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FORM III

HALF-YEARLY EXAMS
February 2008

PHYSICS

NAME..... CLASS..... MARK.....

Section One - Work out **ALL** Problems in this section. Give all your answers in the spaces provided.

EQUATIONS AND INFORMATION YOU MAY FIND USEFUL FOR THE EXAM:

- 5) Density $\rho = \text{mass} / \text{volume}$
- 6) Gravity on the earth = 10 N/kg
- 7) Gravity on the moon = 1/6 of 10 N/kg
- 8) $W = mg$
- 9) Moment of a force = Force X perpendicular distance away from the pivot.
- 10) Pressure $P = \frac{F}{A}$
- 11) Pressure $P = h \rho g$

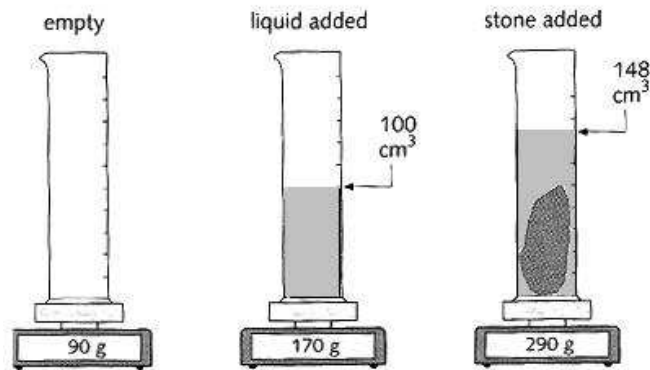
1. The table shows the **density** of various substances. (4 marks)

Substance	Density (g/cm ³)
Copper	8.9
Iron	7.9
Kerosene	0.87
Mercury	13.6
Water	1.0

Consider the following statements and **answer true or false**.

- a) 1 cm³ of mercury has a greater mass than 1 cm³ of any other substance in the table _____ (1)
- b) 1 cm³ of water has a smaller mass than 1 cm³ of any other substance in the table _____ (1)
- c) 1g of iron has a smaller volume than 1g of copper _____ (1)
- d) 1g of mercury has a greater mass than 1g of copper _____ (1)

2. Use the information in the diagram below to calculate. (10 marks)



- a) i) the mass of the liquid (1)

- ii) the volume of the liquid (1)

- iii) the density of the liquid (2)

- b) i) the mass of the stone (2)

- ii) the volume of the stone (2)

- iii) the density of the stone (2)

3. A spacecraft travels from Earth to Mars where the gravitational field strength (g) near the surface is 3.7 N/kg . The spacecraft is carrying a probe which has a mass of 100 kg when measured on Earth. (6 marks)

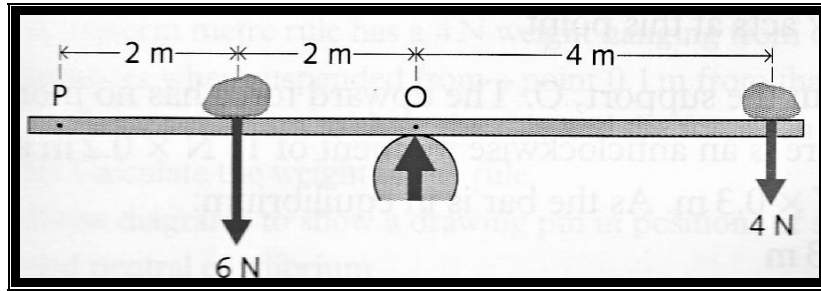
- a) What is the probe's weight on Earth? (2)

- b) What is the probe's mass in space? (1)

- c) What is the probe's mass on Mars? (1)

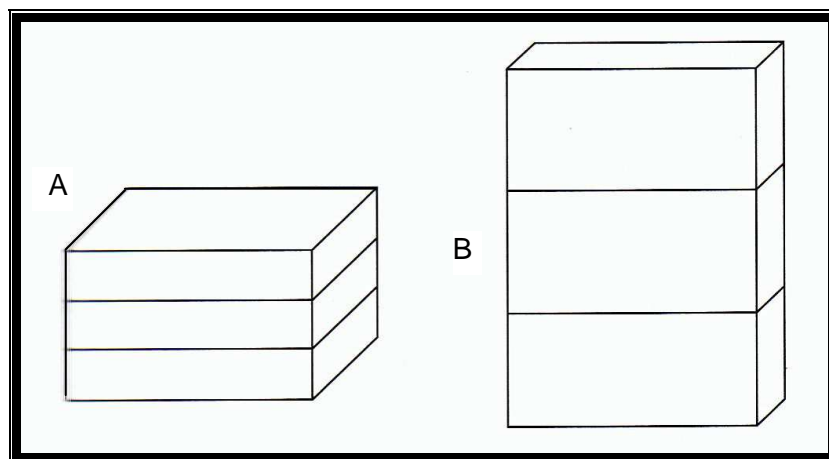
- d) What is the probe's weight on Mars? (2)

4. Someone is trying to **balance** a plank with stones as shown below. The plank has **negligible weight**. (10 marks)



- a) Calculate the moment of the **4N** force about O. (2)
-
- b) Calculate the moment of the **6N** force about O. (2)
-
- c) Will the plank **balance**? If not **which way** will it turn? (2)
-
- d) What extra **force** is needed at point P to balance the plank? (3)
-
- e) In which **direction** must the force at **P** act? (1)
-

5. Three concrete blocks can be stacked in two different ways as shown below. (10 marks)



- a) Complete the paragraph below using a phrase from the following:
- LESS THAN** **THE SAME AS** **MORE THAN**
- (Each phrase may be used **once, more than once or not at all.**)

The force of stack A on the ground is _____ the force of stack B. (2)

The pressure on the ground from stack B is _____ the pressure from stack A, because the area in contact with the ground for B is _____ for A. (2,2)

b) Write down, **in words**, the formula connecting pressure, force and area. (1)

c) If the weight of stack A is 500N and the area in contact with the ground is 200cm^2 , calculate the pressure on the ground in N/cm^2 . (3)

Section Two - Work out **ALL** Problems in this section in the spaces provided.
Total 45 marks.

1. The table shows the result obtained when different stretching forces (F) are applied to a spring to stretch it.

Stretching Force /N	0	1	2		4	5	6
Extension /mm	0	3		9	12	15	18

a) Complete the missing data in the table. (2)

b) Plot a graph of the stretching force F (x-axis) against the extension (y-axis) on the graph paper provided. (6)

c) Use the graph to complete the following:

i. A stretching force of _____ N produces an extension of 13.5 mm. (2)

ii. A force of 1.5 N produces an extension of _____ mm. (2)

d) What is the shape of the graph? _____ (1)

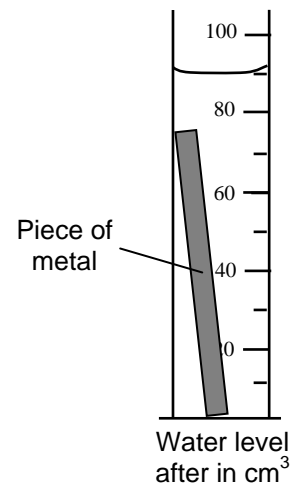
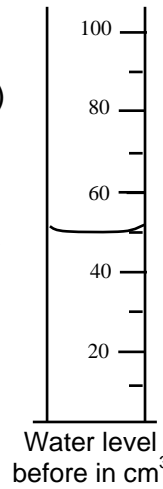
e) Does the spring obey Hooke's Law? _____ (1)

f) What will happen to the spring if you keep on adding weights? (1)

2. Some students carry out an experiment to measure the density of a piece of metal.

a) What instruments are used to measure the : i) mass? _____
ii) volume? _____ (2)

b) Briefly describe how they should carry out the experiment to find the **density** of the piece of metal. (3)



c) From the diagrams above, measure the **initial volume** of water. (1)

d) Measure the **final volume** of water. (1)

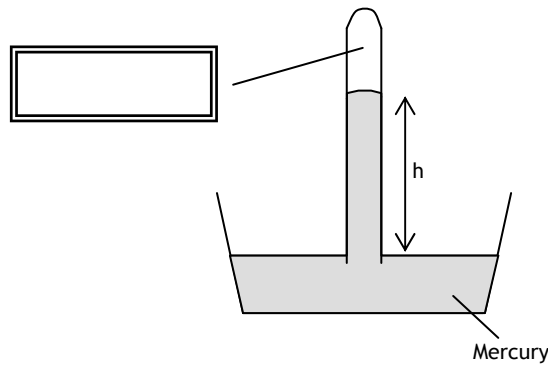
e) Calculate the **volume** of the piece of metal. (2)

f) The **mass** of the rod was found to be 280g. Calculate the **density** of the metal in **g/cm³**. (3)

g) Express the density of the piece of metal in **kg/m³**. (1)

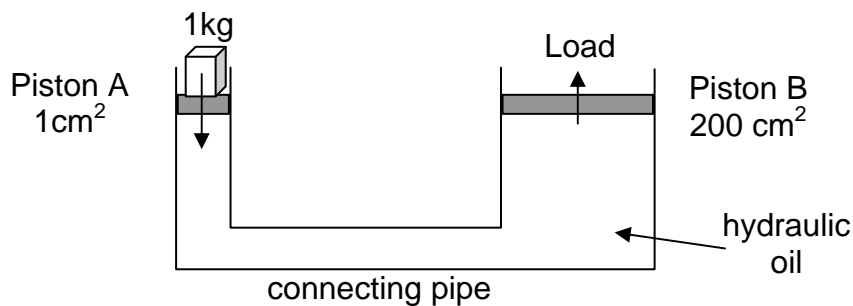
h) The piece of metal is then cut in half. Will the density of the piece of metal **increase, decrease** or **stay the same**? Explain. (2)

3. This instrument is used to measure **atmospheric pressure**.



- a) i. It is called a _____ . (1)
- ii. Pressure is measured in **N/m²** and in _____ . (1)
- iii. **Fill in the empty rectangle** with the appropriate label. (1)
- iv) What would happen to the height of the mercury column if the above instrument is taken on a **high mountain**? **Explain** your answer. (3)

b) The figure represents a simple hydraulic jack. The pistons may be considered weightless and frictionless. A mass of **1kg** is placed on the **small piston A**. The cross-sectional **area** of A is **1cm²** while that of B is **200cm²**.



- i. Calculate the **force** acting on piston A. (1)
- ii. Calculate the **pressure** on the liquid in N/cm² just under piston A. (2)

iii. List **two** properties that make liquids ideal for transferring this pressure from piston A to B. (2)

iv. Would the **pressure in B** be different if the connecting tube were wider? (1)

v. What **pressure** is exerted by the liquid on **piston B**? (1)

vi. Calculate the **load** that can be raised by this jack on **piston B**. (2)

END