

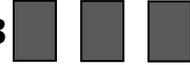
# KULLEĠĠ SAN BENEDITTU

## Secondary School Kirkop

MARK

HALF-YEARLY EXAMINATIONS – FEBRUARY 2016

Track 3



FORM 3

PHYSICS

TIME: 1hr 30mins

NAME AND SURNAME: \_\_\_\_\_ CLASS: \_\_\_\_\_

### INSTRUCTIONS TO CANDIDATES:

**Read all the questions carefully before you start answering.**

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 equations useful:*

Weight	$W = m g$
Density	$\rho = \frac{m}{V}$
Moments	Moment = $F \times$ perpendicular distance
Pressure	$P = \frac{F}{A}$ $P = h \rho g$

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

	Total Theory	Total Practical	Final Mark
Actual mark			
Maximum mark	85	15	100

## Section A

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1. This question is about Measurements.

(a) Draw lines to join each physical quantity with a unit.

<u>Quantity</u>	<u>SI Unit</u>
Force	$m^3$
Length	kg
Pressure	m
Mass	N
Volume	Pa

(5)

(b) Complete the following:

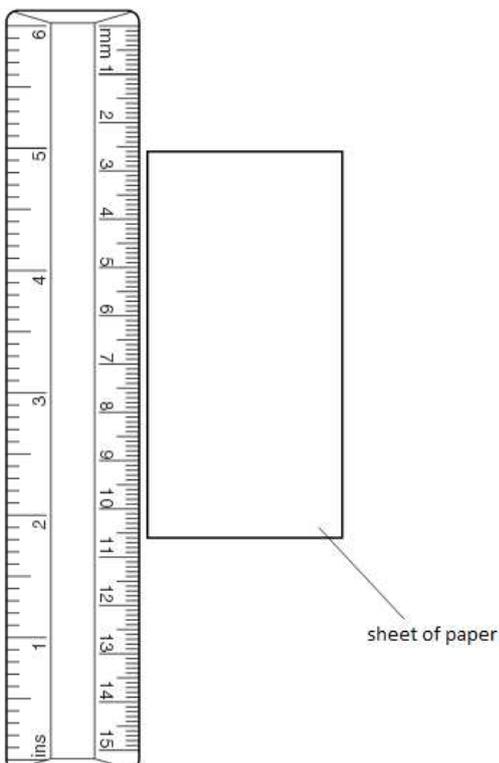
- (i) Jonathan uses a ruler to measure the \_\_\_\_\_ of his Physics book.
- (ii) Maria uses a \_\_\_\_\_ to measure the weight of an object.
- (iii) The time taken for an athlete to run round a track is measured using a \_\_\_\_\_.

(3)

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2. This question is Density.

The length of a rectangular sheet of cardboard is measured using a short ruler, as shown in the figure below. (*not full size*)



(a) From the ruler in the figure shown, find the length in **cm** of the sheet.

Length = \_\_\_\_\_ cm (1)

(b) The sheet of cardboard in (a) has a thickness of 0.50cm and a width that is half its length. Calculate the volume of the sheet of cardboard.

Volume = \_\_\_\_\_ (2)

(c) The cardboard has a density of  $0.7 \text{ g/cm}^3$ .

(i) Calculate the mass of the sheet.

\_\_\_\_\_

\_\_\_\_\_

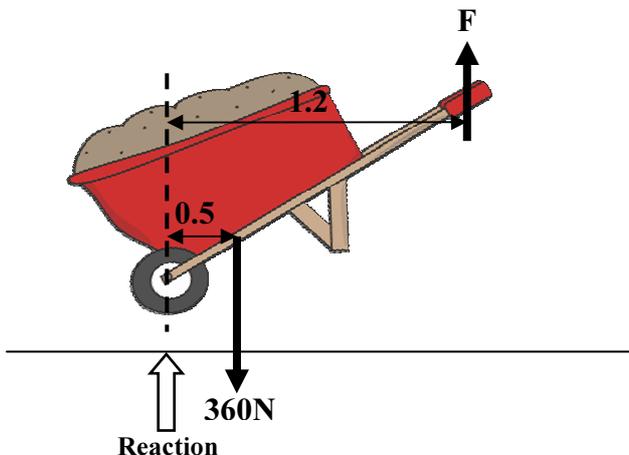
\_\_\_\_\_

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



4. This question is about Moments.

A wheelbarrow shown below is carrying a load of 360N. Force  $F$  is just balancing the load.



(a) Which force is producing an *anticlockwise moment* about the pivot (the wheel)?  
\_\_\_\_\_ (1)

(b) Calculate the moment produced by the load around the pivot.  
\_\_\_\_\_  
\_\_\_\_\_ (2)

(c) What is the moment produced by force  $F$ ?  
\_\_\_\_\_ (1)

(d) Calculate force  $F$  needed to balance the wheelbarrow.  
\_\_\_\_\_  
\_\_\_\_\_ (2)

(e) Calculate the upward reaction force by the **ground** on the wheel  
\_\_\_\_\_ (1)

(f) Write down the principle used to calculate the reaction force.  
\_\_\_\_\_  
\_\_\_\_\_ (1)

5. This question is about Pressure.

Claire bought a new armchair for her study in her new home. The armchair has a mass of 42kg.



(a) Calculate the weight of the armchair.

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(2)

(b) The armchair rests on four legs. Each leg of base area 0.01m by 0.01m is in contact with the floor.

(i) Calculate the area of **one** leg.

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(1)

(ii) Calculate the **total area** in contact with the floor.

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(1)

(iii) Calculate the pressure the armchair exerts on the floor.

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(2)

(iv) Claire watches some television and rests in the armchair. How does the pressure exerted by the armchair on the ground change compared to the answer of b (ii) above?

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(1)

(v) Why?

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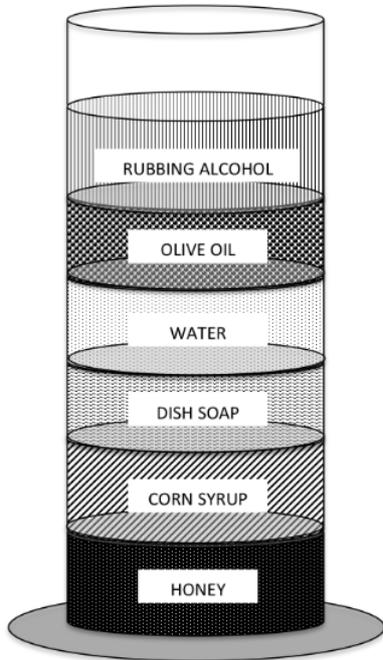
(1)

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**Section B**

6. **This question is about Density.**

(a) Mary found six different liquids in her mother's kitchen cupboard and poured the same amount of each liquid in a measuring cylinder.



(i) Which liquid in the diagram is the most dense?  
\_\_\_\_\_ (1)

(ii) How do you know that liquid is the most dense?  
\_\_\_\_\_ (1)

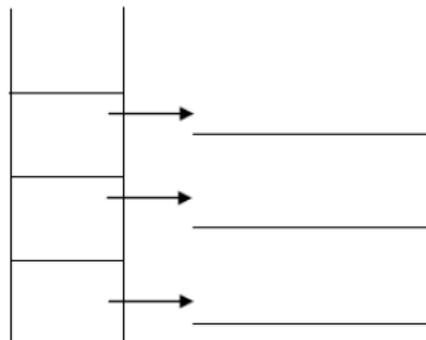
(iii) Which is more dense, olive oil or corn syrup?  
\_\_\_\_\_ (1)

(iv) Would the rubbing alcohol remain at the top of the measuring cylinder if the amount is doubled?  
\_\_\_\_\_  
\_\_\_\_\_ (1)

(v) Explain why.  
\_\_\_\_\_ (1)

(b) A sample of cooking oil of mass 920g has a volume of 1000cm<sup>3</sup>. Calculate the density of the cooking oil in g/cm<sup>3</sup>.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ (2)

(c) Cooking oil, olive oil (density 0.83g/cm<sup>3</sup>) and water are poured into a measuring cylinder as shown in the diagram below. Label the liquids to show their position.



(d) Mary then needs to find the density of a stone. She uses a measuring cylinder to find the volume of the stone as shown.

(i) What is the volume of the stone?

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

(ii) State one precaution Mary should take to find the volume of the stone.

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

(iii) The mass of the stone is 75g. Calculate the density of the stone.

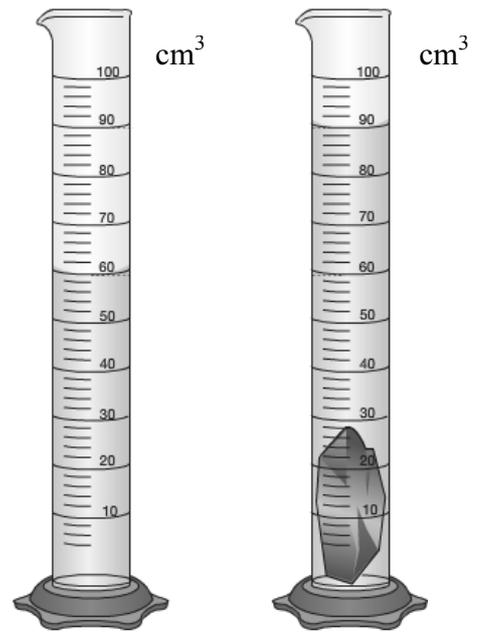
\_\_\_\_\_ (2)

(iv) Underline the correct answer:

A bigger stone will have the *same/ more/ less density* than the original stone. (1)

(v) Give a reason for your answer.

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



## 7. This question is about Pressure.

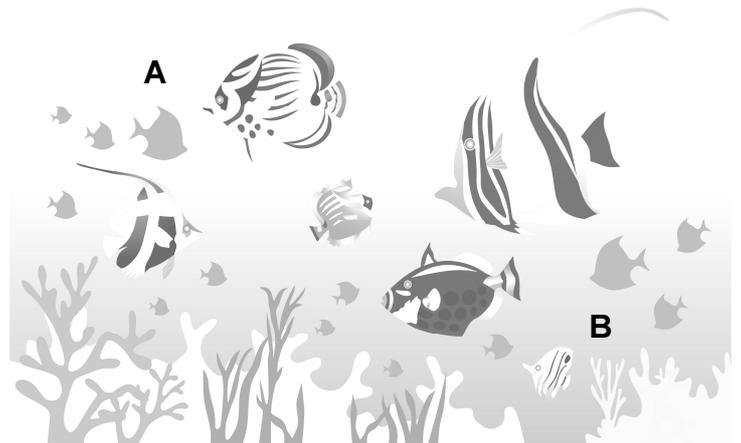
(a) Matthew likes to go swimming and diving. As he was diving, he saw several fish.

(i) At which point is the pressure lowest?

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

(ii) At which point is the pressure greatest?

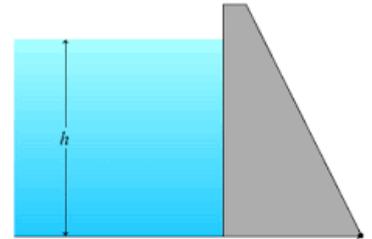
\_\_\_\_\_ (1)



(iii) Two fish are at the same depth. What can you say about their pressure due to the water? \_\_\_\_\_ (1)

(iv) Calculate the pressure exerted on Matthew if he is at a depth of 2.3m. (density of sea water =  $1029 \text{ kg/m}^3$ )  
 \_\_\_\_\_ (2)

(b) Matthew was reading about water dams. He came across the following information in a table:



Depth $d$ (m)	0	1	3	5	7	9	11
Pressure $P$ (kPa)	101	111	131	151	171	191	211

(i) Draw a graph of Pressure  $P$  (kPa) on the y-axis against depth  $d$  on the x-axis. (5)

(ii) What does the graph tell you about the way pressure varies with depth of water?  
 \_\_\_\_\_ (1)

(iii) What is the 101 kPa pressure at the surface of the water called?  
 \_\_\_\_\_ (1)

(iv) From your graph find the depth at which the pressure is double that at the surface.  
 \_\_\_\_\_ (1)

(v) Using the above information, explain to Matthew why a water dam has the above shape.  
 \_\_\_\_\_ (2)



8. This question is about Hooke's Law.

While playing with a rubber band, Shaun wanted to know whether rubber obeys Hooke's law.

- (a) Which statement is correct if rubber obeys Hooke's law? (Tick ✓ **one**)
- The elastic limit increases with the force applied.
  - The force applied and the extension are directly proportional.
  - The extension and force applied are inversely proportional. (1)

Shaun could try this by doing a simple experiment.

- (b) Which of the following apparatus **are not** needed for this experiment? (Tick ✓ **two**)
- |                                       |   |
|---------------------------------------|---|
| <input type="checkbox"/> retort stand | <input type="checkbox"/> electronic balance |
| <input type="checkbox"/> rubber band  | <input type="checkbox"/> masses             |
| <input type="checkbox"/> ruler        | <input type="checkbox"/> spring (2)         |

- (c) Draw a labelled diagram of the setup needed for this experiment: (3)

Diagram:

- (d) What **two** quantities need to be recorded during this experiment?

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

\_\_\_\_\_

- (e) He wanted to be as accurate as possible during the experiment. Write **two** precautions he needs to take during the experiment:

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

\_\_\_\_\_

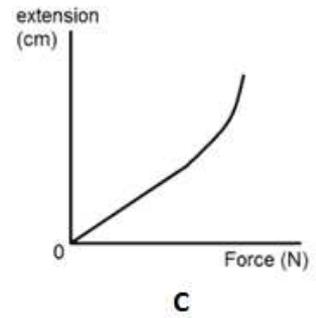
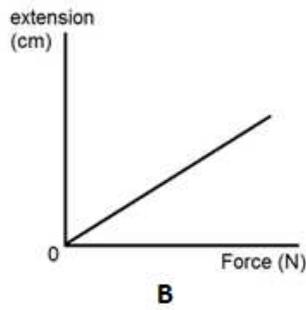
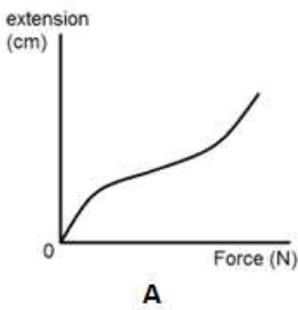
- (f) The original length of the rubber band he used is 9cm. After applying a force of 2N, the band was extended to 10cm. Calculate the extension:

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

(g) What should be the new length if rubber obeys Hooke's Law and a force of 6N is applied? (Show your working).

(1)

The following are three graphs A, B, and C that could be obtained from similar experiments. Shaun found out that rubber **does not** obey Hooke's law.



(h) Write the letter of the graph of:

a helical spring exceeding its elastic limit	
a helical spring without exceeding its elastic limit	
Shaun's rubber band.	

(3)

***End of Examination***