

1

Moon trip

- (a) Astronauts travel to the Moon in a spacecraft.
Rocket engines push the spacecraft away from the Earth.

What name is given to the force that tries to pull the spacecraft back to Earth?



1 mark

- (b) From the Earth, the Moon looks like a circle.



The astronauts know this is not its real shape.

What shape is the Moon?



1 mark

- (c) The Moon orbits the Earth.

Tick **ONE** box to show how many days it takes the Moon to orbit the Earth.




1 day	<input type="checkbox"/>	7 days	<input type="checkbox"/>
28 days	<input type="checkbox"/>	365 days	<input type="checkbox"/>

1 mark

- (d) The astronauts can see the Earth from space. On one half of the Earth it is night. On the other half it is day.

How does the Earth move to cause night and day?


.....

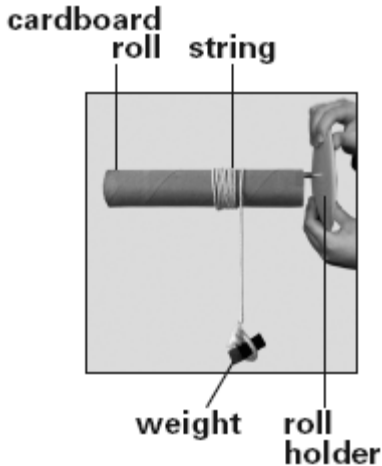
1 mark

2

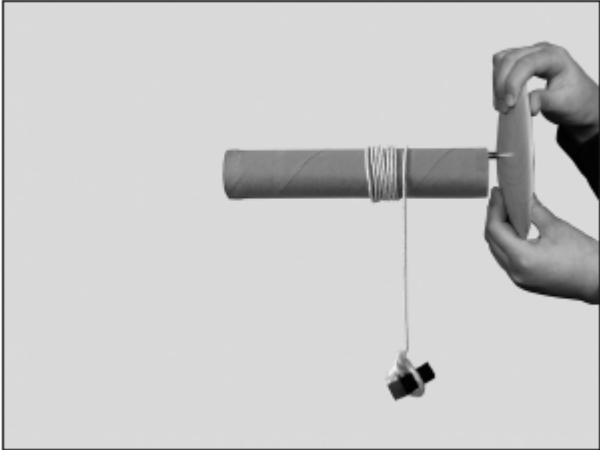
Spinning cardboard roll

- (a) Owen ties a weight onto some string. He winds the string around a cardboard roll.

Owen lets go of the weight. The weight falls, the cardboard roll spins and the string unwinds. Owen records the time taken for the string to unwind.

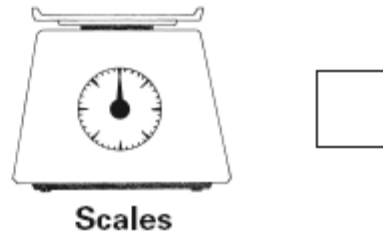
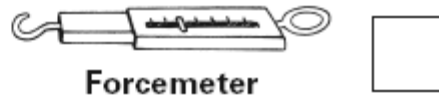


Draw **ONE** arrow on the picture below to show the direction of the force that makes the weight fall.



1 mark

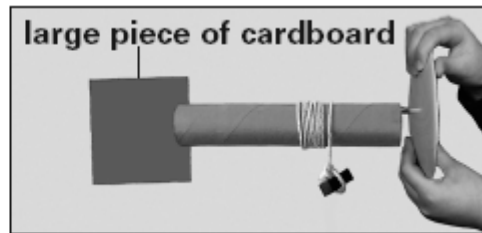
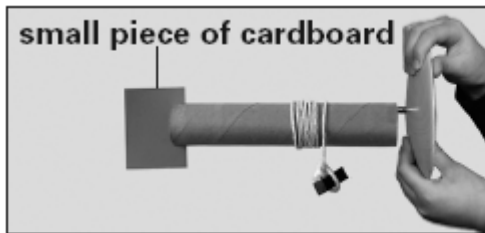
(b) Tick **ONE** box to show the piece of equipment Owen should use to measure the time taken for the string to unwind.





1 mark

(c) Owen repeats his test.

He slots different sized pieces of cardboard into the roll each time.



The table below shows Owen's results.

Size of the piece of cardboard (cm ²)	24 	48 	80 	120 
Time taken for string to unwind (s)	1.5	2.4	4.0	9.3

Estimate the time taken for the string to unwind when the size of the piece of cardboard is 30 cm².

..... s

1 mark

(d) The larger the piece of cardboard, the more slowly it spins.

Name the force that slows down the spinning piece of cardboard.

.....

1 mark

(e) After the test, Owen thinks of four more questions about the spinning roll.

Tick **THREE** boxes to show which of these questions he could answer by doing more tests with the spinning roll.

Will the time to unwind be longer if the string is longer?

What is the name of the force that makes the weight fall?

How can I make the string unwind more slowly?

What happens if I put two weights on the string?

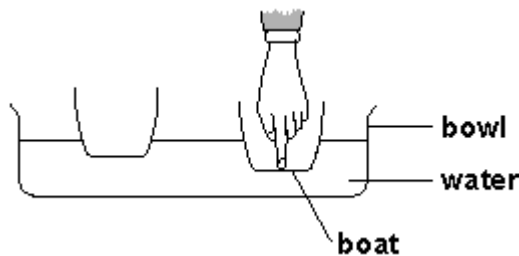
1 mark

3

Boats

(a) Mike puts two boats in a bowl of water. They float on the water.

Mike pushes down on one of the boats with his finger.



Tick **ONE** box to show what Mike can feel as he pushes down.

The force from the water pushing the boat up.

The force from the water pushing the boat down.

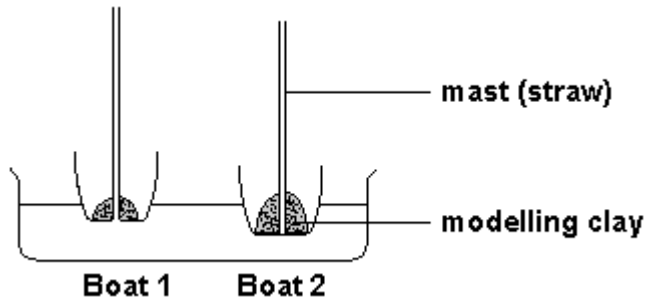
The force from the air pushing the boat up.

The force from the air pushing the boat down.

1 mark

(b) Mike makes masts for the boats with straws.

He attaches the masts to the boats using modelling clay.



Explain why boat 2 floats lower in the water than boat 1.

.....

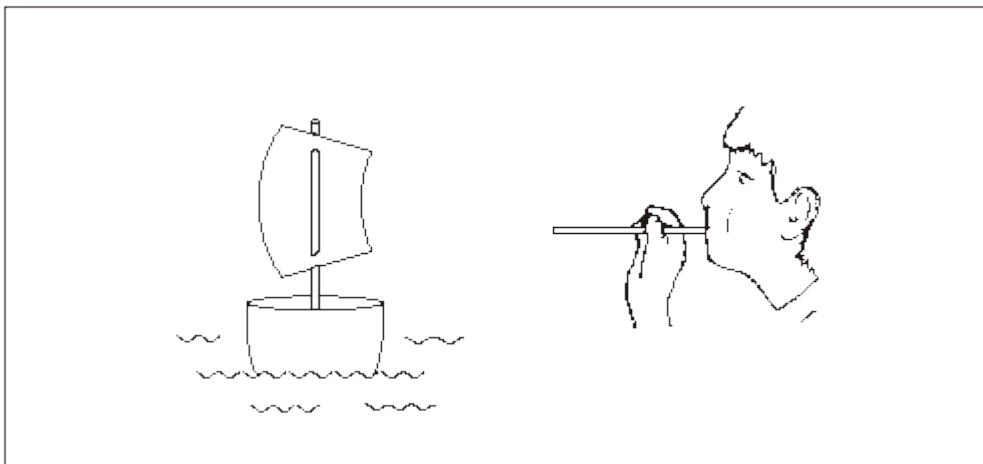
1 mark

(c) Mike makes sails for the boats out of paper.

He uses a straw to blow one of the boats along.

Draw an arrow on the picture to show the direction of the force pushing the boat along.

.....



1 mark

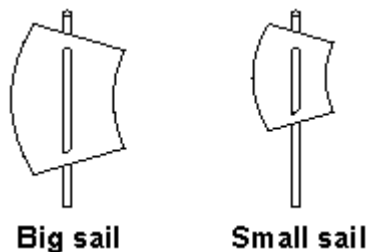
(d) What is the name of the force that slows the boat down?

.....

1 mark

(e) Mike blows the boat when it has a big sail.

Then he puts a small sail on the boat and blows with the same force.



The big sail makes the boat go faster.

Explain why the bigger sail makes the boat go faster.

Write about the forces on the sail in your answer.

.....

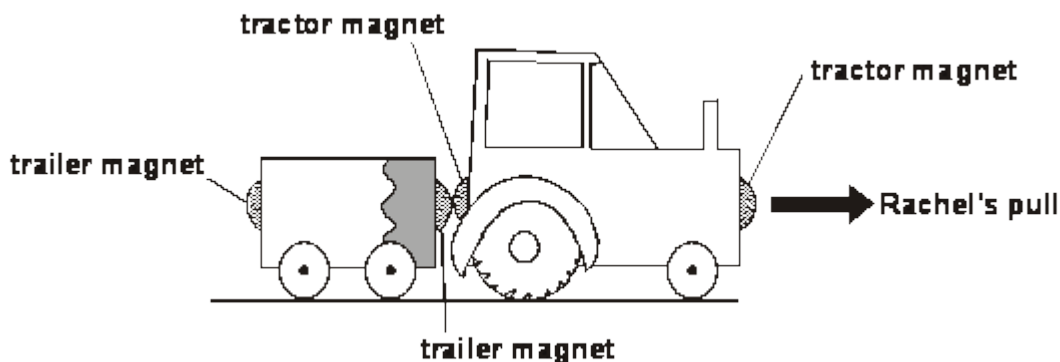
.....

1 mark

4

Tractor

(a) Rachel has a toy tractor and trailer. Both have magnets at each end.



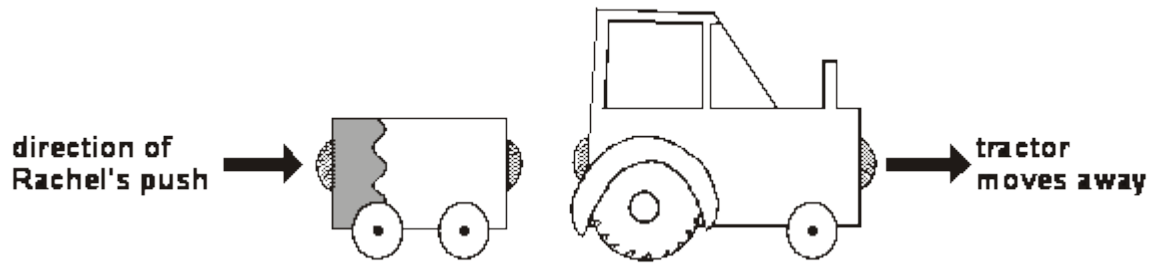
When Rachel pulls the tractor, the trailer comes with it.

Explain why the magnets cause the trailer to move forward when Rachel pulls on the tractor.

.....

1 mark

- (b) Rachel turns her trailer around. She pushes the trailer towards the tractor. The tractor moves away without touching the trailer.



Explain why the magnets cause the tractor to move away when Rachel pushes the trailer towards it.

.....

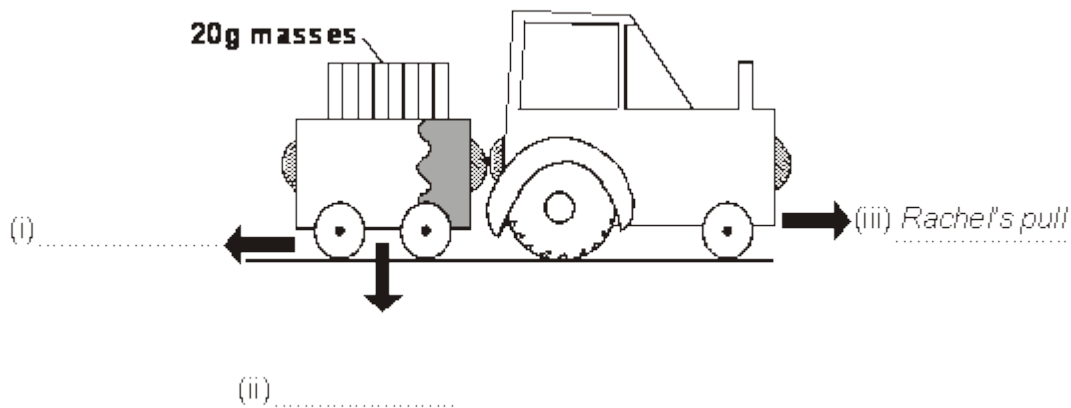
.....

1 mark

- (c) Rachel puts some 20g masses in the trailer. She turns the trailer back around, so the tractor pulls the trailer again.

Label the arrows on the picture below to say what **forces** they show.

One force has been labelled for you.



2 marks

- (d) Rachel can put masses weighing 160g in the trailer before it separates from the tractor. She does this experiment on thick carpet.

Rachel repeats her experiment on a new surface. This time, the trailer holds 240g before it separates from the tractor.

Tick **ONE** box to predict the new surface Rachel tested.

grass

floorboards

gravel path

fluffy rug

1 mark

Mark schemes

1

(a) Award **ONE** mark for:

- weight
- gravitational pull/attraction.

ONE mark may be awarded for:

- *gravity.*

Do not give credit for an insufficient response:

- *downward pull.*

1(L4)

(b) Award **ONE** mark for an indication that the Moon is spherical:

- sphere.
- ♦ **Give credit** for a correct response that goes beyond the key stage 2 programme of study:
- ovoid
- geoid.

ONE mark may be awarded for:

- *(like a) ball.*

Do not give credit for an insufficient response:

- *round*
- *circular*
- *oval.*

1(L3)

(c) Award **ONE** mark for:

- 28 days

1(L5)

(d) Award **ONE** mark for an indication that night and day are caused by the spin of the Earth:

- the Earth/it spins/rotates (on its axis)
- the Earth/it turns on its axis.

ONE mark may be awarded for:

- (the Earth moves) on its axis
- it revolves (about its axis).

ONE mark may be awarded for a creditworthy response accompanied by an insufficient response describing the orbit of the Earth around the Sun:

- the Earth spins as it orbits the Sun
- the Earth turns on its axis and moves around the Sun.

Do not give credit for an insufficient response implying night and day are caused by the orbit of the Earth around the Sun:

- the Earth's orbit
- the Earth going around the Sun
- the Earth spins/rotates/revolves around the Sun.

Do not give credit for an insufficient response:

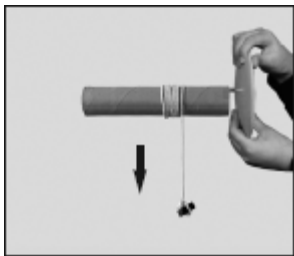
- the Earth/it moves around
- the Earth/it turns
- the rotation [does not indicate what is rotating]
- during the day, the Earth faces the Sun, at night the Earth faces away from the Sun/faces the Moon.

1(L5)

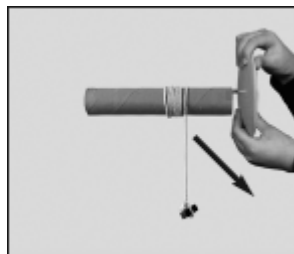
[4]

2

(a) Award **ONE** mark for an arrow drawn anywhere on the picture in a downwards direction:



ONE mark may be awarded for an arrow pointing downwards that is within 45° of the vertical:



1 (L3)

(b) Award **ONE** mark for:

- Stopwatch

1 (L3)

(c) Award **ONE** mark for an estimate between 1.5 and 2.4 seconds exclusive.

1 (L4)

(d) Award **ONE** mark for:

- air resistance.

ONE mark may be awarded for:

- friction
- drag.

Do not give credit for a response that includes incorrect science:

- gravity.

Do not give credit for an insufficient response:

- upwards push of air
- upthrust
- resistance.

1 (L4)

(e) Award **ONE** mark for:

- Will the time to unwind be longer if the string is longer?

- How can I make the string unwind more slowly?

What happens if I put two weights on the string?

1 (L4)

[5]

3

(a) Award **ONE** mark for:

- The force from the water pushing the boat up.

1(L3)

(b) Award **ONE** mark for recognising that the larger lump of modelling clay makes boat 2 sit lower in the water or that boat 2 is heavier:

- boat 2 has more clay;
- the lump of clay in boat 2 is bigger/ heavier;
- the clay makes it heavier;
- the heavier the boat, the lower it sinks;
- it is heavier/weights more;
- there is more force (pulling/pushing) down.

ONE mark may be awarded for an absolute response implying that boat 2 has more modelling clay than boat 1:

- boat 2 has a lot of clay;
- boat 2 is heavy.

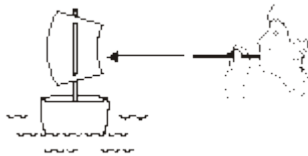
Do not give credit for an insufficient response:

- the clay is weighing down the boat;
- boat 2 floats lower because of the modelling clay;
- there is a force.

1(L3)

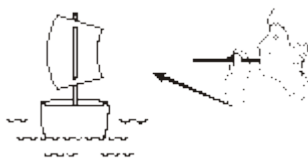
(c) Award **ONE** mark for a horizontal arrow pointing left drawn **anywhere** on the picture:

■



ONE mark may be awarded for an arrow pointing left that is within 45° of the horizontal:

■



Do not give credit for an insufficient response where a line is drawn from the straw to the sail with no arrowhead.

1(L3)

(d) Award **ONE** mark for:

- friction.

ONE mark may be awarded for:

- air resistance;
- water resistance;
- drag.

Do not give credit for a response that includes incorrect science:

- gravity/weight.

Do not give credit for an insufficient response describing friction:

- (the force from the) air/water/wind.

1(L4)

(e) Award **ONE** mark for a response indicating that the big sail will have a greater pushing/blowing force on it:

- the force on the big sail is larger;
- there is more sail for the blowing force to act on;
- there is a bigger force because it has more sail to push;
- the small sail will not get as much pushing force so it will be slower.

ONE mark may be awarded for a response indicating that the big sail catches or traps more air/wind, pushing it along (faster/further):

- the bigger sail catches more wind and is pushed faster;
- more air will collect in the big sail to push it along.

Do not give credit for a response that includes incorrect science:

- air resistance makes the boat go faster.

Do not give credit for an insufficient response where the forces on the sail have not been described:

- the bigger the sail, the faster the boat [this is a consequence of a bigger force, not a description of the force];
- the big sail will catch the wind better;
- a bigger sail will catch more wind;
- the small sail does not get as much wind;
- the wind will blow the bigger sail faster [given].

1(L5)

[5]

4

(a) Award **ONE** mark for an indication that there are forces of attraction between the magnets **OR** that the magnets have opposite poles facing each other:

- they are attracted (to each other);
- because opposite poles attract;
- the tractor magnet pulls on the trailer magnet;
- because the North pole of the trailer's magnet is facing the South pole of the tractor's magnet.

Allow:

- the magnets stick/stay together;
- they are opposite poles.

Allow:

a response implicitly indicating that the magnet attracts the toy:

- the magnet attracts the trailer/tractor.

***Do not** give credit for an insufficient response where it is unclear as to whether Rachel's pulling force or the magnetic force is being discussed:*

- *because the force is pulling it.*

***Do not** give credit for an insufficient response:*

- *the magnets touch;*
- *opposite sides on the magnets are together.*

1(L4)

(b) Award **ONE** mark for an understanding that the magnets repel each other **OR** that the magnets have like poles facing each other:

- because the magnets are now repelling each other;
- because two like poles push each other away;
- she has put like poles together.

Allow:

- they are like poles;
- like poles do not attract;
- the tractor and trailer repel each other.

Allow:

a response implicitly indicating that the magnet repels the toy:

- the magnet repels the tractor;
- the magnet is pushing it away.

1(L4)

(c) (i) Award **ONE** mark for:

- friction.

Allow:

- air resistance.

1(L4)

(ii) Award **ONE** mark for:

- weight;
- gravitational attraction.

Allow:

- gravity.

1(L4)

(d) Award **ONE** mark for:

- floorboards
-

1(L5)

[5]