



St. Ignatius College
Boys Secondary School, Handaq
Half-Yearly Examination 2012

3

Form 3 (Track 3)

Physics

Time: 1 hour 30 minutes

Name: _____

Class: _____

Question No.	1	2	3	4	5	6	7	8	Main Paper	Practical Work	Course Work	Global Mark
Max. Mark	9	9	9	9	9	10	10	10	75	15	10	100
Mark												

Answer all questions.

Where necessary take the acceleration due to gravity to be 10m/s^2 .

All working must be shown. The use of the calculator is allowed.

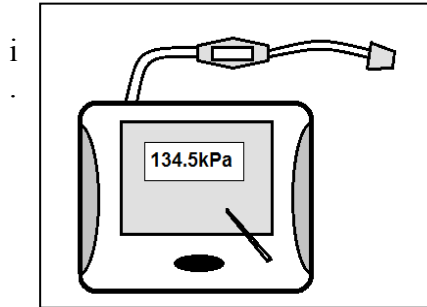
Useful equations:

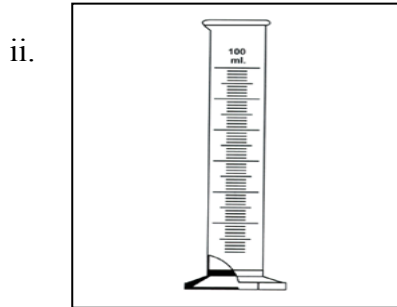
Density	$\rho = \frac{m}{V}$	
Weight	$w = mg$	
Pressure	$P = \frac{F}{A}$	$P = h\rho g$
Energy and Work	$W = Fs$ $KE = \frac{1}{2}mv^2$	$PE = mgh$ $P = \frac{E}{t}$

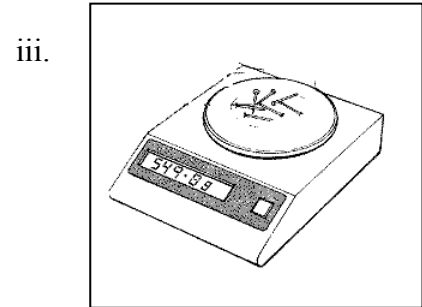
Section A: Answer ALL questions in the space provided.

1. a. **Choose the correct name** for each item from those given below and write the names under each diagram. (3)

Stopwatch	Measuring cylinder	Electronic balance	Data logger	Electronic timer
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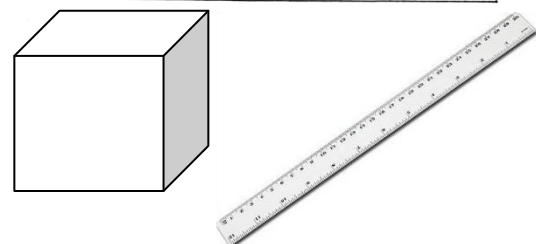


- b. **Underline the correct word.** (3)

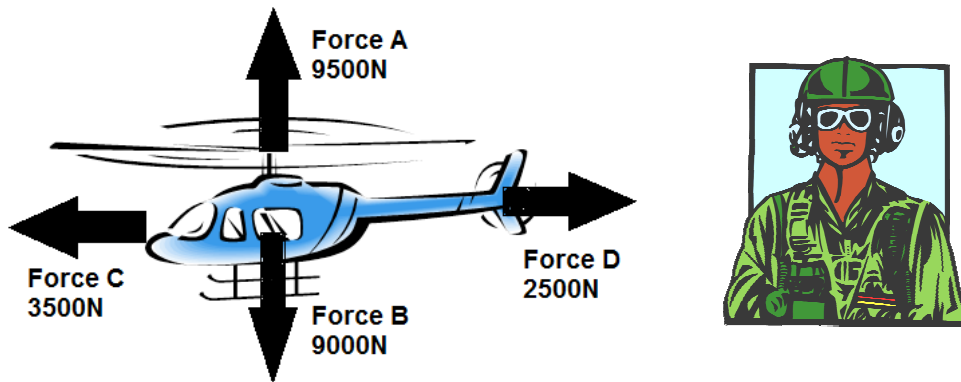
- i. Measurements of **length** should be taken at (the elastic limit , eye level , the zero mark).
- ii. A **spring balance** is used to measure the (length , mass , weight) of an object.
- iii. **Scalars** are quantities that have (only a size , both size and direction , only a direction).

c. Jane wants to measure the **volume** of a block of aluminium.

Describe how Jane could measure the volume of the block. (3)



2. Steve is a pilot and notices that there are a number of forces acting on his helicopter.



a. Draw lines to **match the correct name** of each force. (2)

- | | |
|----------------|-----------------------|
| Force A | Air resistance |
| Force B | Lift force |
| Force C | Weight |
| Force D | Force forward |

b. The weight of the helicopter acts from the (centre of gravity, elastic limit, engine force). (1)

c. Calculate the **horizontal resultant force** on the helicopter. (2)

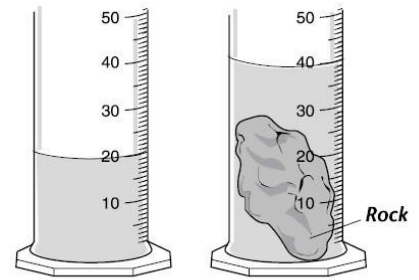
d. Calculate the **vertical resultant force** on the helicopter. (2)

e. Steve thinks that the helicopter will move as shown by the arrow below. **Explain why he is correct.** (2)



3. Maria is a scientist who studies different materials.

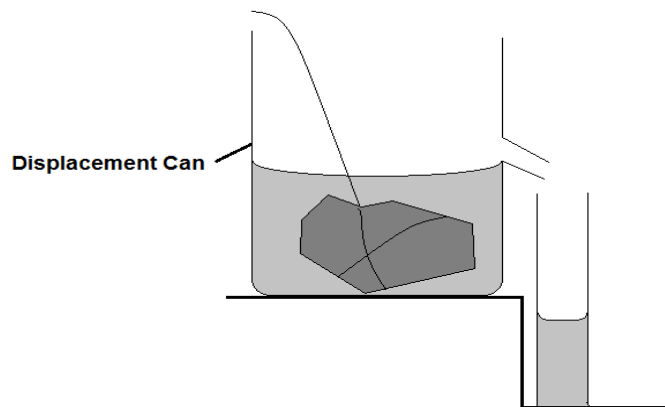
a. She wants to find the volume of a **small rock**. Use the diagram to **calculate the volume of the small rock**. (1)



b. Maria found that the mass of the rock was 50g. **Calculate the density of the rock**. (2)

c. Water has a density of 1g/cm^3 . **Explain why the rock will not float on water**. (2)

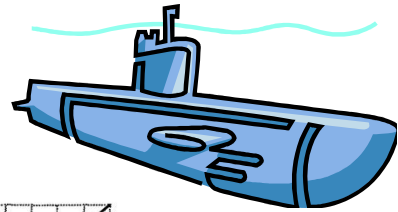
d. Maria found a **large rock** and used a displacement can to find its volume.



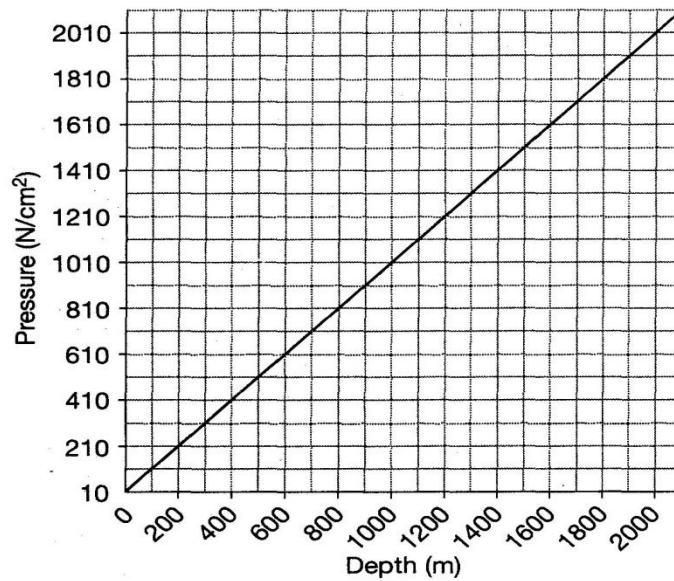
I. The stone had a density of 2.5g/cm^3 . **Calculate the mass of the stone** if the volume of the stone was found to be 3000g. (2)

II. Explain why **the small stone** and **the large stone** are made from the same material. (2)

4. A submarine can travel very deep under the sea.



The graph below shows how the pressure under the sea changes with depth.



a. Use the graph to:

i. Find the **pressure** at a depth of 1000m. _____ (1)

ii. Find the **depth** when the pressure is 1610N/cm². _____ (1)

iii. Calculate the **density** of sea water. (Hint: Use $P = h \rho g$). (3)

iv. Explain why the pressure at the water surface (0m) is **not** 0 N/cm². (2)

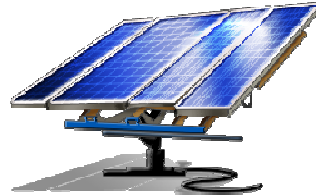
b. The submarine can travel up to a depth of 3000m. Explain in terms of pressure what can happen to the submarine if it reaches a depth that is more than 3000m. (2)

5. Julie and Tom are two engineers who are studying about the best ways of using **renewable energy sources** in Malta.



a. They are planning to use the equipment below to generate electricity. **Name the energy sources used in each situation.** (2)





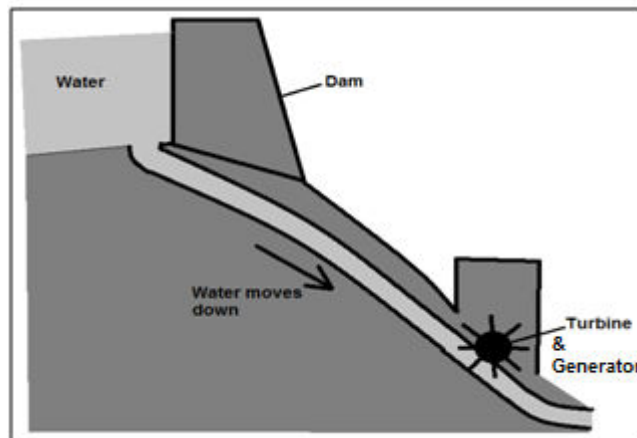
b. Explain the meaning of **renewable energy sources**.

(2)

c. Julie suggested that the equipment mentioned in (a) could be used to give enough electrical energy to our school. Mention **one point in favour** and **one point against** using this equipment in our school.

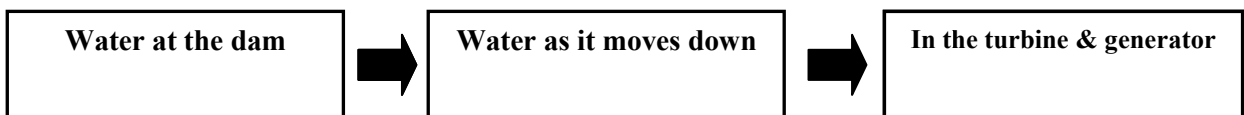
(2)

d. Tom worked in a hydroelectric power station in Italy. The diagram below shows how this power station works.



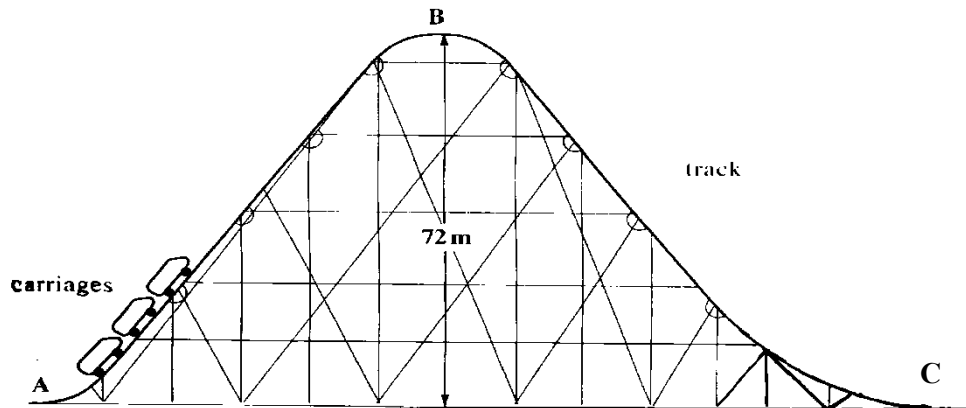
Complete the energy flow diagram below to show how energy is transferred.

(3)



Section B: Answer ALL questions in the space provided.

6. The diagram shows part of a roller coaster in an amusement park. The carriages travel up from Point A to Point B and then down from Point B to Point C.



- a. The mass of the carriage is 3100Kg. Calculate the **work done** by the carriage to move from A to B. (3)

- b. How much **potential energy** will the carriage have gained at Point B? (1)

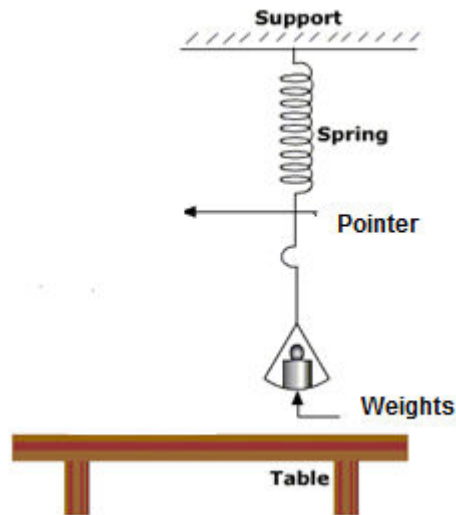
- c. Calculate the **velocity** of the carriage at point C, assuming there is no friction with the track. (3)

- d. The carriage has 3,000,000J of energy when launched at A and it generates 250,000W of power to take the carriage to B. Calculate the **time taken** for the carriage to reach point B? (2)

- e. Explain why the potential energy at B is **less** than the energy at A (3,000,000J)? (1)

7. A student performed the experiment to determine Hooke's Law.

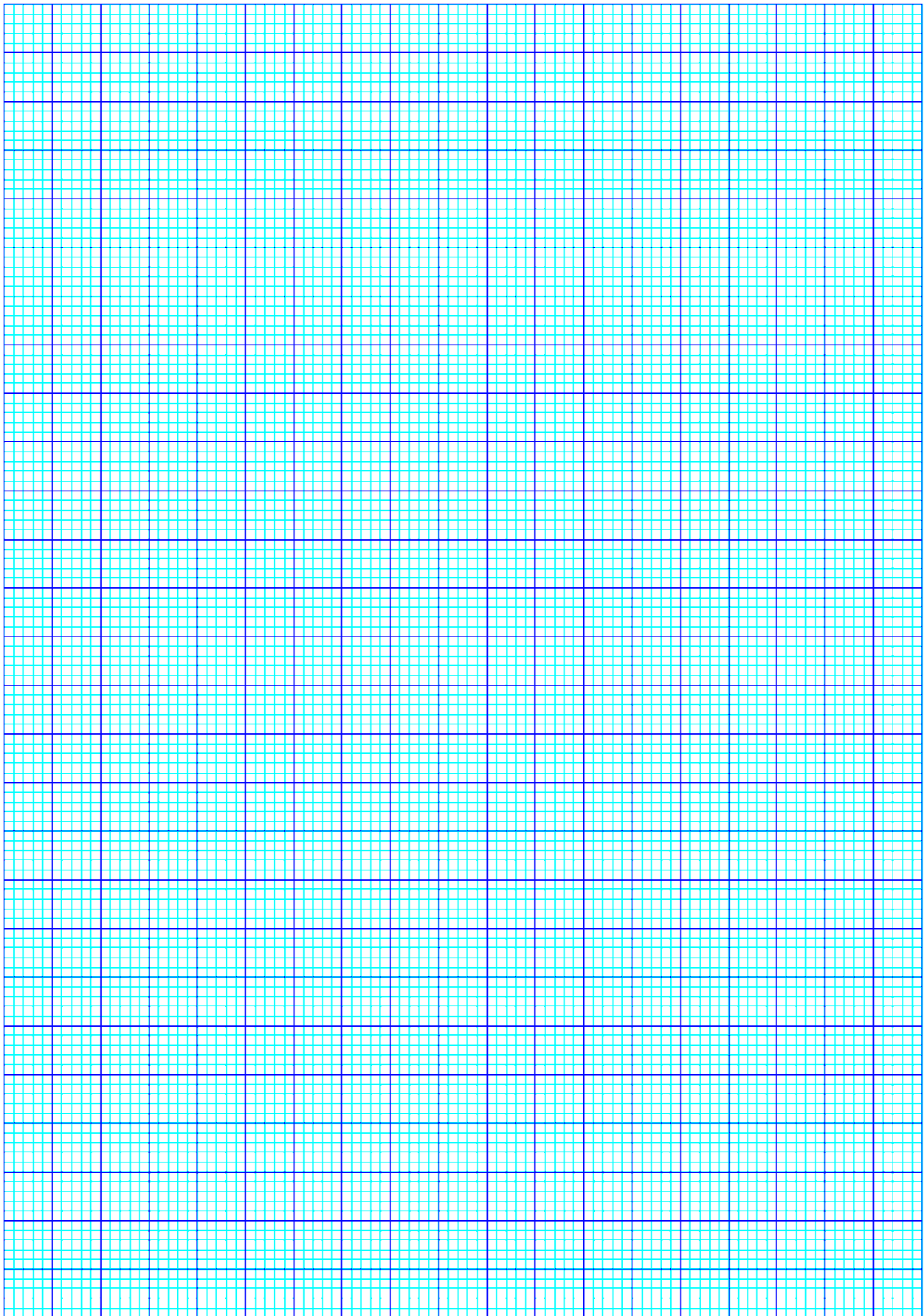
- a. The diagram show the apparatus used during the experiment one piece of equipment is missing. **Draw the missing equipment in the diagram.** (1)



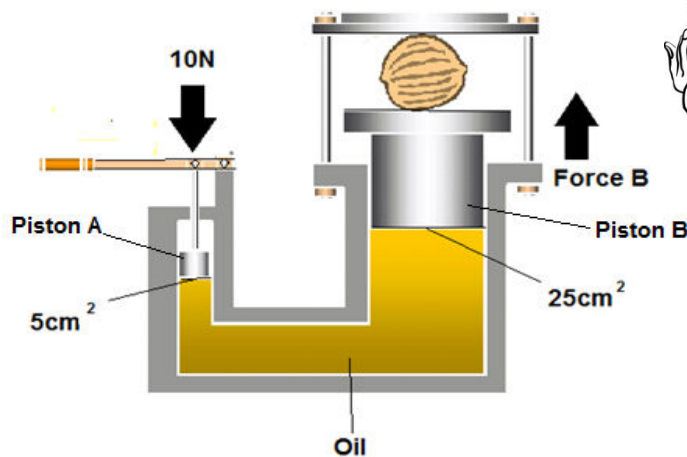
- b. As loads were added, the student obtained the following readings.

Load /N	0	2	4	6	8
Length /mm	100	105	110	115	122
Extension /mm					

- i. **Complete the table** by calculating the extension as loads were added. (2)
- ii. Plot the graph of **Load** (x - axis) against **Extension** (y – axis) on the graph paper. (4)
- iii. Label the **elastic limit** of the spring on your graph. (1)
- iv. Define **Hooke's Law**. (2)



8. A baker uses a nut cracker shown below to crush walnuts.



a. A force of 10N is applied on Piston A.

i. Calculate the **pressure on Piston A**. (2)

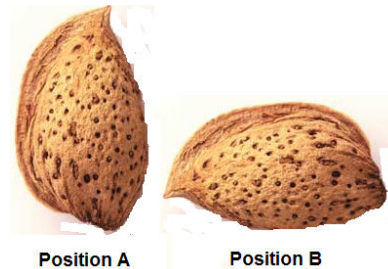
ii. What is the **pressure on Piston B**? (1)

iii. Calculate the value of **Force B**. (2)

b. The baker wishes to use the same nut cracker to crush almonds. **Almond nuts are harder to break than walnuts and cannot be crushed by the nut cracker.**

i. Mention **one change** that can be made to the nut cracker so it can break almonds. (1)

ii. The baker thinks that if he places the nuts in **position B**, it would be easier to crush. Is he correct? Explain your ideas. (2)

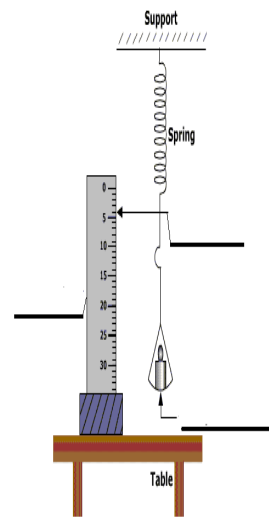


iii. A pressure of 550N/cm^2 is needed to crush the nuts in position A. What is the **area of the nut in contact with the cracker** if a force of 225N is used? (2)

Half yearly Examination 2010/2011

Form 4 Track 1 Marking Scheme

Question	Answer	Mark	Guidelines
1a	i)	filament lamp	ii) Circuit board
5	1	mark each	
1b		iii) spring balance	iii) metre ruler
		iv) data logger	
		current, voltage, variable resistor	
		1 mark each	
2a	i)	0.02m ²	ii) 0.08m ²
		each	2
2b		16000N	
2c		20,000Pa	
	2	1 mark working	
			1 mark answer
2d	i) large, less	iii) large	3
	(accept any reasonable answer)		1 mark each
3a	smaller, bigger		1
			½ mark each
3b	i. 0.04m ²		1
	ii.600N		2
			1 mark working
			1 mark answer
	iii. 15000Pa		3
			1 mark equation
			1 mark working



			1 mark answer
3c	A, B	1	½ mark each
4a	57500Pa	2	1 mark working
			1 mark answer
4b	115000Pa	2	1 mark working
			1 mark answer
4c	increases, density	1	½ mark each
4d	i. Correct drawing	2	No marks if one part is wrong
	ii. pressure	1	
5a	air	1	
5b	i. D, B ii. A, C	2	½ mark each
5c	i. increases	1	
	ii. 102000Pa	2	1 mark working
			1 mark answer
	iii. weather	1	
6a	repulsion, attraction, repulsion, attraction	2	½ mark each
6b	Mark + and - correctly	6	2 mark each
7a	bulb, battery	2	1 mark each
7b	3,5,2,4,1	2	½ mark each
7c	conductor, insulator, insulator, conductor	2	½ mark each
7d	conductor, insulator	2	1 mark each
8	1. Complete 2. Fixed resistor	9	1 mark each
	3. Variable resistor 4. LED		
	3. voltmeter 5. Ammeter		
	6. series 7. Diode		
	8. switch		