

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

Name: _____

Class: _____

Answer all questions.

All working must be shown. The use of a calculator is allowed.

Where necessary take acceleration due to gravity $g = 10\text{m/s}^2$.

You may find some of these formulae useful.

Measurement & Density	$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$	$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$
Force	$W = mg$	
	$\text{Moment of a force} = \text{Force} \times \text{Perpendicular distance}$	
Energy & Work	$\text{Work done} = F s$	$\text{Power} = \frac{\text{Work done}}{\text{Time taken}}$
	$PE = m g h$	$KE = \frac{mv^2}{2}$
Pressure	$\text{Pressure} = \frac{\text{Force}}{\text{Area}}$	$\text{Pressure} = \rho h g$
Heat	$Q = m c \Delta\theta$	

For office use only:

Number	1	2	3	4	5	6	7	8	Total
Max Mark	8	8	8	8	8	15	15	15	85
Actual Mark									

	Total Theory	Total Practical	Final Mark
Actual Mark			
Max Mark	85	15	100

SECTION A**Answer all questions in the space provided. This section carries 40 marks.**

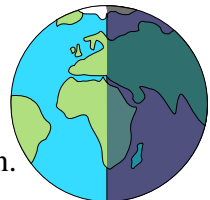
1. Fill in the missing words in the paragraph below using the following words. Each word may be used more than once.

mass	volume	density
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Two aluminium blocks shown above have different _____ and different _____ but their _____ is the same. When a piece of plastic foam is compressed, its _____ remains the same, but its _____ decreases whilst its _____ increases. When air is heated its _____ increases but its _____ decreases. (8)

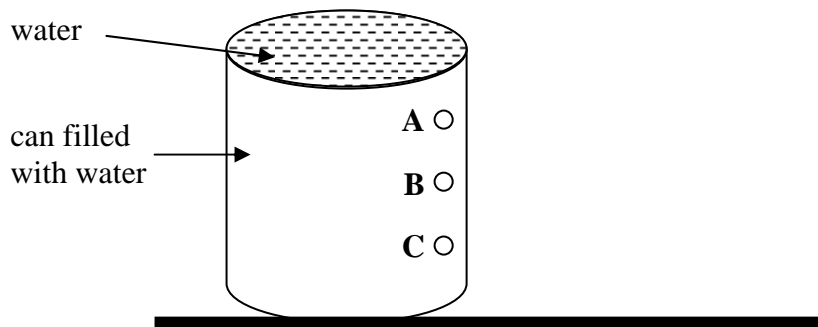
2. Complete these sentences **about** our solar system.



- (i) The sun is a _____.
- (ii) The Earth takes _____ days to orbit once around the sun.
- (iii) When for some countries it is daytime, for others it is night time. This takes place because the Earth is _____ on its axis.
- (iv) Jupiter is a large _____ visible from Earth. It orbits the _____.
- (v) Other solar systems within our galaxy are _____ away from us.
- (vi) Scientists and other people use _____ to see far away planets.
- (vii) What keeps a planet orbiting a star is the force of _____ between the planet and the star.

(8)

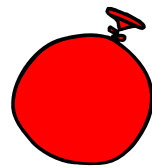
3. (a) The diagram below shows a plastic container completely filled with water. Complete the diagram to show how water flows out from outlets A, B and C.



(2)

- (b) Claire blows up a balloon as shown in the diagram.

- (i) What happens to the balloon when Claire blows in more air inside? Explain why.



_____ (2)

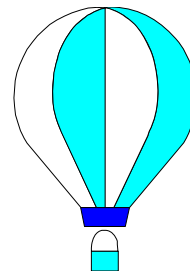
- (ii) Claire ties the end of the balloon and allows the balloon to escape up in the sky. What happens to the atmospheric pressure acting on the balloon as the balloon rises?

_____ (1)

- (iii) The balloon finally bursts when it is very high up above the ground. Explain in terms of air pressure, why it bursts.

_____ (1)

- (c) Hot air is used to make balloons rise up to the sky.



- (i) Why is air heated?

_____ (1)

- (ii) Suggest one way how the balloon can be made to move slowly downwards.

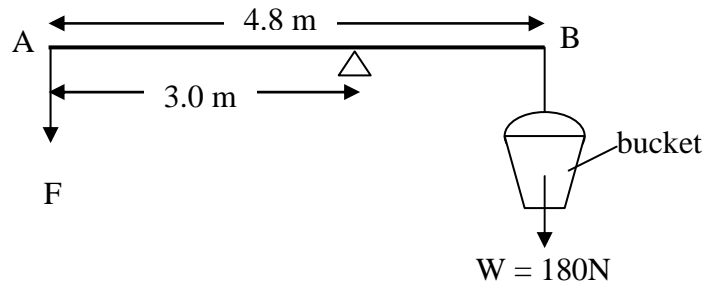
_____ (1)

4. (a) Underline **two** vectors from the following Physical quantities.

mass weight displacement distance pressure

(2)

- (b) The diagram shows a method for lifting water using a rod and a bucket. The weight of the rod AB is negligible.



- (i) What is the horizontal distance between the bucket and the pivot?

_____ (1)

- (ii) What is the direction of rotation of the bucket about the pivot, clockwise or anticlockwise?

_____ (1)

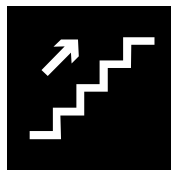
- (iii) Calculate the size of the moment of the bucket about the pivot. Give the correct units.

_____ (2)

- (iv) Calculate the downward force F required to balance the bucket.

_____ (2)

5. (a) Joseph of mass 60 kg climbs up a long flight of stairs in 12 s. He moves the vertical distance of 8.0 m. Calculate the:



- (i) potential energy gained when he is at the top of the stairs. Give the correct units for potential energy,

 _____ (2)

- (ii) work done in climbing up the stairs, giving the correct units,

_____ (2)

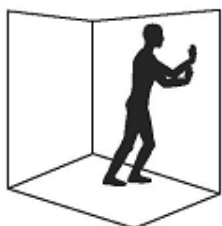
- (iii) personal mechanical power gained, giving the correct units.

 _____ (2)

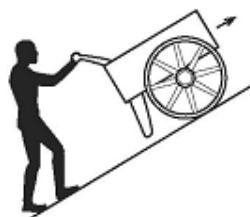
- (b) Circle **one** of the diagrams below which shows 'work' being done. Explain your answer.



Holding a heavy object



Pushing against a wall



Pushing a cart up a slope



Reading a book

 _____ (2)

SECTION B

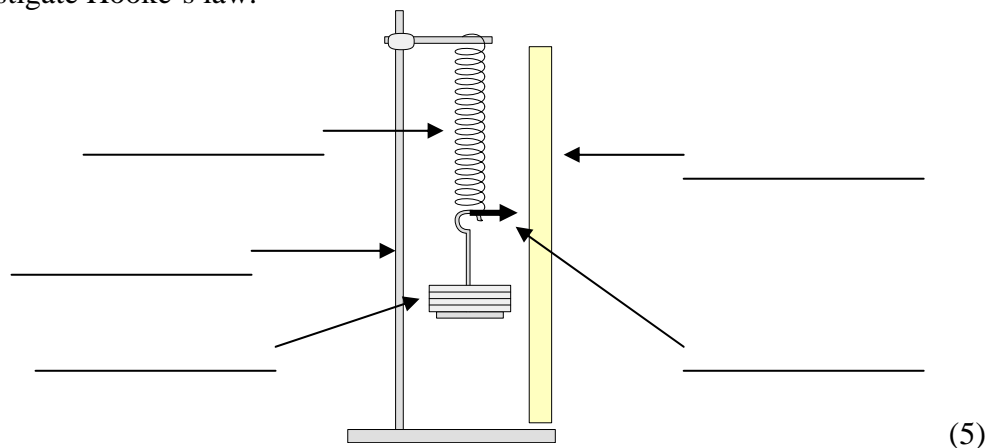
Answer ALL questions. This section carries 45 marks.

6. (a) Robert Hooke discovered the law of elasticity in the middle of the 17th century.

(i) Complete the following:

Hooke's Law states that the _____ of an elastic object is directly proportional to the _____ applied to it. (2)

(ii) Label the diagram of the apparatus you have used in the school laboratory to investigate Hooke's law.



(iii) Name **two** precautions that you have taken when carrying out this experiment.

 _____ (2)

(b) Joseph and Adrian used a helical spring and read the following measurements:

Length of spring	6.2 cm
Length of spring with 0.1 N-weight	11.5 cm
Length of spring with 0.3 N-weight	22.1 cm

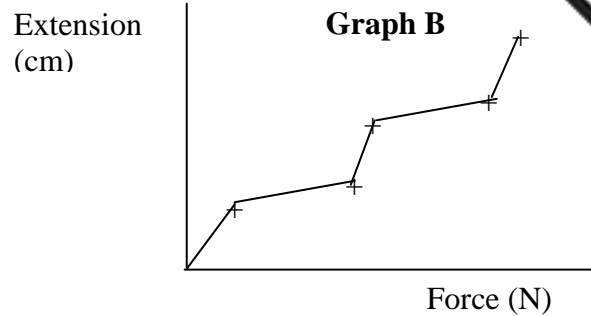
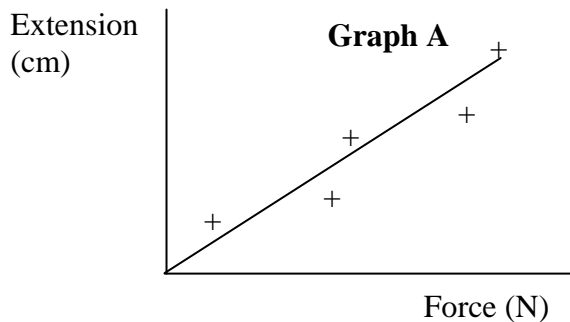
(i) Calculate the extension of the spring due to the

- 0.1 N-weight _____
- 0.3 N-weight _____ (2)

(ii) What is observed if the **elastic limit** of the spring is exceeded?

 _____ (2)

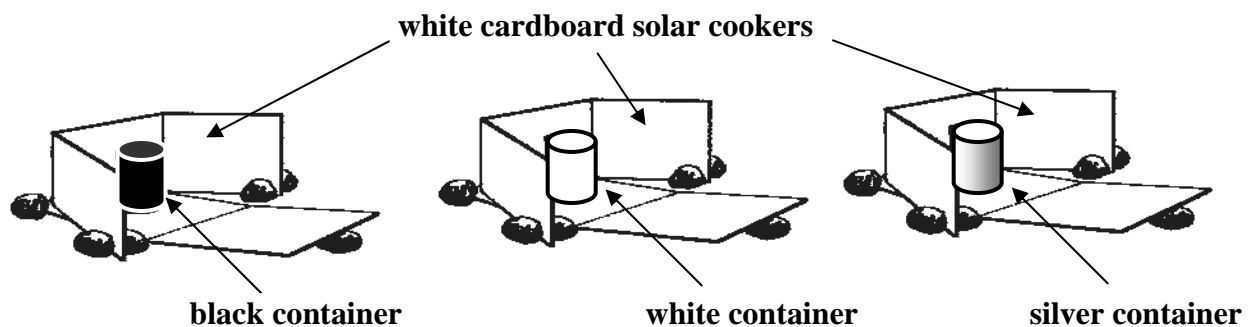
- (iii) Joseph and Adrian plot their results on a graph. They find that the plotted points are not in a straight line.



Which of the above graphs (A or B) should they present on their lab book? Give a reason for your answer.

_____ (2)

7. (a) Nicole and Grace set up an experiment as shown in the diagram below.



They build three identical solar cookers and place them in direct sunlight. Nicole fills the three containers with the same amount of water and places them in the cardboard solar cookers.

Grace measures the temperature of the water in each container every 5 minutes during the next 30 minutes while Nicole records each reading in a table in her lab book.

- (i) Name the instrument used to measure temperature of the water in each container.

_____ (1)

- (ii) Why is white cardboard used?

_____ (1)

- (iii) Heat energy is lost from the food containers mainly by conduction and

_____. (1)

- (iv) Why is it better to cover the food containers with a lid?

_____ (1)

- (v) Which food container reaches the highest temperature after half an hour?

_____ (1)

- (b) The table below shows how the temperature of one of the food containers changes with time assuming that no heat is lost from the container.

temperature (°C)	20	25	30	35	40	45	50
time (minutes)	0	5	10	15	20	25	30

- (i) Plot a graph of temperature (y-axis) against time (x-axis) on the graph paper provided. (4)

- (ii) From the graph, find the temperature of the water in the food container after 12 minutes.

_____ (1)

- (c) A group of students heat a copper block of mass 2 kg using an electric heater. The temperature of the copper rises from 20°C to 34°C in 4 minutes. The specific heat capacity of copper is 385 J/kgK.

- (i) Calculate the rise in temperature.

_____ (1)

- (ii) Calculate the heat absorbed by the copper block in 4 minutes using the formula:

heat absorbed = mass x specific heat capacity x change in temperature.

_____ (1)

- (iii) 4 minutes = _____seconds. (1)

- (iv) Assuming that no heat is lost, calculate the energy per second provided by the electrical heater using the equation:

$$\text{Heat energy provided by the heater every second} = \frac{\text{Heat absorbed}}{\text{time taken}}$$

_____ (2)

GRAPH PAPER

8. (a) Underline the correct word in the following sentences:
- (i) Renewable energy sources once used (can / cannot) be used again. (1)
- (ii) Non-renewable energy sources once used (can / cannot) be used again. (1)
- (b) (i) Name **TWO** examples of renewable energy sources.
- _____ (2)
- (ii) Name **TWO** examples of non-renewable energy sources.
- _____ (2)
- (c) List **TWO** disadvantages of using non-renewable sources of energy.
- i. _____
- ii. _____ (2)
- (d) Complete the following sentences about energy sources using the words below:
- solar, fossil, wind, biomass, nuclear, hydroelectric*
- (i) One way of generating electricity is by using _____ fuels, such as oil, gas and coal.
- (ii) When dead plants and animals decay, bacteria produce methane gas which is collected and burned as a fuel. This type of energy is called _____.
- (iii) Electrical energy generated from water falls is called _____ energy.
- (iv) Two suitable renewable energy sources to generate electrical power in Malta are _____ and _____. (5)
- (e) Today, a number of people install solar water heater panels on the roofs of their houses. From the list below, underline **two** statements, which describe the advantages of using solar energy.
- (i) The use of solar energy does not cause pollution;
- (ii) The use of solar energy causes pollution;
- (iii) The use of solar energy saves money;
- (iv) The use of solar energy contributes to global warming and greenhouse gases;
- (v) No solar energy is produced at all on a cloudy day. (2)