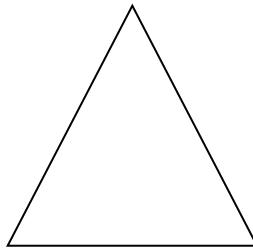
4. An object weighs 2.6 N in air and 2.2N when completely immersed in water. Determine the relative density of the object **(2mks)**
5. A single pendulum consisting of a heavy bob and string is suspended in air as shown in the figure below



- Mark on the diagram and name one other force acting on the bob
6. The bob in the figure above is deflected then released to oscillate. State and explain one factor that will determine whether the string breaks or not **(2mks)**
7. A u-tube vertically holds two liquids L<sub>1</sub> and L<sub>2</sub> as shown in the figure below

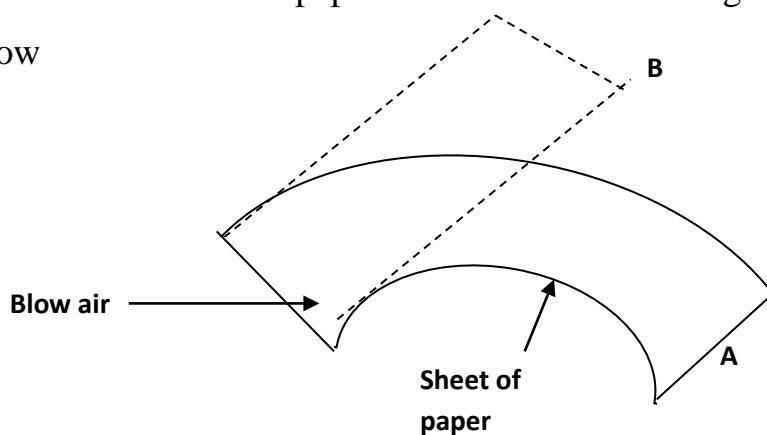


- (a) Mark accurately the point in liquid  $L_2$  that is at the same pressure as point P (1mk)
- (b) Determine the number of times  $L_1$  is denser than  $L_2$  (2mks)
8. Define crystal cleavage (1mk)
9. A crystal of potassium permanganate was carefully introduced at the bottom of water column held in a gas jar. After sometime, the whole volume of water was coloured. Explain this observation (2mks)
10. A turning effect of force depends on the magnitude of the force. State two other factors that determines the moment of a force (2mks)
11. The figure below shows a sheet of material with the shape of an isosceles triangle. Mark its centre of gravity accurately showing how you arrive at the answer (1mk)



12. Two objects made of the same material and having the same mass are heated to a temperature of  $35^{\circ}\text{C}$  above that of the atmosphere and then allowed to cool in still air for 30 minutes. State one factor that will determine their final temperature (1mk)

13. A student holds a sheet of paper at an end so that it hangs in the position A as shown below

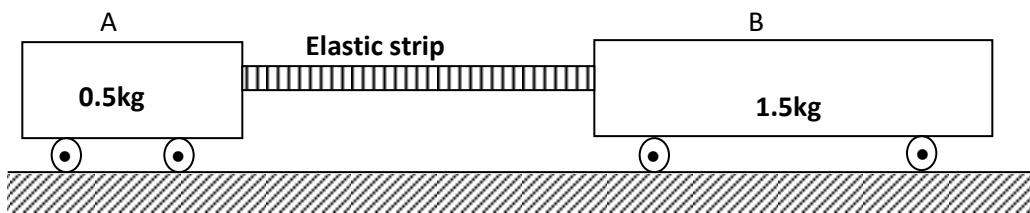


Explain why the paper rises to the position B when the student blows air in the direction shown by the arrow (2mks)

### **SECTION B (55MRAKS)**

**Answer all questions**

14. The diagram below shows two trolleys, A and B connected to each other by an elastic strip of negligible mass. The trolleys are pulled apart on a smooth plane till tension in the elastic strip is 4.0N and are then released suddenly



- (a) State with reason the total momentum of the trolleys when they are just released (2mks)
- (b) Calculate the initial acceleration of trolley A when released (3mks)
- (c) The velocity of the trolley B is  $0.9\text{ms}^{-1}$  just before it collides with A. Determine the velocity of A just before the collision (3mks)
- (d) Which trolley covers a longer distance before collision? Explain (2mks)
- (e) Explain why the elastic strip may not stretch to the same original length after impact. (2mks)

15. The readings tabulated below shows how the length of a helical spring varied with the load hanging on it

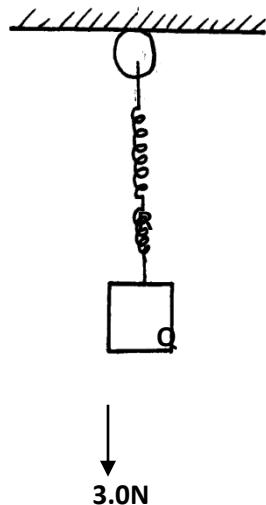
<b>Load (N)</b>	0	1	2	3	4	5
<b>Length of spring (cm)</b>	0.80	12.5	17.2	21.8	26.5	31.2
<b>Extension (cm)</b>						

- (a)(i) Complete the table to show the values of extension (2mks)
- (ii) Draw a graph of extension (y-axis) against load for the spring (5mks)

**(Graph paper provided)**

**(iii) Determining form the graph the proportionality constant of the spring (2mks)**

**(b)** Two springs **Q** and **R** have proportionality constants  $20\text{N/M}$  and  $25\text{N/M}$  respectively. **Q** weighs  $0.2\text{ N}$  while the weight of **R** is negligible. The two springs are arranged to support a load of  $3.0\text{N}$  as shown in the diagram below



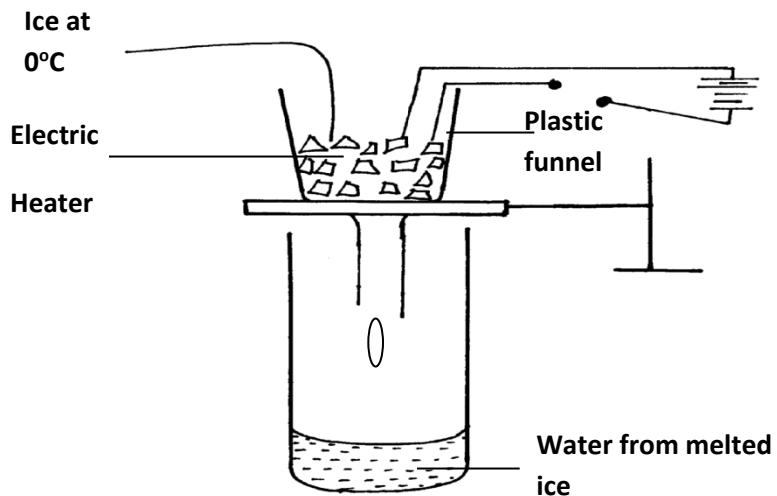
Determine the extension in

**(i) Q** **(1mk)**

**(ii) R** **(1mk)**

**(c) State two factors that determine the proportionality constant of a helical spring (2mks)**

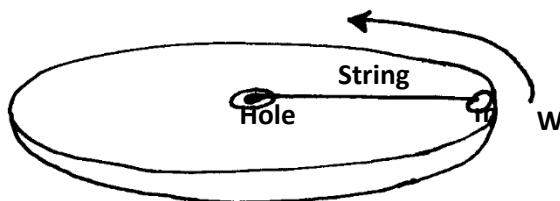
16. A student set-up the apparatus as shown below to determine the power of an electric heater



- (a)(i) Other than time, state the measurements that would be used to determine the quantity of heat  $P$  absorbed by ice in a unit time (2mks)
- (ii) Complete the circuit to show the connection of the essential circuit components (2mks)
- (iii) Describe how the student would proceed to determine  $P$  (3mks)
- (iv) Give a reason why  $P$  may not be equal to the value indicated by the manufacturer (1mk)
- (b) In another experiment, 100g of hot water at 90°C was mixed with 20g of ice at 0°C in a lagged plastics colorimeter. After stirring, all the ice melted and the temperature of the mixture was found to be 61.5°C. Determine the latent heat of fusion of ice (3mks)  
(Specific heat capacity of water = $4200\text{Jkg}^{-1}\text{k}^{-1}$ )

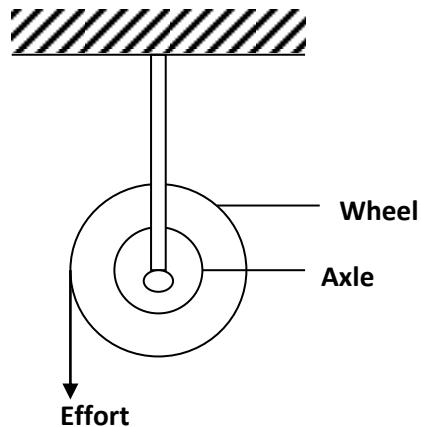
17. (a) Explain what you understand by each of the following terms  
 (i) Angular velocity (1mk)  
 (ii) Centripetal force (1mk)
- (b) A bicycle wheel with radius 28cm moves with a linear velocity of 8m/s, determine  
 (i) the angular velocity of the wheel (2mks)  
 (ii) the centripetal acceleration of a point on the rim of the wheel (2mks)

- (c) To determine the relationship between angular velocity  $\omega$  and tension  $T$ , a student used a smooth disc with a hole at the centre, a string and cylindrical object of mass  $m$ , as shown below



Describe how the student went about determining the relationship, specifying any other necessary material or instrument not shown in the diagram (3mks)

18. (a) The diagram in the figure below represents a wheel and axle used as a machine, whose efficiency is 80% to raise 400N of building materials. The wheel and axle have diameters of 75cm and 15cm respectively.



- (i) Mark on the diagram the correct position and direction of the load to be lifted (1mk)

- (ii) Name the principle on which this machine works (1mk)

- (iii) Calculate the effort needed to raise the load (3mks)

- (iv) The machine is operated manually and raises the load to a height of 5m in 20 seconds. Calculate the power developed by the operator (2mks)

- (b) (i) State two factors that determines the efficiency of an inclined plane as a machine (2mks)

- (ii) Explain how these factors affect efficiency (2mks)

NAME.....ADM NO.....

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# **TOP STUDENT KCSE PREDICTIONS**

## **SERIES 1 TRIAL 7 PHYSICS PAPER 2**

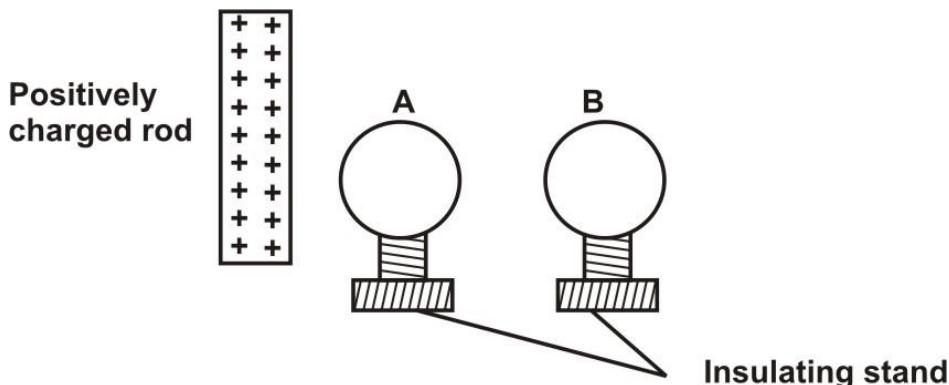
*Kenya Certificate of Secondary Exams*

**TIME: 2 HOURS**

### **SECTION A**

**Answer all questions**

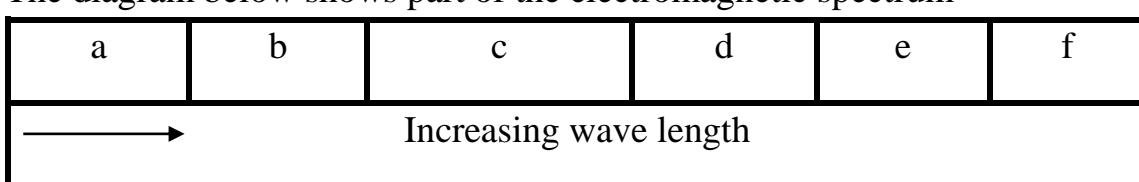
1. Give two reasons why prisms may be preferred over plane mirrors in the construction of a periscope **(2mks)**
2. Two spherical conductors are placed close together without touching as shown below



Show the distribution of charges in the sphere when a highly positively charged rod is brought near A **(2mks)**

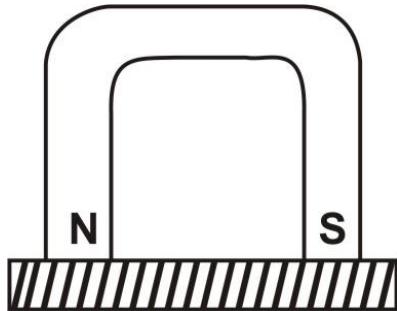
3. Give two similarities between cathode rays and x-rays. **(2mks)**

4. Give a reason why it is not advisable to smoke a cigarette near a charging battery. (1mk)
5. A radio station broadcast on a wavelength 150m at a frequency of 200kHz. Calculate the velocity of the radio waves (2mks)
6. The diagram below shows part of the electromagnetic spectrum



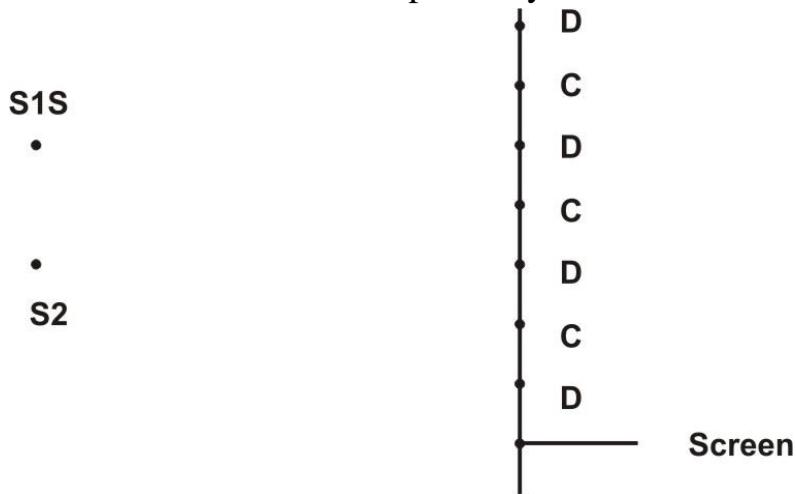
Radiation of frequency corresponding to each of the above regions is allowed strike a metal plate and in some cases electrons wave ejected from the metal surface.

- (i) From which of the above regions is the radiation most likely to eject electrons from metal plate? (3mks)
- (ii) Give a reason for your answer in (i) above (1mk)
7. On the space provided below, draw a ray diagram to show how a doctor can use a curved mirror to examine a patient tooth (3mks)
8. A girl places her ear at one end of a long metal rod. The slightest tap at the other end of the rod is clearly heard. Although it may be inaudible when her ear is removed from the rod. Explain this observation (1mk)
9. Explain what happens to the depletion layer when a diode is in forward biased (1mk)
10. The experiment below is an equation for a radioactive element A. element B and C are daughter nuclide
- $$^{235}_{92}A \longrightarrow ^{231}_{90}B + {}_X^Y C$$
- (i) Identify the element C (1mk)
- (ii) State one characteristics of the element C (1mk)
11. The figure below shows a u-shaped magnet stored with a keeper.



Explain how this method helps to retain magnetism longer. **(1mk)**

- 12.** The figure below shows a setup for observing interference of waves from two sources  $S_1$  and  $S_2$ . The points C and D represents positions of the constructive and destructive interference respectively as observed on the screen



If the observation was made in a nipple tank

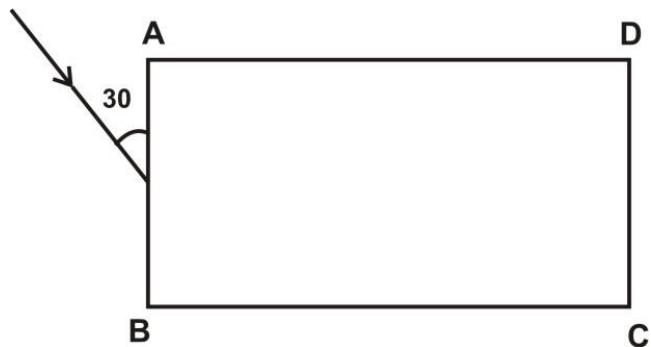
- (i) Explain how the constructive and destructive interference patterns are produced **(2mks)**
- (ii) Draw a line joining all points where waves from  $S_2$  have travelled one wavelength further than the waves from  $S_1$  **(1mk)**

## SECTION B

**(55 marks)**

*Answer all questions*

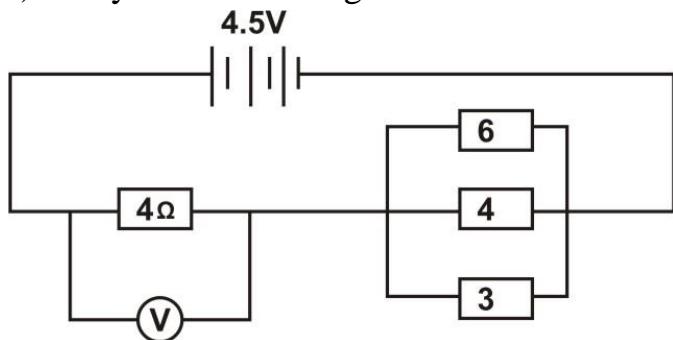
- 13.a)** State the conditions to be satisfied for total internal reflection to occur **(2mks)**
- b)** A ray of light travelling in the air enters a rectangular glass block at an angle of  $30^\circ$  face AB.



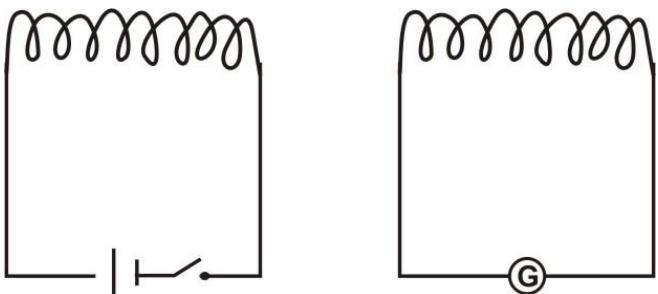
If the refractive index of the glass is 1.5, find;

- (i) The angle of refraction in the glass block (2mks)
- (ii) The critical angle of the glass block (2mks)
- (iii) In the same diagram, complete the diagram to show the path of light through and out of the glass block (2mks)
- c) In the spaces provided below, draw a diagram to illustrate the correction of myopia (short sight) (2mks)

**14.a)** Study the circuit diagram below and answers the question that follows.



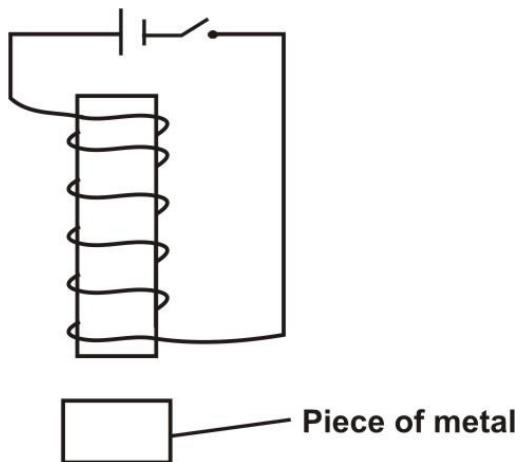
- (i) Calculate the effective resistance of the circuit (3mks)
  - (ii) Find the voltmeter reading (2mks)
  - b) A cell drives a current of 3.2A through a  $2.8\Omega$  resistor. When it is connected to  $1.6\Omega$  resistor, the current that flows is 5A. Find the Emf and the internal resistance of the cell (3mks)
  - c) A house has five rooms with 240V, 60W bulbs. If the bulbs are switched on from 7.00pm to 10.30pm. Find the cost per week for the lighting this rooms at Ksh. 14.20 per unit (3mks)
- 15.a)** The figure below shows two circuit close to each other as shown



when the switch is closed, the galvanometer shows a reading and then returns to zero. When the switch is then opened the galvanometer shows a reading in the opposite direction and then returns to zero.

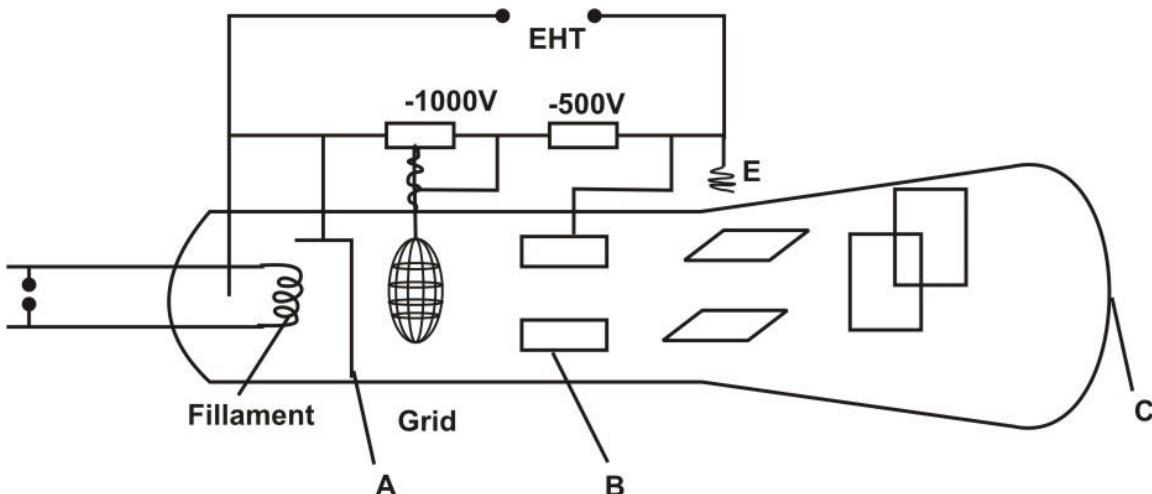
Explain this observations (3mks)

- b)** A step-down transformer has 2000 turns in the primary circuit and 200 turns in the secondary circuit. When the primary circuit is connected to a 240v a.c source, the power delivered to a resistor in the secondary circuit is found to be 800w.
- (i) What is meant by a step-down transformer (1mks)
- (ii) Explain how energy losses in this transformer can be reduced by having a soft iron core in it (2mks)
- (iii) Determine the current in the secondary circuit if the transformer is 100% efficient (3mks)
- c)** A student wanted to lift a magnetic piece of metal using an electromagnet. He connected the circuit as shown below.

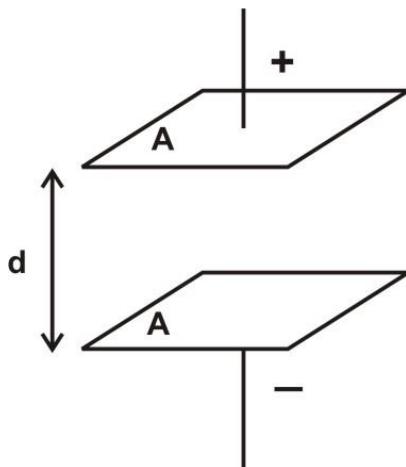


Suggest three adjustment he can make to his set up so that it can perform the intended function (3mks)

- 16.** The figure below shows a cathode ray oscilloscope (C.R.O)



- a) (i)** State the function of the components labeled **A**, **B** and **C** (3mks)
- A-**
- B-**
- C-**
- (ii)** What would be the effect on the C.R.O if the temperature of the filament of the electron gun was raised? (1mk)
- b)** A T.V tube uses a voltage of 4550V to accelerate electrons released from its cathode by thermionic emission.
- (i)** What is meant by thermionic emission (1mk)
- (ii)** If an electron has a charge of  $1.6 \times 10^{-19} \text{C}$  and a mass of  $9.11 \times 10^{-34} \text{kg}$ . find the speed of the electron as it strikes the screen (3mks)
- c)** Give a reason why it is possible to have a wider screen in the television set than on a cathode ray oscilloscope (C.R.O) (1mks)
- d)** The figure below represent two parallel plates of a capacitor separated by a distance **d**, each plate has an area of **A** square units



Suggest two adjustments that can be made so as to reduce the effective capacitance  
**(2mks)**

- 17.a)** State two factors which determine the speed of photoelectrons emitted by a metal surface **(2mks)**
- b)** The figure below is a graph of the stopping potential,  $V_s$ , against frequency  $f$  in an experiment on photoelectric effect **(GRAPH PAPER PROVIDED)**
- What is meant by stopping potential **(1mk)**
  - Given that the stopping potential,  $V_s$  is related to the frequency  $f$ , by the equation  

$$V_s = \frac{hf}{e} - \frac{W_0}{e}$$
 where  $e$  is the charge of an electron  $e = 1.6 \times 10^{-19} C$
- Determine from the graph
- Planks constant,  $h$ , **(4mks)**
  - work function,  $W_0$  for the metal in electron volts (eV) **(3mks)**

NAME.....ADM NO.....

SCHOOL.....CLASS.....

DATE.....

# **TOP STUDENT KCSE PREDICTIONS**

## **SERIES 1 TRIAL 8 PHYSICS PAPER 1**

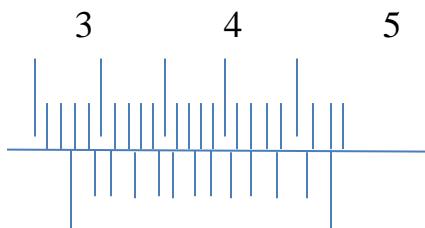
*Kenya Certificate of Secondary Exams*

**TIME: 2 HOURS**

### **SECTION (25marks)**

**Answer all the Questions in this section**

- Figure 1 below shows a section of a vernier caliper.



**Figure 1**

If the vernier calipers has a zero error of +0.02 what is the actual reading of the vernier caliper. **(2mks)**

- A body is projected vertically upward from the top of a building. It lands at the base of the building. Sketch the velocity time graph of the motion. **(2mks)**
- When floating in a liquid of relative density 0.8 a rod displaces 90cm<sup>3</sup>; what volume will it displace when it floats in a liquid of relative density 1.2? **(3mks)**
- Two** identical pick-ups A and B are loaded such that their center of gravity is as shown in the figure below.

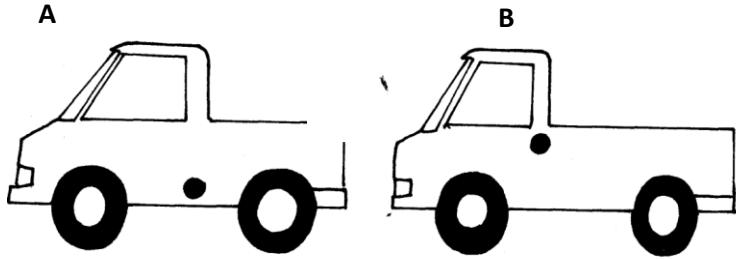
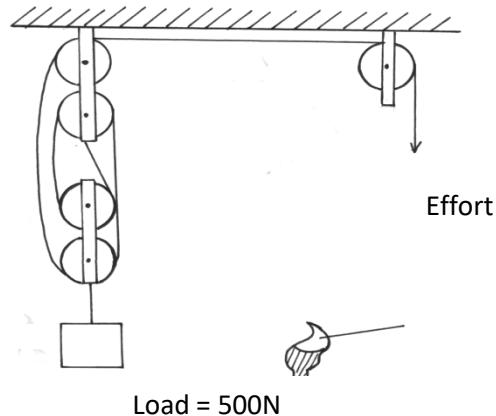


Figure 2.

Explain which one of the pick-ups is more stable. (2mks)

5. Oil accidentally spilt on an ocean and spread into a monolayer film of area  $2.0 \times 10^{12} \text{ cm}^2$ . The oil was found to consist of molecules of thickness  $5 \times 10^{-9} \text{ m}$  each. Calculate the volume of oil that splint. (3mks)
6. Give a reason why mercury is preferred as a barometric liquid. (2mks)
7. A drawing pin was observed to float on the surface of pure water. When a few drops of soap solution were added to the water the pin sank. Explain this observation. (2mks)
8. A ball of mass 2kg is whirled at the end of a string in a horizontal circular path at a Constant Speed of  $5 \text{ ms}^{-1}$ . if the string is 2.0m long calculate the tension in the string. (3mks)

Figure 3 shows a set of pulley used to lift a load of 500N



**Figure 3**

Use the information above to answer questions 9 and 10

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

10. If the efficiency of the machine is 80%, find the effort required to just lift the load. (2mks)

11. Water flows steadily through a pipe whose diameter is 2cm with a speed of 4.5m/s. The pipe widens at some point to 3.0cm in diameter. What is the speed of water flow at this point? (3mks)

## **SECTION B (55marks)**

**Answer all questions in this section**

12. A fair ground ride trolley of mass 120Kg carrying two passengers of average mass 40Kg was released at point  $P$  of a frictionless curved surface  $S$ . upon reaching the horizontal, it collided with a stationery trolley of mass 140Kg carrying three passengers of average mass 60Kg. if the two trolleys moved together with a common velocity along the horizontal for 1.2 seconds before coming to rest, determine:

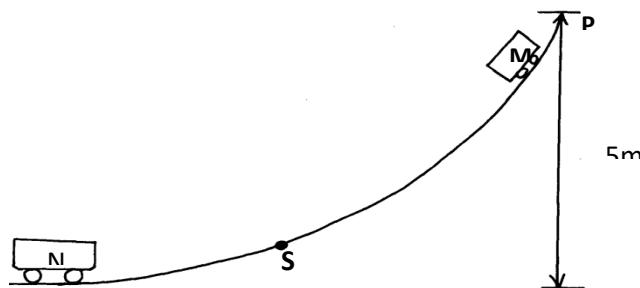


Figure 5

(a) The gravitational potential energy of the trolley at point  $P$  (2mks)

(b) The velocity of trolley  $M$  just before it collides with trolley  $N$  (3mks)

(c) The common velocity of the two trolleys after collision. (3mks)

(d) The impulse (2mks)

13 (a) State Boyle's law. (1mk)

(b) The figure 6 below shows a simple set up for pressure law apparatus.

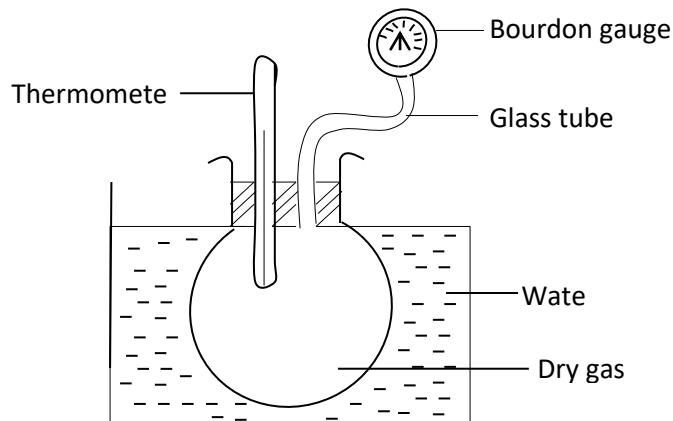
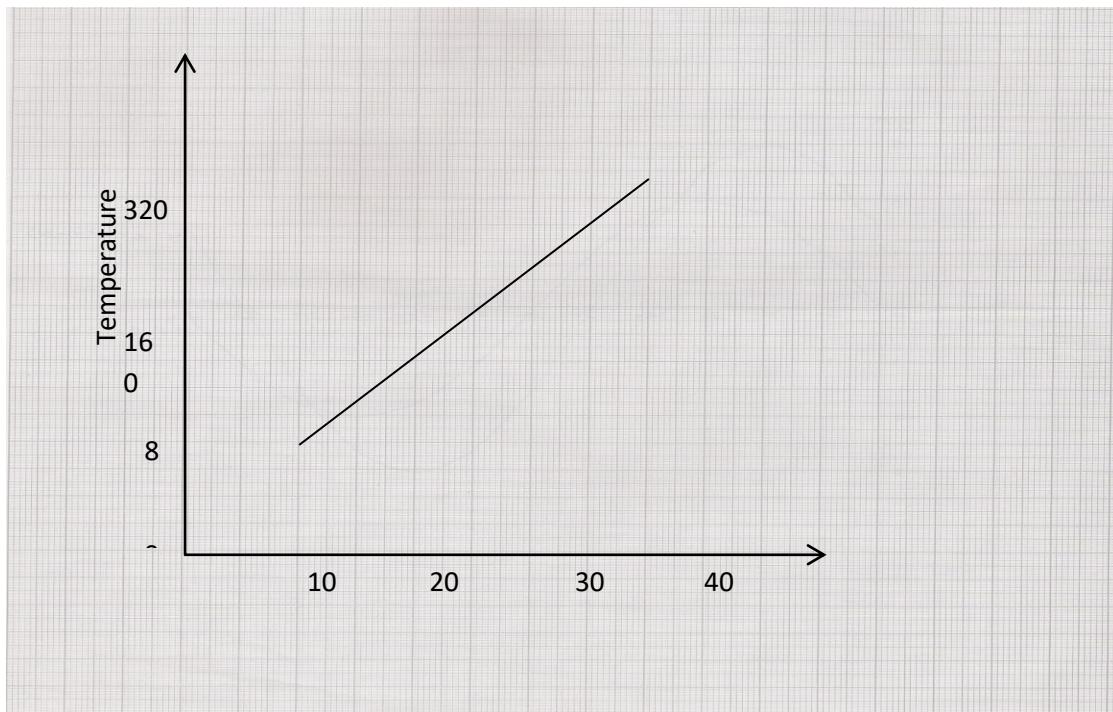


Figure 6

↑↑↑

- (i) State measurement to be recorded. (2mks)
- (ii) The graph in the figure **below** shows the relationship between temperature and pressure for a fixed mass of an ideal gas at constant volume.



- (ii) Given that the relationship between temperature T and pressure P is of the form  $TK + C = P$  where K and C are constants, determine from the graph the values of K and C. (3mks)

(c) A sample of the gas has a pressure of  $1.0 \times 10^5 \text{ Pa}$  when its temperature is  $10^\circ\text{C}$ . What will be its pressure when its temperature is raised to  $100^\circ\text{C}$  and its volume doubled

(3mks)

14.(a) Define specific latent heat of fusion of a substance

(1mk)

(b) Water of mass 400g at a temperature of  $60^\circ\text{C}$  is put in a well lagged copper calorimeter of mass 160g. A piece of ice at  $0^\circ\text{C}$  and mass 40g is placed in the calorimeter and the mixture stirred gently until all the ice melts. The final temperature, T, of the mixture is then measured. (*Specific latent heat of fusion of ice =  $334000 \text{ J/kg}$ , specific heat capacity of water =  $4200 \text{ J/kgK}$  specific heat capacity of copper =  $400 \text{ J/kgK}$* )

Determine:

(i) The heat absorbed by the ice during melting. (2mks)

(ii) Total heat gained by the ice (*Give your answer in terms of T*) (2mks)

(iii) Heat lost by the water. (1mk)

(iv) Heat lost by the calorimeter. (1mk)

(iv) The final temperature T of the mixture (2mks)

c) Figure 7 below shows a block of ice with two heavy weights hanging such that the copper wire connecting them passes over the block of ice block resting on wooden support.

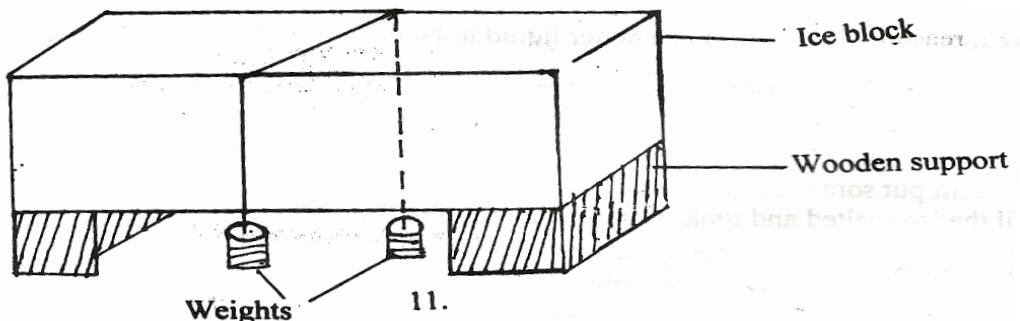


Figure 7

It is observed that the wire gradually cuts its way through the ice block, but the ice is left as one piece. Explain why. (2mks)

15 a) State the law of flotation (1mk)

b) A piece of wood is floating with three fifth of its volume immersed in water  
What is the density of the wood (*density of water  $1000 \text{ kg/m}^3$* ) (2mks)

c) A metal block of mass 3kg and volume  $500 \text{ cm}^3$  is hang at the 10cm mark of a uniform

meter rule and then is completely submerged in water in a beaker as shown in the diagram below.

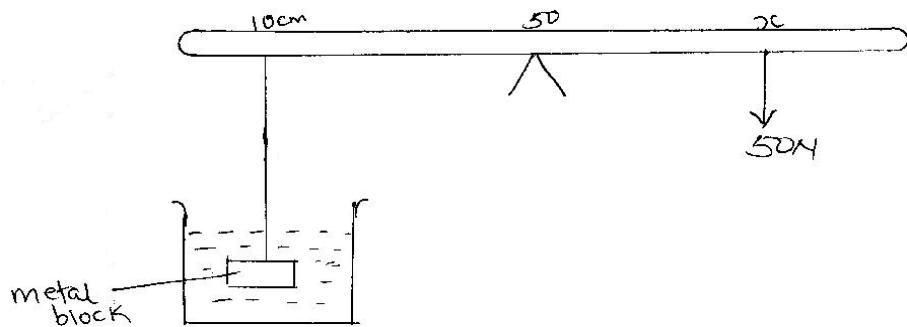


Figure 8

- i) Show all the force acting on the metal block (3mks)
  - ii) If the rule is pivoted at the 50cm mark determine the point  $x$  at which a 50N weight should be placed so as to balance it ( $\text{density of water} = 1000 \text{kg/m}^3, g = 10 \text{N/kg}$ ) (3mks)
  - d) i) State two factors that determine the pressure of a fluid at a place. (2mks)  
ii) Explain why ducks are able to walk over swampy grounds without sinking. (1mk)
- 16. (a)** Define angular velocity (1mk)
- (b)** Figure 9 shows a body of mass  $m$  attached to the centre of a rotating table with a String whose tension can be measured .

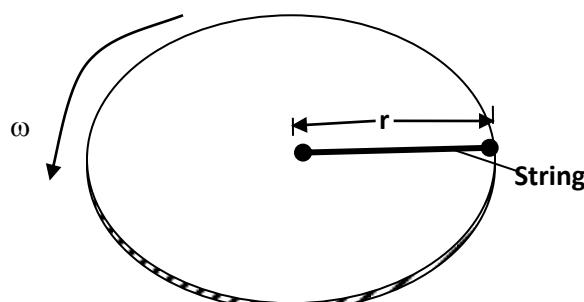


Figure 9

The tension  $T$ , on the string was measured for various values of angular velocity  $\omega$ . The distance  $r$  of the body from the centre was maintained at 60cm. Table below shows the results obtained:-

Angular velocity ( $\omega$ ) (rads <sup>-1</sup> )	2.0	3.0	4.0	5.0	6.0
Tension (T) (N)	0.04	0.34	0.76	1.30	1.96

(i) Plot the graph of T against  $\omega^2$  (5mks)

**(GRAPH PAPER PROVIDED)**

(ii) From the graph determine the mass m of the body given that  $T + C = \omega^2$ , where C is Constant mr (3mks)

c) i) State the principle of conservation of energy. (1mk)

ii) A ball of mass 1.5kg falls freely from a height 20m and rebounds to a vertical height of 6m. Determine time the ball takes to reach the ground. (2mks)

iii) Account for the loss in kinetic energy on impact. (1mk)

NAME.....ADM NO.....

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# **TOP STUDENT KCSE PREDICTIONS**

## **SERIES 1 TRIAL 8 PHYSICS PAPER 2**

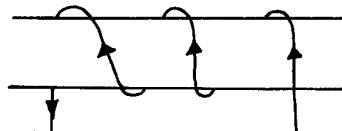
*Kenya Certificate of Secondary Exams*

**TIME: 2 HOURS**

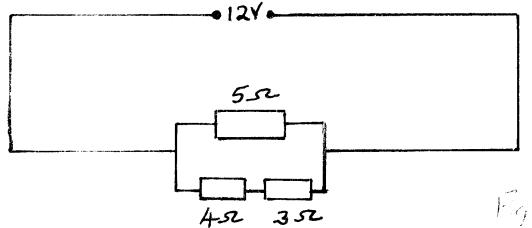
### **SECTION A (25 Marks)**

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

1. Sketch the magnetic field for a conductor shown in the figure below. (2mks)

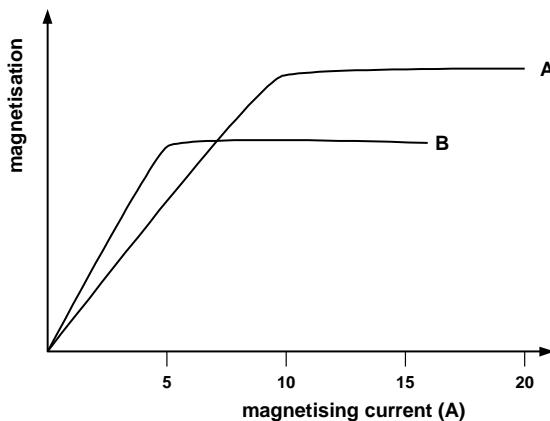


2. State **one** similarity and **one** difference between a camera and a human eye. (2mks)
3. State **one** factor which does not change as water waves move from shallow to deep end. (1mk)
4. A girl standing 200m from the foot of a high wall claps her hands and the echo reaches her 1.16 seconds later. Calculate the velocity of sound in air using this observation. (3mks)
5. With the aid of a diagram, explain why convex mirror is preferred for use in supermarkets for surveillance to plane mirrors. (2mks)
6. Figure 1. is a circuit diagram of three resistors connected to a 12V battery.



Determine the potential difference across the  $3\Omega$  resistor. (3mks)

7. State the energy transformation that takes place in a hydroelectric power station. (2mks)
8. Name **one** type of electromagnetic radiation that ionizes air. (1mk)
9. When the moon comes between the sun and the earth in a straight line, an eclipse occurs. Name the eclipse. (1mk)
10. Explain how polarization affects the working of a simple cell. (2mks)
11. Why is concave mirror used as a saloon mirror? (2mks)
12. Write **one** difference between a virtual and a real image. (1mk)
13. Figure 2 shows a graph of magnetisation against magnetising current for two materials A and B.



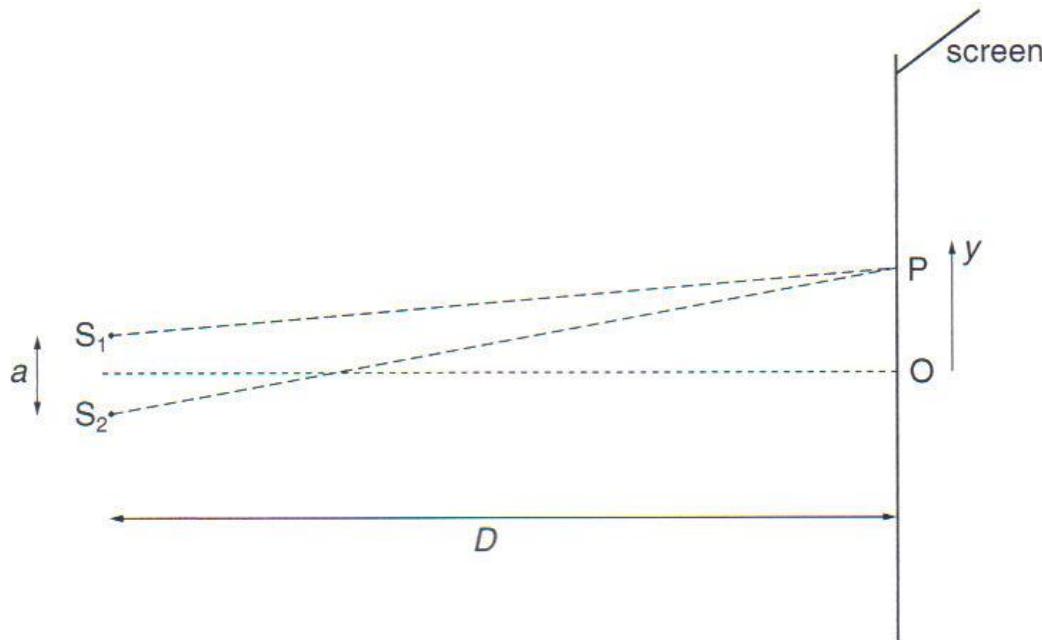
State with a reason, the material which is more suitable for use in a transformer to concentrate the magnetic fields. (3mks)

## SECTION B (55 MARKS)

**Answer all the questions in this section**

- 14.(a) Explain what is meant by the principle of superposition of two waves. (2mks)

**(b)** In an experiment to try to produce an observable interference pattern, two monochromatic light sources,  $S_1$  and  $S_2$ , are placed in front of a screen, as shown in Fig.1.



**Fig. 1**

- (i)** In order to produce a clear interference pattern on the screen, the light sources must be *coherent*. State what is meant by *coherent*. **(1mk)**
- (ii)** In Fig 1, the central point O is a point of maximum intensity. Point P is the position of **minimum** intensity nearest to O. State, in terms of the wavelength  $\lambda$ , the magnitude of the path difference  $S_1P$  and  $S_2P$ . **(2mks)**
- 15.** An X-ray tube is operated at 120Kv with a beam current of 0.5mA. Assuming its efficiency is 1%, calculate:
- (i)** The number of electrons hitting the target each second **(3mks)**
  - (ii)** The X-ray energy emitted each second **(2mks)**
  - (iii)** The heat energy dissipated **(2mks)**
  - (iv)** The minimum wavelength of the emitted X-radiation. **(2m)**
- 16.** In an experiment to determine the range of beta particles in aluminium, different thicknesses of aluminium sheets were interposed between a small beta source and the window of a Geiger tube 20mm apart.

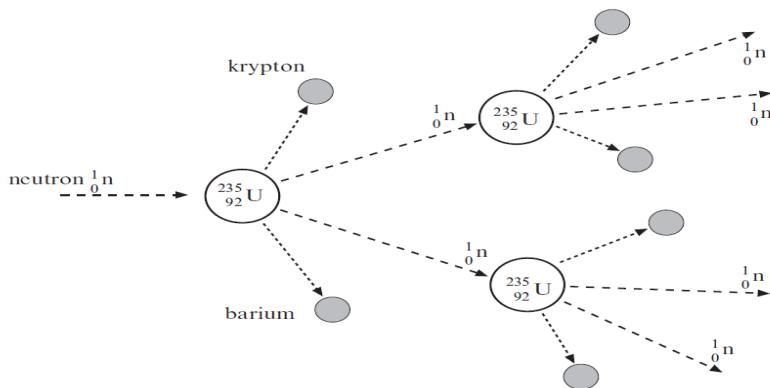
Thickness/m	0	0.45	0.90	1.35	1.80	5.40	7.20
Count rate/s <sup>-1</sup>	85.0	59.5	41.6	29.2	20.4	1.5	1.5

a) Plot a graph of count rate against thickness.

(GRAPH PAPER PROVIDED) (5mks)

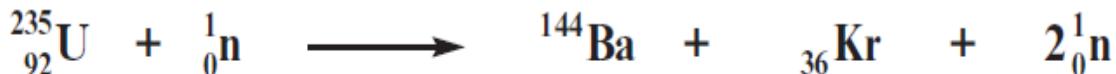
b) Use your graph to determine the range of beta particles in aluminium. (2mks)

c) The diagram shows an uncontrolled nuclear fission reaction. When a **slow-moving** neutron strikes an atom of U, the atom splits. In this reaction two **fast moving** neutrons are produced together with the radioactive fission fragments of Ba (barium) and Kr (krypton).



I. What name is given to an uncontrolled fission reaction? (1mk)

II. Complete the nuclear equation for this reaction. (2mks)

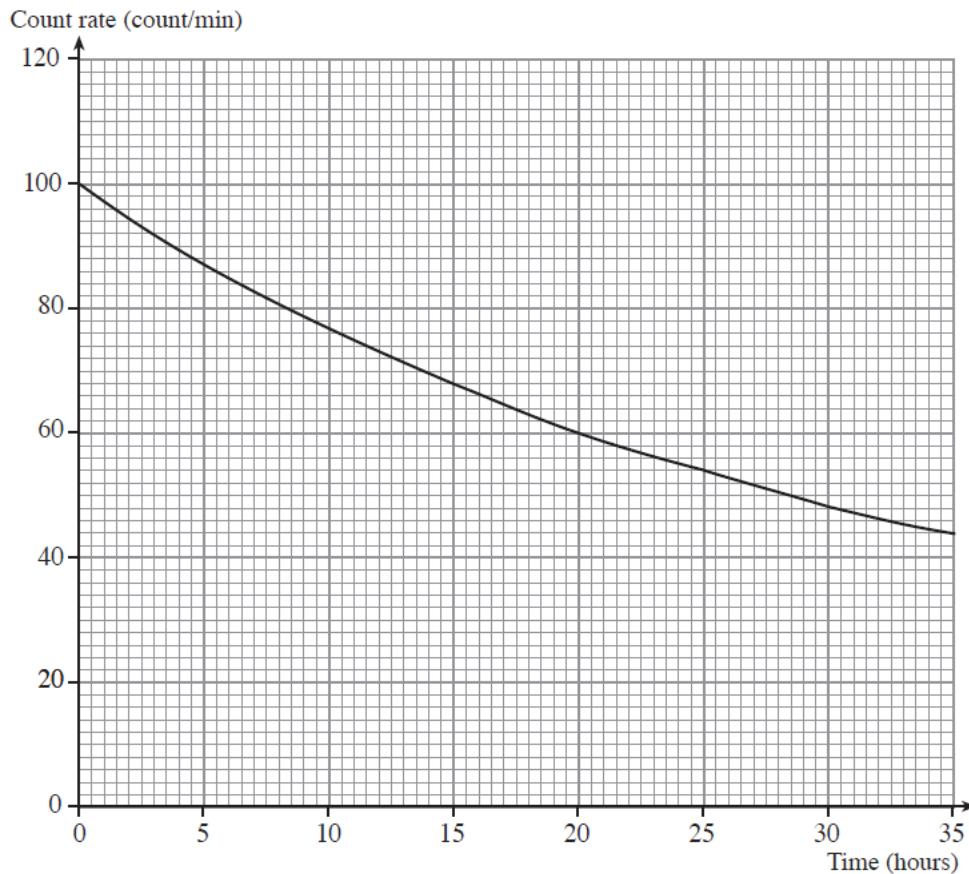


III. In a nuclear reactor, the fission reaction is controlled using control rods of boron steel which readily absorb neutrons and a graphite moderator which improves the chances of uranium atoms splitting apart. State how the graphite moderator improves the possibility of fission of uranium. (1mk)

(i) Explain how the energy released from a nuclear reactor can be increased. (2mks)

(ii) Outline the advantages of producing electricity from nuclear fusion rather than nuclear fission in the future. (2mks)

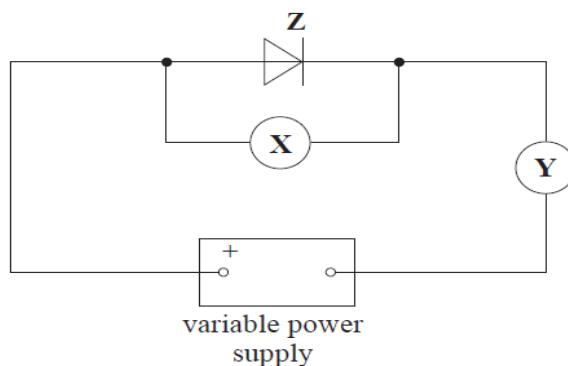
- d) Explain what is meant by the half-life of a radioactive substance. (1mk)  
e) The count rate changed in the way shown in the graph below:



Use the graph to find a value for the half-life of the radioactive source. (2mks)

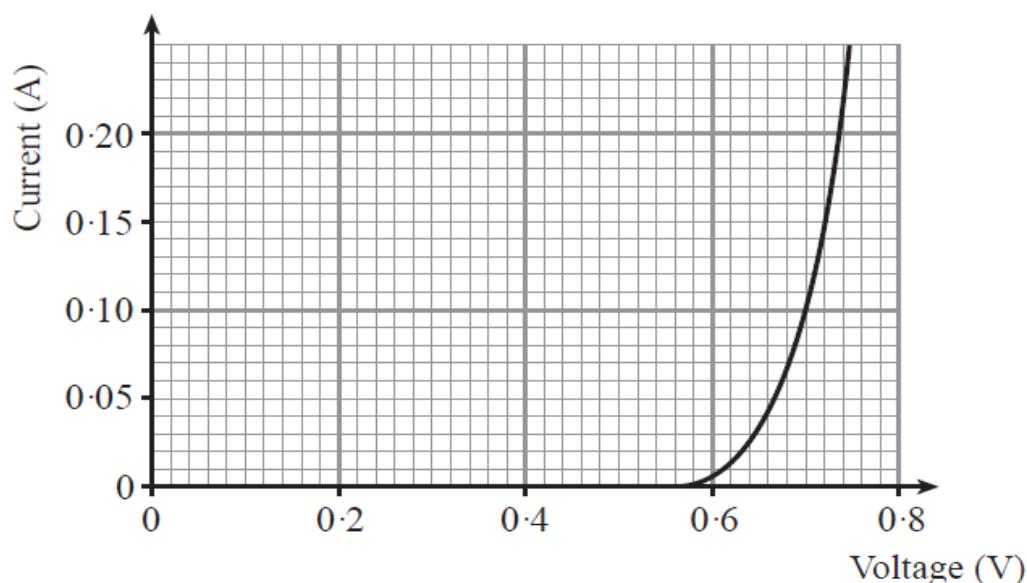
17. A set of Christmas tree lights consists of 40 identical filament lamps connected in series across a supply of 240V.

- (a) Define *resistance*. (3mks)  
(b) Each lamp when lit normally carries a current of 250mA. Calculate:  
(i) The potential difference  $V$  across a lamp. (3mks)  
(ii) The resistance  $R$  of a lamp. (3mks)  
(c) The circuit shown is used to investigate how the current changes with voltage for component Z.



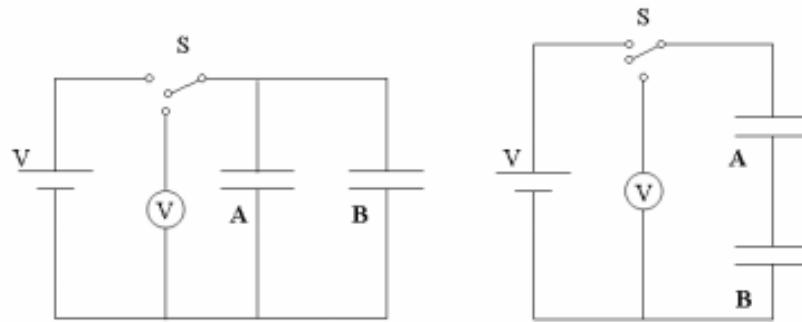
- (a) Name the component: (3mks)
- X**  
**Y**  
**Z**

(b) The results from the investigation are shown on the graph.



- (i) Describe **carefully** how the current through Z changes as the voltage is increased from 0.0 to 0.7V. (2mks)
- (ii) Write down in words an equation and use it to find the resistance of Z when the voltage is 0.7V. (2mks)

18. Fig. 2.1 shows two capacitors, A of capacitance  $2\mu\text{F}$ , and B of capacitance  $4\mu\text{F}$ , connected in parallel. Fig. 2.2 shows them connected in series. A two-way switch S can connect the capacitors either to a d.c. supply, of e.m.f. 6V, or to a voltmeter.



(V required in both circles)

**Fig. 2.1**

**Fig. 2.2**

**(a)** Calculate the total capacitance of the capacitors

**(i)** When connected as in Fig. 2.1 (2mks)

**(ii)** When connected as in Fig. 2.2 (2mks)

**(b)** The switch in the circuit shown in Fig. 2.1 is then connected to the battery. Calculate

**(i)** The potential difference across capacitor (2mks)

**(ii)** The total charge stored on the capacitors. (2mks)

**(c)** The switch in the circuit shown in Fig. 2.2 is then connected to the battery.

Calculate the total energy stored in the two capacitors. (2mks)

NAME.....ADM NO.....

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# **TOP STUDENT KCSE PREDICTIONS**

## **SERIES 1 TRIAL 9 PHYSICS PAPER 1**

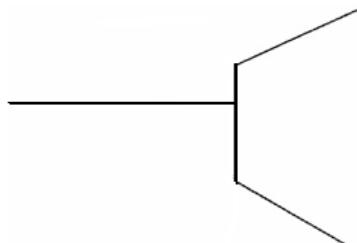
*Kenya Certificate of Secondary Exams*

**TIME: 2 HOURS**

**SECTION A: 25marks**

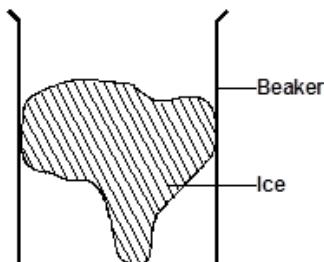
**Answer all questions**

1. The figure below shows part of micrometer screw gauge with 50 divisions on the thimble scale. Complete the diagram to show a reading of 5.73mm. **(2 marks)**



2. A bottle containing a smelling gas is opened at the front bench of a classroom. State the reason why the gas is detected throughout the room. **(1 mark)**

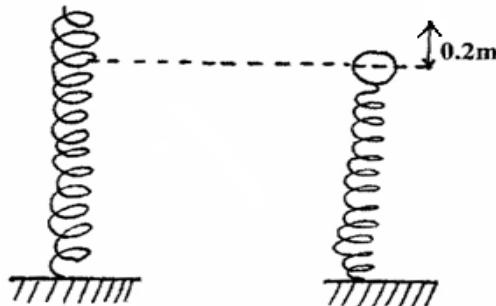
3. The figure below shows beaker containing a block of ice.



State and explain the change in stability when the ice melts. **(2marks)**

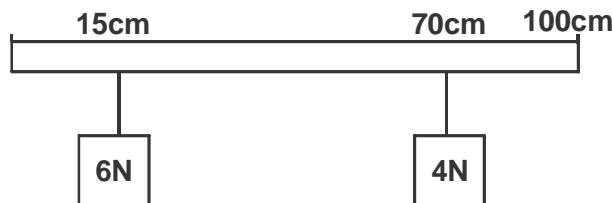
4. An aero plane is moving horizontally through still air at a uniform speed. It is observed that when the speed of the plane is increased, its height above the ground increases. State the reason for this observation. **(2 marks)**

5. A steel ball of mass 0.05kg was placed on top of a spring on a level ground. The spring was then compressed through a distance of 0.2m.



If the spring constant is 15N/m. Calculate the maximum height reached when the spring is released **(3marks)**

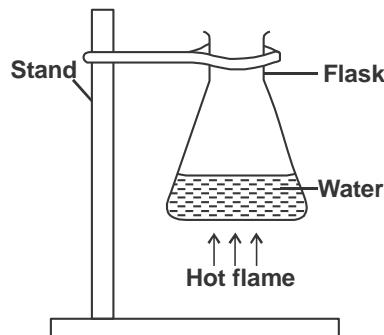
6. The figure below shows a uniform metre rule of weight 3N supporting two weights. The metre rule is pivoted somewhere such that it is horizontally balanced. (Pivot not shown)



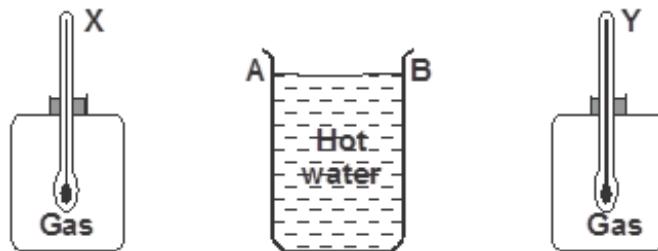
The 6N weight is at 15cm mark while the 4N weight is at 70cm mark. Determine the position of the pivot from zero cm mark. **(3 marks)**

7. State one environmental hazard that may occur when oil spills over a large surface area of the sea. **(1 mark)**

8. The figure shows a flat bottomed flask containing some water. It is heated directly with a very hot flame. Explain why the flask is likely to crack. **(2marks)**



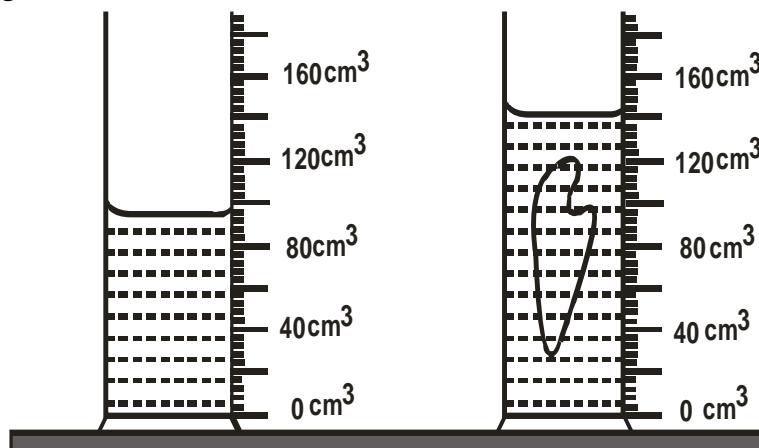
9. The figure below shows a cylindrical container having hot water at 95°C. End A is shiny while end B is dull black. At equal distances from the container is placed two identical gas jars fitted with thermometers X and Y.



Compare the readings of the two thermometers after two minutes (1 mark)

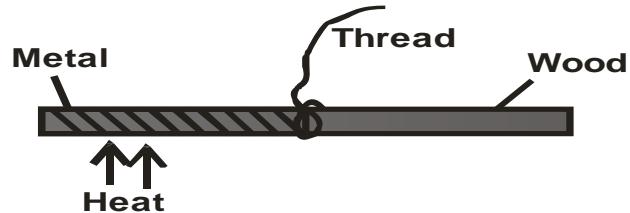
10. Give a reason for your answer in question 9 above (1 mark)

11. The figure below shows the change in volume of water in a measuring cylinder when an irregular solid is immersed in it.



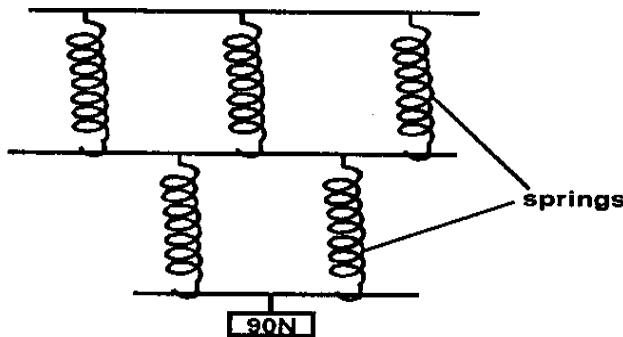
Given that the mass of the solid is 268g, determine the density of the solid in SI units. (3 marks)

12. The following figure shows a rod made of wood on one end and metal on the other end suspended freely with a piece of thread so that it is in equilibrium.



The side made of metal is now heated with a Bunsen flame. State with a reason, the side to which the rod is likely to tilt (2 marks)

13. The spiral springs shown in the figure below are identical. Each spring has a spring constant,  $k = 300\text{N/m}$

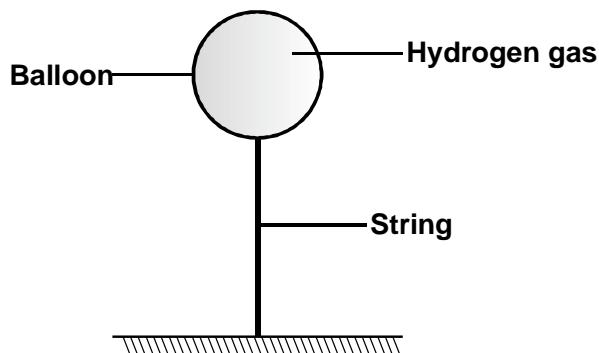


Determine the total extension of the system. (Take the weight of the cross bars to be negligible) (2 marks)

## SECTION B: 55marks

Answer all questions

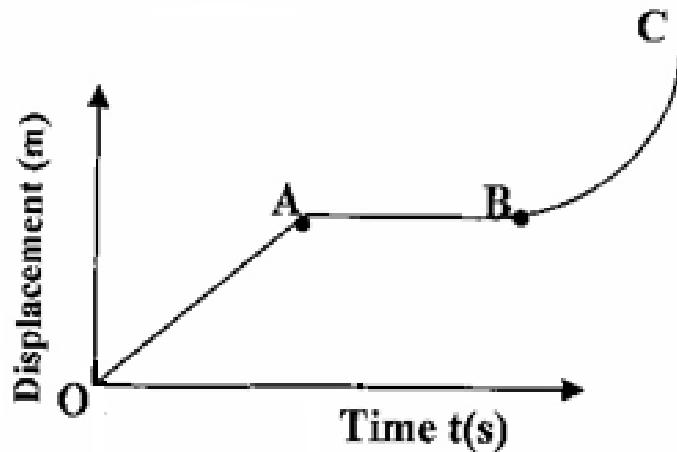
14. (a) State the Archimedes principle. (1 mark)
- (b) A rubber envelope of a hydrogen filled balloon having volume of  $2\text{m}^3$  is held in position by a vertical string as shown below.



The mass of the balloon is 1.3kg. Given that density of hydrogen is  $0.1\text{kg/m}^3$  density of air is  $1.3\text{kg/m}^3$ . Calculate

- (i) the total weight of the balloon including the hydrogen gas. (2 marks)
- (ii) the up thrust. (2 marks)
- (iii) the tension in the string. (2 marks)
- (c) A solid weighs 50N in air and 44N when complete immersed in water. Calculate  
(i) Relative density of the solid. (2 marks)  
(ii) Density of the solid. (2 marks)

15.a) The figure below shows a displacement-time graph of the motion of a particle.



a) Describe the motion of the particle in the region. (3marks)

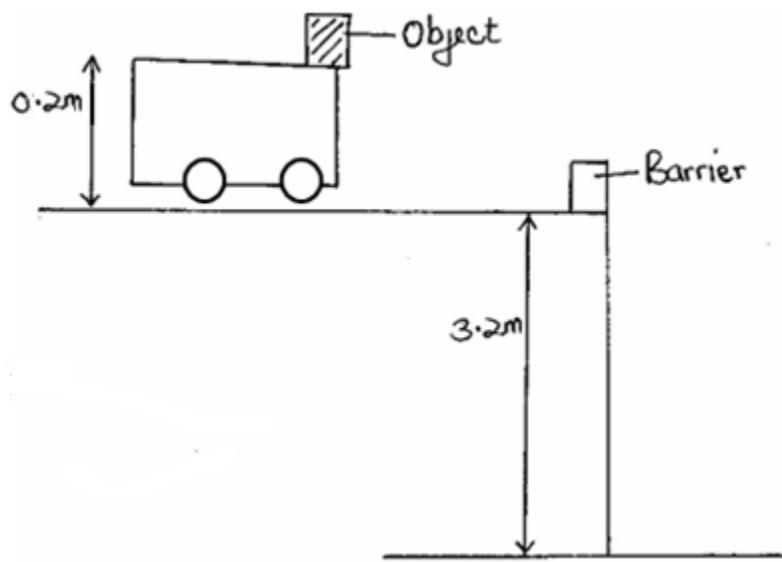
OA-

AB-

BC-

(b) State the Newton's first law of motion. (1 mark)

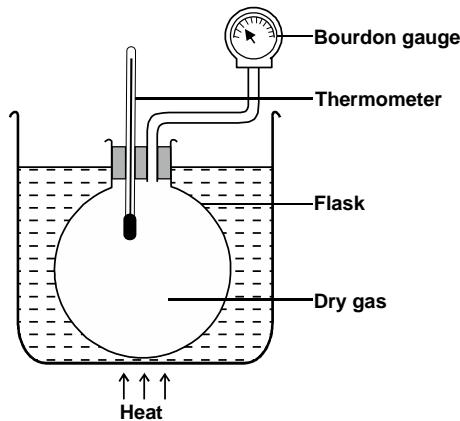
c) The figure below shows a trolley moving towards a barrier at a constant velocity of 20m/s. Use this information to answer the questions that follows.



- i) Sketch the path followed by the object after the impact (1mark)
- ii) Give a reason why the object on the trolley flies off on impact. (1 mark)
- iii) Determine the time taken by the object to reach the ground. (2 marks)
- iv) Determine the horizontal distance covered by the object from the point of impact to the point where it reached the ground. (2 marks)

**16. a)** What is meant by absolute zero temperature? (1 mark)

**b)** The set up below was used by a group of form three students to verify pressure law.

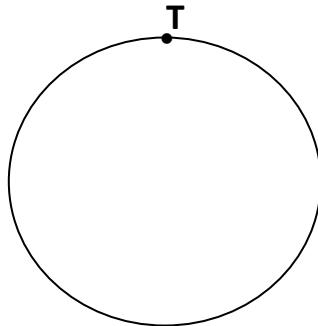


Describe briefly how the set-up can be used to verify pressure law. (4 marks)

c) A  $4.5\text{cm}^3$  bubble released at the bottom of a dam measured  $18\text{cm}^3$  at the surface of the dam. Work out the depth of the dam taking atmospheric pressure to be  $10^5 \text{ Pa}$  and the density of water as  $1\text{g/cm}^3$ . (3marks)

17(a) One of the factors that affect the centripetal force is the mass of the body. State another factor. (1mark)

(b) A mass of  $400\text{g}$  is rotated by a string at a constant speed  $V$  in a vertical circle of radius  $100\text{cm}$ . The tension in the string is  $9.2\text{N}$  which is experienced at point T.

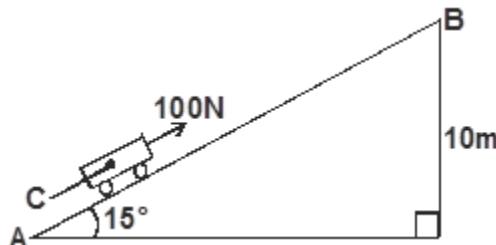


i) Determine the velocity  $V$  of the mass at point T. (3marks)

ii) Determine the tension in the string at the bottom of the circle. (2marks)

c) State two applications of circular motion (2marks)

18. The figure below shows an inclined plane, a trolley of mass  $30\text{kg}$  is pulled up a slope by a force of  $100\text{N}$  parallel to the slope. The trolley moves so that the centre of mass C travels from points A to B.



a) What is the work done on the trolley against the gravitational force in moving from A to B? (2marks)

b) Determine the work done by the force in moving the trolley from A to B (2 marks)

c) Determine the efficiency of the system. (3 marks)

d) Determine the mechanical advantage of the system. (3 marks)

19. a) Explain why it is advisable to use a pressure cooker for cooking at high altitudes. (1 mark)

**b)** A block of metal of mass 150g at 100°C is dropped into a lagged calorimeter of heat capacity 40J/K containing 100g of water at 25°C. The temperature of the mixture is 34°C. (specific heat capacity of water = 4200J/kg/K).

Determine:

- (i) Heat gained by the calorimeter. **(2marks)**
- (ii) Heat gained by water. **(2marks)**
- (iii) Specific heat capacity of the metal block. **(3marks)**

NAME.....ADM NO.....

SCHOOL.....CLASS.....

DATE.....

# **TOP STUDENT KCSE PREDICTIONS**

## **SERIES 1 TRIAL 9 PHYSICS PAPER 2**

*Kenya Certificate of Secondary Exams*

**TIME: 2 HOURS**

### **SECTION A: 25marks**

**Answer all questions**

1. The chart below shows an arrangement of different parts of the electromagnetic spectrum.

Radio wave	A	Infrared rays	B	Ultra-violet	$\chi$ -Rays
------------	---	---------------	---	--------------	--------------

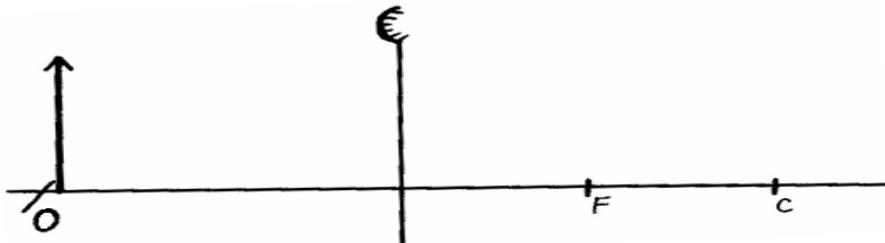
Name the radiation represented by

**A -** (1mark)

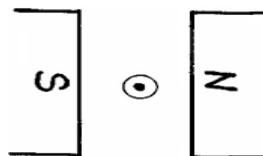
State one use of radiation represented by B (1mark)

2. An object O is placed in front of convex mirror as shown in the diagram below.

Complete the diagram to locate the position of the image, 1. (3 marks)



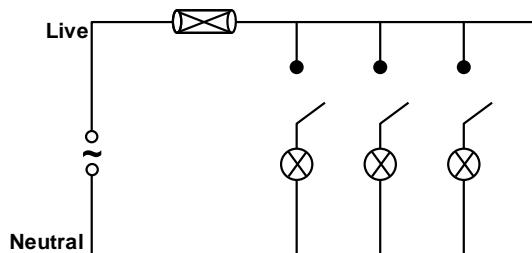
3. The figure below shows a wire carrying current whose direction is out of the paper. The wire is placed in a magnetic field.



(a) Indicate on the figure the direction of the force F, acting on the wire. **(1 mark)**

(b) State what would be observed on the wire if the direction of the current is reversed. **(1 mark)**

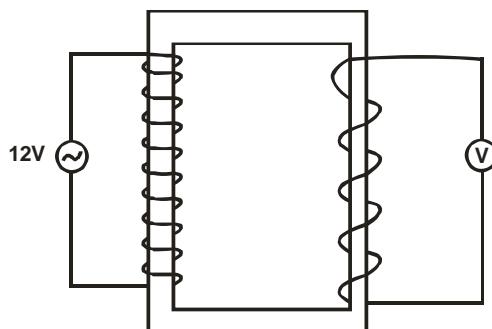
4. The figure below shows part of the lighting circuit of a house.



i) Give a reason why a fuse is included in the circuit. **(1 mark)**

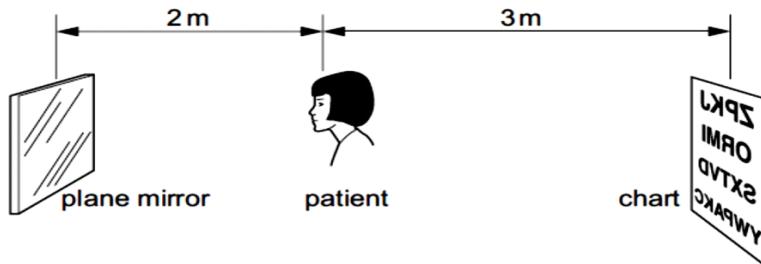
ii) If each lamp has a power of 60W at voltage of 240V. Calculate the current through one lamp when it is switched on. **(2 marks)**

5. Figure 5 below shows a simple transformer connected to a 12v a.c source and an a.c voltmeter.



Determine the reading on the voltmeter. **(2 marks)**

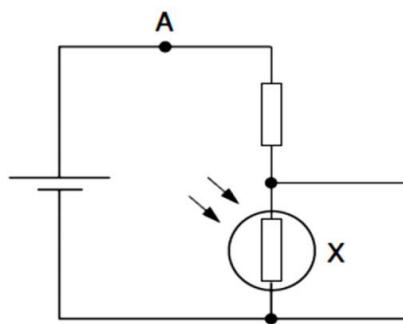
6. The diagram shows a patient having her eyes tested. A chart with letters on it is placed behind her and she sees the chart reflected in a plane mirror.



Determine how far away from the patient, the image of the chart is seen. **(2 marks)**

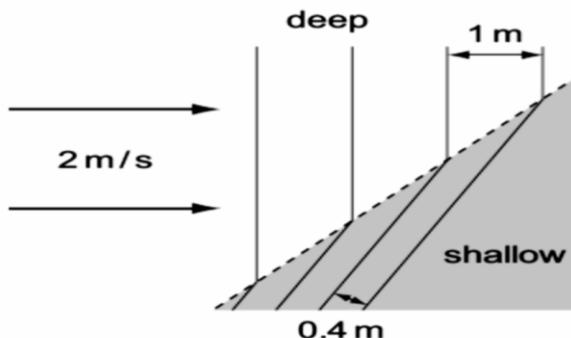
7. State Snell's law. **(1 mark)**

8. The figure below shows an electric circuit.



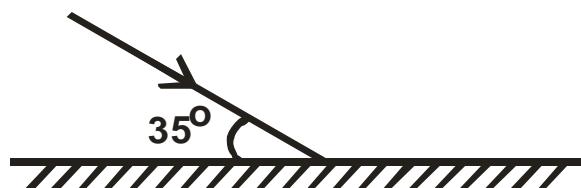
State and explain how the potential difference across X varies as the light shining on it becomes brighter. **(2marks)**

9. Waves pass from deep water to shallow water and refraction occurs.

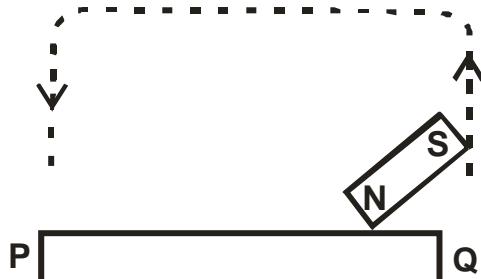


Calculate the speed of the waves in the shallow water **(2 marks)**

10. The diagram below shows a ray of light striking the plane at  $35^\circ$  as shown below. State the angle of reflection. **(1 mark)**



**11.** The figure below shows an iron bar being magnetized by stroking it with a magnet.



Indicate on the iron bar the polarity of resulting magnet. **(1 mark)**

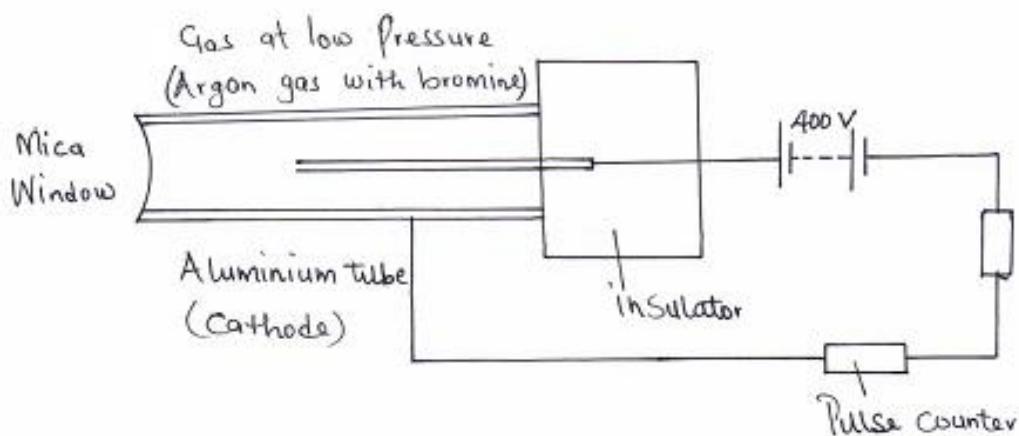
**12.** An echo sounder of a ship transmits sound waves to the depth of the sea and receives the echo after 2.4 seconds. If the speed of sound in water is  $1600\text{ms}^{-1}$ , determine the depth of the sea. **(3 marks)**

**13.** It is observed that when a charged body is brought near the cup of a positively charged electroscope, the divergence of the leaf increases. State the type of charge on the body. **(1mark)**

## **SECTION B (55 marks)**

**Answer all questions**

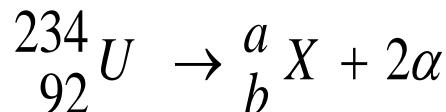
**14. (a)** The figure below shows a diagram of a Geiger Muller tube connected to a power supply and a pulse counter.



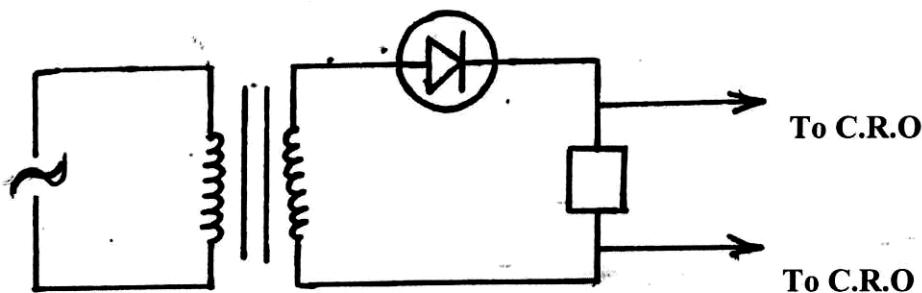
- (i) Why should the argon gas be at low pressure? **(1mark)**  
(ii) State the purpose of the bromine gas in the tube. **(1mark)**  
(iii) Suggest one way of increasing the sensitivity of the tube **(1mark)**

**(iv)** Find the value of a and b in the following equation.

**(2marks)**



**b)** The figure below shows a PN junction diode used in a rectifier.



**i)** What is an extrinsic semi conductor?

**(1mark)**

**ii)** What type of rectification is shown?

**(1mark)**

**iii)** Describe how the rectification is achieved

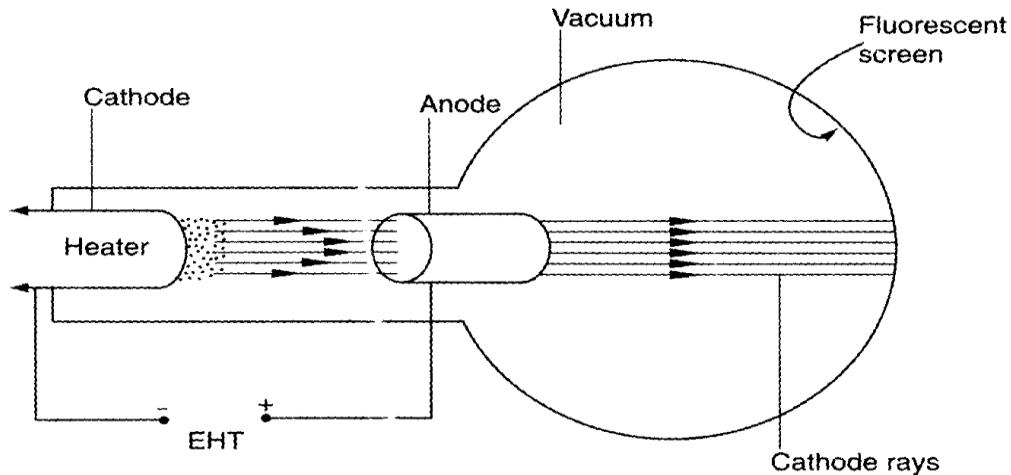
**(2marks)**

**iv)** In the space provided below, sketch the output signal displayed on the CRO during the rectification process.

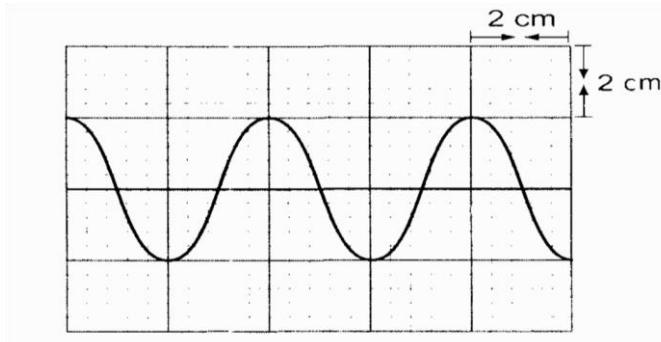
**(2marks)**



**15.** The figure below shows a cathode ray tube



- a) State the function of the (1 mark)
- i) Heater (1 mark)
  - ii) Extra High Tension (E.H.T.) (1 mark)
- b) State how the intensity of the fluorescence on the screen can be increased. (1 mark)
- c) State the effect of having air in the tube instead of a vacuum (1 mark)
- d) State one properties of cathode rays (1 mark)
- e) Distinguish cathode rays and X-rays (1 mark)
- f) Give one advantages of using a C.R.O instead of a voltmeter in measuring voltages (1 mark)
- g) The figure below shows an a.c. voltage. If the Y-gain control reads 10V/cm and the time base reads 5 milliseconds/cm



**Calculate:**

- i) The frequency of the alternating voltage (2 marks)
- ii) Peak to peak voltage of the alternating voltage (2 marks)

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

**(ii)** State why this observation does not occur if the electroscope is positively

charged.

(1 mark)

(iii) Explain why the leaf of the electroscope does not fall when infra-red radiation is directed onto the zinc plate (1 mark)

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

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

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

c) Light of wavelength  $4.3 \times 10^{-7} \text{ m}$  is incident on two different metal surfaces, nickel and potassium. (Take speed of light as  $3.0 \times 10^8 \text{ ms}^{-1}$  and plank's constant  $h$  as  $6.63 \times 10^{-34} \text{ Js}$ ).

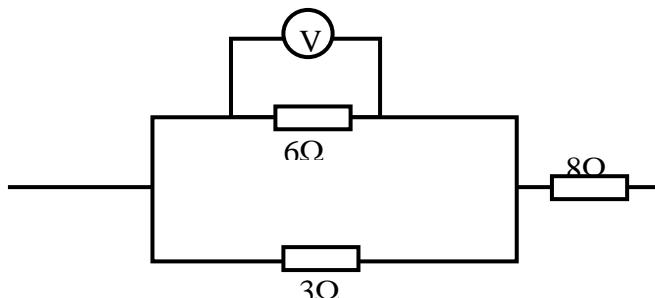
(i) Determine the energy of the incident radiation. (3 marks)

(ii) If the work function of nickel is  $8.0 \times 10^{-19} \text{ J}$  and that of potassium is  $3.68 \times 10^{-19} \text{ J}$ , state with a reason from which of the two metals the given light will eject electrons. (2 marks)

(iii) Determine the velocity of the emitted electrons from the metal surface in b(ii).

(Take the mass of an electron as  $9.1 \times 10^{-31} \text{ kg}$ ). (2 marks)

17(a) The figure below shows three resistors as shown.



If the voltmeter reads 4V, find the

(i) Effective resistance (3marks)

(ii) Current through the  $3\Omega$  resistor (2 marks)

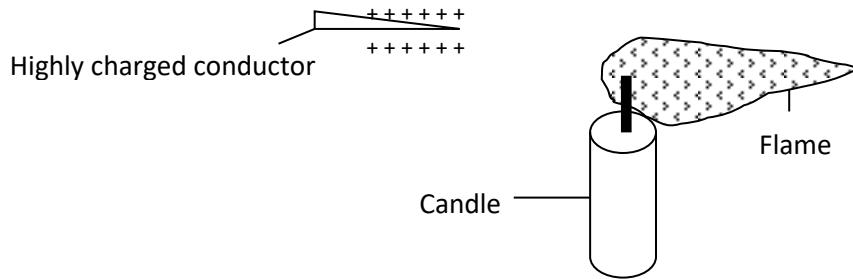
(iii) Potential difference across the  $8\Omega$  resistor if the total voltage in the circuit is 10V (1mark)

(c) (i) What is meant by the term "terminal voltage" as used in current electricity?

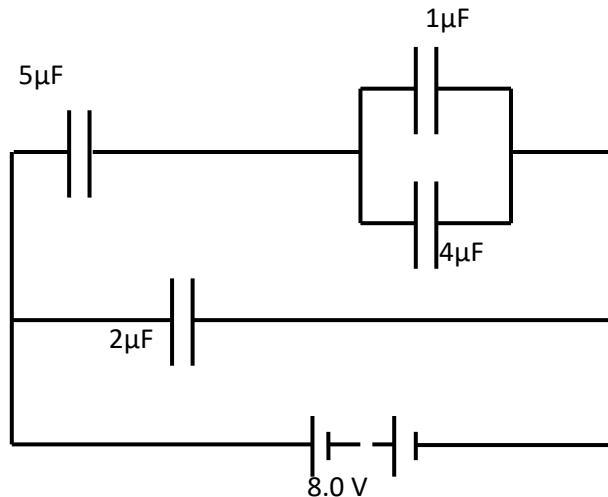
(1 mark)

(ii) A cell supplies a current of 2.0A when connected to a  $0.6\Omega$  resistor and 1.5A when the same cell is connected to a  $0.9\Omega$  resistor. Find the e.m.f and the internal resistance of the cell. (3marks)

**18((a))** Give a reason why a candle flame is blown when a highly charged conductor is brought close to it as shown below. **(1mark)**



**b)** State two factors that affect capacitance of a capacitor **(2 marks)**  
**c)** The figure below shows  $1\mu F$ ,  $2\mu F$ ,  $4\mu F$  and  $5\mu F$  capacitors connected to a battery.



Determine:

- The total capacitance. **(3marks)**
- The total energy stored by the capacitors. **(2marks)**
- Voltage across the  $4\mu F$  capacitor. **(2marks)**

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# **TOP STUDENT KCSE PREDICTIONS**

## **SERIES 1 TRIAL 10 PHYSICS PAPER 1**

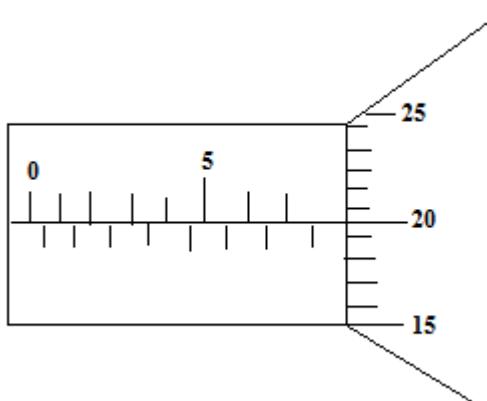
*Kenya Certificate of Secondary Exams*

**TIME: 2 HOURS**

### **SECTION A (25 MARKS)**

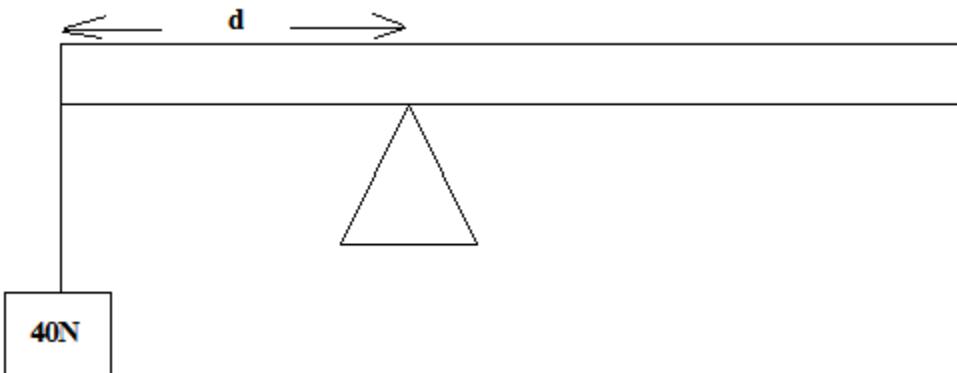
**Answer all questions**

1. The figure below shows a micrometer screw gauge. What is the reading shown on the figure. **(2 marks)**



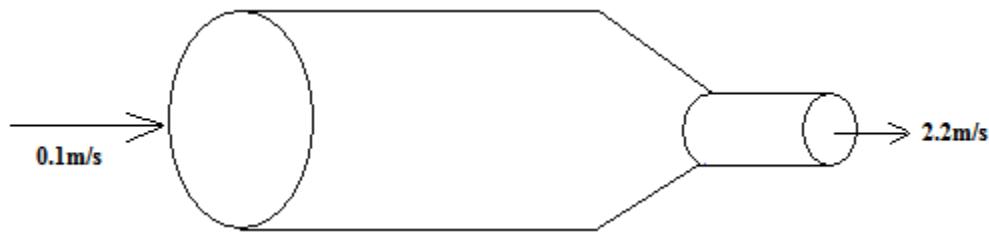
2. State pressure law. **(1 mark)**
3. State two factors that affect stability of a body. **(2 marks)**

4. The diagram below shows a uniform wooden plank of length 4m and weight 10N. The plank is held at equilibrium by a weight of 40N placed at one end as shown below.



Determine the distance d. (3 marks)

5. Figure below shows a non-viscous fluid that is not compressible moving through a pipe of varied cross-sectional area.

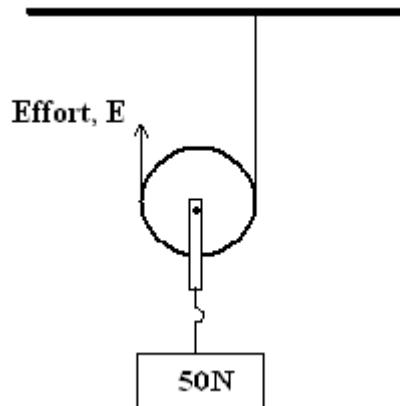


If the area of the narrow region is  $0.05\text{m}^2$ , calculate diameter of the wider region.

(3 marks)

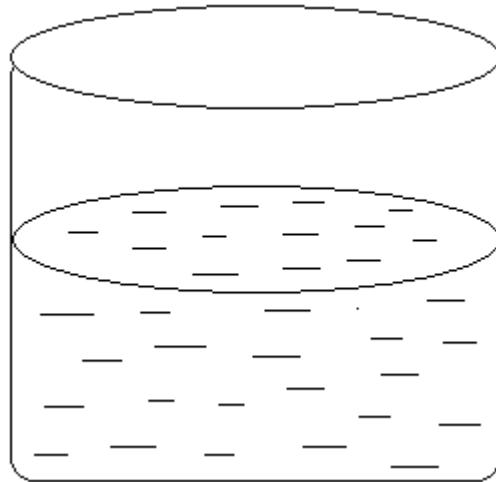
6. State one use of thermal expansion. (1 mark)
7. State two factors that affect melting point of a substance. (2 marks)
8. A body is projected vertically upwards from the top of a building. If it lands on the base of the building. Sketch the velocity-time graph for motion. (2 marks)
9. State a reason why transfer by radiation is faster than by conduction. (1 mark)

**10.** The pulley system in the figure below supports a load of 50N.



Given that the efficiency of the system is 80% calculate the effort, E. **(3 marks)**

**11.** The figure below shows a glass container with cross-section area of  $50\text{cm}^2$ .



When a wooden block of mass 120g is immersed into the water it floats while fully submerged and the water level rises by 4cm, determine the density of the water.

**(3 marks)**

**12.** Define the term momentum.

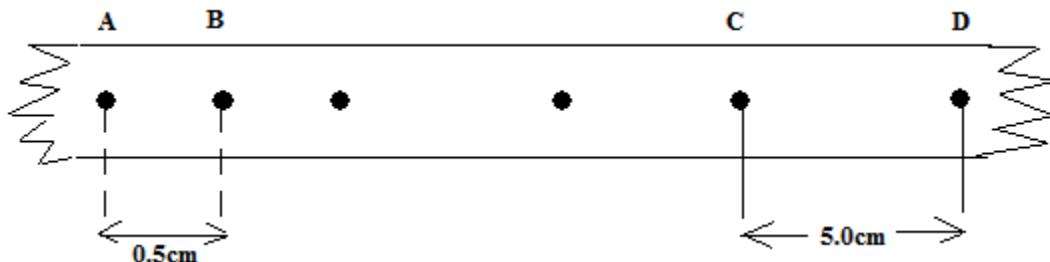
**(1 mark)**

**13.** What is a pitch of a screw.

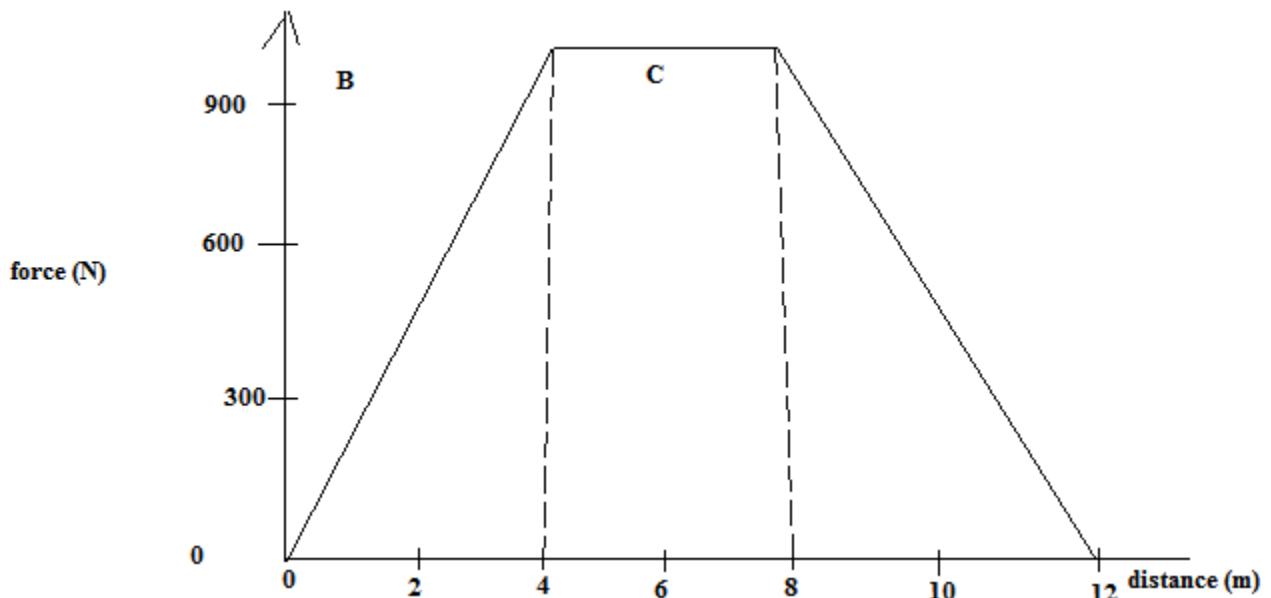
**(1 mark)**

## SECTION B

14. The figure below shows the motion of a trolley on ticker timer. The ticker has a frequency of 100Hz.



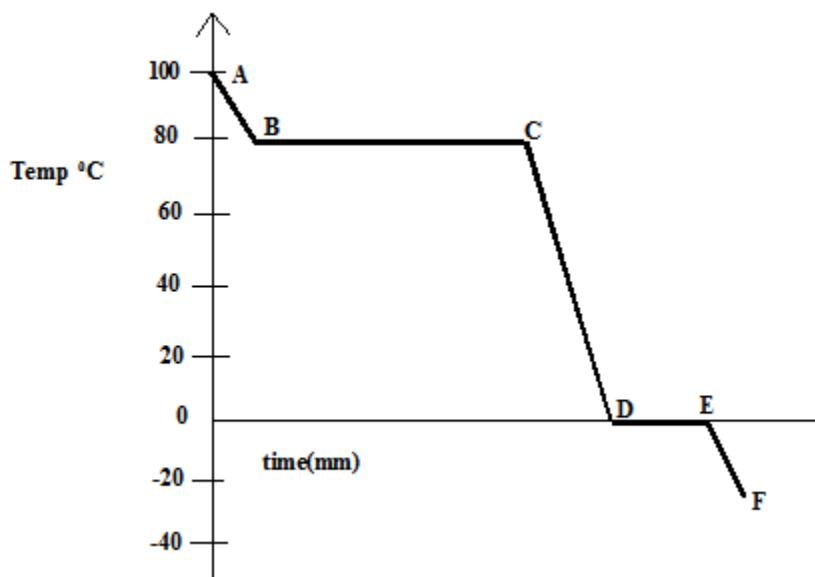
- a) i) Calculate the initial velocity between A and B. (3 marks)  
 ii) Calculate the final velocity between C and D. (3 marks)  
 iii) Calculate the acceleration of the trolley during the motion. (3 marks)
- b) Figure below shows a force-distance graph for a car being towed on a level ground.



- i) Calculate the total work done. (3 marks)  
 ii) If the velocity just before reaching point C is 0.6m/s. Calculate the power developed by the engine at this point. (2 marks)

**15. a)** A metal ball of mass 100g is dipped into boiling water at  $100^{\circ}\text{C}$  and then placed in a calorimeter containing 80g of water at  $20^{\circ}\text{C}$ . After stirring, the temperature of the mixture stabilizes at  $23.4^{\circ}\text{C}$ . Ignoring the heat gained by the calorimeter, determine the specific heat capacity of the metal. (Specific heat capacity of water = 4200J/Kg K). **(4 marks)**

**b)** The cooling curve below is for a pure substance.



i) What is the melting point of the substance. **(1 mark)**

ii) State two factors that affect boiling point of a substance.

iii) At what part of the curve is the substance.

Solid only?

Liquid only?

Solid and Liquid?

**(3 marks)**

**16. a)** State Newton's second law of linear motion. **(1 mark)**

**b)** The legal speed limit on motorways is approximately 30m/s. In an incident on a motorway, a car of mass 900kg leaves a skid mark 75m long when stopping. The maximum deceleration of the car when skidding is approximately  $10\text{m/s}^2$ .

i) Show that before the incidence, the car must have been travelling above the legal speed limit. **(3 marks)**

ii) Calculate for this skid, the maximum average braking force between each of the four tyres and the road. **(3 marks)**

**iii)** When the motorway is wet, the braking force provided by each wheel is reduced to 50% of the calculated in (ii) above. What is the effect of this reduced breaking force on stopping distance, explain your answer. Assume that the speed of the car before breaking is the same in both cases. **(2 marks)**

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# **TOP STUDENT KCSE PREDICTIONS**

## **SERIES 1 TRIAL 10 PHYSICS PAPER 2**

*Kenya Certificate of Secondary Exams*

**TIME: 2 HOURS**

### **SECTION A (25 MARKS)**

**Answer all questions**

1. Two electric heaters A and B rated 1000 W and 2500 W respectively are connected in parallel across a 240 mains supply. Calculate the ratio  $R_A: R_B$  of their resistances. **(3mks)**
2. Fig. 2 represents crests of water waves approaching a wide opening.

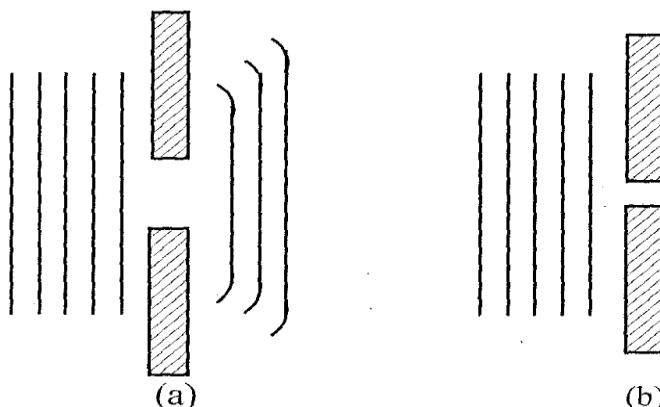
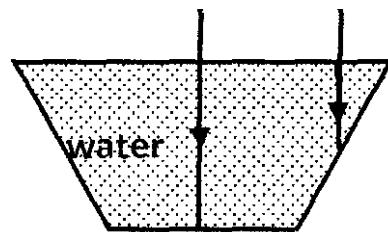


Fig. 2

Crests of the same water waves are now approaching a narrow opening. Sketch the crests after passing through the opening. **(2mks)**

3. One of the factors which affect the capacitance of a parallel plate capacitor is the area of overlap of the plates. Name **two** other factors. **(2mks)**

4. Fig. 5 shows two rays of light incident on a water-glass surface.

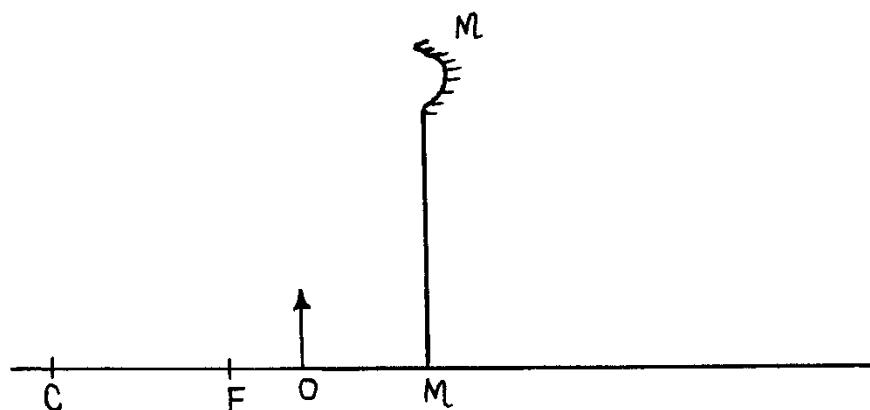


**Fig. 5**

**glass**

Complete the rays to show their paths from the glass to water. **(2mks)**

5. The transmission of mains electricity on the national grid is at high voltage. Give a reason **(1mk)**
6. The figure below shows an object O in front of a curved mirror M.
- a) On the figure, locate the image formed. **(2 marks)**



7. Complete the table by stating the different types of radiations **(3 marks)**

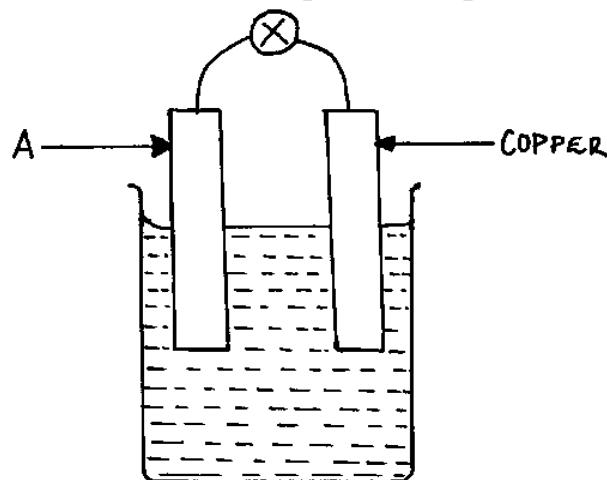
Type of radiation	Use
	Sending information to and from satellites
	Emitted by a remote control unit

Producing shadow pictures of bones

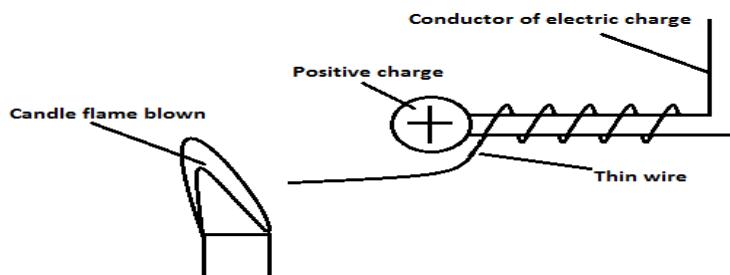
8. The figure below shows a conductor carrying current placed in the magnetic field of two magnets. Complete the diagram by showing the field pattern and the direction of force F that acts on the conductor. **(2mks)**



9. The figure below shows a setup for a simple cell.



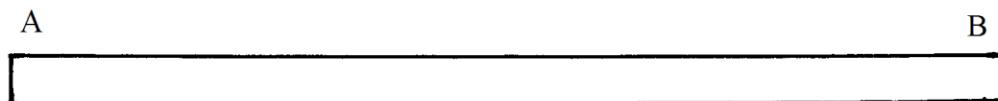
- a) Name the electrode A **(1 mark)**  
 b) Explain why the bulb goes off after only a short while **(1 mark)**  
 c) Explain how the defect can be minimized. **(1 mark)**
10. Light of a certain wavelength strikes a metal surface. State two factors that determine the maximum kinetic energy of the electrons emitted **(2 marks)**
11. The figure below shows a thin wire connected to a charge generator and placed close to a candle flame.



Explain why the candle flame is deflected as shown

(2 marks)

12. You are provided with a long metal steel rod as shown below.



On the diagram, show how you would magnetize end A to obtain a south pole using an electric current. (2marks)

## SECTION B (55MARKS)

Answer all questions

13. The figure below shows an x-ray tube

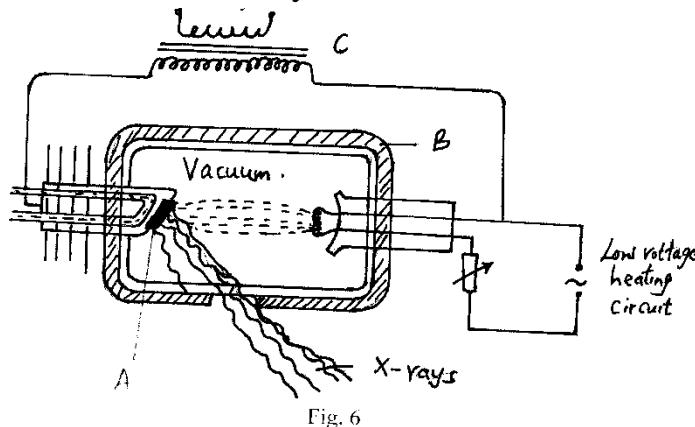


Fig. 6

- a) i) Name the elements used in making the parts labeled A and B. (2 marks)

A-

B-

- ii) Explain the use of the part labeled C. (1 mark)

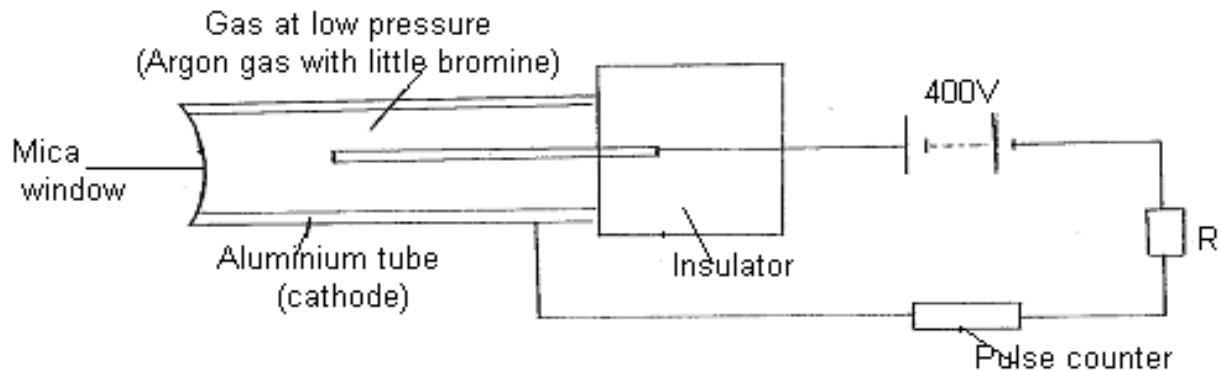
- iii) Explain how the x-rays are produced. (3marks)

- b). (i) Give a reason why X-ray tube is evacuated. (1mk)

- (ii) How is the intensity of X-rays increased? (1mk)

- c) The energy of x-ray is  $1.989 \times 10^{-14}$  joules. Given that the speed of light is  $3.0 \times 10^8 \text{ m/s}$  and plank's constant is  $6.6 \times 10^{-34} \text{ Js}$ , find the wavelength of the x-rays. (3 marks)

- 14.a) The figure below shows the diagram of a Geiger – Muller tube connected to a power supply and a pulse counter.



**Fig. 5**

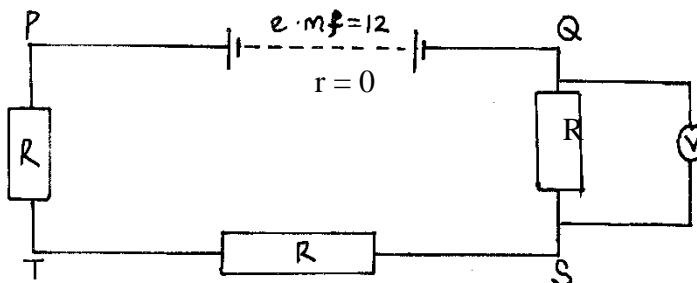
- (i) Why should the Argon gas be at low pressure? **(1 mark)**
- (ii) Briefly explain how the Geiger – Muller tube detects the radiation emitted by a radioactive element **(3 marks)**
- (iii) State the purpose of the bromine gas in the tube **(1 mark)**
- b) A radioactive element A of half-life 31 days' decays to element B. A sample of A of mass 32g is kept in a container. Assuming B is stable; calculate the mass of B that will be in the container after 124 days. **(3 marks)**
- c) Find the value of a and b up the following equation **(2 marks)**



a =

b =

- 15.a) The circuit diagram in figure 8 shows three identical resistors connected to a cell of e.m.f. 12V.



**Figure 8**

- (i) Determine the reading of the voltmeter. **(2 marks)**
- (ii) If another identical resistor R is connected parallel to PT, determine the potential difference across QS **(3 marks)**

- b).(i)** Distinguish between semi-conductors and conductors. **(2 marks)**
- (ii)** Give one example of a semi-conductor and one example for a conductor. **(2 marks)**
- (iii)** What is meant by donor impurity in a semi-conductor. **(1 mark)**
- (iv).** Draw a circuit diagram including a cell, a diode and a resistor in the reverse biased mode. **(1 mark)**
- (v).** In the circuit in figure 12 below, when the switch is closed, the voltmeter shows a reading. When the cell terminals are reversed and the switch is closed the voltmeter reading is zero.

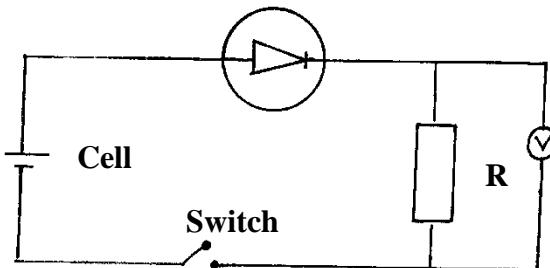


Figure 12

Explain this observation. **(2 marks)**

- 16. (a)** State one difference between:  
Mechanical and electromagnetic waves. **(1mk)**
- (b)** Briefly describe how sound is propagated in air. **(2mks)**
- (c)** Fig. 6 shows a set up by a student.

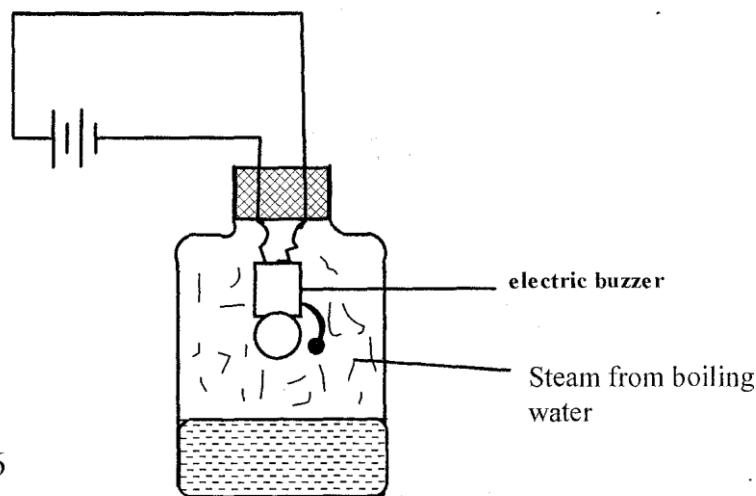
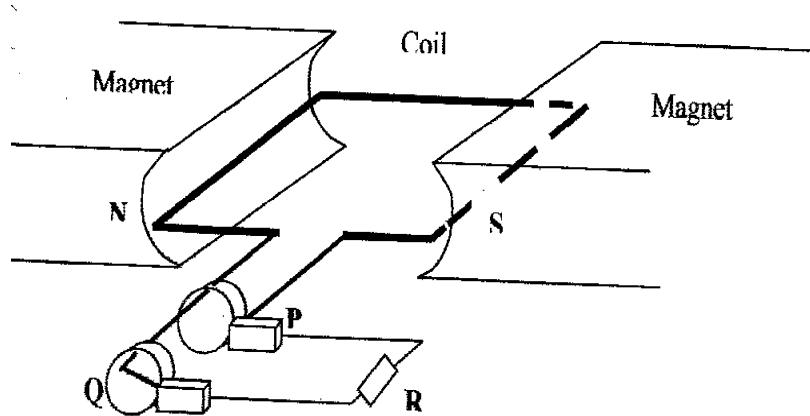


Fig. 6

- (i)** State what happens to the sound from the buzzer as the bottle and its contents are cooled to 0°C . **(1mk)**

- (ii) Explain the observation you have stated in (i) above. (3mks)
- (d) A boy standing in level ground between two high walls claps his hands. He hears an echo from one wall after 0.7s and from the other wall 0.2s later. Determine the distance between the two walls. (Speed of sound in air  $v = 330 \text{ ms}^{-1}$ ) (3mks)

17. The figure below shows a simple electric generator.



a) i) Name the parts labeled P and Q (2 marks)

P-

Q-

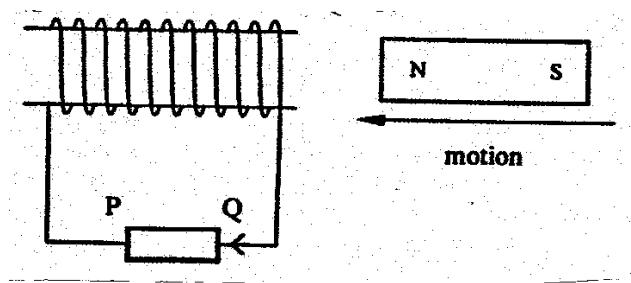
ii) State two ways of increasing the magnitude of the induced current in this type of generator. (2 marks)

b) The primary coil of a transformer has 1200 turns and the secondary coil has 60 turns. The transformer is connected to a 240v a.c source. Determine the:

i) Output voltage (2 marks)

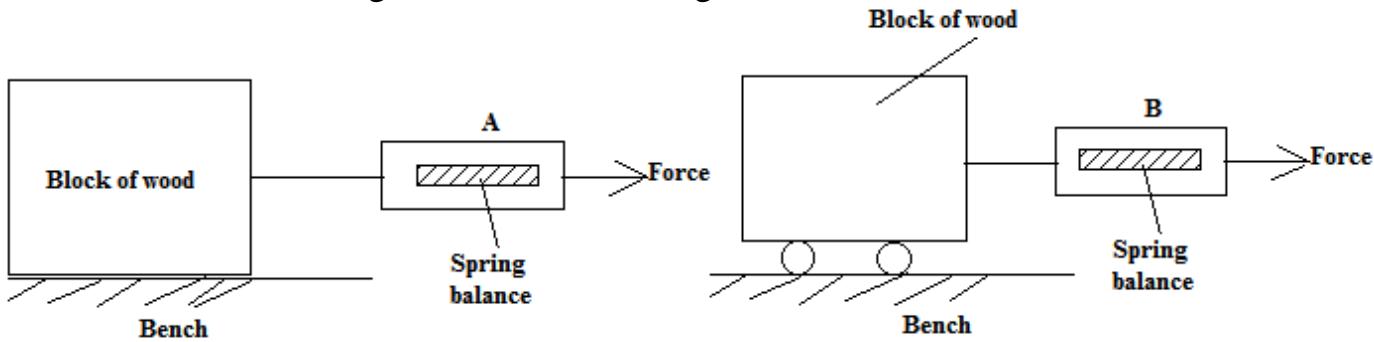
ii) Output current when the primary coil has a current of 0.5A. Assume there are no energy losses. (2marks)

c) Figure 12 shows a magnet being moved towards a stationary solenoid. It is observed that a current flow through the circuit in a direction Q to P.



**Figure 12**

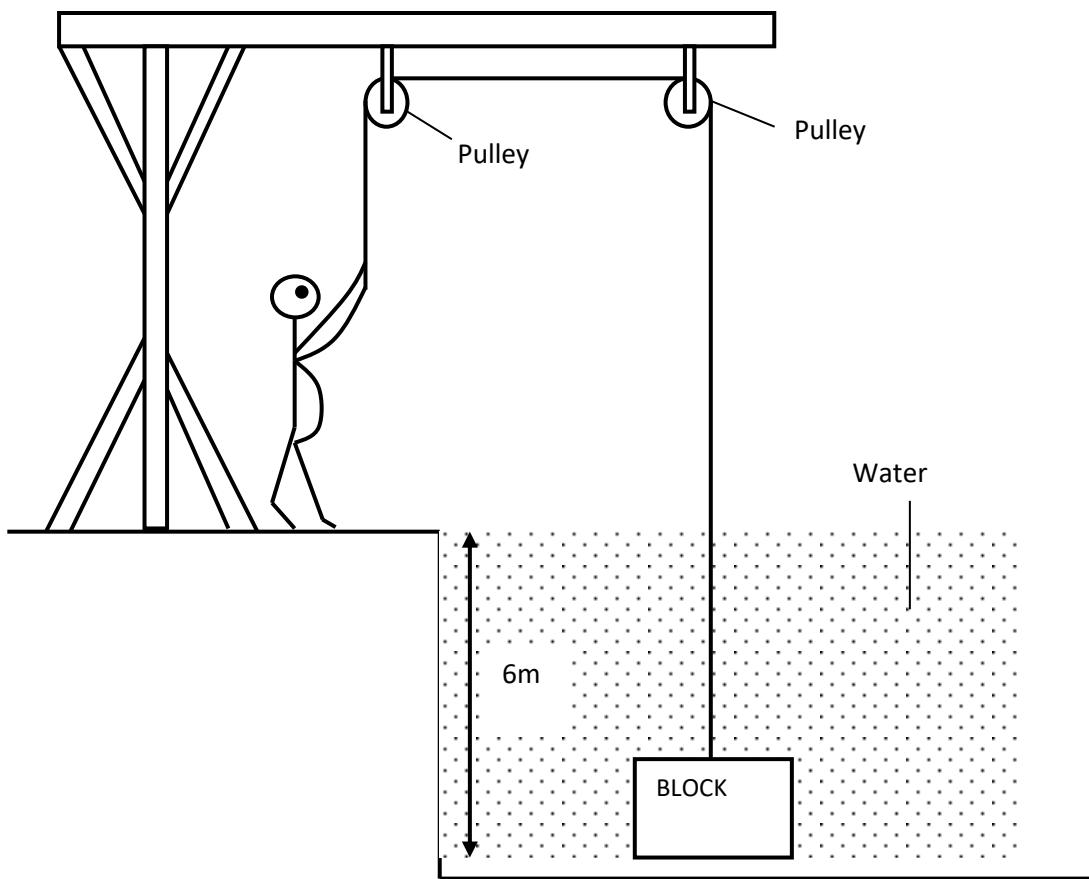
- Explain why the current flows from Q to P (1 mark)
- d). State **two** ways in which power is lost in a transformer (2 marks)
- c) A student carried out an experiment to measure static friction using identical wooden blocks arranged as shown in the figure.



State and explain which spring balance will indicate a smaller reading when the block just starts to move. (2 marks)

17. a) Give a reason why people experience nose bleeding when they climb tall mountains. (1 mark)

- b) The diagram shows a person raising a concrete block from a river bed by using two pulleys.



As shown in the diagram, the top of the block is 6.0m below the water surface.

The density of water is  $1000\text{kg/m}^3$  and the acceleration of free fall is  $10\text{m/s}^2$ .

Calculate the water pressure acting on the top of the block. **(3 marks)**

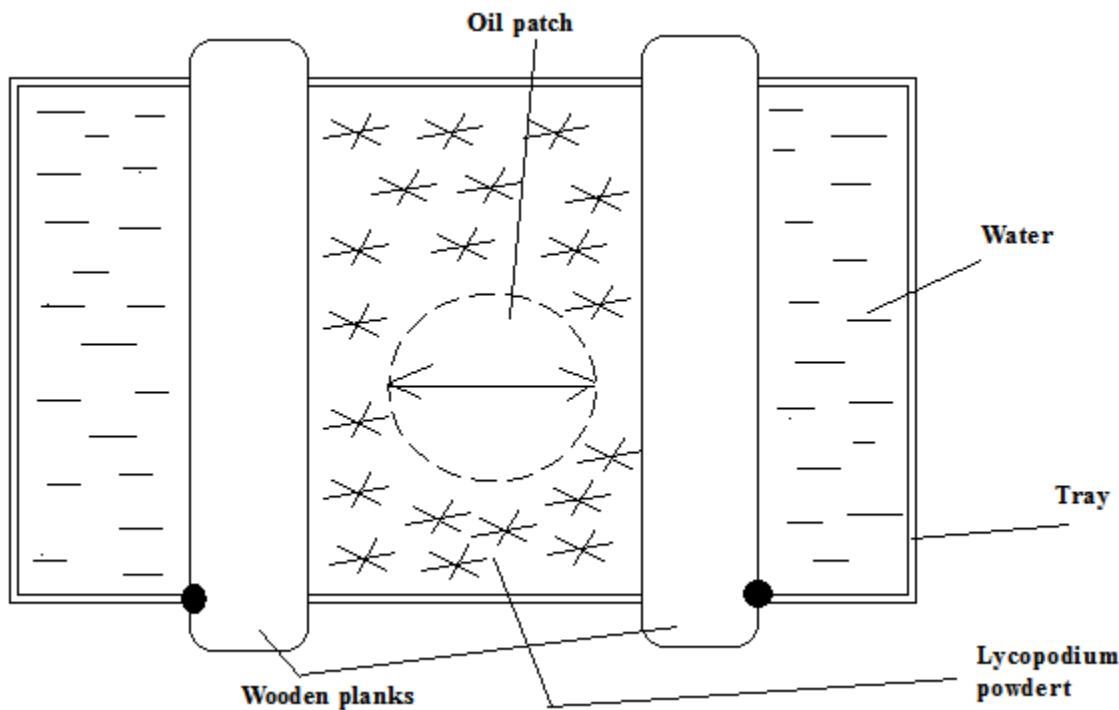
- c) The block is raised through water. At one part, the water pressure acting on the top of the block  $4.5 \times 10^4 \text{ pa}$ . The area of the top of the block is  $0.015\text{m}^2$ .

Calculate the downward force exerted by the water on top of the block. **(3 marks)**

- d) When the block is clear of the water, it is raised a further 4.0m. The weight of the block is 550N. Calculate the work on the block as it is raised the 4.0m through air.

**(3 marks)**

- 18.** The figure below shows part of an experiment set up to estimate the diameter of an oil molecule.



- i)** Describe how the oil patch is formed. **(2 marks)**
- ii)** What is the role of the Lycopodium powder. **(1 mark)**
- b)** An oil drop of average diameter 0.7mm spreads out into a roughly circular patch of diameter 73.5cm on the surface of water in a trough.
- i)** Calculate volume of the drop in mm<sup>3</sup>. Take ( $\pi = 22/7$ ) **(3 marks)**
- ii)** Calculate the area of the patch in mm<sup>2</sup>. **(2 marks)**
- iii)** Calculate the thickness of the oil molecule and express your answer in standard form. **(2 marks)**



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