

## Gravity

**Name & Set**

1 (a) What is weight?

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(b) Is your weight the same everywhere, i.e. on different planets? Explain your answer.

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2 Estimate the weight in newtons of the following objects

	Object	Weight in newtons
(i)	a 50 p coin	
(ii)	an apple	
(iii)	a bag of flour	
(iv)	a five year old child	
(v)	a fully grown man	
(vi)	a small car	

3 A balance is used to measure the mass of a brick on earth. The balance reads 2 kg. The brick is then weighed with a newtonmeter.

(a) What does the newtonmeter read? The Earth's gravitational field strength,  $g = 10 \text{ N/kg}$ .

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The brick is then transported to the Moon and its mass and weight measured.

(b) What is its mass and its weight on the moon?

The Moon's gravitational field strength,  $g = 1.6 \text{ N/kg}$ .

(i) Mass of brick on the Moon \_\_\_\_\_ [1]

(i) Weight of brick on the Moon \_\_\_\_\_ [1]

3 (a) What is the mass of a of an object that weighs 200N on Earth (on Earth  $g = 10 \text{ N/kg}$ )

\_\_\_\_\_ [2]

(b) What is the mass of a of an object that weighs 200N on Mercury (on Mercury  $g = 3.7 \text{ N/kg}$ )

\_\_\_\_\_ [2]

4 On Earth the weight of a man of mass 90kg is 900N. On Mars his mass is still 90kg but his weight is 342N.

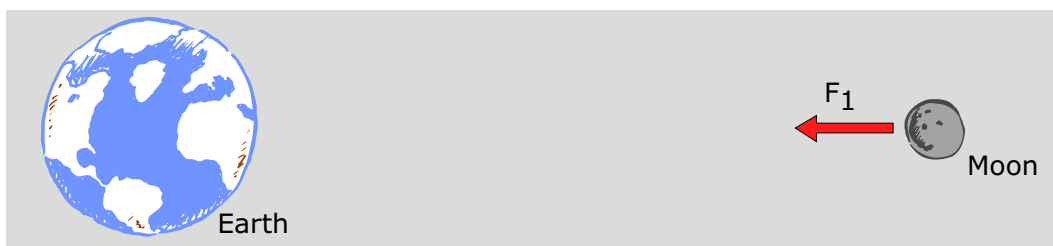
(a) Explain why his weight is not the same on Mars as it is on Earth

\_\_\_\_\_ [2]

(c) Calculate the gravitational field strength on Mars.

\_\_\_\_\_ [2]

5 In the diagram below, which is not drawn to scale,  $F_1$  is a force exerted by Earth on the Moon.



(a) What is name the force  $F_1$  that the Earth exerts on the Moon?

\_\_\_\_\_ [2]

(b) Draw an arrow, and label it, to show another force acting between Earth and Moon. [1]

(c) On what *two* factors does the force between the Earth and the Moon depend?

(i) \_\_\_\_\_ [1]

(ii) \_\_\_\_\_ [1]

(d) What effect on the force between the Earth and the Moon does an increase in factor c (i) have?

\_\_\_\_\_ [2]

(e) What effect on the force between the Earth and the Moon does an increase in factor c (ii) have?

\_\_\_\_\_ [2]

(f) What other forces act on the Earth apart from those between it and the Moon?

\_\_\_\_\_ [1]

6 Which would you choose: 10N of gold on earth or 10N of gold on the moon. Justify your answer by calculating the mass of the object on the Moon and on the Earth.

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7 If you lift your exercise book into the air and let go of it, it falls to the floor.

(a) What is the force that makes the book fall to the floor?

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(b) Do any other forces act on the book as it falls to the floor? Name them.

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(c) What happens if you drop a heavier object? Does it fall faster? Try it! Drop a large and small object at the same time.

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(d) What, if anything, would be different about how the book falls on the moon? Explain the differences.

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(d) Why does a feather or a single sheet of paper fall more slowly than a book?

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(e) Where, or under what circumstances would the feather fall at the same rate as the book?

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8 Here are details of an experiment to measure the strength of the Earth’s gravitational field.

**Method**

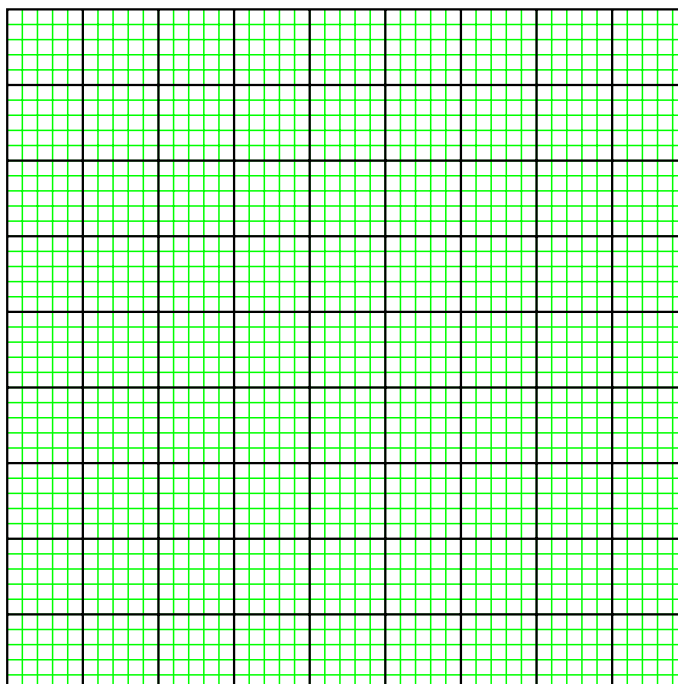
1. Select several objects
2. Hang each object from a newtonmeter
3. Measure the pull of gravity on the object by reading the newtonmeter.
4. Measure the mass of the object with a balance.
5. Record the force measured by the newtonmeter and the mass measured by the balance.

**Results**

<i>Object</i>	<i>Pull of gravity / Newtons</i>	<i>Mass of object / grams</i>
Brick	18.0	1800
Concrete block	6.0	590
Wooden block	2.1	210
Aluminium block	1.5	160
Exercise Book	1.1	120
Shoe	5.0	510
Rock	12.0	1200

(i) Plot a graph of pull of gravity against mass of object.

[4]



(b) Draw a line of best fit through the points.

(c) Use your graph to calculate the pull of gravity on *one kilogram* here on Earth

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