NAME:……INDEX……..…..DATE

SCHOOL:……..……SIGNATURE……

232/1
FORM THREE PHYSICS
PAPER 1
END OF YEAR, 2017
2 HOURS

INSTRUCTIONS TO CANDIDATES

- *Write your name and index number in the spaces provided above*
- *Attempt all questions in all spaces provided*
- *Sign and write the date of the examination in the spaces provided*
- *Mathematical tables and electronic calculators may be used.*

For Examiner's Use Only

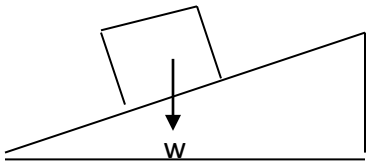
Section	Question	Maximum Score	Candidates' Score
A	Q1 – Q11	25	
B	Q12 Q13 Q14 Q15 Q16	11 11 14 10 10	
		80	

SECTION A (25 MARKS)

1. A drug manufacturer gives the mass of the active ingredient in a tablet as 5 mg. Express this quantity in kilogram and in standard form. (2 mks)

2. The masses of equal volumes of a certain liquid and of water were found to be m_t and m_w respectively. Given that the density of water is $1gm^{-3}$, express the relative density, p, of the liquid in terms of m_t and m_w. (3 mks)

3. Fig. 1 shows a brick placed on a plane inclined at an angle θ to the horizontal. The weight, W, of the brick is shown.

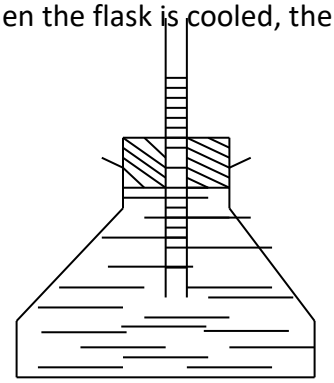


a) On the same diagram show with arrows the other two forces acting on the brick and name them. (2 mks)

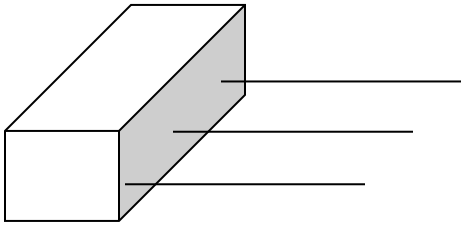
b) State how each of the two forces named in (a) above is affected when the angle θ is reduced. (2 mks)

4. Water is known to boil at 100°C. A student heated some water and noticed that it boiled at 101°C. State two possible reasons for this observation. (2 mks)

5. Fig. 2 shows a flask filled with water. The flask is fitted with a cork through which a tube is inserted. When the flask is cooled, the water level rises slightly, then falls steadily. Explain this observation. (3 mks)



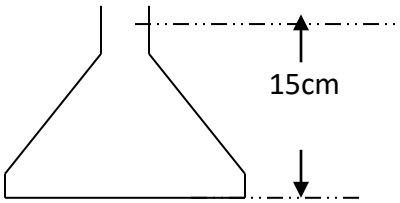
The figure below shows a hot water bath with metal rods inserted through one of its sides. Some wax is fixed at the end of each rod. Use this information to answer questions 6 and 7.



6. What property of metals could be tested using this set-up? (1 mk)

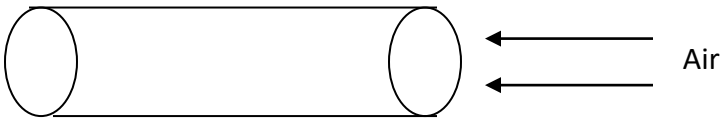
7. Besides the length of the rods that is kept constant, what else should be kept constant when comparing the property for the different metal rods. (1 mk)

8. The figure below shows a conical flask 15cm high, filled with a liquid of density 1200kgm^{-3}. The atmospheric pressure of the surrounding is 8.4 x 10^4 Pa. Determine the pressure at the point marked X, at the bottom of the flask. (3 mks)



9. Explain the difference between a liquid and a gas in terms of intermolecular distances and forces. (2 mks)

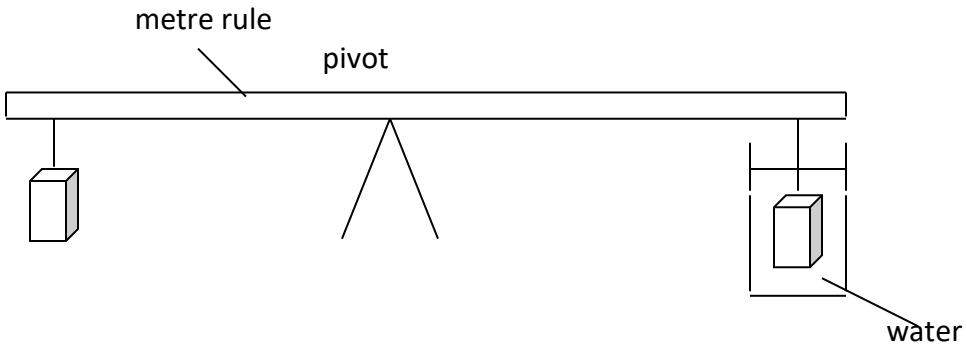
10. Fig. 5 shows a sheet of paper rolled into a tube.



Paper tube

When a fast stream of air is blown into the tube as shown in the diagram the paper tube collapses. Explain the observation. (2 mks)

11. The system in Fig. 6 is in equilibrium



When the temperature of the water is raised the system is observed to tilt clockwise. State the reason for this observation. (2 mks)

SECTION B (55 MARKS)

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

12. (a) State Newton's second law of motion. (1 mk)

(b) A matatu starts from rest and accelerates to cover a distance of 49m in 7 seconds. Determine:

(i) its acceleration; (3 mks)

(ii) its velocity after 7 seconds (3 mks)

(c) A trolley moving on a horizontal bench of height 1.2m, strikes a barrier at the edge of the bench. The brass mass on the top of the trolley flies off on impact and lands on the ground 2.5m from the edge of the bench. Determine:

(i) the time taken by the brass mass to reach the ground; (2 mks)

(ii) the speed at which the trolley struck the barrier (2 mks)

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

b) In an experiment to determine the specific latent heat of vaporization of water, steam at 100^0c 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 = 123g
Initial temperature of mixture = 30^0C
Final temperature of mixture = 52^0C

(Specific heat capacity of water = 4200 J kg $^{-1}$K and specific heat capacity for copper = 390 J kg $^{-1}$ K^{-1})

Determine the

I) Mass of condensed steam (2 mks)

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

III) Given that L is the specific latent heat of evaporation of steam

i). Write an expression for the heat given out by steam(2 mks)

ii). Determine the value of L. (3 mks)

14. (a) (I) What is meant by absolute zero temperature? (1 mk)

(II) A sealed gas cylinder contains $300cm^3$ of a certain gas at a temperature of 25^oC, and at a Pressure of $9.5 \times 10^4 Pa$. The gas in the cylinder was then cooled at constant volume to 10^oC. Determine the new pressure of the gas in the cylinder. (4 mks)

(b) (I) (i) Draw and label a diagram of the apparatus you would use to verify Charle's law. (3 mks)

(ii) Describe how to use the apparatus to verify the law. (3 mks)

(II) A gas has a volume of $20cm^3$ at 27^0C and normal atmospheric pressure. Calculate the new volume of the gas if it is heated to 54^0C at the same pressure (3 mks)

15. (a) Define the term velocity ratio of a machine. (1 mk)

(b) A machine of velocity ratio 45, overcomes a load of 4.5 x 10^3N when an effort of 135N is applied. Determine:

(i) the mechanical advantage of the machine; (2 mks)

(ii) efficiency of the machine; (2 mks)

(iii) the percentage of the work that goes to waste. (1 mk)

d) The figure below is a simplified diagram of a hydraulic jack. The cross selection area A2 of the load piston is 25 times the area A1 of the effort piston. F2 = 25N. F1 is the force applied (Effort) while F_2 represents the load.

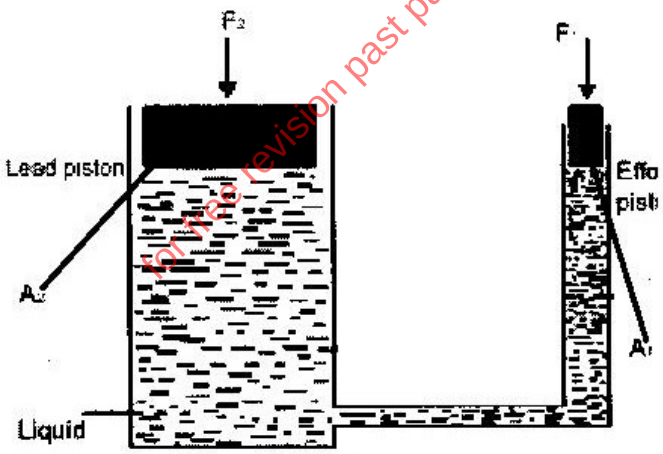


Figure 3

Write an expression for the pressure exerted on the liquid by the effort piston. (1 mark)

(e) A mechanic applies a force of 100N on the effort piston while raising the rear part of a car.

(ii) Determine the maximum load that can be raised (2 marks)

(iii) Give a reason why gas is not suitable for use in place of the liquid in the jack (1 mark)

16 (a) State the principle of moments. (1 mark)

(b) Two men P and Q carried a uniform ladder 3.6 m long weighing 1200N. P held the ladder from end while Q supported the ladder at a point 0.4m from the other end.

(i) Sketch a diagram showing the forces acting on the ladder. (3 mks)

(ii) Calculate the load supported by each man. (3 mks)

c) The figure shows a uniform half metre rod that is balanced over a pivot using a block of weight 2N and a spring.Given that the tension in the spring is 9N, determine the weight of the rod. (3 mks)