St. Thomas More College
Boys Junior Lyceum
Half Yearly Examinations February 2011

Form 3	Physics	Time: 1hr 30mins

Name: _____ Class: _____ Index No. _____

Graph Paper to be provided

Useful Formulae

Average speed = $\frac{\text{total distance}}{\text{total time}}$ W = mg   g = 10 N/Kg

Density = $\frac{\text{mass}}{\text{volume}}$ Moment of a Force = Force x perpendicular distance

F = PA   P = hρg

Area of rectangle = $\ell \times$ b   Volume of rectangle = $\ell \times$ b $\times$ h

ANSWER ALL QUESTIONS
*Give your answers correct to **2 decimal places** where necessary.*

SECTION A   **(55 marks)**

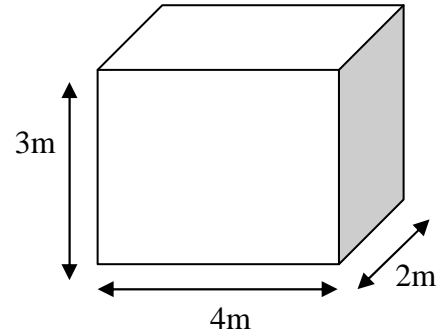*1.*   ***This question is about symbols and S.I. units.***   (5 marks)

Complete the following table (the first one has been given to help you) :-

Physical Quantity	**Symbol**	**S.I. Unit**
length	*l*	*m*
mass		
time		
force		
density		
pressure		

2. *This question is about pressure.*

a. The diagram shows a block of concrete of sides 3m by 2m by 4m. It has a mass of 6000 kg.

3m

4m

2m

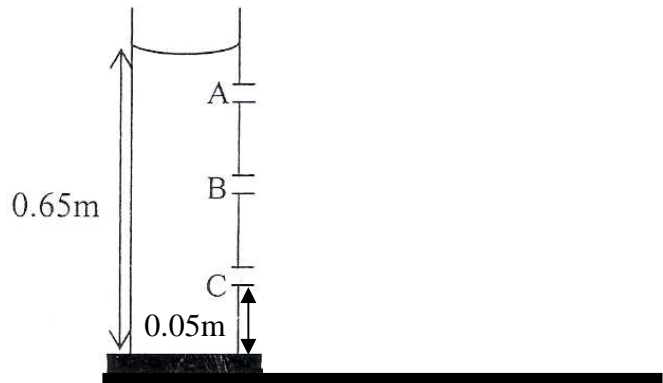i. Calculate the area of the **smallest** face in m^2. (2 marks)

_____

_____

ii. Calculate the weight of the block in N. (2 marks)

_____

_____

iii. Calculate the maximum pressure that can be exerted by the stone. (2 marks)

_____

_____

b. John fills a tall can with water. The can has three identical holes.

Draw the paths of the water when the can is full.
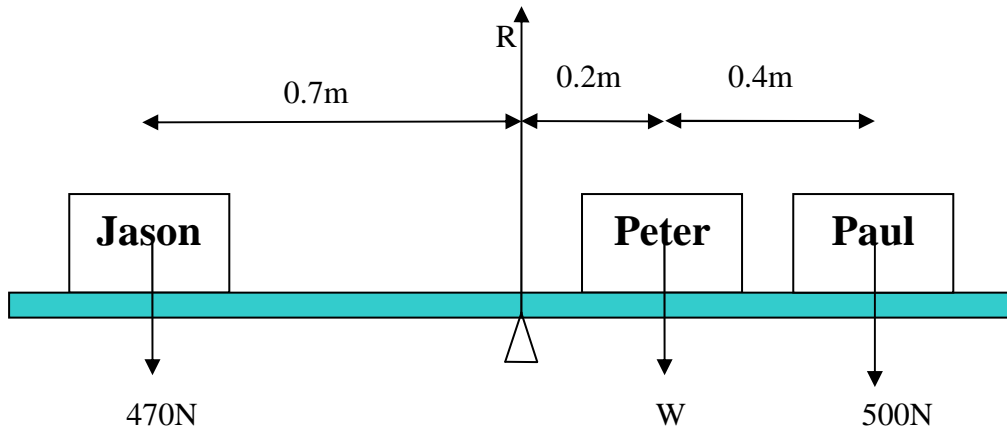
(1 mark)

0.65m

A

B

C

0.05m

i. At which point is there the largest pressure, A, B or C? _____ (1 mark)

ii. The density of water is 1000 kg/m^3. Calculate the pressure of the water at the at point C. (2 marks)

_____

_____

_____

3. *This question is about moments.*

The diagram shows a balanced see-saw. Jason, Peter and Paul sit on the see-saw in the positions shown.

a. The centre of gravity of this uniform see-saw acts through its _____ (1 mark)

b. State the principle of moments. (2 marks)

_____

_____

c. State the type of Jason's Moment. _____ (1 mark)

d. Calculate Jason's Moment. (2 marks)

_____

_____

e. If the system is in equilibrium, what is the total clockwise moment ? _____

(1 mark)

f. Calculate Peter's weight. (3 marks)

_____

_____

_____

_____

g. Find the value of the reaction force of the pivot R. _____

_____ (1 mark)

4. *This question is about measuring instruments.*

Fill in with the correct measuring instrument:-

a. Jack needs to measure the **<u>length</u>** of his room

He uses a _____ (1 mark)

b. Sandro needs to find the **<u>weight</u>** of a stone.

He uses a _____ (1 mark)

c. Alex needs to find the **<u>mass</u>** of an empty bottle.

He uses a _____ (1 mark)

d. Joseph needs to measure the **<u>time</u>** for the 25 oscillations of a pendulum.

He uses a _____ (1 mark)

5. *This question is about density and pressure.*

a. Alfred investigates the air in a closed tank. The room measures 5 m by 8 m by 3 m.
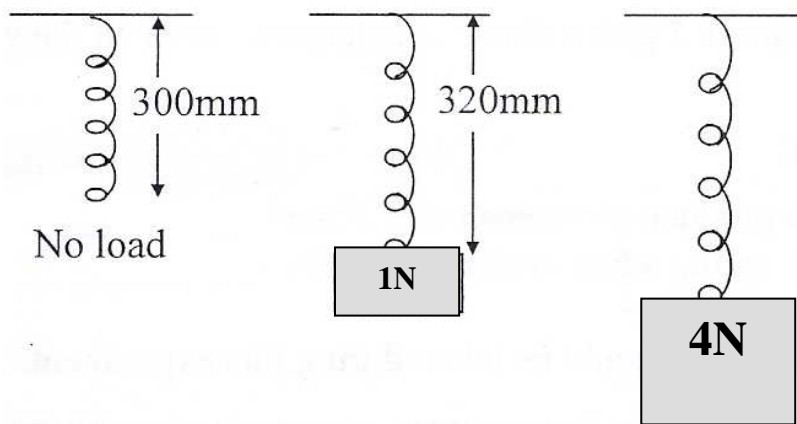
   i. Calculate the volume of the room in m^3. (1 mark)

_____

   ii. The density of air is 1.1 kg/m^3. Find the mass of air inside the room. (2 marks)

_____

_____

   iii. More air is compressed into the tank. In terms of collisions, briefly explain what happens to the air pressure inside the tank. (2 marks)

_____

_____

_____

b. A sample of air is trapped in a closed container. State what changes occur to the following when the air is heated.

   i. Mass of air. _____ (1 mark)

   ii. Pressure of air. _____ (1 mark)

6. *This question is about stretching forces.*

The diagram shows a spring that obeys Hooke's Law.

a) What is the original length in **mm** of the spring? _____ (1 mark)

b) Calculate the extension in **mm** produced by the 1N Force. (1 mark)

_____

c) Calculate the extension in **mm** when a Force of 4N is hung on the spring. (2 marks)

_____
_____
_____

d) Calculate the length in **mm** of the spring when a Force of 4N is hung on the spring.

_____
_____ (1 mark)

e) State Hooke's Law.

_____
_____
_____ (2 marks)

7. *This question is about gravity.*
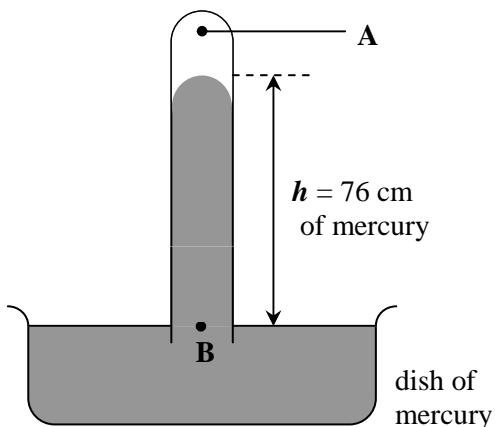
a. The pull of gravity on the moon is 1.7 N/Kg, and that on the earth is 10 N/Kg. Find the weight of an object of mass 0.5 Kg :

    i.   on the earth.   (2 marks)

_____

_____

    ii.   on the moon.   (2 marks)

_____

_____

b. Why is the gravity on the earth, larger than the gravity on the moon ?   (1 mark)

_____

_____

8. *This question is about pressure*

A mercury barometer is shown in the diagram below. The level of mercury in the barometer is 76cm.

i. What is this instrument used for ?   (1 mark)

    _____

    _____

$h = 76$ cm of mercury

ii. What is the space at A called? _____
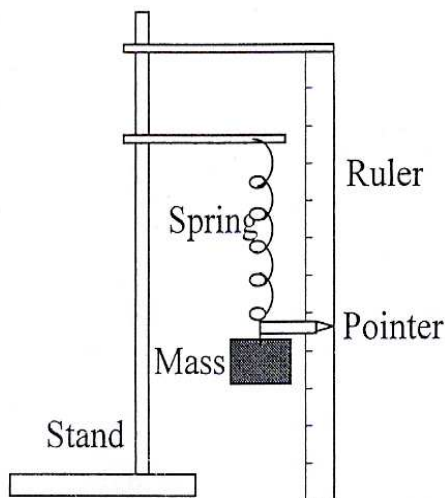
(1 mark)

iii. The density of mercury is 13, 600 Kg/m^3. Find the pressure at point B.   (2 marks)

_____

_____

iv. What happens to the mercury column in the tube, if this instrument is taken :

    a. i) on a high mountain _____   (1 mark)

    b. ii) deep in the sea _____   (1 mark)

9. This question is about Hooke's Law.

James sets up the apparatus shown in the diagram. He suspends different masses and each time he reads the length of the spring and tabulates the results as shown below.
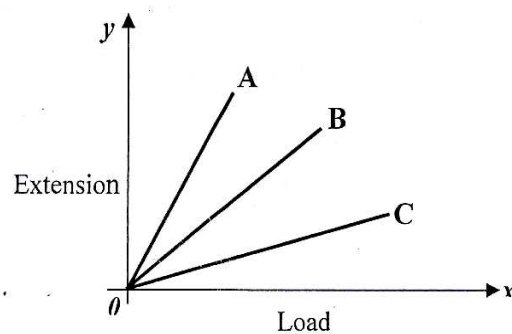
Mass/kg	0	0.4	0.8	1.2	1.6	2
Force/N	0	4	8	12	16	20
Length of spring/cm	9	12	15	18	21	24
Extension/cm		3			12	

a. Complete the missing values of the extension in the above table.   (2 marks)

b. What is the original length of the spring ? _____   (1 mark)

c. On the graph paper provided, plot a graph of extension (cm) on the y-axis against Force (N) on the x-axis.   (5 marks)

d. Use the graph to find:

    i.   The load required to extend the spring by 7.5cm _____   (1 mark)

    ii.   The extension of the spring with a load of 18 N _____   (1 mark)

e. Mention two precautions which should be taken during this experiment.   (2 marks)

_____

_____

f. Continue the following sentence: From the graph plotted, we can conclude that the spring

_____ (1 mark)

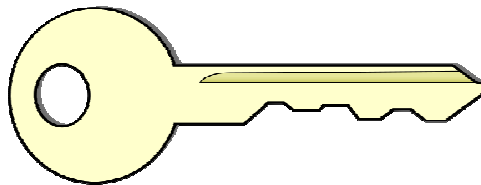g. James repeated the experiment using three different springs, A, B and C and obtained the following graphs.

Look at the graphs, which spring is the softest ?

_____ (1 mark)

h. What happens to the spring when it exceeds the elastic

limit ? _____ (1 mark)

10. This question is about density.

Joseph wants to find the density of a key made of brass.

a. Give three steps used to measure the volume of the key. (3 marks)

1. _____

2. _____

3. _____

b. Name two precautions taken when measuring the volume of the key. (2 marks)

1. _____

2. _____

c. Joseph finds that the volume of the brass key is 7.0 cm^3 and its mass is 60 g. Calculate its density in g/cm^3. (2 marks)

_____

_____

_____

d. Given that the density of water is 1 g/cm^3, will the key float or sink in water? Explain your answer. (2 marks)

_____

_____

e. What do you understand by the term 'density' ? (1 mark)

_____

_____

f. *Fill in:-* If I have another brass key, but smaller than the one mentioned above. The mass of the small key is _____, the volume is _____ and the density is _____. (3 marks)
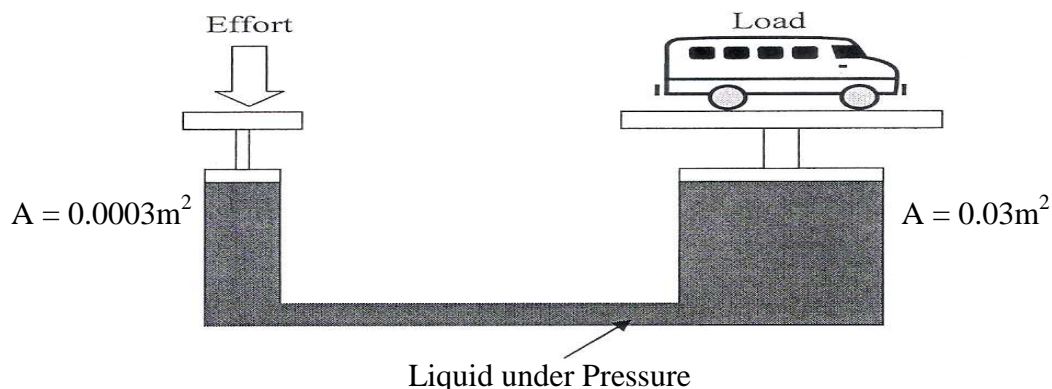
g. Given that the density of mercury is 13.6 g/cm^3, write True or False in the following.

i. 1 cm^3 of mercury has a larger mass than 1 cm^3 of brass. _____

ii. 1 g of mercury has a larger mass than 1 g of brass _____

(2 marks)

11. *This question is about pressure.*

The diagram shows a simple hydraulic machine used to lift a heavy car of mass 2400 kg. The area of the small piston is 0.0003 m^2 and the area of the large piston is 0.03 m^2.

Effort   Load

$A = 0.0003 m^2$ $A = 0.03 m^2$

Liquid under Pressure

a. Name the force which is causing the load _____ (1 mark)

b. Calculate the weight of the car.   (2 marks)

_____

_____

c. Calculate the pressure exerted on the large piston.   (2 marks)

_____

_____

d. What is the pressure under the smaller piston?_____(2 marks)

e. Why is oil used in such hydraulic systems ? _____

_____(2 marks)

f. Calculate the effort which must be exerted on the small piston.   (2 marks)

_____

_____

g. Underline the correct word from the brackets.   (4 marks)

     i.   The (smaller, larger) the base area, the larger the pressure.

     ii. Liquid pressure (increases, decreases) with depth.

     iii. The greater the density of a liquid, the (greater, smaller) is the pressure at a depth of 1m.

     iv. 3 holes at the same level, have (same, different) pressure.