

# KULLEGG SAN BENEDITTU

## Secondary School, Kirkop

Mark

### HALF YEARLY EXAMINATION – 2014/2015

Track 2

FORM 3	PHYSICS	TIME: 1h 30min
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Question	1	2	3	4	5	6	7	8	Theory	Practical	Global Mark
Max. Mark	8	8	8	8	8	15	15	15	85	15	100
Mark											

DO NOT WRITE ABOVE THIS LINE

Name: \_\_\_\_\_

Class: \_\_\_\_\_

- Answer ALL questions in the spaces provided on the Exam Paper.
- All working must be shown. The use of a calculator is allowed.
- Where necessary take the acceleration due to gravity,  $g = 10\text{m/s}^2$ .
- To gain marks you should write your ideas in good English. Put them in a sensible order and use the correct scientific words.
- You may find some of these equations useful:-

Energy & Work	$W = F s$ $K.E. = \frac{1}{2} mv^2$	$E \text{ (or } W) = P t$ $P.E. = m g h$
Force	$W = m g$	Moment = force $\times$ perpendicular distance
Pressure	$\text{Pressure} = \frac{\text{Force}}{\text{Area}}$	$P = h \rho g$
Heat	$\rho \text{ (or } D) = \frac{m}{V}$	$\Delta Q = m c \Delta \theta$

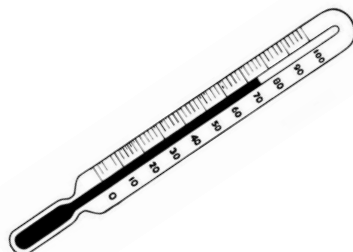
## SECTION A

### Answer ALL Questions

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#### 1. This question is about measuring instruments

The diagram below shows some measuring tools that are used in physics.



Use the above diagrams to help you fill in the missing apparatus.

- a) The \_\_\_\_\_ is used to measure the **length** of a book.
- b) The \_\_\_\_\_ is used to measure the **volume** of a stone.
- c) The \_\_\_\_\_ is used to find the **mass** of a wooden block.
- d) The \_\_\_\_\_ is used to record to **time taken** for some water to boil.
- e) The \_\_\_\_\_ is used to measure the **temperature** of water.
- f) The \_\_\_\_\_ is used to measure the **volume** of water in a glass.
- g) To measure the **weight** of a rubber a \_\_\_\_\_ is used.
- h) To measure the **length** of the Physics laboratory a \_\_\_\_\_ is used.

(8 marks)

## 2. This question is about Transfer of Heat.

- a) The diagram below shows a metal pan containing water is being heated over a gas flame.



- (i) **Name** the process by which heat energy is transferred from the metal to the water?

\_\_\_\_\_

(1)

- (ii) **Name** the process by which heat is transferred throughout all parts of the water in the pan?

\_\_\_\_\_

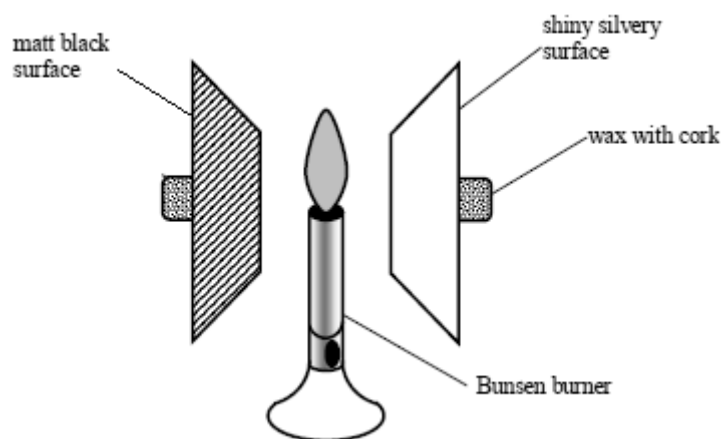
(1)

- (iii) Why is it more efficient for the outer surface of the pan to be highly polished?

\_\_\_\_\_

(2)

- b) John carries out an experiment to see which surface is the best absorber of radiation. The diagram shows the setup of the apparatus used by John.



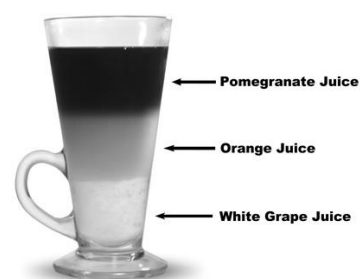
Fill in the blanks:

- (i) The cork attached to the \_\_\_\_\_ surface fell off first. This means that this surface is a \_\_\_\_\_ absorber of radiation. (2)
- (ii) The cork attached to the \_\_\_\_\_ surface took a very long time to fall. This means this surface is a \_\_\_\_\_ absorber of radiation. (2)

(8 marks)

**3. This question is about density.**

The diagram on the right shows a glass containing pomegranate juice, orange juice and white grape juice. The juices formed different layers because the juices have different densities.

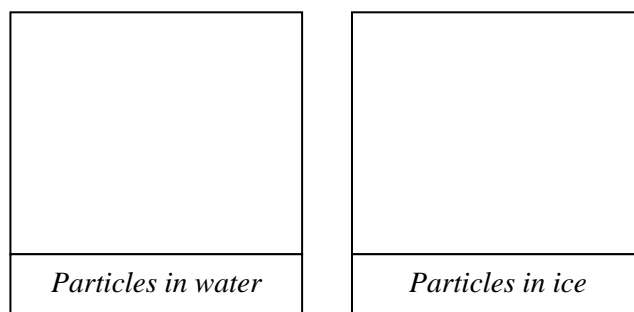


- a) Use the diagram above to fill in the following sentences:-

Density is the \_\_\_\_\_ per unit \_\_\_\_\_. (2)

The least dense juice is \_\_\_\_\_ whilst the densest is \_\_\_\_\_ juice. (2)

- b) John crushed some ice into the juice and it melted to form water. In the spaces below **draw** how particles are arranged in water and in ice. (2)



- c) John then placed some water in a kettle to make some tea. When he poured hot water in the mug he noticed that some of it became water vapour. **Explain** in terms of particles what happens during evaporation.

\_\_\_\_\_  
\_\_\_\_\_. (2)

(8 marks)

**4. This question is about stretching forces.**

Mark hangs a steel spring to a stand and its length reads **25.5cm** on the ruler. Matthew then places a 50g mass and the new ruler reading becomes **30cm**.

a) What is the **original length** of the spring? \_\_\_\_\_ (1)

b) Calculate the **extension** of the steel spring.

\_\_\_\_\_ (1)

c) What reading would the ruler give if Arnold adds another 50g mass?

\_\_\_\_\_ (1)

d) What load in grams, will give an extension of 18 cm?

\_\_\_\_\_  
\_\_\_\_\_ (2)

e) Why is it important to have the ruler exactly vertical?

\_\_\_\_\_ (1)

f) When the spring was loaded with a 700g mass, Mark noted that the spring lost its shape. Explain why.

\_\_\_\_\_ (1)

g) What would finally happen to the spring if Mark kept on adding masses?

\_\_\_\_\_ (1)

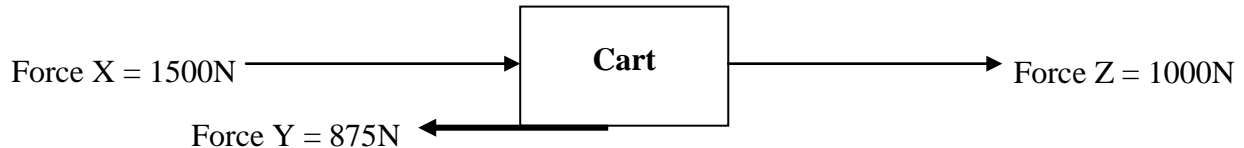
**(8 marks)**

**5. This question is about Forces.**

A cart becomes stuck in a river bed. A group of people gets it moving again. Some of them push and some of them pull the cart.



a) The diagram below shows the horizontal forces acting on the cart.



Consider the above diagram to complete the following sentences.

- (i) Force Y is called the \_\_\_\_\_ force.
- (ii) Force \_\_\_\_\_ is the pushing force. (2)
- b) Using the values given in the diagram above, **calculate** and **give the direction of the resultant force which acts on the cart.**

\_\_\_\_\_  
\_\_\_\_\_ (2)

c) A rock has a mass of 30kg and weighs 300 N.

- (i) Is the rock on Earth or on the Moon? Explain your answer.
- \_\_\_\_\_  
\_\_\_\_\_ (2)
- (ii) The rock falls from a great height. Add arrows on the diagram and label the forces acting on the falling rock. (2)



**(8 marks)**

## Section B

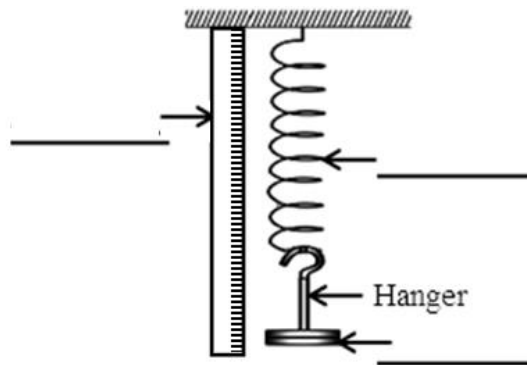
### 6. This question is about Hooke's Law

Paul was performing an experiment to verify Hooke's Law using the apparatus shown in the diagram below.

a) Complete the following statement:-

Hooke's Law states that the \_\_\_\_\_ is directly proportional to the \_\_\_\_\_ provided that the \_\_\_\_\_ limit is not exceeded. (3)

b) Fill in the missing labels in the diagram below. (3)



c) Write down **three steps** that Paul should follow to measure the extension.

\_\_\_\_\_

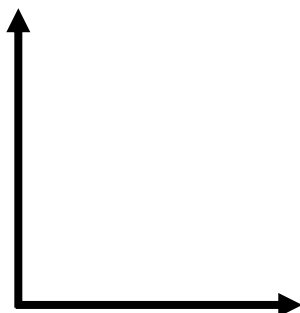
\_\_\_\_\_

\_\_\_\_\_ (3)

d) Paul obtains five measurements for the extension of the spring. How did he increase the extension of the spring?

\_\_\_\_\_ (1)

- e) On the axis provided, sketch an extension - load graph for the spring. Assume that Hooke's law is obeyed and that the elastic limit is not exceeded.



(3)

- f) List two precautions taken during the experiment.

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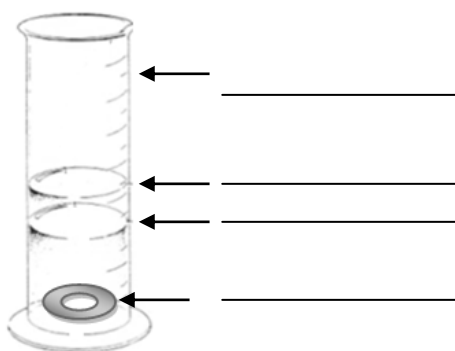
(2)

**(15 marks)**

**7. This question is about density.**

Sarah and Maria found four metal rings of different materials and wanted to find out what material they were each made of.

- a) Sarah measured the mass of the rings using an electronic balance whilst Maria found the volume of each ring by using a measuring cylinder.
- (i) Label the diagram to show how Maria can find the volume of the ring. (2)





- (ii) Arrange these statements in order by writing numbers 2 to 4 in the column. The first one has been done for you. (3)

	Pour some water in the measuring cylinder and read its volume.
1	Put the measuring cylinder on a flat surface.
	The volume of the ring is found by subtracting the volume of the water from the volume of the water and ring.
	Gently place the ring and measure the new volume.

- b) After they measured the masses and volumes of the rings they wrote the results in the table below.

Work out the density of each ring. **Show all working.** (4)

	Mass(g)	Volume(cm <sup>3</sup> )	Working	Density(g/cm <sup>3</sup> )
<b>Ring 1</b>	81.9	7.8		
<b>Ring 2</b>	33.2	4.2		
<b>Ring 3</b>	68.3	6.5		
<b>Ring 4</b>	30.3	3.4		

- c) Sarah and Maria went to the school library and found a table of densities in g/cm<sup>3</sup> for a number of metals in the Physics Book.

Metal	Density (g/cm <sup>3</sup> )
<b>Gold</b>	19.29
<b>Lead</b>	11.35
<b>Rhodium</b>	12.9
<b>Silver</b>	10.5
<b>Nickel</b>	8.9

In the same book they found the following information:

***‘The mass of 1cm<sup>3</sup> of iron metal was found to be 0.00787 kg’***

- (i) Convert 0.00787kg into g

\_\_\_\_\_ (1)

- (ii) Calculate the density of iron in  $\text{g/cm}^3$ .

\_\_\_\_\_ (1)

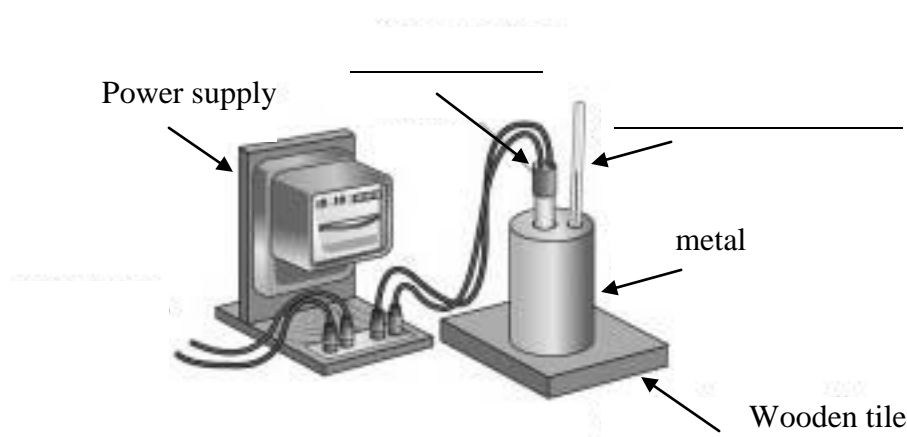
- (iii) Using the information obtained above and the answers obtained in part b) write down the material each ring is made up of. (4)

	Material
Ring 1	
Ring 2	
Ring 3	
Ring 4	

(15 marks)

## 8. This question is about Specific Heat Capacity

- a) The following diagram shows the apparatus used to measure the specific heat capacity of a metal.



- (i) Fill in the blanks: The specific heat capacity of a substance is the \_\_\_\_\_ energy required to raise the \_\_\_\_\_ of 1 kg of a substance by  $1^\circ\text{C}$ . (2)
- (ii) Mark the apparatus on the diagram. (2)

- b) Sarah wanted to find the specific heat capacity of an unknown liquid. She places **0.2 kg** of liquid in a polystyrene cup. An **18W** heater was put into the liquid and switched on. The temperature was recorded every minute. The cup was lagged to reduce heat losses. The results obtained are shown in the table below:

<b>Time (mins)</b>	0	2	4	6	8	10
<b>Temperature (°C)</b>	10.0	14.4	19.0	23.4	27.5	32.0

- (i) On the graph paper provided draw a graph of **temperature / °C (y-axis)** against **time/ mins (x-axis)**. Draw the best straight line. (4)
- (ii) Use your graph to find how long it takes the temperature to reach 25 °C. \_\_\_\_\_(1)
- (iii) What is the temperature rise two minutes from the start of the experiment? \_\_\_\_\_(1)
- (iv) Use your answer to (iii) to calculate the temperature rise per minute.  
\_\_\_\_\_(1)
- (v) Calculate the energy supplied by the heater to the liquid in 600 seconds.  
\_\_\_\_\_  
\_\_\_\_\_(2)
- (vi) Find a value for the specific heat capacity of the liquid.  
\_\_\_\_\_  
\_\_\_\_\_(2)

**(15 marks)**

**END OF EXAM**