

# KULLEĠĠ SAN BENEDITTU

## Secondary School Kirkop

MARK

HALF-YEARLY EXAMINATIONS – FEBRUARY 2016

Track 2



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	$\text{m}^3$
Length	kg
Pressure	m
Mass	N
Volume	Pa

(5)

(b) Complete the following:

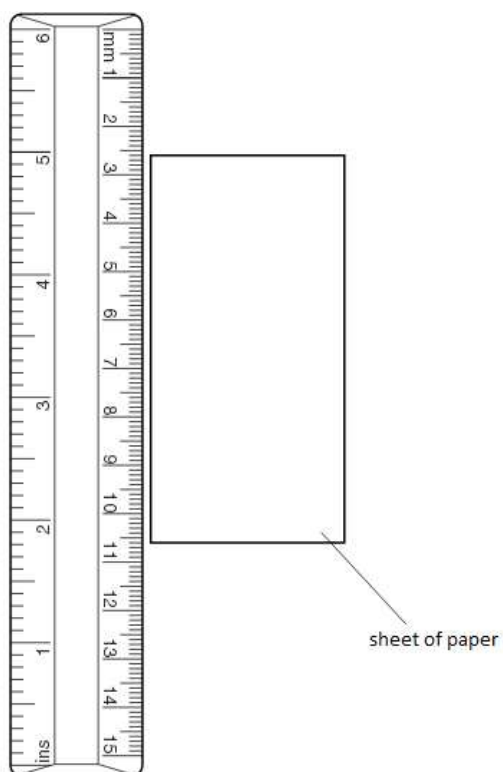
- (i) Jonathan uses a ruler to measure the \_\_\_\_\_ of his Physics book.
- (ii) Maria uses a \_\_\_\_\_ to measure the weight of an object.
- (iii) The time taken for an athlete to run round a track is measured using a \_\_\_\_\_.

(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)

(ii) Which laboratory instrument could be used to check the mass of the sheet? (1)

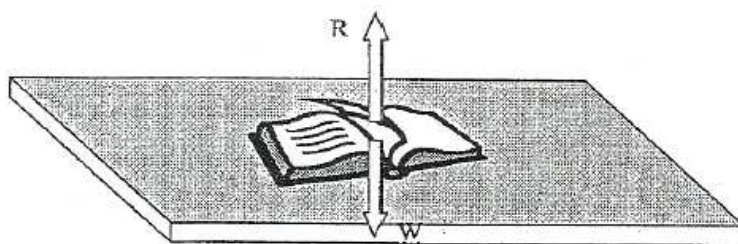
(iii) If the cardboard was to be thrown in water will it float or sink? Why?

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(2)

3. **This question is about Forces.**

A book rests on a flat surface. The forces acting on the book are shown in the diagram below. R is the force exerted by the table on the book.



(a) Fill in the blank spaces below:

W is the \_\_\_\_\_ of the book while R is the \_\_\_\_\_ force. W is the force exerted by the \_\_\_\_\_ on the \_\_\_\_\_.

(2)

(b) If  $W$  has a value of  $5\text{N}$ , what is the value of  $R$ ? (1)

(c) Calculate the mass of the book.

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(2)

(d) A pen having a mass of 0.1kg is put on the table as well. What is its weight?

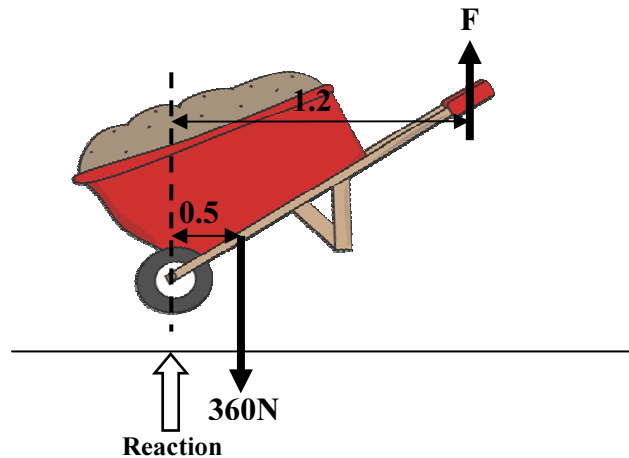
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(1)

(e) The book is now lifted off the table and dropped.  
In the space below, draw and label the force/s acting on the book as it is falling.

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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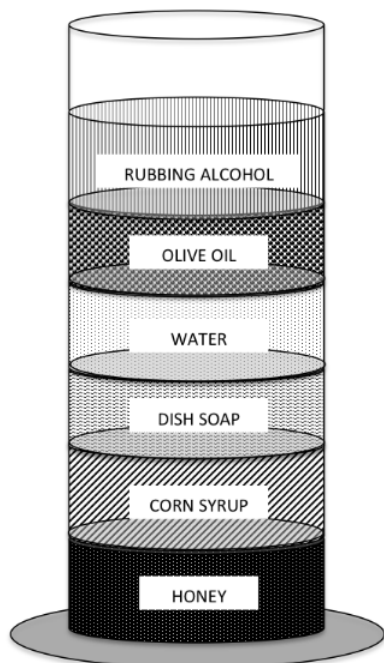
(1)

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## Section B

### 6. This question is about the experiment of 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)

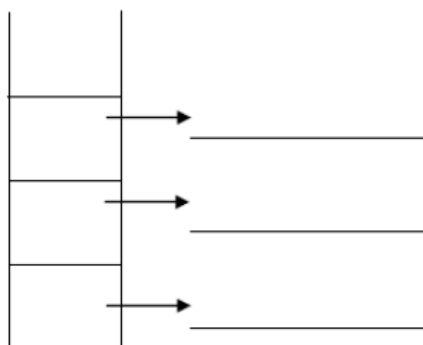
(v) Explain why.

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

(b) A sample of cooking oil of mass 920g has a volume of  $1000\text{cm}^3$ . Calculate the density of the cooking oil in  $\text{g/cm}^3$ .

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

(c) Cooking oil, olive oil (density  $0.83\text{g/cm}^3$ ) 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.

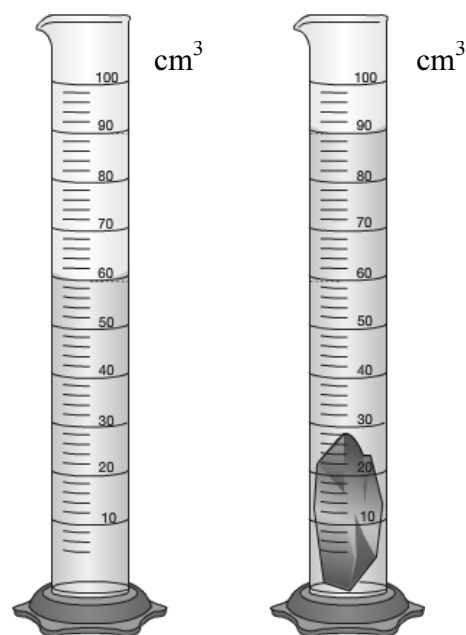
(i) The initial volume of water is \_\_\_\_\_ (1)

(ii) The final volume of water is \_\_\_\_\_ (1)

(iii) The volume of the stone is \_\_\_\_\_ (1)

(iv) The mass of the stone is 214g. Calculate the density of the stone.

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



(v) Underline the correct answer:

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

(vi) Give a reason for your answer.

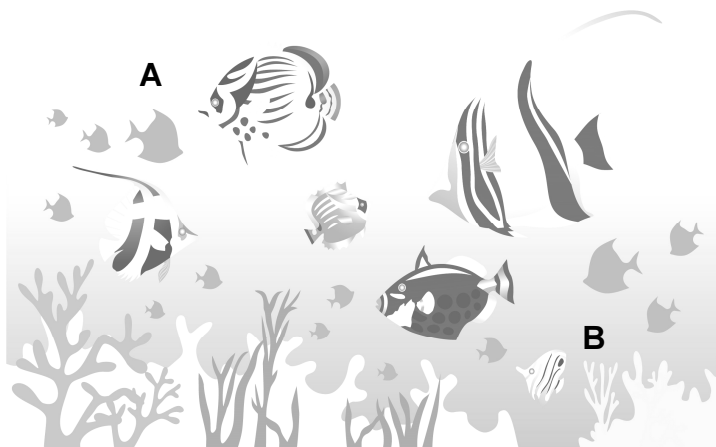
\_\_\_\_\_  
 \_\_\_\_\_ (1)

## 7. This question is about Pressure.

(a) Matthew likes to go swimming and diving. He put on his flippers and oxygen mask and dives underwater. As he was diving, he saw several fish.

(i) Pressure is **lowest** at point \_\_\_\_\_ (1)

(ii) Pressure is **greatest** at point \_\_\_\_\_ (1)



- (iii) If two fish are at the **same** depth, then the pressure due to the water on them is *greater / the same / lowest*. (1)
- (iv) Calculate the pressure exerted on Matthew if he is at a depth of 2.3m.  
(density of sea water =  $1029 \text{ kg/m}^3$ )

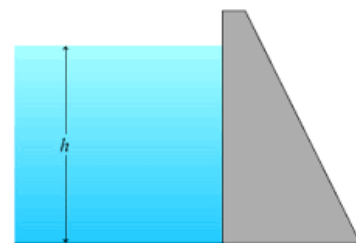
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(2)

- (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) The graph obtained is a \_\_\_\_\_ line which means that pressure is \_\_\_\_\_ to depth. (1)
- (iii) The 101 kPa pressure at the surface of the water is called \_\_\_\_\_ pressure. (1)
- (iv) From your graph find the depth when the pressure is 202 kPa.  
\_\_\_\_\_ (1)
- (v) From the above information, Matthew concluded that water dams have the above shape because pressure is \_\_\_\_\_ at the bottom. (1)  
This is because \_\_\_\_\_ (1)



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) If rubber obeys Hooke's Law, the load and the extension are:

- ☐ inversely proportional.
- ☐ directly proportional.
- ☐ the same.

(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) Complete the diagram of the setup needed. Draw and label:

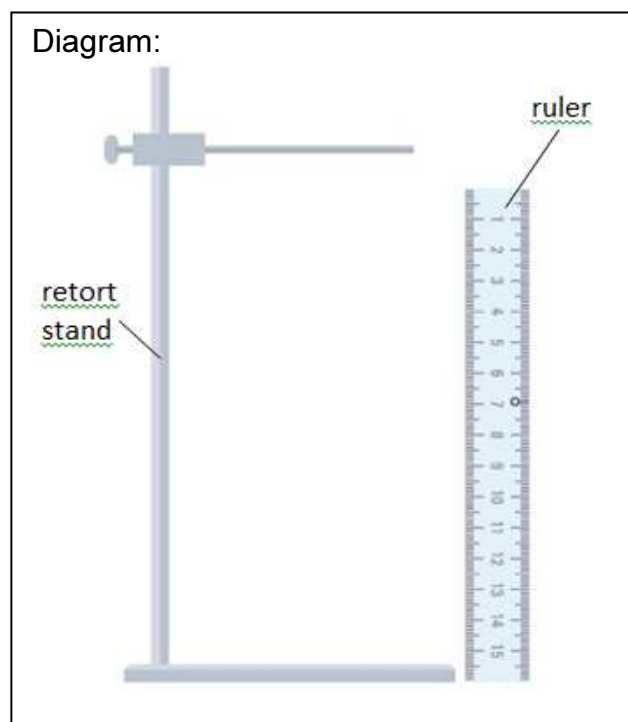
**rubber band, masses and pointer.**

(3)

(d) Complete the table of the quantities recorded in this experiment:

Quantity	Units
	Newton
extension	

(2)



(e) He wanted to be as accurate as possible during the experiment. Complete the precautions he needs to take during the experiment:

- Measurements from the ruler were taken at \_\_\_\_\_.
- Allow the \_\_\_\_\_ to come to rest before taking readings.

(2)

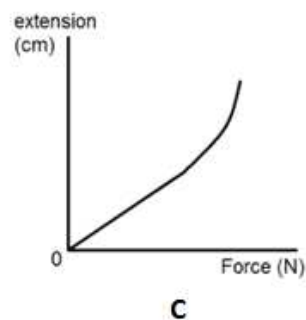
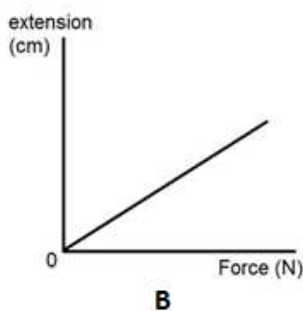
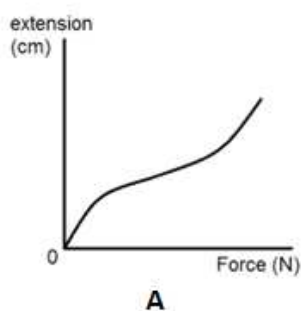
(f) The original length of the rubber band he used is 9cm. After applying a force of 2N, the band was extended to 10cm.  
Calculate the extension:

(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**