

Name

Mark

Class

Date

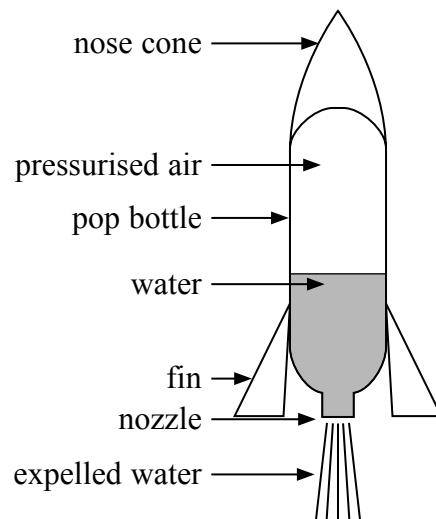
GCSE Science/Physics

Internally Assessed Activity Unit P1b

Topic 12 – Space and its Mysteries

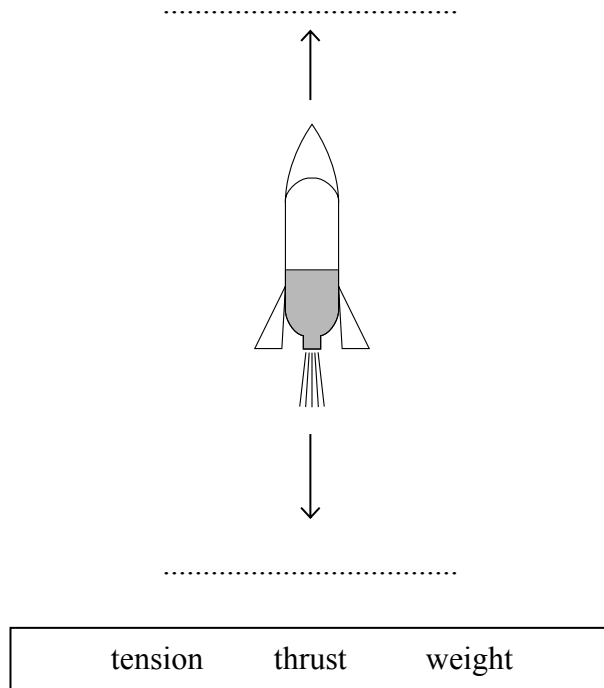
Water Rockets

Sheryl and her uncle Simon made a water rocket. Here is a picture of their water rocket.



Question 1

(a) Use words from the box to label the forces on the diagram below.



2 marks

(b) Which of the forces in the box must be caused by gravity?

.....
1 mark

(3 marks)

Question 2

Sheryl wanted to know if using a different mass of water changed the height the rocket could reach. Sheryl and Simon carried out an investigation on a school playing field.

(a) Why was a large open space necessary to fire the rocket?

.....
.....
1 mark

(b) Suggest **one** suitable precaution that Sheryl and Simon should take when setting up the rocket.

.....
.....
1 mark

(c) Here are Sheryl's and Simon's results. The final column is incomplete.

mass of water (g)	maximum height reached (m)					
	test 1	test 2	test 3	test 4	test 5
50	2.7	2.7	2.7	2.7	2.6	2.7
100	6.0	6.0	5.9	6.1	5.9	6.0
150	8.9	9.0	9.0	9.0	8.9	9.0
200	11.0	10.9	11.0	11.0	10.9	11.0
250	11.6	11.8	11.9	11.9	11.7	11.8
300	11.2	11.0	10.9	11.1	11.3	11.1
350	9.1	9.0	9.0	9.2	9.0	9.1
400	6.0	6.0	6.0	6.0	6.0	6.0
450	2.4	2.4	2.3	2.3	2.2	2.3
500	1.6	1.3	1.4	1.3	1.3	1.4
550	1.2	1.1	1.3	1.1	1.2

(i) Why did they test five times for each mass of water?

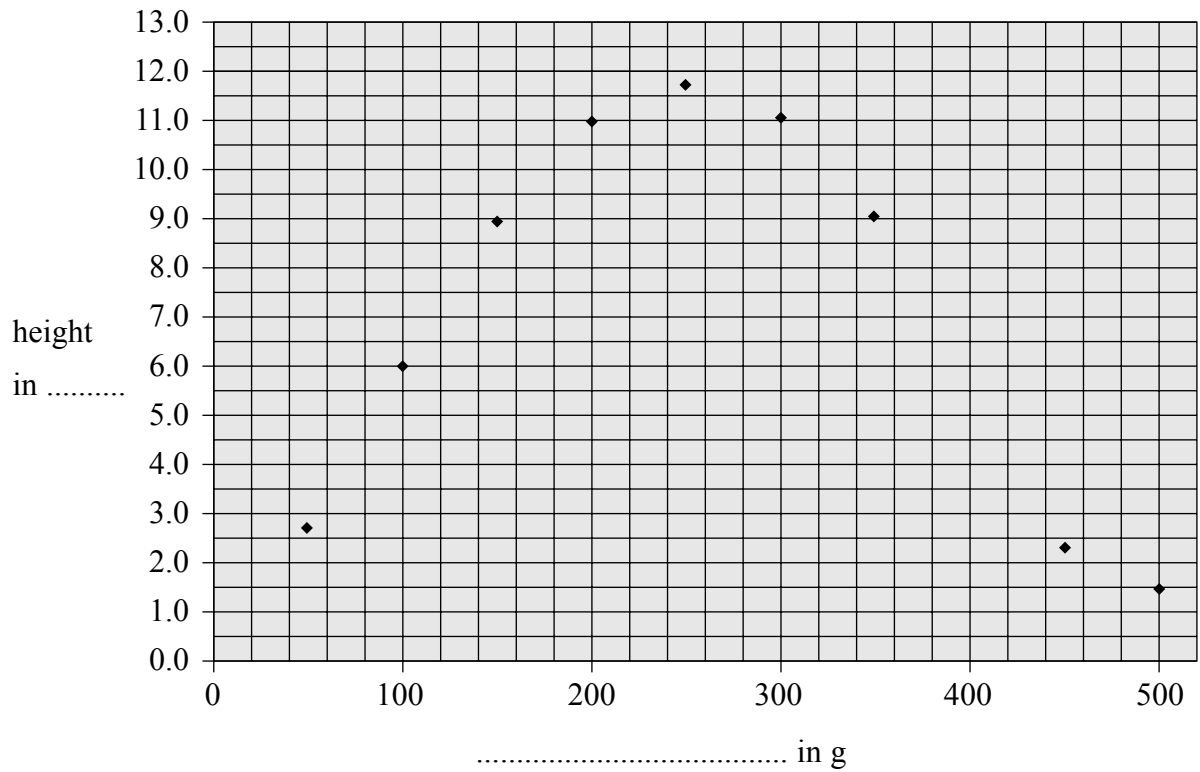
.....

2 marks

(ii) Sheryl has left out a heading and a number in the final column of the results table. Fill in the missing heading and the missing number.

2 marks

(d) Simon plotted this graph using their results.



(i) **On the graph**

- fill in the missing label
- fill in the missing unit
- plot the point for the mass of 400 g
- draw a curve of best fit.

4 marks

(ii) Use the graph to find the two values of mass which give a height of 7.5 m.

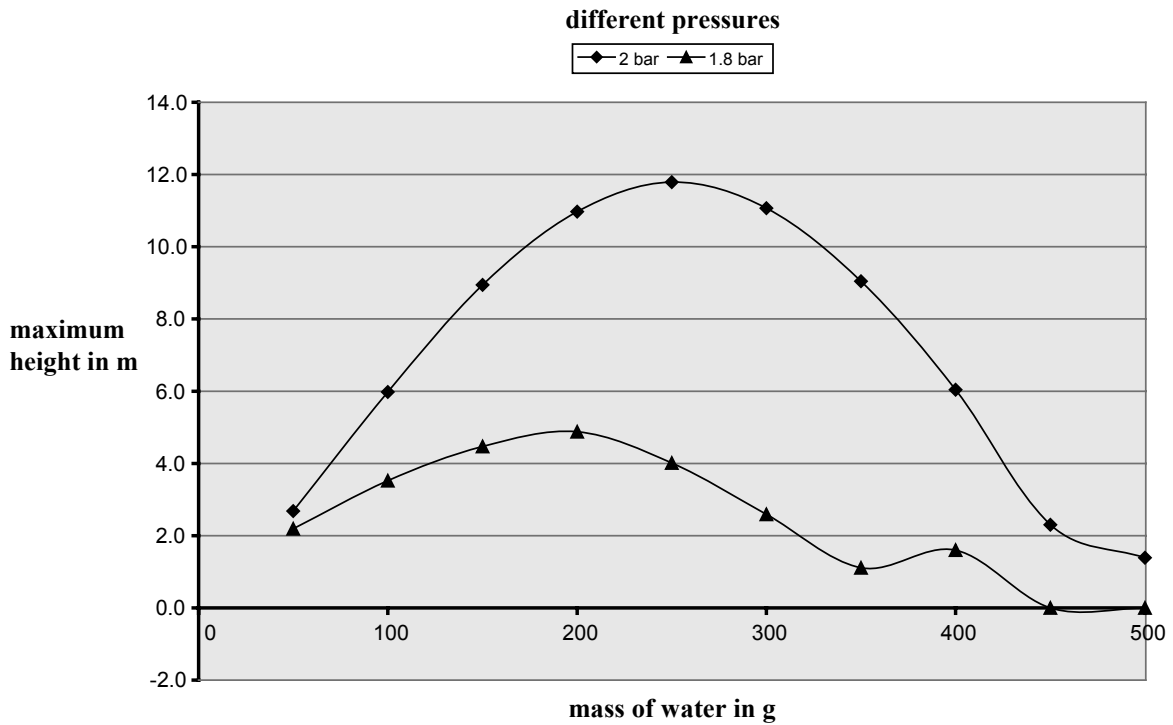
..... and

2 marks

(12 marks)

Question 3

Sheryl and Simon repeated the experiment pumping the air in the rocket to a different pressure. This is the graph of their results for pressures of 2 bar and 1.8 bar. (A pressure of 1 bar equals 100 000 Pascals)



(a) Which result is anomalous in the data for the pressure of 1.8 bar? Circle this point.

..... **1 mark**

(b) Use the graph to give evidence to support the idea that the maximum height reached increases as the pressure increases.

.....

2 marks

(3 marks)

Question 4

Simon explains to Sheryl how the rocket works.

“The pump compresses air in the bottle which pushes against the bottle and water. Finally the rubber stopper is pushed out and the air and water escape from the nozzle. The water pushed out from the rocket causes an upward thrust. At blast-off the rocket has maximum force but is not moving very fast. The rocket accelerates as the water escapes. Adding a nose cone reduces drag.”

Use Simon’s explanation to help you answer these questions.

- (a) Explain, in terms of forces, why the rocket accelerates as the water escapes.

.....
.....
.....
.....

2 marks

- (b) Explain why it is important to reduce drag.

.....
.....
.....
.....

2 marks

- (c) Explain why the thrust does not stay constant.

.....
.....

1 mark

- (d) Explain why the rocket stops accelerating.

.....
.....

1 mark

(6 marks)

Question 5

Sheryl and Simon talked about rockets travelling through space.



It can't be the same!
There's nothing for
the rocket to push
against in space.

Our rocket works
the same way as a
rocket in space.



Which person is correct?

Explain your reasoning and suggest how a simple space rocket works.

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.....

(3 marks)
27 marks

Quality of written communication (/3)

Total 30 marks