St. Ignatius College
Boys Secondary School, Ħandaq
Half-Yearly Examination 2011

3

Form : 3 **Physics** **Time: 1 hr 30 mins**

Name: _____ **Class:** _____

1	2	3	4	5	6	7	8	Main	Practical	Total

Answer ALL questions in Section A and Section B.
All working must be shown. The use of a calculator is allowed.
Where necessary take the gravitational field strength on earth as g = 10N/kg.

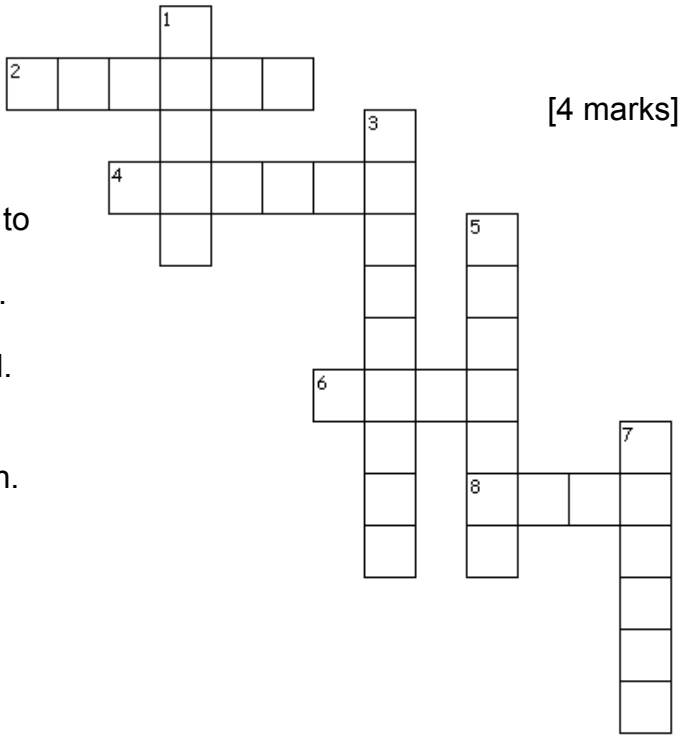
You may also find these formulae useful:

Density: $\text{density} = \frac{\text{mass}}{\text{Volume}}$ **Force:** $W = mg$

Pressure: $\text{Pressure} = \frac{\text{Force}}{\text{Area}}$ $P = h\rho g$

Section A.

1. **Fill in** this criss-cross puzzle correctly [4 marks]



Across
2. The measuring cylinder is used to measure this quantity.
4. This is affected by the gravitational force.
6. This is measured in kilograms.
8. The SI unit for this quantity is the second.

Down
1. This instrument is used to measure length.
3. This is used for accurate timings.
5. The mass of packed particles in 1 cm^3.
7. This is the unit of a Force.

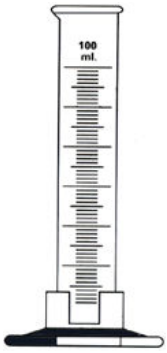
2. Maria found three identical rings. They were painted so she couldn't identify each of their material. She decided to carry out an experiment to find out the material of each ring.

First she prepared the apparatus she needed.

a. **Name** the apparatus below:

A

B



A = _____ B = _____ [2]

b. The three rings were identical in shape and had the same volume. **Number** the steps below correctly to show what Maria had to do to find the volume of the ring.

☐ Gently lower the ring into the measuring cylinder and read the new volume.
☐ Fill the measuring cylinder with some water.
☐ Subtract the two readings for volume. [3]

c. **Calculate** the density of each ring. The first one has been done for you.

	Mass (g)	Volume (cm^3)	Density (g/cm^3)
Ring A	4.5	5	**0.9**
Ring B	96.5	5	
Ring C	52.5	5	

[2]

d. In a physics book Maria found the following densities for each material.

Write down the name of each ring. The first one has been done for you.

Density of plastic = $0.9g/cm^3$	Density of Silver = $10.5g/cm^3$	Density of Gold = $19.3g/cm^3$
Ring A		

[2]

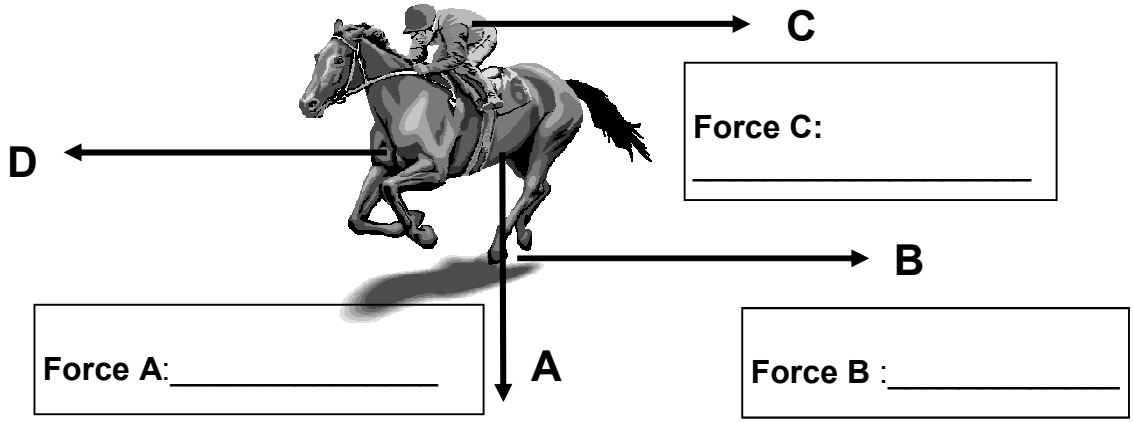
e. Briefly **explain** how Maria should have noticed that ring A was made of plastic? (Density of water = $1g/cm^3$)

_____[1]

3. In a horse race fundraising activity, Henry participates with his horse Tornado in two competitions.

First Competition: 2 Miles Horse racing

a. **Label** the forces in this diagram [3]



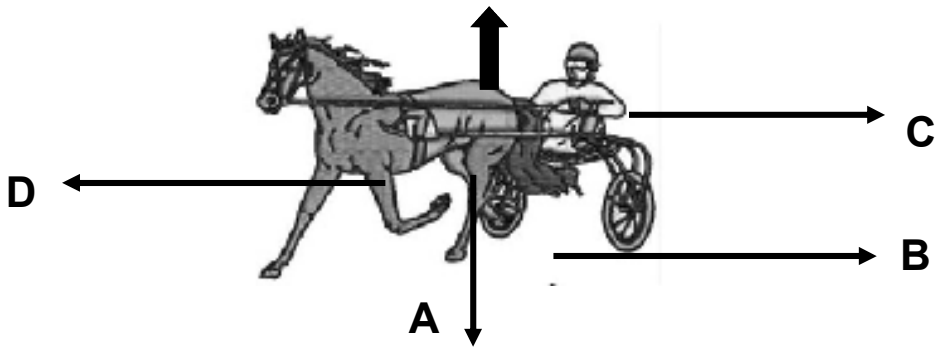
b. If force B is 200 N and force C is 1000 N, **find** the **resultant force** when force D is 3000 N.

_____[2]

c. Look carefully at the picture above. What is Henry doing to decrease **Force C**?

_____[1]

Second Competition: 1 Mile Cart racing



d. Force B is the force between the wheels and the ground. What can be done to the cart's wheels to increase **Force B**?

_____[1]

e. What is the force exerted by the ground on the horse and the cart called? **Label** it on the diagram. [1]

f. **Fill in** using the correct words: **Force A** and **Force E** are _____ in size and _____ in direction. [2]

4. Mr Agius, a physics teacher carried out an experiment on pressure. The following table shows the results of one of his students:

Student's Name	**Jaime**
Weight	**525 N**
Area of both feet	**250 cm^2**

a. **Calculate** Jaime's pressure, in N/cm^2, when he stands on both feet.

_____

_____[2]

b. Mr Agius asks Ronald to perform a cartwheel. Mr. Agius asks his students the **questions bi-iii** and they collected their results in the table below:

Student's Name	**Ronald**
mass	**36 kg**
Area of one hand	**25 cm^2**

i) **Find** Ronald's weight.

_____ [1]

ii) **Calculate** the area of both Ronald's hands in cm^2.

_____ [1]

iii) **Calculate** Ronald's pressure on both hands in N/cm^2.

_____

_____[2]

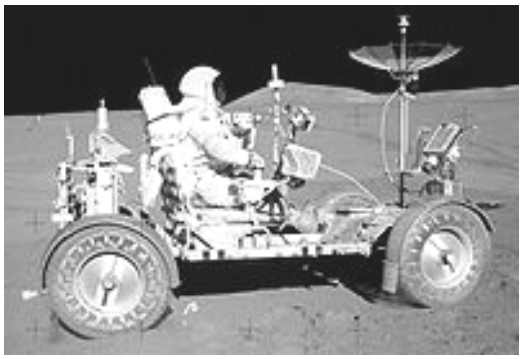
c. In the gym Jaime stands on both feet and Ronald is doing a handstand on both hands. **Underline** the correct answer:

i) Jaime and Ronald exert the same pressure on the ground.
ii) Jaime exerts more pressure than Ronald.
iii) Ronald exerts more pressure on Jaime. [1]

d. Give one suggestion to Jaime how he can **increase** his pressure.

_____ [1]

5. In 1972, the astronaut John Young landed on the moon. This astronaut also drove the Lunar Roving Vehicle around the surface of the moon.



This Lunar vehicle had a mass of 210 kg.

a. **Calculate** the weight of this vehicle on the moon if the moon's gravity is 1.6 N/kg.

_____

_____ [2]

The following Rover was sent to the planet Mars in 2003 to explore its geology.

b. **Calculate** the weight of this vehicle of mass 1000 kg on mars, if the gravity on this planet is 4 N/kg.

_____

_____ [2]

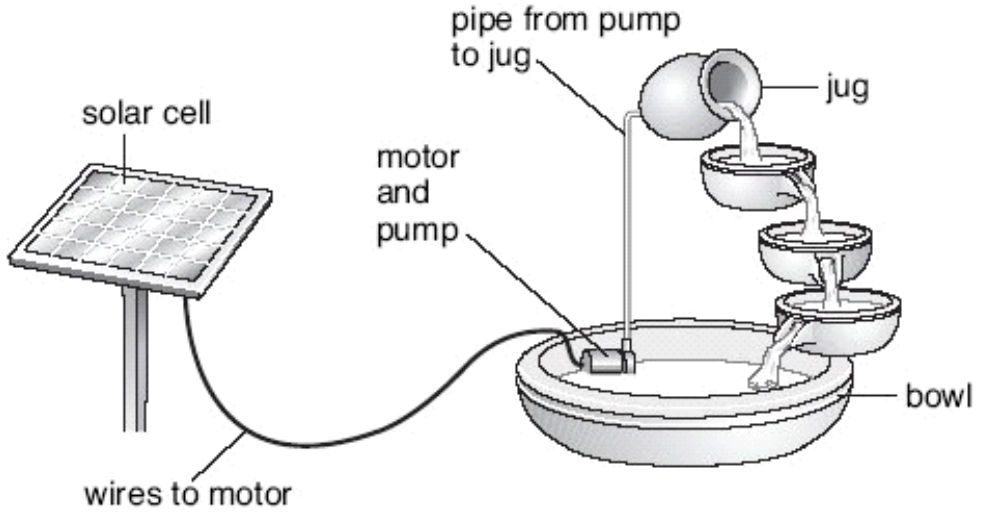
c. What will be the **mass** of both vehicles on Earth? [2]

Lunar Vehicle: _____ kg Mars Vehicle:_____ kg

d. Give a reason for your answers in question (c) .

_____[1]

6. The drawing below shows a garden water decoration. It is solar-powered.



The solar cell absorbs energy from the Sun. The solar cell is connected to a motor in the bowl. The motor drives a pump. Water is pumped up to the jug and it flows back down to the bowl.

a. Use the information above to help you **complete** the following sentences. Choose words from the list. Each word may be used more than once.

chemical	**electrical**	**Gravitational potential**	**kinetic**
light	**sound**	**heat**	

(i) The useful energy change in the solar cell is from _____ to _____ energy [1]

(ii) The useful energy change in the motor is from _____ energy to _____ energy. But some energy in the motor is changed to _____ and _____ energy. This is called the waste energy. [2]

(iii) As the water flows from the jug to the bowl _____ energy is changed into _____energy. [1]

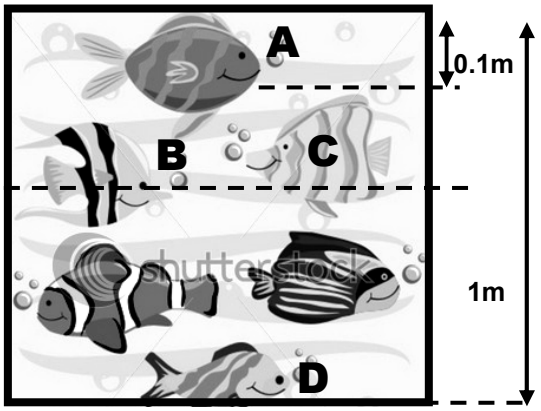
b. Give **one** advantage and **one** disadvantage of using a solar cell to power the water decoration.

advantage _____ [1]

disadvantage _____ [1]

Section B

7a. Look at the aquarium below. **Fill in** the following sentences correctly.



i) Fish _____ and _____ are under the same pressure as the pressure at equal depths is the same.

ii) Fish _____ feels the greatest pressure due to the water above it as pressure _____ with depth.

iii) Fish ____ feels the least pressure exerted by the water since it is at the _____ depth. [3]

The pressure at different depths inside the aquarium was measured. The results are tabulated below:

Depth/m	0	0.2	0.4	0.6	0.8	1.0
Pressure/Pa	0	2000	4000	6000	8000	10000

b. **Plot** a graph of **pressure** in Pascal (y-axis) against **depth** in meters (x-axis)

c. Using the **graph** find:

i. the **depth** of the liquid when the pressure due to the liquid is 9000 Pa. _____ [1/2]
ii. the pressure **due to the liquid** at a depth of 0.5 m, _____ [1/2]
iii. the **density** of the liquid. [2]

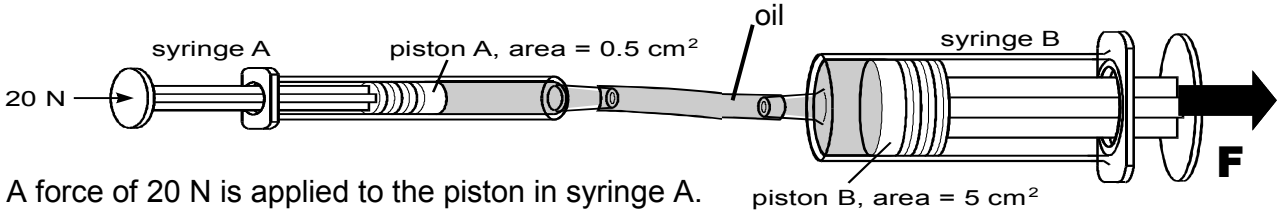
_____

_____

d. Given that atmospheric pressure is **100 000 Pa** calculate the **total pressure** at a depth of 0.5m.

_____ [2]

e. A hydraulic jack is used to raise and lower the aquarium for cleaning purposes.
A simple hydraulic system is shown below:



A force of 20 N is applied to the piston in syringe A.

(i) **Calculate** the pressure that the piston in syringe A exerts on the oil in N/cm^2.

_____

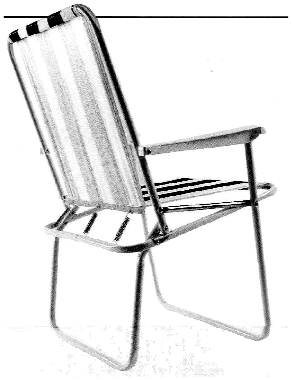
_____[2]

(ii) What is the **pressure** inside the oil between the two syringes? _____[1]

(iii) Calculate the force, F produced by syringe B.

_____

_____[2]



8. A factory makes camping chairs using springs. Each spring is first tested to check that it obeys Hooke's Law. Kevin a laboratory technician carries out the tests.

a. **State** Hooke's law

_____

_____

_____[3]

b. **Draw** a well-labeled diagram to show the apparatus used in the experiment.

[4]

c. Mention **<u>one</u>** precaution taken during the experiment.

_____[1]

d. **Sketch** a graph of the results obtained assuming Hooke's Law is obeyed. **Label** the axes of the graph.

[2]

e. Kevin now tests another spring. The length of the spring is 18cm. When a 2N weight is attached to the spring, its length becomes 20.5cm.

(i) What is the **extension** of the spring? _____[1]

(ii) A total of 8N are attached to the spring. Assuming the spring obeys Hooke's Law, calculate the expected **extension** of the spring.

_____[2]

(iii) Kevin notes that the extension of the spring is more than that calculated in e(ii) above. **Explain** what may have occurred to the spring.

_____

_____[2]