ST. NICHOLAS COLLEGE
HALF YEARLY SECONDARY EXAMINATIONS
February 2012

FORM 3 **PHYSICS Track 2** **TIME: 1 h 30 min**

Name: _____ Class: _____ Register Number: _____

Answer all questions.
All working must be shown. The use of a calculator is allowed.
Where necessary take acceleration due to gravity g = 10m/s^2.

You may find some of these equations useful:

Weight	W= mg
Density	$\rho = \frac{m}{V}$
Moments	M= Fs
Pressure	$P = \frac{F}{A}$

For office use only:

Question No.	1	2	3	4	5	6	7	8	Total Mark	Practical Mark	Final Mark
Score											

SECTION A : This section carries a total of 40 marks.

1a. **Fill in** the blanks of the following table, by inserting the correct **UNITS**.

Quantity	Units
length	
time	
volume	
force	

(2 marks)

1b. You are going to measure the following.
Match the correct instrument with the measurement of each object.

The **weight** of a banana.	 top pan balance
The **length** of a room.	 Newton balance
The **length** of a copybook.	 tape measure
The **mass** of a banana.	 measuring cylinder
The **volume** of a cup of water.	 bathroom scales
Your own **mass**.	 ruler

(6 marks)

2. This question is about **mass** and **weight**.

a i. The mass of a bag of apples is 2500 g.

Its mass in kg is _____ (2)

a ii. Calculate the weight of this bag of apples ?

_____ (2)

b. A boy travels from Earth to the moon. Underline the correct words between the brackets.

i. The moon's gravitational pull is (greater / smaller) than that on Earth.
ii. The boy's mass on the Moon will (increase / decrease / stay the same).
iii. The boy's weight on the Moon will (increase / decrease / stay the same).
iv. Whilst doing a high jump on the moon the boy found it (more difficult / easier) to do the same thing on Earth. (4)

3. This question is about density.

Karen needs to find the **density** of an unknown liquid. She places an empty beaker on a top-pan balance, its mass was **183g**, then she poured in the liquid and the mass increased to **213g.** When the liquid was poured in a measuring cylinder she read a volume of **35cm³**.

a. What is the mass of the liquid? _____ (1)

b. What is the volume of the liquid? _____ (1)

c. Calculate the density of the liquid

_____ (2)

d. Which of the liquids in the table could be the unknown liquid?

_____ (1)

liquid	density (g/cm³)
Turpentine	0.86
Benzine	0.81
Acetone	0.79

e. Will this liquid float on water? Explain your answer.

_____ (3)

4. The table gives some nutritional information about vanilla ice-cream.

100g of **full fat** vanilla ice-cream	806 kJ
100g of **low fat** ice cream	402 kJ

a. How much energy would you gain if you eat 100g of full fat ice-cream.

_____ (1)

b. Ice-cream should be stored at the right temperature . Underline the correct temperature for storing ice-cream .

80 ºC , 5 °C , - 4 °C (1)

c. If the ice-cream is heated to a room temperature of 20ºC it will (melt/boil) and becomes a (solid/liquid). (2)

d. The energy value of low fat ice-cream is less than full-fat ice-cream . Explain why.

_____ (2)

e. How does an ice-cream keep us cool in Summer ?

_____ (2)

5. This question is about forces.

a. The force which tries to stop moving objects is called _____ (1)

b. A way to reduce friction is to add _____ (1)

c. On the diagram below **draw arrows** to show how the two forces **air resistance** and **weight** are acting (2)

d. A car has a forward force of 2000 N and a frictional force of 200N .

i. Draw arrows to represent forces on the car below.

(2)

ii. What is the Resultant force?

_____ (2)

SECTION B : This section carries a total of 45 marks

6a. A boy of mass 44 kg sits on a stool of mass 4 kg.
The stool has 4 legs each of area 0.004 m² in contact with the floor.

i. The total mass of boy and stool is _____ (1)

ii. Calculate the total weight of the boy and stool _____ (1)

iii. The total area of the four legs is _____ (1)

iv. The pressure exerted on the ground when the boy sits on the stool is:

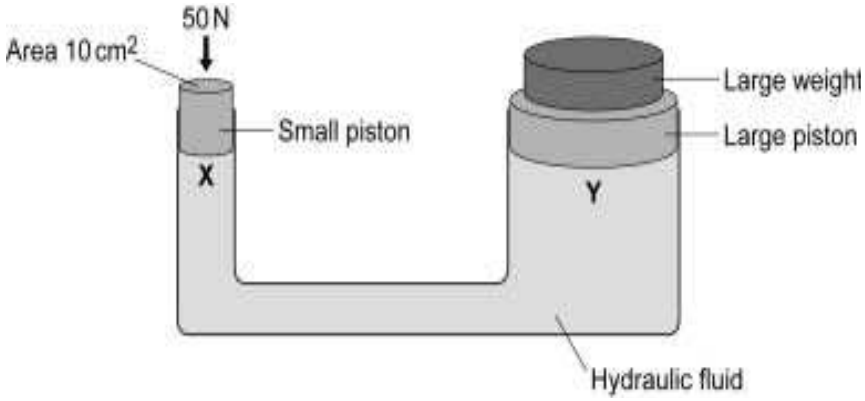
_____ (2)

v. How will the pressure made on the ground by the stool change if a heavier man sits on the stool? Explain your answer.

_____

_____ (3)

6b. The diagram shows a simple hydraulic jack. The jack is designed to lift a large weight using a much smaller force.



i. Complete the following sentence .

A hydraulic jack is an example of a _____ multiplier. (1)

ii. Calculate the pressure in N/cm², created on the small piston of area 10 cm² by the force of 50N pushing downwards.

_____

_____ (2)

iii. Complete the following sentence

The pressure at Y will be _____ to the pressure at X . (1)

iv. If the piston at Y has an area of 250 cm².What is the force created at this piston?

_____ (2)

v. If there are air bubbles in the hydraulic fluid how would it affect the jack?

_____ (1)

7. This question is about Hooke's Law

Two wires of different materials were suspended vertically. 1N weights were loaded on each wire and the extension was measured. This was repeated using weights of 2N, 3N, 4N and 5N. Below is a table with results:

Weight suspended (N)	0	1	2	3	4	5
Length of wire A (mm)	500	505	510	515	522	530
Length of wire B (mm)	500	502	504	506	508	510

a. What is the length of each unloaded wire?

Wire A _____

Wire B _____ (1)

b. From the table above find the extension for each wire when a weight of 3N was suspended.

Wire A _____

Wire B _____ (2)

c. Hooke's Law says that the _____ is directly proportional to the force if the _____ limit is not exceeded. (2)

d. Complete the following table by filling the missing extensions: (2)

Weight suspended (N)	0	1	2	3	4	5
Length of wire A (mm)	500	505	510	515	522	530
Extension of wire A (mm)	0	5		15	22	

e. On the graph paper provided plot a graph of Extension (y-axis) against Weight (x-axis) (6)

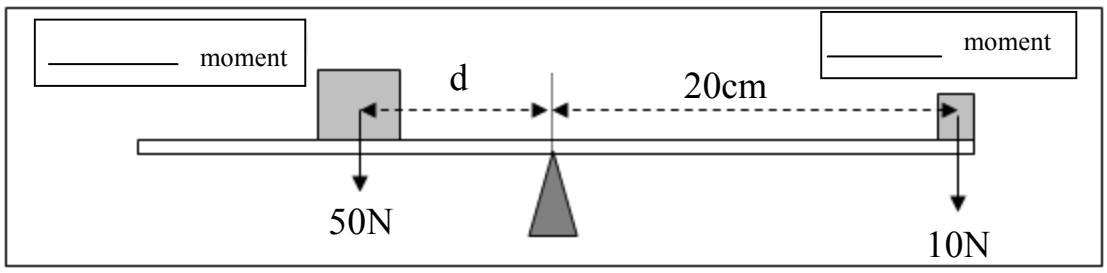
f. On your graph mark the elastic limit with an E. (2)

8 a. A spanner 0.30m long has a force of 20N applied to it .

What is the moment of the force applied ?

_____ (3)

b.



i. On the diagram above mark the **Clockwise** and **Anti-clockwise** Moments. (2)

ii. Continue the sentence about the Principle of moments:

In Equilibrium total anti-clockwise moments are equal to total

_____ (1)

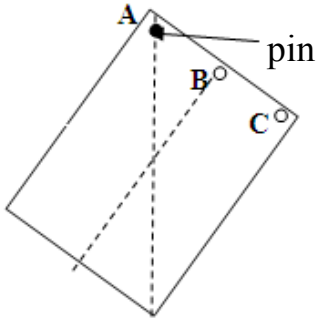
iii. Calculate distance **d**

_____

_____ (3)

c. The diagram shows an experiment to find the centre of gravity of a flat sheet of card board. Arrange these sentences in the correct order to describe how the student can find the centre of mass of the card.

D					



A A line is drawn on the card marking the position of the string.
B A pin is put through hole A in the card.
C This is repeated using the other holes B and C.
D Three holes are made in the card with each hole near to the edge of the card.
E The centre of mass is where the lines cross on the card.
F A weight is tied to a string and the string is hung from pin A. (6)