DIRECTORATE FOR QUALITY AND STANDARDS IN EDUCATION
Department for Curriculum Management and eLearning
Educational Assessment Unit
Annual Examinations for Secondary Schools 2010

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 = 10m/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	$W = mg$	
	Moment of a force = Force x Perpendicular distance	
Energy & Work	Work done = F s	$\text{Power} = \frac{\text{Work done}}{\text{Time taken}}$
	PE = m g h	$KE = \frac{mv^2}{2}$
Pressure	$\text{Pressure} = \frac{\text{Force}}{\text{Area}}$	Pressure = ρ 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

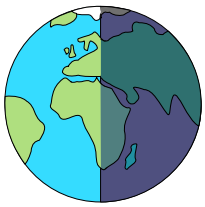
SECTION A
Answer all questions in the space provided. This section carries 40 marks.

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**

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.

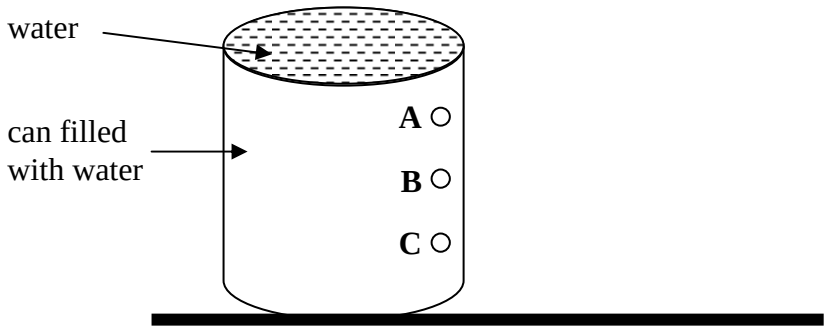
(iv) Jupiter is a large _____ visible from Earth. It orbits the _____.

(v) Other solar systems within our galaxy are _____ _____ away from us.

(vi) Scientists and other people use _____ to see far away planets.

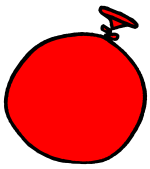
(vii) What keeps a planet orbiting a star is the force of _____ between the planet and the star. (8)

3. (a) The diagram below shows a plastic container completely filled with
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)

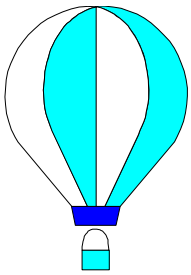
(ii) Claire ties the end of the balloon and allows the balloon to escape up in the sky. What happens to the atmospheric pressure acting on the balloon as the balloon rises?

_____ (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)

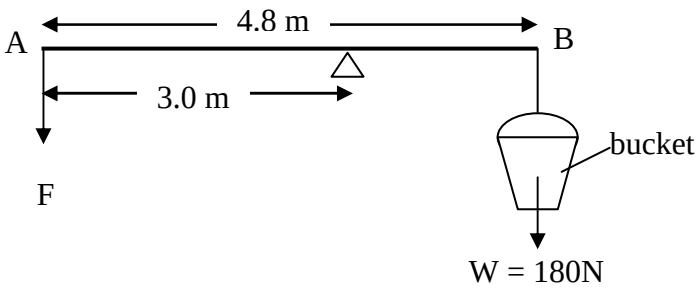
(ii) Suggest **one** way how the balloon can be made to move slowly downwards.

_____ (1)

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

mass weight displacement distance pressure (1)

(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.

_____

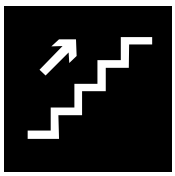
_____ (2)

(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 th 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)

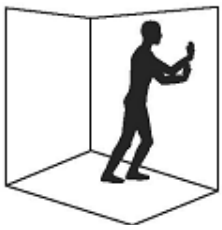
(iii) personal mechanical power gained, giving the correct units.

_____

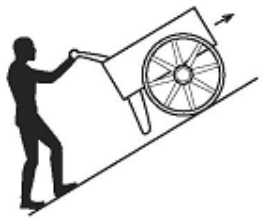
_____ (2)

(b) Circle **<u>one</u>** 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 has a total of 45 marks.

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

(i) State Hooke's Law:_____

_____ (2)

(ii) State what is observed when the elastic limit of a spring is exceeded.

_____

_____ (2)

(iii) Draw a well labelled diagram of all the apparatus used to investigate Hooke's Law.

(3)

(iv) Name **two** precautions that you have taken when carrying out this experiment in the school laboratory.

_____

_____ (2)

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

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

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

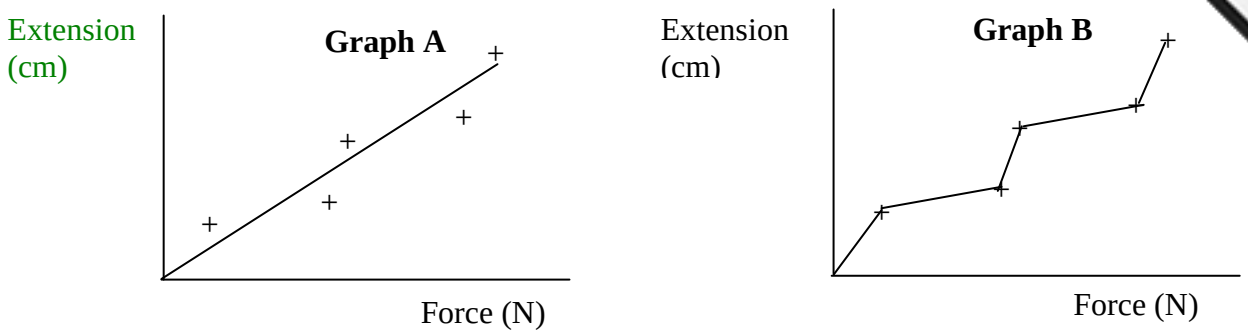
- 0.1N weight _____
- 0.3N weight _____ (2)

(ii) Estimate the length of the spring when a 0.4 N weight is attached, provided that the elastic limit has not been exceeded.

_____

_____ (2)

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

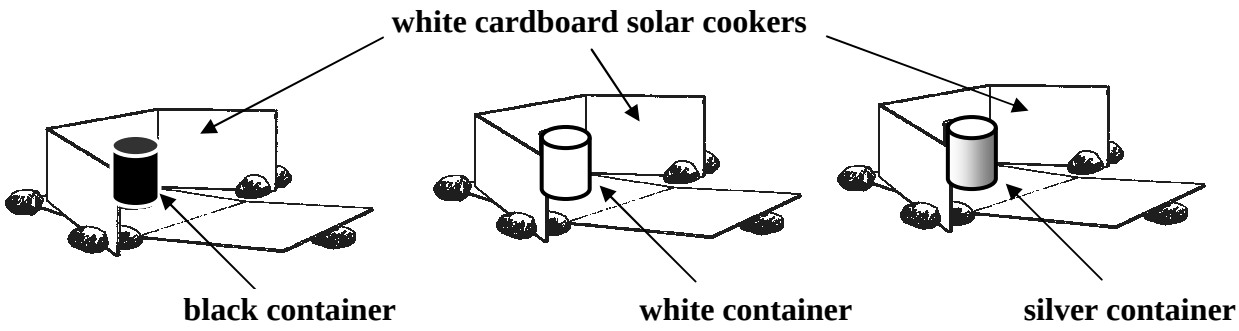


Which of the above graphs (A) or (B) should they present on their lab book and why?

_____

_____ (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.

_____ (1)

(ii) Why is a white cardboard used?

_____ (1)

(iii) Name the **two** main processes through which heat is lost from containers.

_____ (2)

(iv) Why is it better to cover the beakers with a lid?

_____ (1)

(v) Which container reaches the highest temperature after 30 minutes?

_____ (1)

(b) Nicole tabulates the temperature of one of the containers against time as shown below.

Temperature (^oC)	22	29	36	41	46	50	53
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. Draw the best smooth curve. (4)

(ii) Use your graph, to find the temperature of the water after 12 minutes.

_____ (1)

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

(i) Calculate the heat absorbed by the copper block in 4 minutes.

_____

_____ (2)

(ii) Assuming that no heat is lost, calculate the energy per second provided by the electrical heater.

_____

_____ (1)

(iii) The value obtained in c(ii) is less than that marked on the heater. Give **one** possible reason for the difference observed.

_____ (1)

GRAPH PAPER

8. (a) Explain what is meant by:

(i) renewable energy sources,

_____ (1)

(ii) non-renewable energy sources.

_____ (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.

(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 a solar water heater on the roofs of their houses. Name **two** advantages of using solar energy.

_____

_____ (2)