

SECONDARY SCHOOLS ANNUAL EXAMINATIONS 2007

Educational Assessment Unit – Education Division

FORM 4**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 $g = 10\text{m/s}^2$.

You might find the following list of formulae useful.

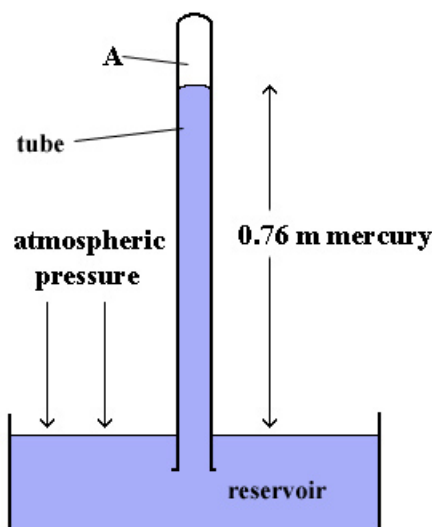
Pressure	$P = \rho gh$	$F = pA$
Force	$F = ma$	$W = mg$
Motion	Momentum = mv	$s = \frac{1}{2} at^2$
	Impulse = Change in Momentum	
Electricity	$Q = It$	$W = QV$
	$V = IR$	$R = R_1 + R_2 + R_3$
	$P = IV = I^2R = \frac{V^2}{R}$	$R \propto \frac{1}{A} \quad R \propto L$
Heat	$H = mc\Delta\theta$	$E = Pt$

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			
Maximum Mark	85	15	100

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

1.



- a) A mercury _____ is used to measure atmospheric pressure (1 mark)
- b) The space labelled A is a _____ (1 mark)
- c) The height of the column of mercury is measured by using a _____ (1 mark)
- d) If the atmospheric pressure **increases**,
 - the level of mercury in the tube _____ (1 mark)
 - the level of mercury in the reservoir _____ (1 mark)
- e) The atmospheric pressure on top of a mountain is _____ than the pressure at sea level (1 mark)
- f) Find the atmospheric pressure if the height of mercury in the tube is 0.76m and the density of mercury is 13600kg/m^3 (2 marks)

2

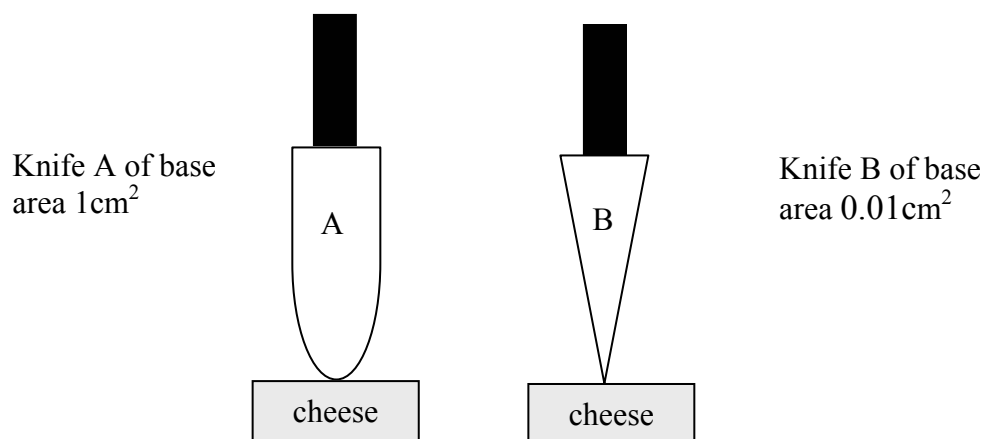
Francesca jumps out of a boat which is **at rest**.

- a) What is the momentum of the boat **before** Francesca jumps off? _____ (1 mark)
- b) Calculate the momentum of Francesca whose mass is 50kg, if she jumps off the boat with a velocity of 2m/s. (2 marks)

- c) What is the momentum of the boat just **after** Francesca jumps off? _____ (1 mark)
- d) Find the recoil velocity of the boat if its mass is 400kg (2 marks)

- e) When Francesca jumps off, the boat moves backwards since according to Newton's third law, for every _____ there is an equal and _____ reaction. (2 marks)

3. a) The diagram below shows two knives, A and B.



- i) Gabriel makes a force of 10N to cut through cheese using knife A of base area 1cm^2 . Find the pressure exerted on the cheese in N/cm^2 . (2 marks)

- ii) If the base area of knife B is 0.01cm^2 , find the force Gabriel needs to make to cut through the cheese with knife B using the same pressure. (2 marks)

- iii) Why is it easier to cut something using a sharp knife rather than a blunt one? (1 mark)

- b) Gabriel lies on two different mattresses as shown in the diagrams below.



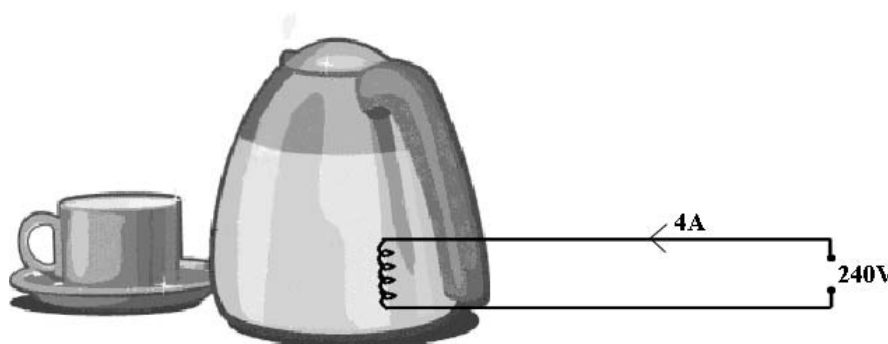
Diagram 1



Diagram 2

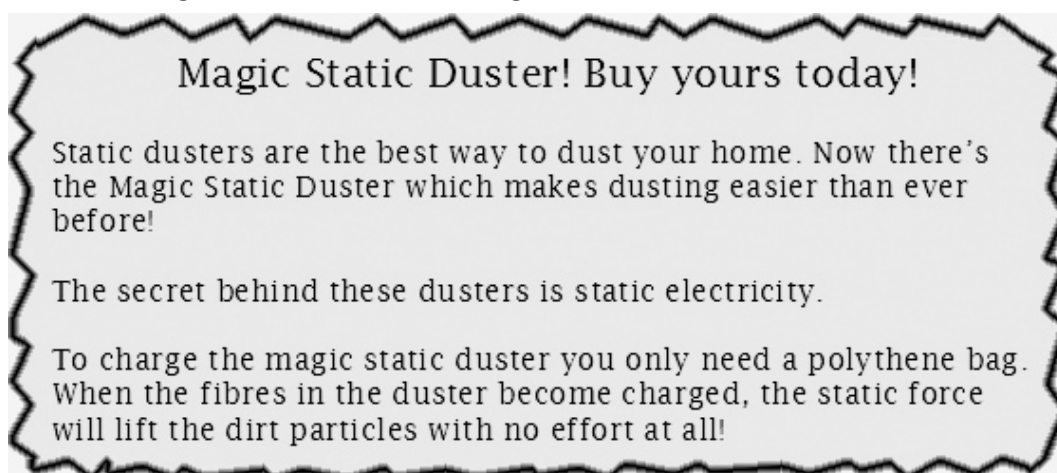
- i) The pressure exerted is **larger** in diagram ____ (1 mark)
- ii) The _____ the contact area, the **larger** the pressure (1 mark)
- iii) Which mattress is most comfortable? Diagram ____ (1 mark)

4. Sarah heats 0.5kg of water in a small electric kettle to make some tea. The temperature of the water rises from 20°C to 80°C.

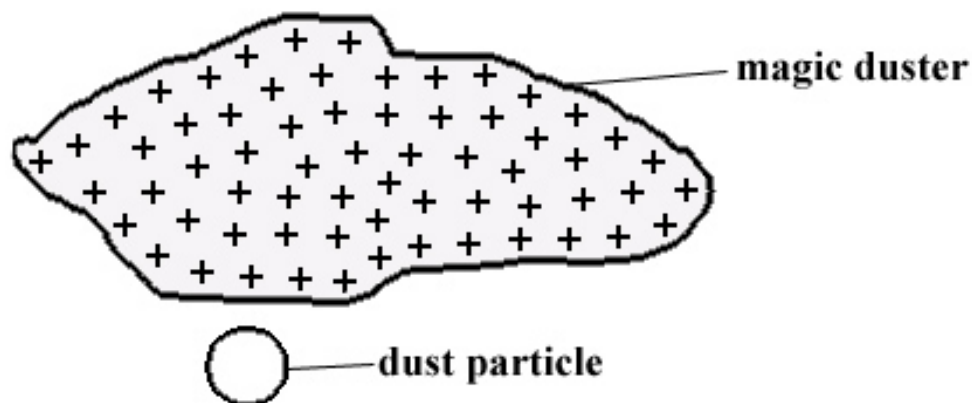


- a) What is the rise in temperature? _____ (1 mark)
- b) Given that the specific heat capacity of water is 4200J/kg°C find the heat energy needed to heat the 0.5kg of water from 20°C to 80°C. (2 marks)
- _____
- _____
- _____
- c) If the current in the circuit is 4A and the voltage is 240V, find the power of the kettle. (2 marks)
- _____
- _____
- _____
- d) Choose a fuse suitable for this circuit from the box below _____ (1 mark)
- 3A, 5A or 13A
- e) Using your answers in b) and c) find the time taken to heat the water from 20°C to 80°C. (1 mark)
- _____
- _____
- _____
- f) In actual fact, more time is needed to heat the water, why is this so? (1 mark)
- _____
- _____

5. The following advert is seen on a magazine:



- a) The static magic duster becomes _____ by rubbing it with the polythene bag. (1 mark)
- b) Name the charges that are being transferred **from** the magic duster **to** the polythene bag. (1 mark)
- _____
- c) The magic duster is brought close to a **neutral** dust particle. Draw the charges on the dust particle when it gets close to the magic duster. (1 mark)

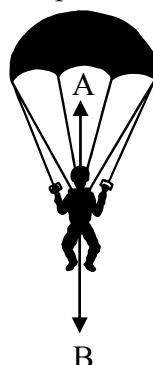


- d) Why is the dust particle attracted to the magic duster? (2 marks)
- _____
- _____
- e) If the dust particle sticks to the magic duster, what charge will it have now? (1 mark)
- _____
- f) What happens to the dust particle after some time? Explain (2 marks)
- _____
- _____

SECTION B - Answer all questions. Each question carries 15 marks.

6. This question is about different sports:

- a) Joanna's favourite sport is skydiving. The diagram below shows Joanna falling some time after she opens her parachute.



- i) Name the forces A and B
A= _____ B= _____ (2 marks)

- ii) Fill in the blanks using the following:

equal, constant, 10m/s^2 , 0m/s^2 , terminal

(5 marks)

When Joanna jumps off the airplane, her initial acceleration is _____. Some time after she opens her parachute, force B and force C become _____ and the acceleration is _____. Thus she continues falling at _____ velocity called _____ velocity.

- b) Mark's sport is driving a racing car.



- i) Find the resultant force acting on the car _____ (1 mark)
ii) If the mass of the car is 1500kg , find its acceleration. (2 marks)

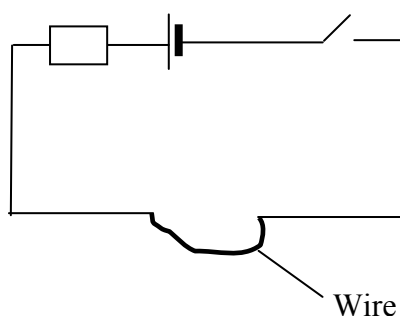
- iii) Mention two safety features of a modern car. (2 marks)

- iv) Circle the correct answer (3 marks)

The backward force on the car may be reduced by using:

• Wider tyres	True / False
• A streamlined car design	True / False
• A more powerful engine	True / False

7. a) Two students were given the task to measure how the length of a wire changes the current in a circuit. They set up the apparatus below



- i) In the above circuit, draw an ammeter to measure the current (1 mark)
 ii) Label the symbols below:

(3 marks)

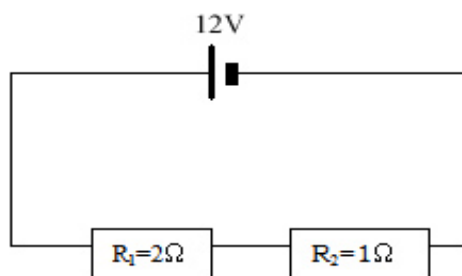
- iii) After they find the current for each length of wire, they calculate the resistance for each length by using the formula $V = IR$

Resistance (Ω)	0.3	0.6	0.9	1.2
Length of Wire (cm)	5	10	15	20

Plot a graph of **Resistance on the y axis against length of wire on the x-axis** (4 marks)

- iv) The longer the wire, the _____ the resistance. (1 mark)


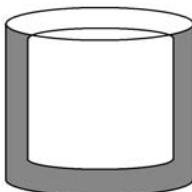
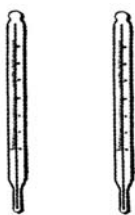


- b) Look at the circuit below



- i) How are the two resistors connected, in series or in parallel? (1 mark)
 ii) What is the total resistance of the circuit? _____ (2 marks)
 iii) Find the current in the circuit _____ (2 marks)

- iv) In the above circuit, draw a voltmeter to measure the voltage across R_1 (1 marks)

- 8 Sue and Dave work in a fashion design company. They are asked to design a winter jacket with good insulation. Before they start their design, they need to find **which the best insulator is: feathers or a layer of cloth**. They are given the following apparatus:

				
Can covered with feather as an insulation	Can covered with material as an insulation	Two thermometers	Boiling Water	Stopwatch

- a) Fill in the blanks with the following words:

stopwatch, temperature, water, thermometer

The two cans are filled with hot _____. A _____ is inserted in each beaker and the _____ is switched on. The _____ is recorded every two minutes.

(4 marks)

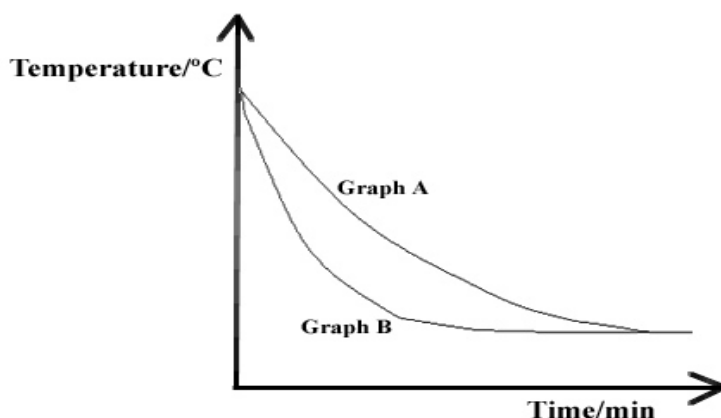
- b) Mention two precautions taken in their experiment.

1. _____

2. _____

(4 marks)

- c) The following diagram shows the graphs obtained. Which graph shows the best insulator? Graph _____ (1 mark)



- d) It is expected that the experiment which had feathers is the best _____ since air is a _____ conductor of heat. (2 marks)
- e) This would not be a fair experiment if the inside of one beaker is silver and the other is black since black surfaces are _____ absorbers of heat whilst silver surfaces are _____ absorbers of heat. (2 marks)
- f) Dave and Sue design a quilted reversible jacket. One side of the jacket is black and the other side is white. Choose the best way to wear the jacket to keep a person warmer in winter.

	<p>Option 1</p> <p>Black inside and Shiny White outside</p>
	<p>Option 2</p> <p>Shiny White inside and Black outside</p>

Option _____ (2 marks)