

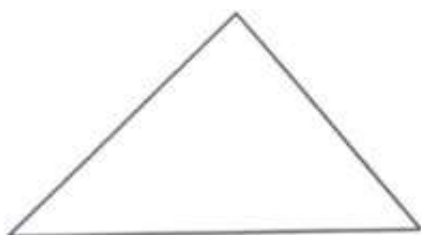
# FORM FOUR CLUSTER KCSE MODEL5

## PHYSICS PAPER 1 QUESTIONS

### SECTION A (25 Marks)

**Answer all questions**

1. The figure below shows a uniform triangular lamina.



Locate the centre of gravity of lamina

2. The figure below shows two containers of equal volume but of different diameters.



Equal volume of hot water was put in both containers. Explain why it cools faster in the wider container than in the narrower one.

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3. State one advantage of hydraulic brakes over mechanical brakes.

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4. A body in a uniform circular motion experiences acceleration despite moving at a constant speed. Explain.

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5. **Use the information below to answer question 5 and 6:**

**In an experiment to determine the density of a liquid, the following readings were made.**

**Mass of empty density bottle = 20g**

**Mass of bottle filled with water = 70g**

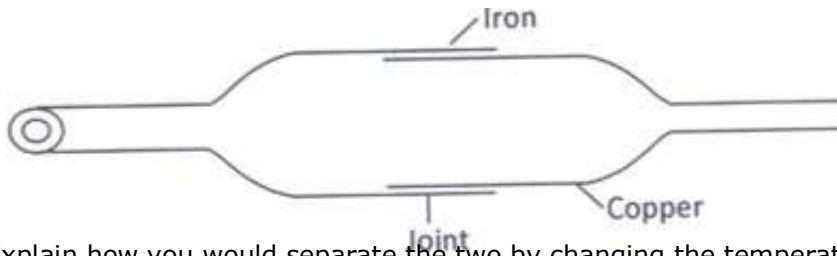
Find the density of the liquid, given that density of water is  $1000\text{kgm}^{-3}$

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6. Find the volume of the liquid.

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7. The diagram below shows a metal tube made of iron and copper. The joint is tight at room temperature.



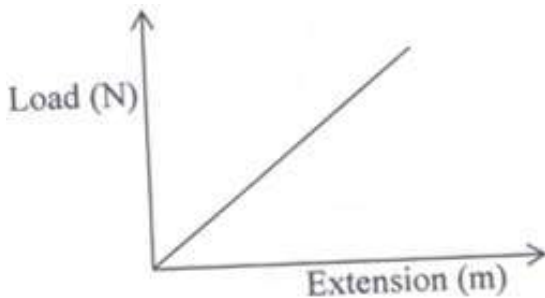
Explain how you would separate the two by changing the temperature given that copper expands more than iron for some change in temperature.

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8. State one assumption made when estimating the size of an oil molecule in the oil drop experiment.

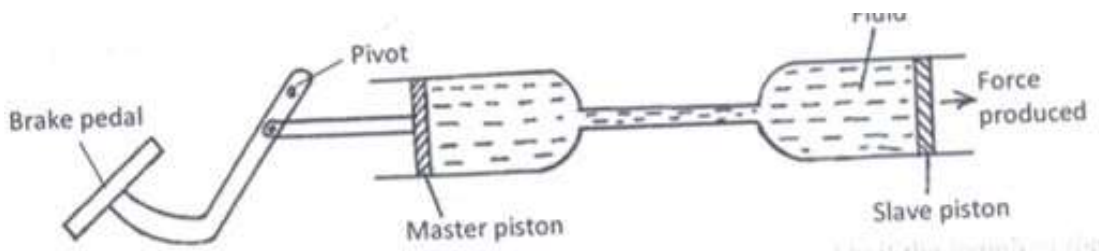
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9. The figure below shows a load – extension graph for various loads hung from a single spring.



On the same axes sketch a graph for a spring double the diameter and half the length of the first one.

10. Use the information in the figure below which represents hydraulic braking system to answer questions 10 and 11.



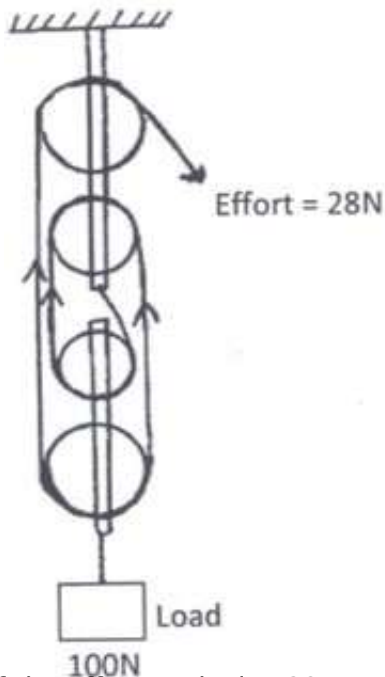
State one property that the fluid should have.

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11. Explain briefly how the system operates.

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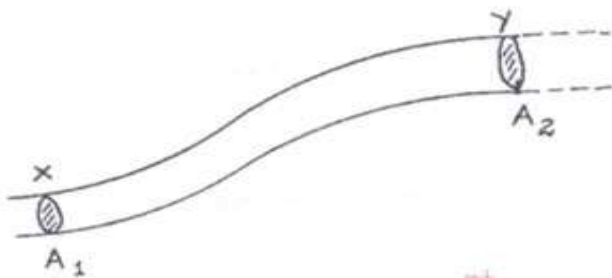
12. The Figure below shows a pulley system being used to raise a load.



If the effort applied is 28N and the load lifted is 100N, determine the efficiency of the system.

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13. The Figure below shows a section of a pipe XY. A constant pressure difference maintains a streamline flow of a liquid in the pipe.



If the cross-sectional area  $A_1$  at X is less than  $A_2$  at Y, state how the liquid velocity  $V_2$  at Y compares with  $V_1$  at X. ....

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14. Explain the cause of random motion of smoke particles as observed in Brownian motion experiment using a smoke cell.

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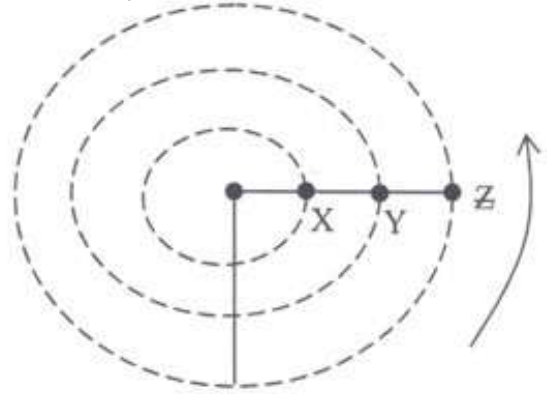
**SECTION B (55 Marks)**

**Answer all questions**

15. a) State what is meant by centripetal acceleration.

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b) The figure below shows masses X, Y and Z placed at different points on a turn table. The turn table is rotated at different angular velocities.



i) State two factors that would cause the masses to slide.

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ii) At the time that they start to sliding off, state the mass that will have the highest angular velocity, giving a reason for your answer.

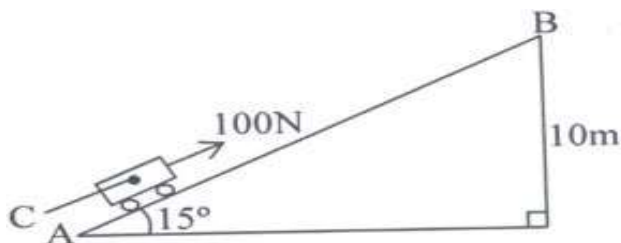
c)

i) If the centripetal force is 2N and the mass and radius of the path for mass Y are 100g and 0.03m respectively. Calculate the angular velocity of the mass when the system is in equilibrium.

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ii) Indicate on the same diagram the direction of velocity of mass Z at that position.

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



i) What is the work done on the trolley against the gravitational force in moving from A to B?(take acceleration due to gravity,  $g=10\text{m/s}^2$ )

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ii) Determine the work done by the force in moving the trolley from A to B.

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iii) Determine the efficiency of the system.

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iv) Determine the work done in overcoming the frictional force.

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v) Determine the mechanical advantage of the system.

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17. a) State Archimedes' principle.

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b) A solid Y weighs 40N in air, 30N when in water and 35N in liquid X. Find the density of;

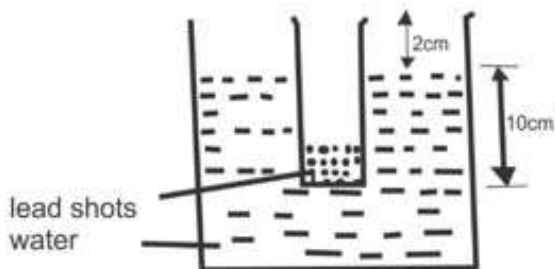
i) Solid Y

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ii) Liquid X

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c) A simple hydrometer is set up with a test - tube of mass 10g and length 12cm with a flat base and partly filled with lead shots. The test tube has a uniform cross-sectional area  $2.0\text{cm}^2$  and 10cm of its length is under water as shown in the figure below.



i) Taking the density of water as 1000kg/m<sup>3</sup>. Calculate the mass of the lead shots in the test tube.  
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ii) The mass of the lead shots to be added if it has to displace an equal volume of a liquid of density 1.25g/cm<sup>3</sup> .....  
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18. For a body moving with a constant acceleration, a, show that:

i)  $v = u + at$  where v and u are the final and initial velocities respectively while t is the time taken.  
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ii)  $S = ut + \frac{1}{2} at^2$  where S is the distance covered.  
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iii) A car of mass 1200kg moving at 90km/h is brought to rest over a distance of 20m. Calculate the braking force. ....  
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b) An object is projected vertically upwards with a velocity of 200m/s. Calculate:

i) Its velocity after 5 seconds  
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ii) The distance covered in the first 8 seconds.  
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19. a) What is meant by specific latent heat of vaporization of a substance?  
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b) In an experiment to determine the specific latent heat of vaporization of water, steam at 100°C was passed into water contained in a well-lagged copper calorimeter. The following measurements were made:

- Mass of calorimeter = 55g

-Initial mass of water = 75g □

-Final mass of calorimeter + water + condensed steam = 133g

-Final temperature of mixture = 30°C

[Specific heat capacity of water =  $4200\text{JKg}^{-1}\text{k}^{-1}$  and specific heat capacity of copper =  $390\text{JKg}^{-1}\text{k}^{-1}$ ]

Determine the

i) Mass of condensed steam.

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ii) Heat gained by the calorimeter and water if the initial temperature of the calorimeter +water =  $200\text{C}$ .

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iii) Given that  $L$  is the specific latent heat of vaporization of steam,

I) Write an expression for the heat given out by steam.

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II) Determine the value of  $L$ .

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c) i) In verifying the Charles' law of gases, the volume and the temperature of a gas are varied at constant pressure, State the condition necessary for the law to hold.

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ii) With an aid of a labelled diagram, describe an experiment to verify Charles' law.