

KULLEĠĠ SAN BENEDITTU

Boys' Secondary, Kirkop

Mark

HALF-YEARLY EXAMINATION – 2012/13

Track 3



FORM 3	PHYSICS	TIME: 1 hr 30 mins
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Question	1	2	3	4	5	6	7	8	9	Global Mark
Max. Mark	8	8	9	9	10	11	15	15	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	$W = F s$ $K.E. = \frac{1}{2} m v^2$	$E \text{ (or } W) = P t$ $P.E. = m g h$
Force	$W = m g$	Moment = force \times perpendicular distance
Pressure	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: This question carries 55 marks
Answer all questions

1. This question is about Quantities and Measuring Instruments.

a) Match the correct quantity with the correct symbol and the correct unit

<u>Quantity</u>	<u>Symbol</u>	<u>SI Unit</u>
Length	m	kg
Weight	t	m ³
Time	V	m
Mass	W	N
Volume	L	s

(5)

b) Jonathan had various items in his school bag. Fill in the blanks using the correct apparatus.

- He can find out the **mass** of his Math book by using a _____.
- A large **measuring cylinder** could be used to measure the _____ of water found in his drinking bottle.
- The **length** of one of his copybooks can be found using a _____.

(3)

[8 marks]

2. This question is about Specific Heat Capacity.

A metal cup contains 200g of water which was originally at 15°C. It is heated for 3 minutes by means of an electric heater immersed in water. This heater is rated at 120W.

- What is the **mass** of the water in **kg**? _____ (1)
- What is the **time** in **seconds**? _____ (1)
- Calculate the **heat energy** is supplied in 3 minutes?

(2)

- d) Calculate the **change in temperature** of the water if the specific heat capacity of water is $4200\text{J/kg}^\circ\text{C}$.

(3)

- e) What was the **final temperature** of the water after 3 minutes?

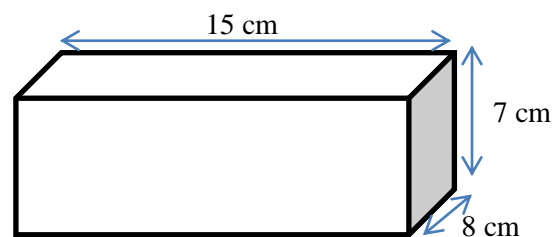
(1)

[8 marks]

3. This question is about Density.

Andrew wants to find out if a block made from an unknown material can float on water. He measures the block's sides as in the diagram.

Andrew finds that the mass of the block is 800g.



- a) Calculate the **volume** of the block in cm^3 .

(1)

- b) Calculate the **density** of the material in g/cm^3 .

(3)

- c) If the density of water is 1g/cm^3 , will the block float or sink in water? Give a reason for your answer.

(2)

d) Suggest a suitable material that the block could be made of. _____

(1)

e) If the block was cut into smaller pieces, will its density change? Why?

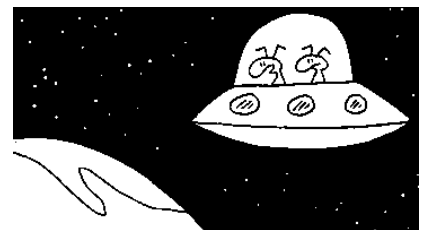
(2)

[9 marks]

4. This question is about Forces.

a) Some aliens landed on several planets, including Earth. In the table below there is some information about the aliens. Remember, gravity on Earth is 10 N/kg .

Alien	Mass in kg	Weight in N
A	40	80
B	20	200
C	10	200
D	20	40



i. Which alien landed on Earth? _____

i. Which aliens landed on the same planet? _____

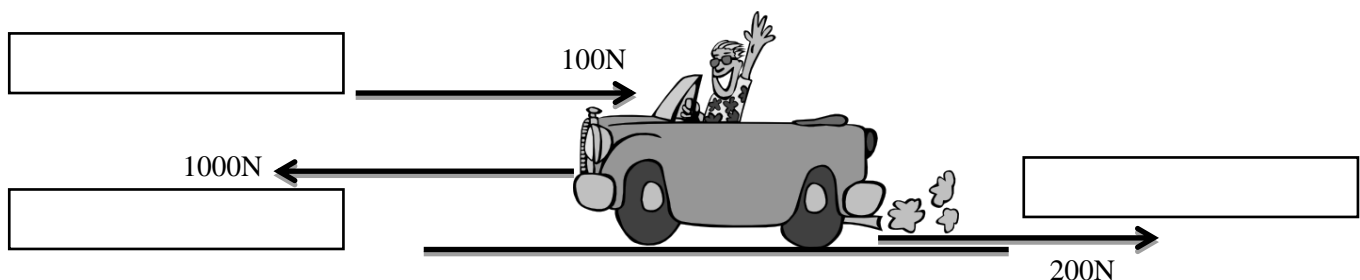
ii. The aliens have to jump from their spacecraft when they land. Which alien will feel the greatest pull by the planet? _____

iii. If all the aliens came to our planet, which would weigh least? _____

(4)

b) The alien who landed on Earth got interested in the humans driving their cars in the street and wanted to learn more about the forces acting on the car when it is moving down the street.

i. Write down the names of the following forces:



(3)

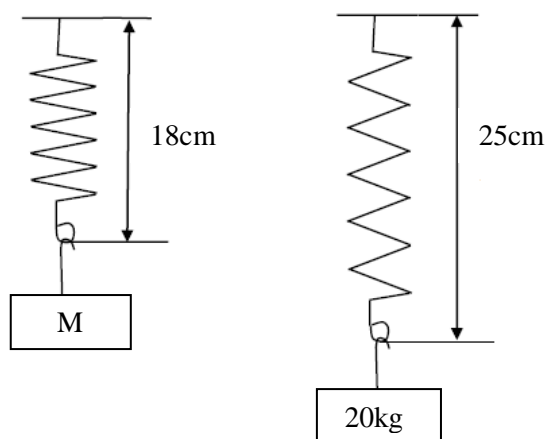
- ii. Work out the **resultant force** on the car

(2)

[9 marks]

5. This question is about stretching of springs.

Andrew was studying a 15cm spring and he came out with this diagram of a spring when loaded with different masses:



- a) What is the **length** of the spring without any load?

_____ (1)

- b) What is the **extension** produced by the 20kg?

(2)

- c) Calculate the **unknown mass M**?

(3)

- d) What is the **weight** on the spring when it is 18 cm long?

(2)

- e) What is the **length** of the spring when a 12 kg mass is attached to it?

(2)

[10 marks]

6. This question is about the Three States of Matter and Heat.

a) Fill in using the words below. Each word can be used more than once.

three	liquid	matter	solid(s)	gas(es)	shape
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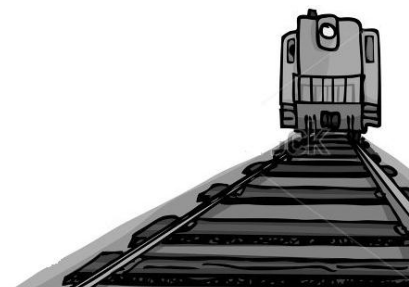
All objects are made up of _____. Matter can exist in _____ states. These are _____, liquids, and _____. A _____ has a definite size and definite volume. A _____ has weaker forces between its molecules and therefore does not have a definite _____. A _____ has no definite shape or volume.

(4)

b) The diagram below shows the structure of a railway track.

i. Describe what happens to the railway track on a hot day.

(2)



ii. Using the kinetic theory of matter, explain this effect.

(2)

iii. What allowances can be made for this effect?

(1)

c) On a hot summer morning, Mark left a bird bath dish in his garden for the birds. When he went in the evening, he noticed that there was no water left in the bird bath dish. Explain what happens to the molecules of the water on a hot day.

(2)

[11 marks]

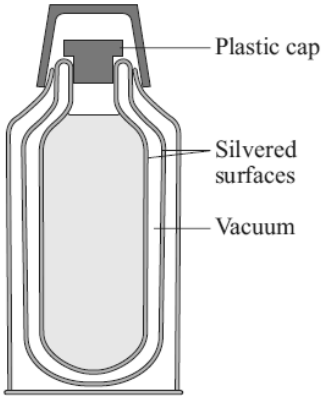
Section B: This question carries 45 marks
Answer all questions

7. This question is about Heat Transfer

a) A vacuum flask is designed to reduce the rate of heat transfer.

- i. Complete the table to show which methods of heat transfer are reduced by each of the features labelled in the diagram.

(The first row has been done for you.)



Feature	Conduction	Convection	Radiation
Vacuum	✓	✓	
Silvered Surfaces			
Plastic Cap			

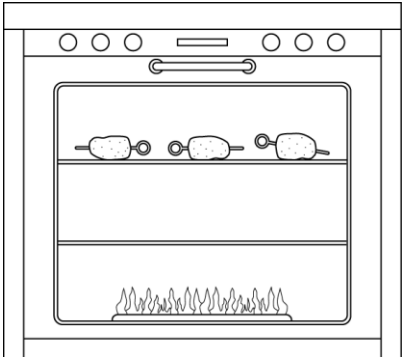
(2)

- ii. Explain why the vacuum between the glass walls of the flask reduces heat transfer by conduction and convection.

(2)

b) The diagram shows potatoes being baked in a gas oven. Each potato has a metal skewer pushed through it.

- i. Explain how heat is transferred by the process of convection from the gas flame at the bottom of the oven to the potatoes at the top of the oven.



(3)

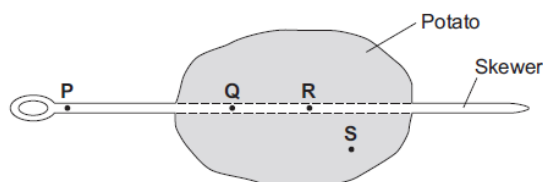
- ii. **Draw** the convection currents occurring in the oven.

(1)

- iii. The metal skewers help the potatoes to cook by transferring heat to the inside of the potatoes.

By what method is heat transferred through a metal skewer?

_____ (1)



- iv. The diagram shows the potato and skewer one minute after the potato is put in the oven.

Which of the four points P, Q, R and S, will be the coolest? _____ (1)

- v. When the potatoes are taken out of the oven, they start to cool down. Suggest one factor that will affect how fast a potato cools down.

_____ (1)

- vi. If the potatoes need to be kept hot, they may be wrapped in shiny aluminium foil. Why does this help to keep the potatoes hot?

_____ (1)

- c) The figures below represent three metal sheets A, B and C, painted in different colours.



Fill in the blanks:-

- i. Surface _____ absorbs heat energy very quickly.
- ii. Surface _____ is a very good emitter of thermal radiation
- iii. Surface _____ is the best reflector of heat energy.

(3)

[15 marks]

8. This question is about density.

- a) Keith wants to show his sister why cooking oil floats on water. To do this he has to prove that the density of oil is smaller than that of water (1g/cm^3).

Write an account of what Keith must do to find the **density of cooking oil**. Your account must include:

- i. Labelled diagrams of the apparatus needed to find the mass and volume:

mass

volume

(4)

- ii. 5 steps for the method:

(5)

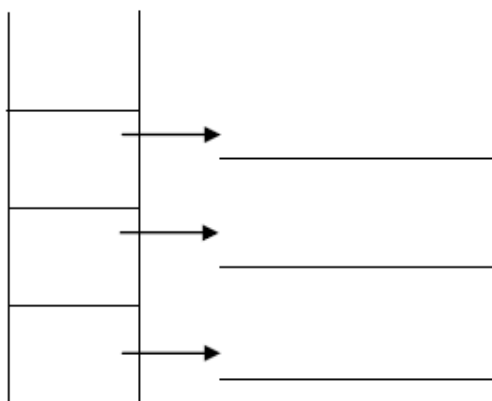
- iii. The equation used to calculate the density of cooking oil:

(1)

- b) A sample of cooking oil of mass 920g has a volume of 1000cm^3 . Calculate the **density** of the cooking oil in g/cm^3 .

(3)

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



(2)

[15 marks]

9. This question is about Hooke's Law.

- a) Paul carried out this experiment and obtained the following results:

Load (N)	0	1	2	3	4	5	6	7	8	9
Extension (cm)	0	0.5	1	1.5	2	2.5	3.3	4.5	6.1	9.5

- i. Plot a graph of extension (y-axis) against load (x-axis) on the graph paper provided. (5)
- i. On your graph, mark the **elastic limit** of the spring with the letter 'E'. (1)
- ii. From your graph or otherwise, determine the greatest load which can be applied to the spring without damaging it. _____ (1)
- iii. What is the extension of the spring if a 4.5N load is applied to it? _____ (1)
- iv. **Fill in:** Hooke's law states that the load applied to a spring is directly proportional to the extension of the spring, provided that the _____ of the spring is not exceeded. (1)

(1)

- b) In his experiment Andrew measured the extension of a steel spring changes with different load. He was provided with the following apparatus:

**a steel spring, a pointer, a mass hanger, a meter ruler,
a stand and clamp, a set of 1N weights.**

- i. Draw a **well labelled diagram** of how he used the above apparatus in order to investigate Hooke's Law.

(4)

- ii. Name **two precautions** Andrew should have followed while carrying out his experiment.

(2)

[15 marks]

END OF EXAMINATION