



7.3.5 Force Diagrams

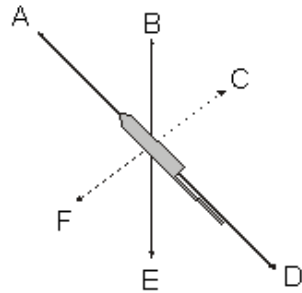


115 minutes



161 marks

Q1. The diagram shows a firework rocket.



- (a) Three forces act as the rocket flies through the air.
Which arrows show the directions of these three forces?

.....

3 marks

- (b) When there is no fuel left, the rocket falls to the ground.

- (i) Give the name of the force which pulls it down.

.....

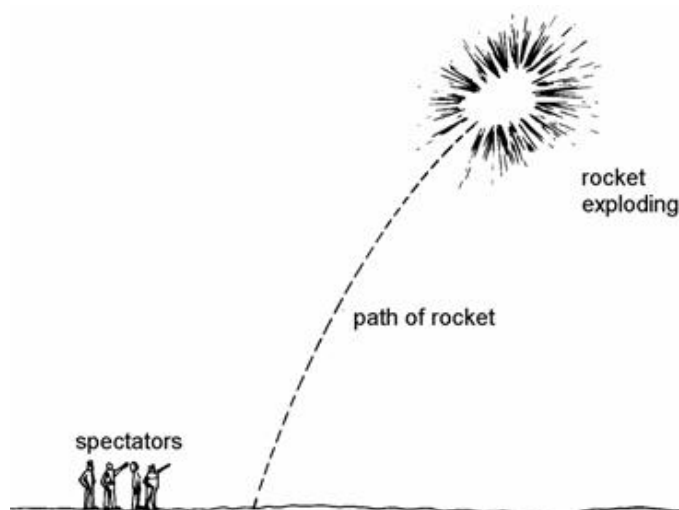
1 mark

- (ii) Give the name of the force which acts against the motion of the rocket.

.....

1 mark

- (c) Another rocket was sent high into the air. It exploded with a loud bang and a bright flash of light.



Put a tick in the box by the correct statement.

the bright flash of light was seen first

☐

the loud bang was heard first

☐

the flash of light was seen and the bang was heard at the same time

☐

1 mark

Give a reason for your answer.

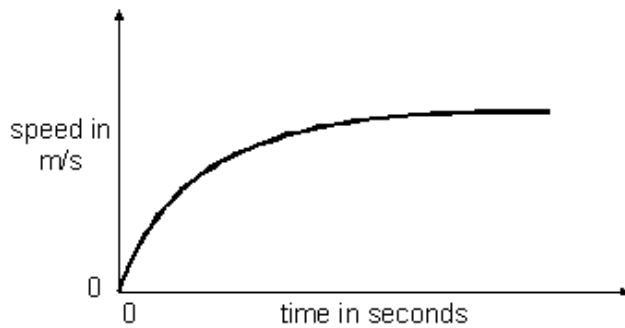
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1 mark

Maximum 7 marks

Q2. The graph shows the results of a test in which a car accelerates to its maximum speed.



(a) (i) Describe how the acceleration of the car changes after the car has started to move.

.....

.....

1 mark

(ii) How does the **resultant** force on the car change?

.....

.....

1 mark

The car has a mass of 1000 kg and the maximum forward force on the car, produced by the engine, is 4000 N.

It is claimed that the car will accelerate from 0 to 24 m/s in 6 seconds.

- (b) Use calculations, with the correct units, to show that the claim is false.

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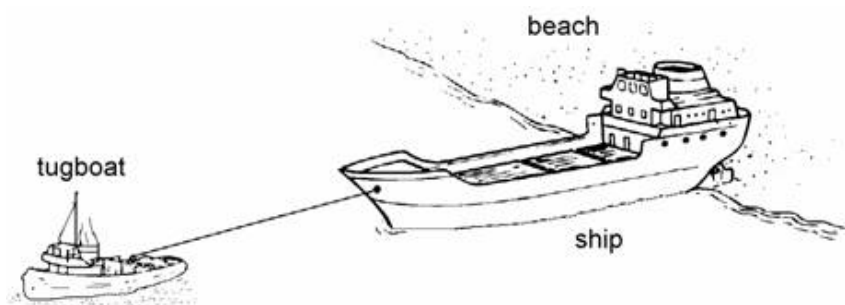
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3 marks
Maximum 5 marks

##

In a storm, a small ship was blown onto a beach. Now it is calm and there is no wind. A tugboat is trying to pull the ship off the beach.



- (a) The tugboat pulls the ship with a force of 25 000 N.

The ship does not move because of the force of friction acting on it.

- (i) Tick **one** box to show the size of the frictional force acting on the ship.

zero

☐

more than zero but less than 25 000 N

☐

25 000 N

☐

more than 25 000 N

☐

1 mark

- (ii) Add an arrow to the drawing to show the direction of the frictional force acting on the ship.

1 mark

- (b) When the tide is higher, the tugboat again pulls the ship with a steady force of 25 000 N. The ship begins to move.

Once the ship is off the beach, the tugboat continues to pull the ship with a force of 25 000 N.

A frictional force due to the water acts on the ship.

- (i) At first, the speed of the ship increases.

Tick **one** box to describe the frictional force acting on the ship while its speed is increasing.

zero

☐

more than zero but less than 25 000 N

☐

25 000 N

☐

more than 25 000 N

☐

1 mark

- (ii) After a short while, the ship reaches a steady speed. The tugboat continues to pull with a force of 25 000 N.

Tick **one** box to describe the frictional force acting on the ship while it is going at a steady speed.

zero

☐

more than zero but less than 25 000 N

☐

25 000 N

☐

more than 25 000 N

☐

1 mark

- (iii) The ship is towed to the north. What is the direction of the frictional force acting on the ship?

.....

1 mark

Maximum 5 marks

Q4. (a) Some of the statements in the list describe forces, and some do not.

Tick the boxes by the **three** forces.

the movement of a car travelling along a road

☐

the push of a jet engine on an aeroplane.

☐

the flow of electricity through a light bulb.

☐

the weight of a book on a table.

☐

the pull of a horse pulling a cart.

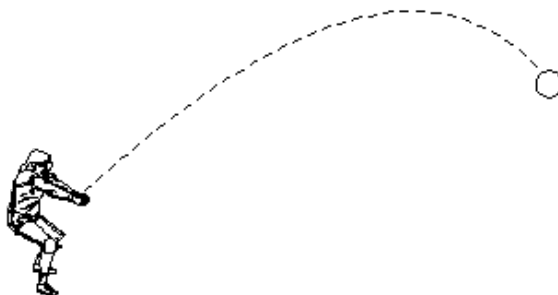
☐

the speed of a hockey ball flying through the air.

☐

3 marks

(b) A girl throws a ball. The diagram shows the path of the ball after she has thrown it.



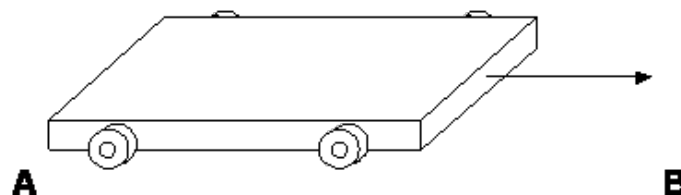
How can you tell from the **path** of the ball that there is a force acting on the ball?

.....

.....

1 mark

(c)



The drawing shows a trolley rolling along a table from **A** to **B**.
Then another force acts on the trolley. This is shown by the arrow on the drawing.

What effect does this force have?

Tick the correct box.

It makes the trolley go faster.

☐

It makes the trolley go slower.

☐

It makes the trolley change direction.

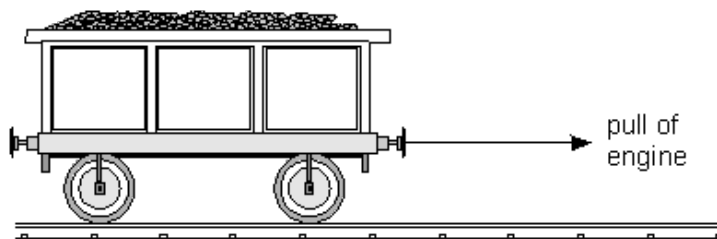
☐

It has no effect.

☐

1 mark
Maximum 5 marks

Q5.



- (a) A railway engine is being used to try to pull a wagon along a level track. The wagon's brakes are on, and the wagon does not move.

- (i) Draw **one** arrow on the diagram to show the direction of the force which prevents the wagon from moving.

1 mark

- (ii) Is the force which prevents the wagon from moving **greater than, equal to or less than** the pull of the engine?

.....

1 mark

- (b) (i) When the wagon's brakes are off, the engine pulls the wagon forwards. A frictional force also acts on the wagon. In what direction does the frictional force act?

1 mark

- (ii) The pull of the engine is 5000 N. When the wagon's speed is increasing, how large is the frictional force?
Tick the correct box.

zero

☐

between 0 and 5000 N

☐

5000 N

☐

more than 5000 N

☐

1 mark

- (c) After a while, the wagon travels at a steady speed. The engine is still pulling with a force of 5000 N.

How large is the frictional force now?
Tick the correct box.

zero

☐

between 0 and 5000 N

☐

5000 N

☐

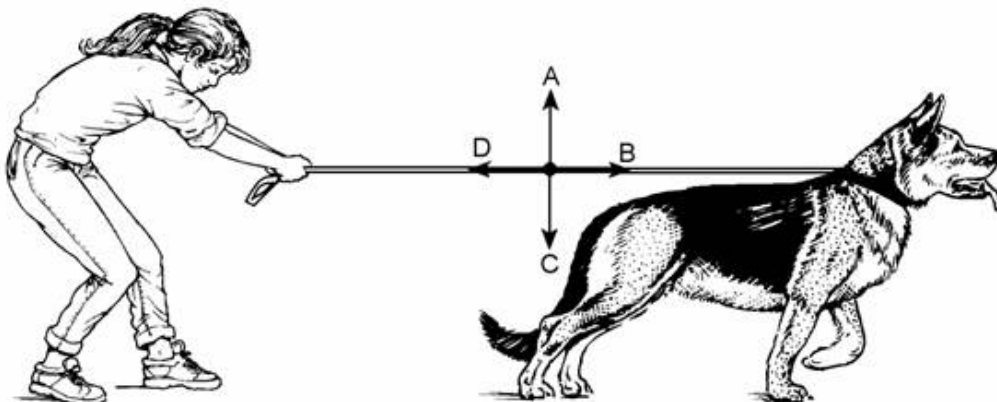
more than 5000 N

☐

1 mark

Maximum 5 marks

Q6.



- (a) Megan's dog is pulling on his lead.
Which arrow, A, B, C or D, shows the direction of this force?
Give the letter.

.....

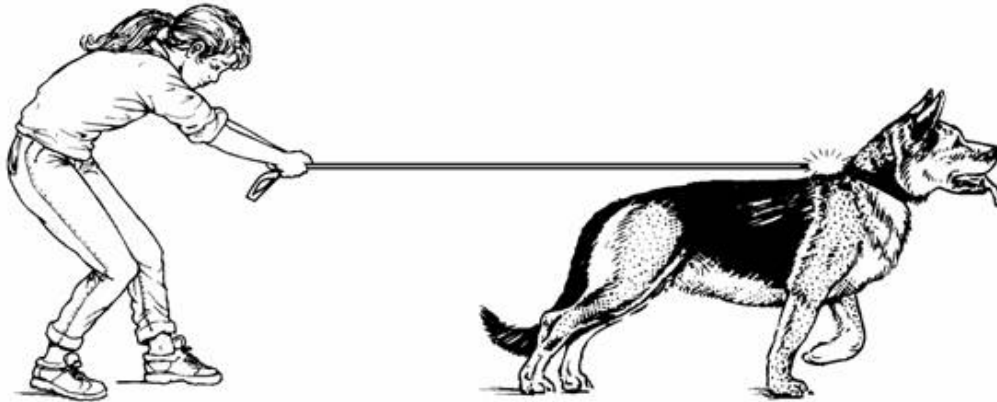
1 mark

- (b) Megan has to pull to keep the dog still.
Which arrow shows the direction of this force? Give the letter.

.....

1 mark

- (c) Suddenly the dog's collar breaks.



- (i) When the collar breaks, the lead moves.
Draw an arrow on the diagram to show which way the lead starts to move.

1 mark

- (ii) Why does the lead move when the collar breaks?

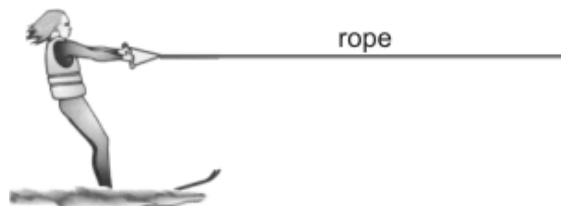
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.....

1 mark

Maximum 4 marks

- Q7.** The drawing shows Amy water-skiing.



- (a) (i) The rope is pulling Amy. Draw an arrow on the rope to show the direction of this force.
Label the arrow A.

1 mark

- (ii) Draw an arrow to show the direction of Amy's weight.
Label the arrow B.

1 mark

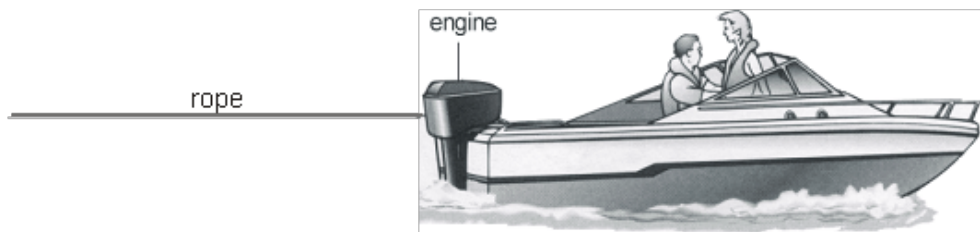
- (b) Give the names of **two** other forces which act on Amy or on her skis.

1.

2.

2 marks

The drawing below shows the speed boat which is pulling Amy along.



- (c) The rope which pulls Amy also exerts a force on the boat.
Draw an arrow on the rope to show the direction of this force.
Label the arrow C.

1 mark

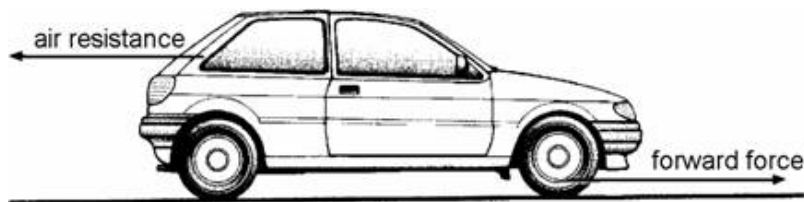
- (d) The force of the engine on the boat is increased.
What effect will this have on the speed of the boat?

.....

1 mark

Maximum 6 marks

- Q8.** When a car is being driven along, two horizontal forces affect its motion.
One is air resistance and the other is the forward force.



- (a) (i) Explain how molecules in the air cause air resistance.

.....
.....

1 mark

- (ii) Explain why air resistance is larger when the car is travelling faster.

.....
.....

1 mark

- (b) (i) Compare the sizes of the forward force and the air resistance when the car is speeding up.

The forward force is
.....

1 mark

- (ii) Compare the sizes of the two forces while the car is moving at a steady 30 miles per hour.

The forward force is
.....

1 mark

- (c) The forward force has to be larger when the car is travelling at a steady 60 mph than when it is travelling at a steady 30 mph. Why is this?

.....
.....

1 mark

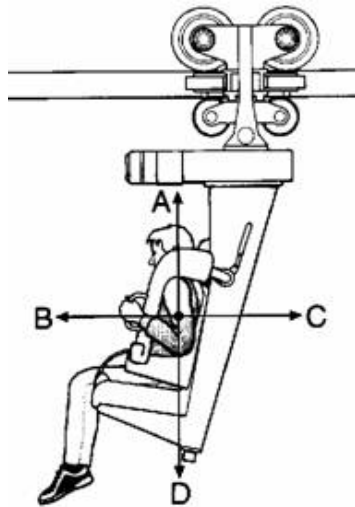
- (d) The forward force is the result of the tyres **not** being able to spin on the road surface. What is the name of the force that stops the tyres spinning?

.....

1 mark

Maximum 6 marks

- Q9.** (a) The diagram shows Alan sitting on a ride at a theme park.



- (i) Which arrow shows Alan's weight?

Give the correct letter.

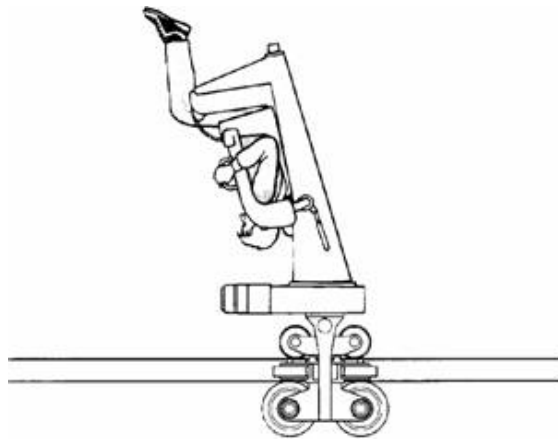
1 mark

- (ii) Alan begins to move forwards. Which arrow shows the force which makes Alan move faster?

Give the correct letter.

1 mark

- (b) During the ride, Alan is upside down.

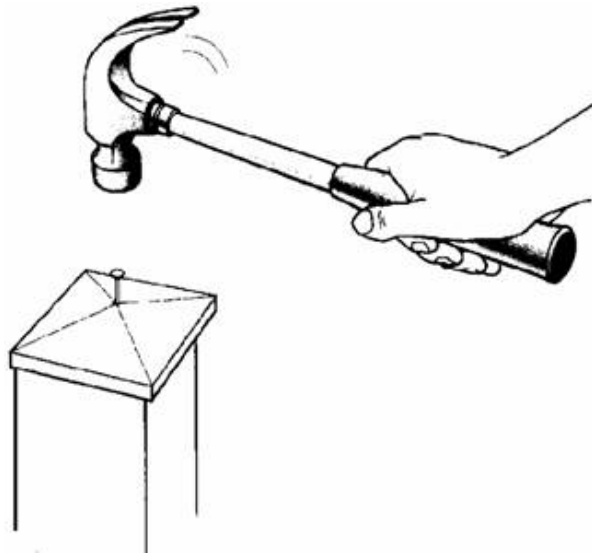


Draw an arrow on the diagram to show the direction of Alan's weight while he is upside down.

1 mark

Maximum 3 marks

- Q10.** A man was hammering nails into a wooden fence post.
The drawing shows the hammer just before it hit a nail.



- (a) The hammer hit the nail. What is the direction of the force of the hammer on the nail?

Draw an arrow on the diagram to show this.

1 mark

- (b) What effect did this force have on the nail?

.....

1 mark

- (c) How did the speed of the hammer change when the hammer hit the nail?

.....

1 mark

- (d) The hammer hit the nail again. The hammer was moving faster this time.
The size of the force of the hammer on the nail was different.
In what way was it different?

.....

1 mark

- (e) Mark could see the man mending the fence. The man was at the other end of a large field. Mark saw the man hit a nail with the hammer. One second later he heard the sound.

Why did Mark hear the sound **after** he saw the hammer hit the nail?

.....

.....

1 mark

- (f) Mark walked half way across the field, nearer to the man. Again he saw the hammer hit a nail, then heard the sound.

This time, how long was the gap between seeing and hearing the hammer hit the nail?

Tick the correct box.

longer than one second

☐

one second

☐

less than one second

☐

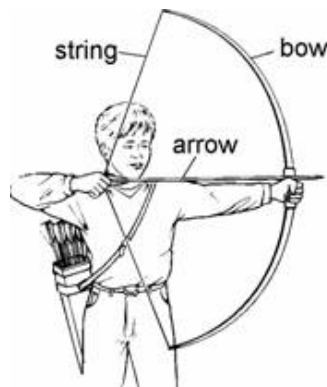
there was no gap

☐

1 mark
Maximum 6 marks

##

The drawing shows a boy with a bow and arrow. He is holding the **arrow** and pulling it back.



- (a) Two horizontal forces act on the arrow. These are the force exerted by the boy's hand and the force exerted by the string. The arrow is **not** moving.

The boy pulls the arrow with a force of 150 N. What is the size of the force exerted by the string on the arrow?

..... N

1 mark

- (b) When the boy lets go of the arrow, it starts to move forward.

Explain why it starts to move.

.....

.....

1 mark

- (c) The arrow flies across a field and hits a target.

Two forces act on the arrow while it is in the air. Air resistance acts in the opposite direction to the movement, and gravity acts downwards. These two forces **cannot** balance each other, even when they are the same size. Why is this?

.....

.....

1 mark

- (d) The arrow has a sharp pointed end. When the arrow hits the target, the sharp point exerts a very large pressure on the target.

Why does a sharp pointed end exert a larger pressure than a blunt end?

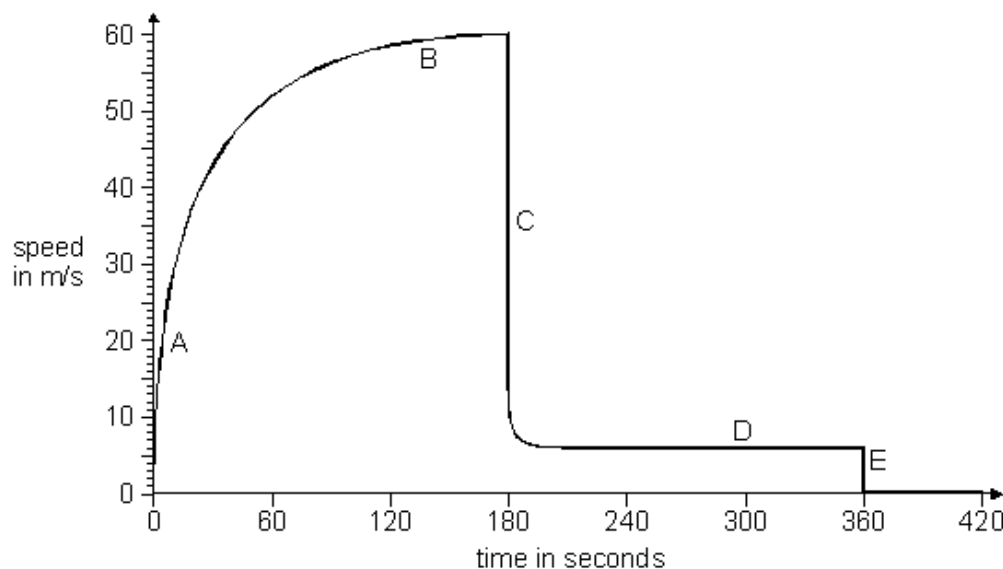
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1 mark

Maximum 4 marks

- Q12.** A sky-diver jumped out of an aeroplane. After falling for some time she opened her parachute. The graph below shows how the speed of the sky-diver changed from the moment she jumped out of the aeroplane until she landed on the ground.



- (a) What happened at 180 seconds and at 360 seconds after the sky-diver jumped out of the aeroplane?

180 seconds

360 seconds

2 marks

- (b) There was an increase in air resistance on the sky-diver as her speed increased. Explain how the graph shows this.

.....

.....

1 mark

- (c) Two sections of the graph show where the air resistance was equal and opposite to the sky-diver's weight. Which sections are they?

Give the letters.

..... and

1 mark

- (d) (i) Use the graph to estimate how far the sky-diver fell between 180 s and 360 s.

.....

.....

1 mark

- (ii) Why can this only be an approximate figure?

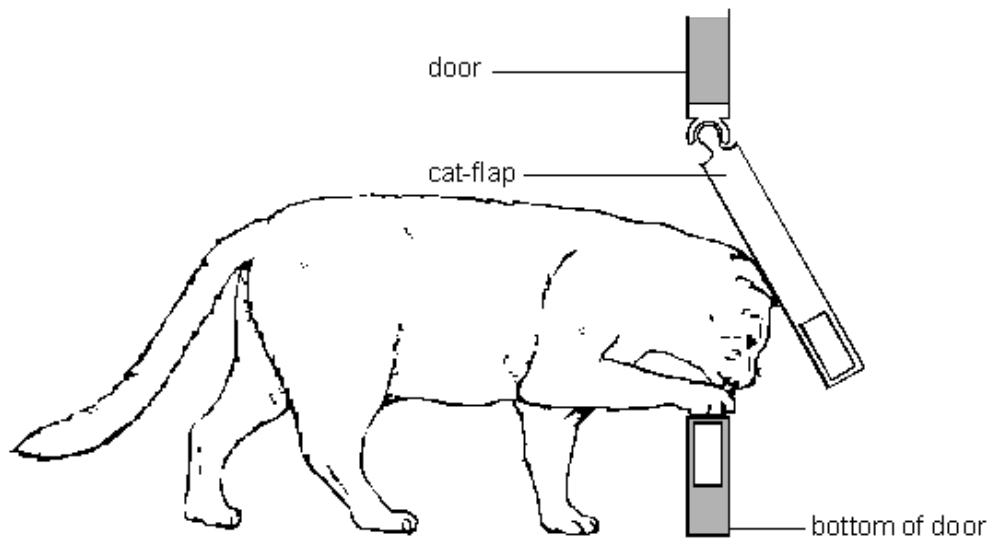
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.....

1 mark

Maximum 6 marks

Q13. Ali made a cat-flap to fit into a door.



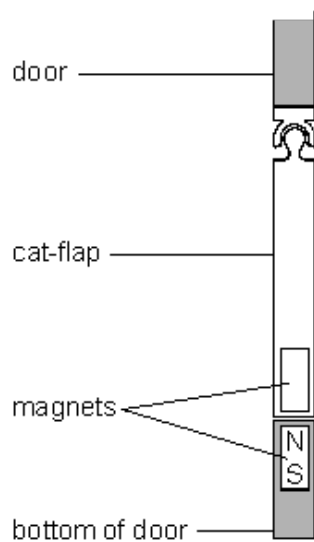
- (a) (i) On the diagram above, draw an arrow to show the direction of the force of the cat's head on the cat-flap.

1 mark

- (ii) Add a label to the diagram to show the pivot of the cat-flap. Label it P.

1 mark

When the cat has gone through the cat-flap, the weight of the cat-flap makes the flap close.



- (b) Ali used two bar magnets to keep the cat-flap closed, so that it does **not** blow open in the wind.

On the diagram above, label **both** the North and South poles on the magnet in the cat-flap.

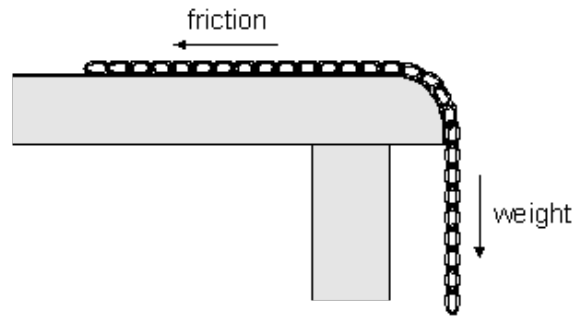
1 mark

- (c) Friction at the pivot made the cat-flap squeak. What could Ali put on the pivot to make the friction less?

.....

1 mark
Maximum 4 marks

- Q14.** The diagram shows a chain hanging down over the edge of a table.



Two of the forces on the chain are:

- the weight of the part of the chain which is hanging over the edge;
- friction between the chain and the table.

- (a) The chain is **not** moving. What does this tell you about these two forces acting on the chain?

1 mark

- (b) The chain is moved slightly to the right. It begins to slide off the table.

- (i) What does this tell you about these two forces now?

.....

1 mark

- (ii) Describe how the size of each force changes as the chain slides off the table.

- weight of the part of the chain hanging over the edge

.....

- friction between the chain and the table

.....

2 marks

(iii) How does the speed of the chain change as it slides off the table?

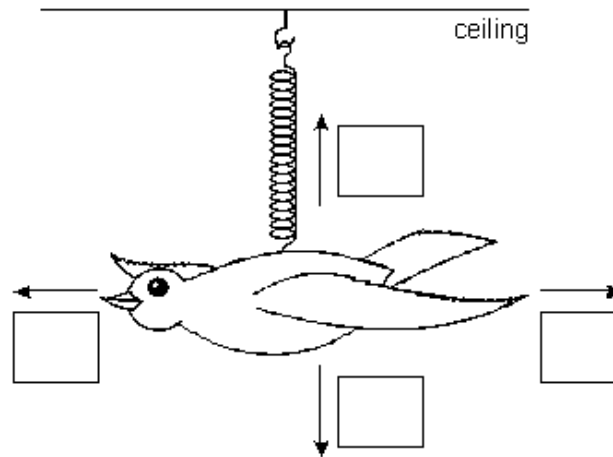
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1 mark
Maximum 5 marks

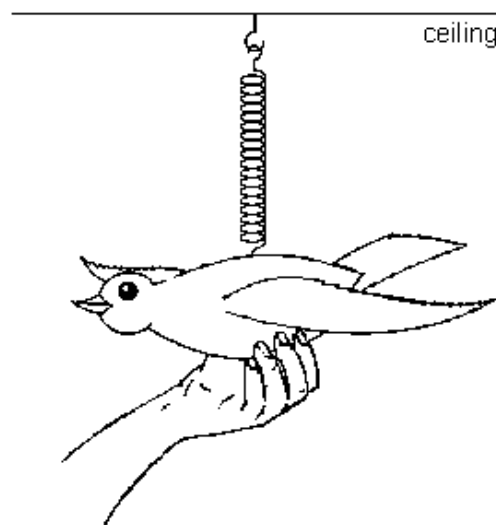
Q15. Anne has a toy bird on a spring.

- (a) Which arrow shows the direction of the force of gravity on the bird? Tick the box by the correct arrow.



1 mark

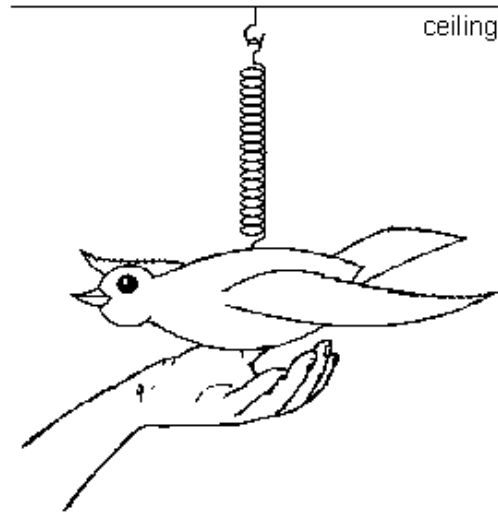
- (b) Anne pulls the toy bird down. On the diagram below, draw an arrow to show the direction of Anne's force on the bird. Label the arrow F.



1 mark

(c) Anne lets go of the bird.

- (i) On the diagram below, draw an arrow to show which way the bird will start to move. Label this arrow M.



1 mark

- (ii) What makes the bird move in this direction?

.....

1 mark

- (d) The bird bounces up and down for several minutes, and then stops. Why does the bird stop moving?
Tick the correct box.

Air resistance slows it down.

☐

Gravity gets less.

☐

The bird gets heavier.

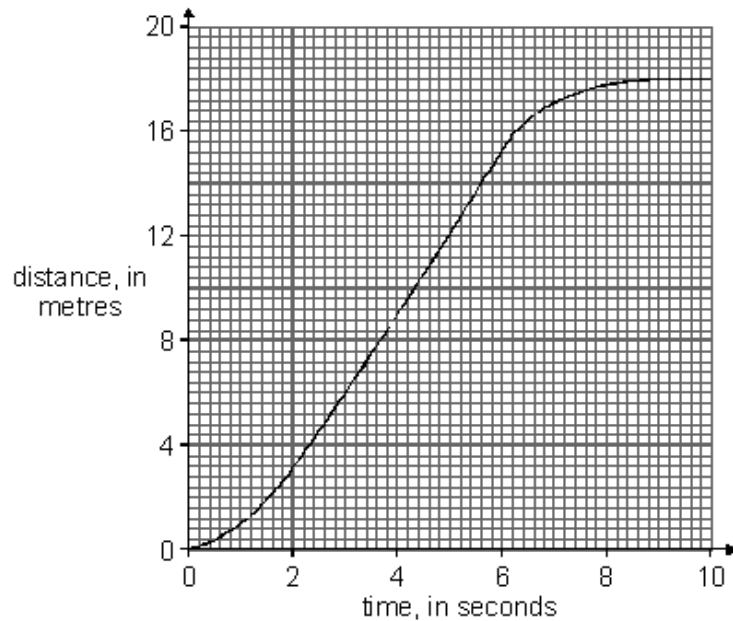
☐

The spring stretches.

☐

1 mark
Maximum 5 marks

- Q16.** A remote-controlled car was timed over a period of 10 seconds.
A graph of **distance** against **time** is shown below.



- (a) Describe the motion of the car between:

- (i) 2 seconds and 6 seconds;

.....

1 mark

- (ii) 9 seconds and 10 seconds.

.....

1 mark

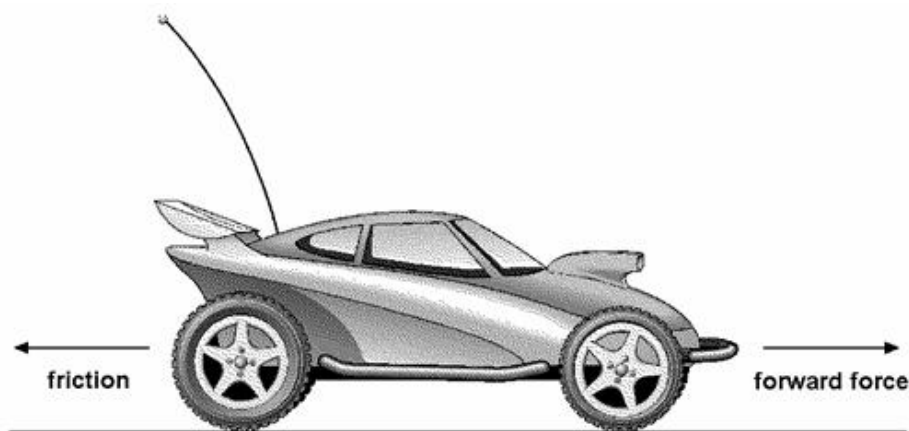
- (b) Calculate the average speed of the car between 0 and 10 seconds.
Give the unit.

.....

.....

2 marks

- (c) The diagram below shows **two** of the forces acting on the car when it is moving.



- (i) When the motor was switched off, the car slowed down and then stopped.

While the car was slowing down, which of the following was true? Tick the correct box.

Friction was zero and the forward force was greater than zero.

☐

The forward force was zero and friction was greater than zero.

☐

Friction was zero and the forward force was zero.

☐

The forward force and friction were both greater than zero.

☐

1 mark

- (ii) Use the graph to find the time when the car started to slow down.

The car started to slow down after s.

1 mark

Maximum 6 marks

- Q17.** (a) Megan was doing time-trials on her bike around a 400 metre horizontal track.

- (i) She took 32 seconds to travel 400 m.
What was her average speed? Give the unit.

.....
.....

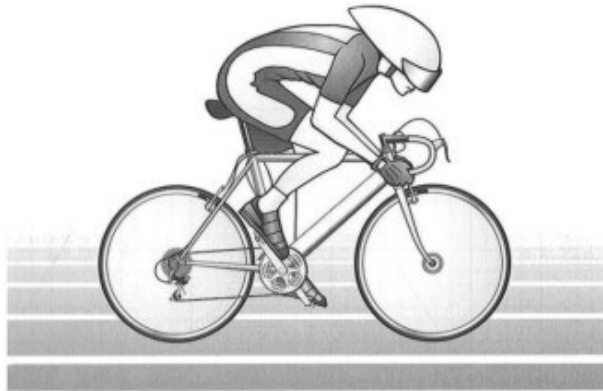
1 mark

- (ii) Compare the forward force on the bike with the backward force on the bike when Megan was travelling at a constant speed.

.....
.....

1 mark

- (b) Megan then crouched down over the handlebars to make herself more streamlined, as shown below.
She continued to pedal with the same force as before.



Compare the forward and backward forces on Megan and her bike now.

.....
.....

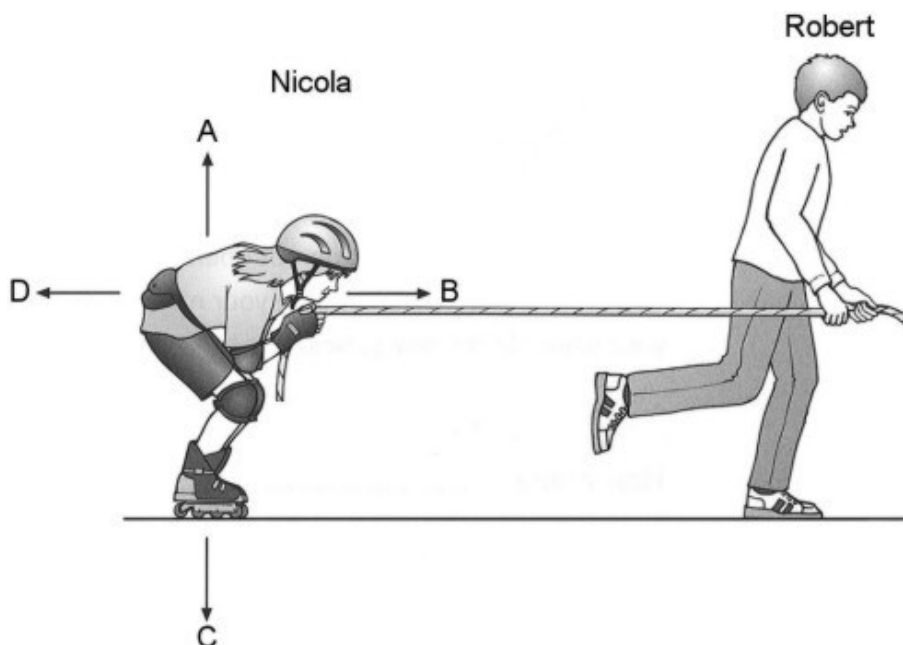
1 mark

Explain your answer.

.....
.....

1 mark
maximum 4 marks

- Q18.** (a) Nicola is trying out her new roller blades. Robert is pulling her along with a rope. Arrows A, B, C and D show the directions of four forces acting on Nicola.



- (i) Which arrow shows the direction of the force of **gravity** on Nicola?
Give the letter.

.....

1 mark

- (ii) Which arrow shows the direction of the force of the **rope** on Nicola?
Give the letter.

.....

1 mark

- (b) Robert pulls Nicola at a steady speed of 2 metres per second. How far will Nicola travel in 10 seconds?

..... metres

1 mark

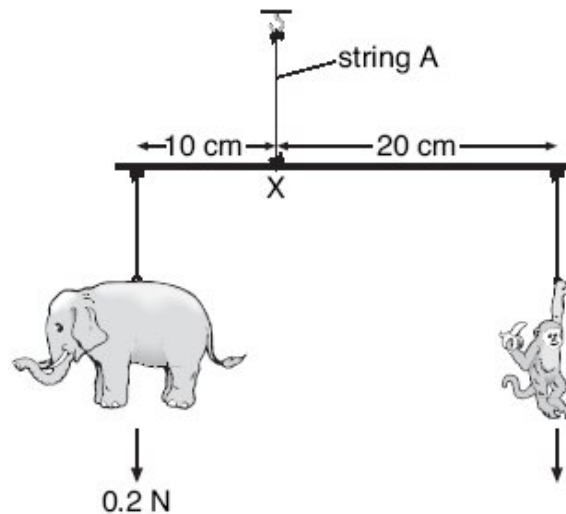
- (c) Nicola lets go of the rope and she slows down. Gravity still acts on Nicola.

Give the name of **one** other force still acting on Nicola after she lets go of the rope.

.....

1 mark
maximum 4 marks

- Q19.** A father makes a simple mobile for his young son. He uses plastic animals as shown below.



- (a) (i) The elephant weighs 0.2 N.

What is the turning moment produced by the elephant about point X?
Give the unit.

.....

.....

2 marks

(ii) What is the turning moment produced by the monkey about point X?

.....
.....

1 mark

(iii) What is the weight of the monkey?

..... N

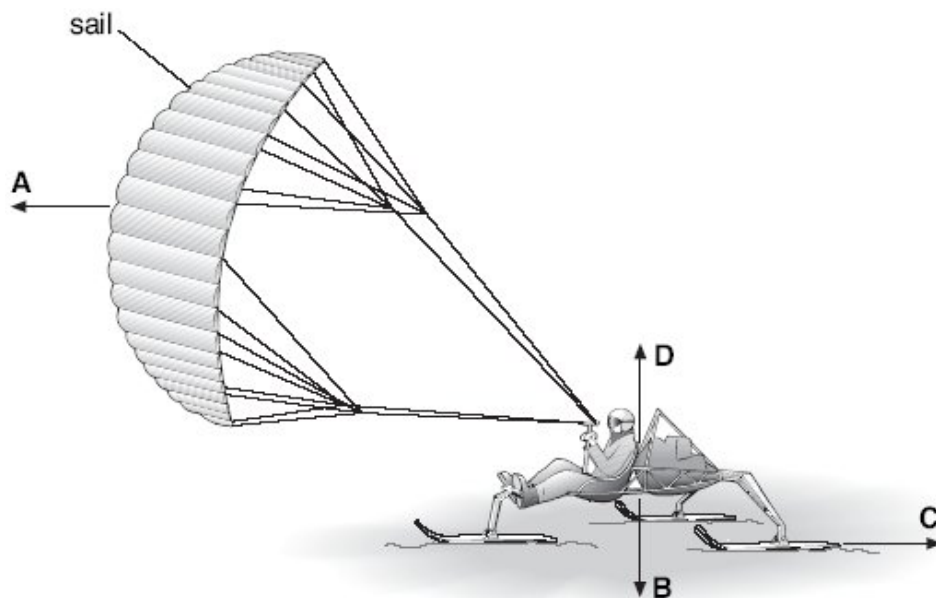
1 mark

(b) What is the size of the tension (force) in string A?

..... N

1 mark
maximum 5 marks

Q20. The drawing shows a snow-buggy being pulled by a sail. The buggy rests on three skis on the snow.



- (a) The drawing shows four forces that act when the snow-buggy is moving.

Draw a line from each force in the list below to the correct letter from the diagram.

Draw only **three** lines.

force	letter
the weight of the buggy	A
the force pulling the buggy along	B
the friction between the skis and the snow	C
	D

3 marks

- (b) A scientist travelled 80 kilometres (km) each day in the buggy.

How many kilometres did he travel in 10 days?

..... km

1 mark

- (c) The buggy carried the scientist, food and equipment for the journey.
The table shows how the total mass changed.

	total mass at start of journey (kg)	total mass at end of journey (kg)
mass of buggy, scientist, food and equipment	295	130

The buggy sank deeper into the snow at the start of the journey than at the end.

Why did it sink deeper at the start? Use the table to help you.

.....
.....

1 mark

- (d) The buggy rests on three skis instead of three wheels.

Why are skis better than wheels for travelling on snow?

.....
.....

1 mark

- (e) When a bigger sail is used, the buggy goes faster.

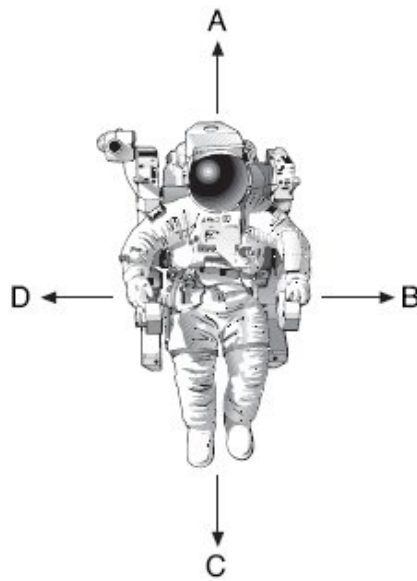
How does a bigger sail help the buggy to go faster?

.....

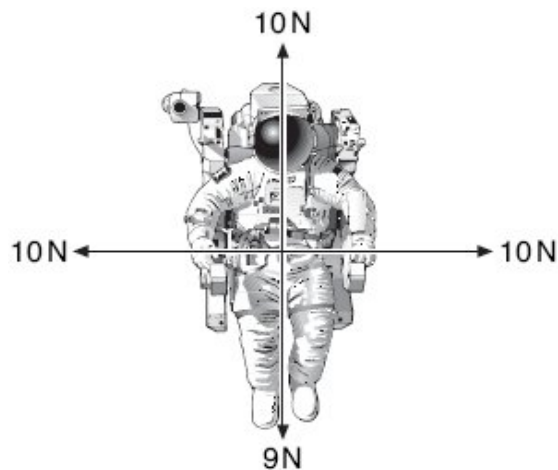
.....

1 mark
maximum 7 marks

- Q21.** The drawing below shows an astronaut in space.
He has four small jets attached to his space suit.
These jets produce forces on the **astronaut** in the directions A, B, C and D.



- (a) The drawing below shows the size and direction of four forces acting on the astronaut.



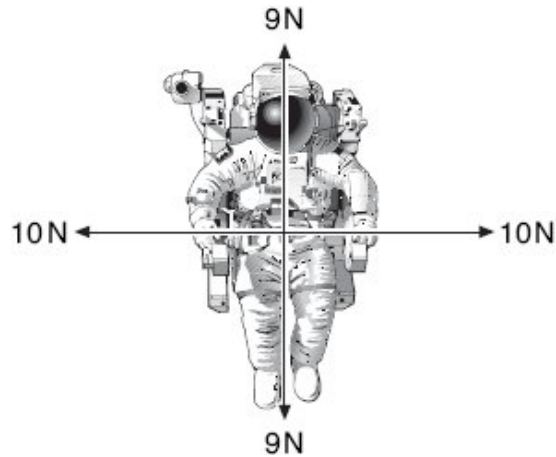
In which direction, A, B, C or D, will the astronaut move?

Give the letter.

.....

1 mark

- (b) The drawing below shows the size and direction of four different forces acting on the astronaut.



What will happen to the astronaut when the jets produce these four forces?

.....

1 mark

Explain your answer.

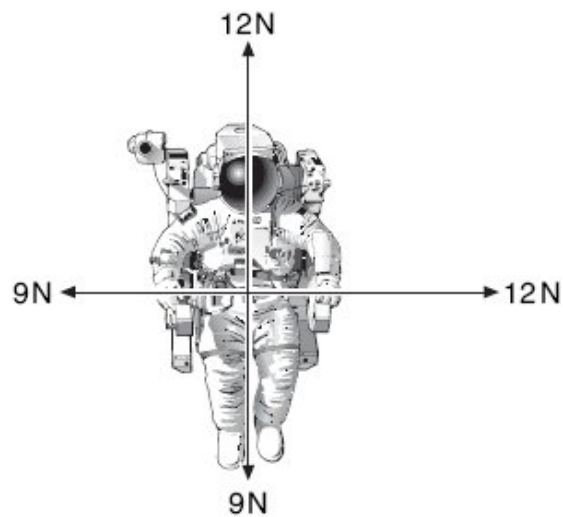
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1 mark

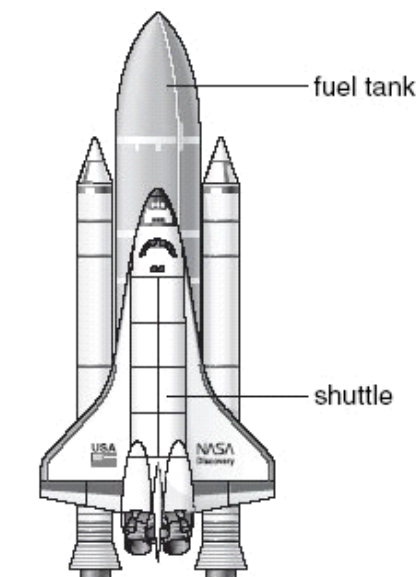
- (c) The drawing below shows the size and direction of four different forces acting on the astronaut.

Draw an arrow on the diagram below to show the direction in which he will move.



1 mark
maximum 4 marks

- Q22.** The shuttle is a spacecraft which is used to take satellites into space.
The drawing below shows the shuttle just about to take off.



- (a) The shuttle has a separate fuel tank containing liquid hydrogen and liquid oxygen.

Explain why hydrogen and oxygen are transported as liquids rather than as gases.

.....

.....

1 mark

- (b) Oxygen is needed to burn the fuel in the shuttle's engines.
Vehicles on Earth do **not** need a tank containing oxygen.

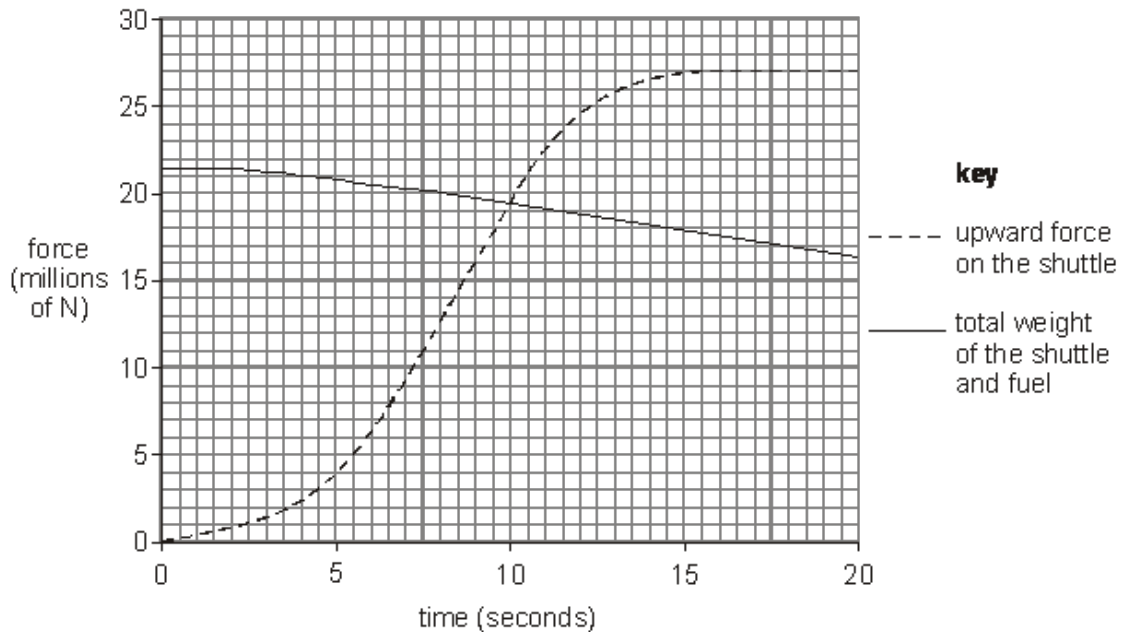
Why does the shuttle need to have a tank containing oxygen?

.....

.....

1 mark

- (c) The graph below shows how the upward force and the weight of the shuttle, including fuel, change during the first 20 seconds, after the fuel is ignited.



Why does the total weight of the shuttle **decrease** during the first 20 seconds?

.....

1 mark

- (d) (i) Look at the graph. At 20 seconds, what is the value of:
 the upward force on the shuttle?

..... millions of N

the total weight of the shuttle and fuel?

..... millions of N

1 mark

- (ii) At 20 seconds, what is the **resultant** force on the shuttle?

..... millions of N

1 mark

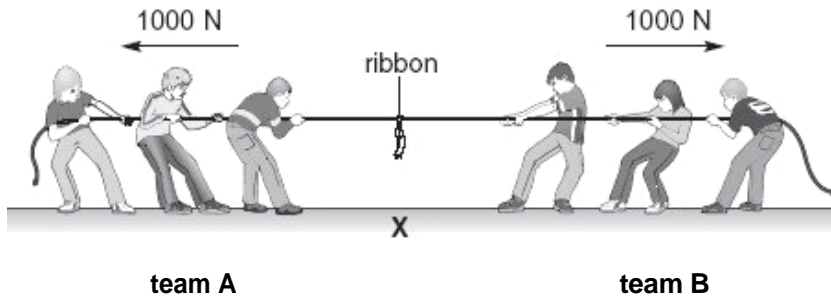
- (iii) Use the graph to explain why the shuttle **cannot** take off before 10 seconds.

.....

1 mark
 maximum 6 marks

Q23. The drawings in parts (a), (b) and (c) show two teams of pupils in a tug-of-war. There is a ribbon tied to the middle of the rope.

(a) The sizes and directions of the forces of each team are shown.



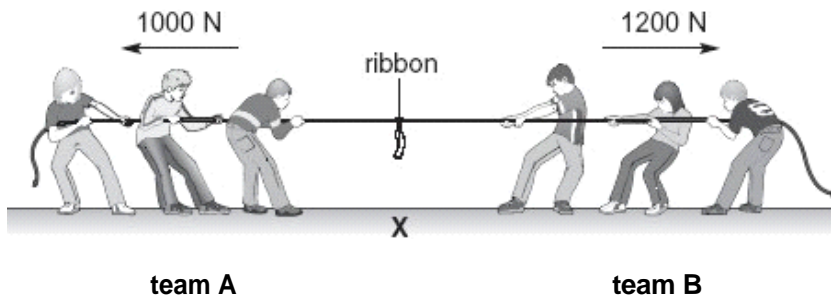
The ribbon stays above point X on the ground.
Give the reason for this.

.....

.....

1 mark

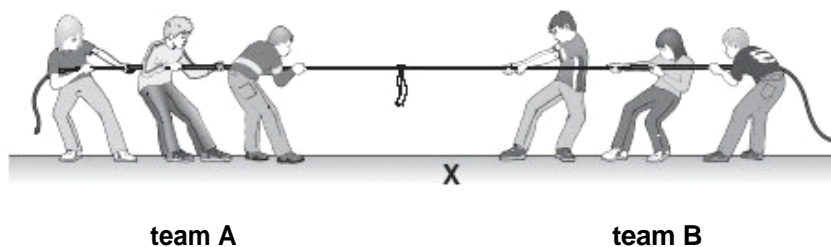
(b) The teams then pull with the forces shown below.



Draw an arrow on the rope to show the direction in which the ribbon will move.

1 mark

(c) Later, the ribbon was to the left of point X as shown below.



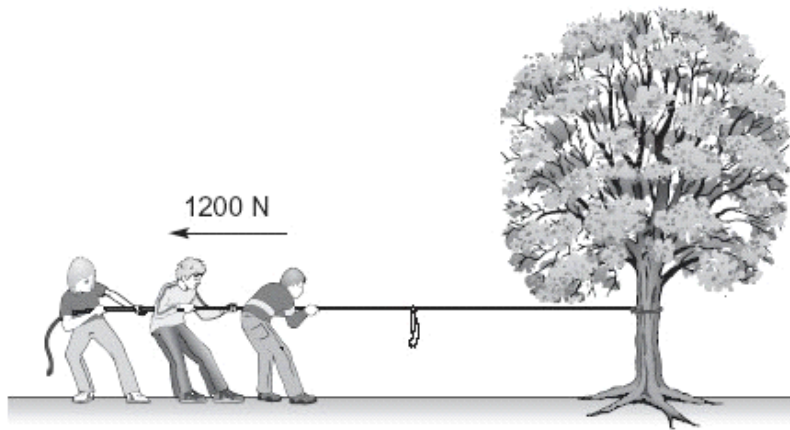
Why did the ribbon move towards the left?

.....

.....

1 mark

- (d) Team A practises by pulling a rope tied to a tree.



The team pulls with a force of 1200 N but the tree does **not** move.

What is the force of the tree on the rope?

Tick the correct box.

zero ☐ less than 1200 N ☐ 1200 N ☐ more than 1200 N ☐

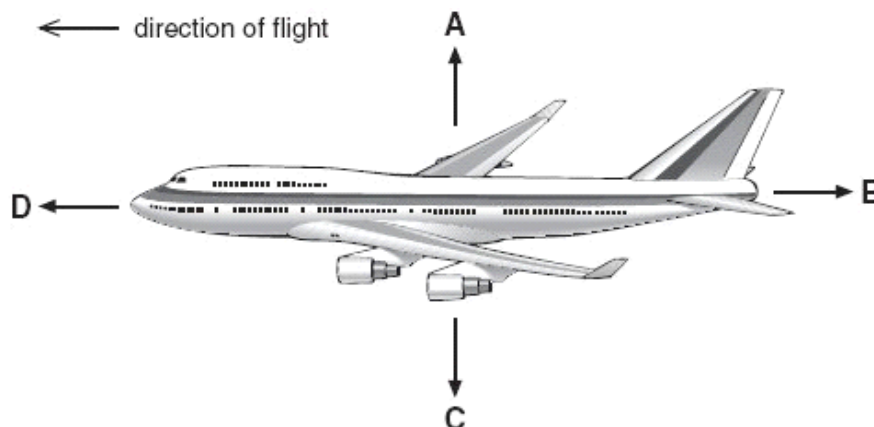
1 mark

- (e) The pupils do **not** slip because there is a force between their shoes and the ground. What is the name of this force?

.....

1 mark
maximum 5 marks

- Q24.** The diagram shows four forces acting on a plane in flight.



- (a) Which arrow represents air resistance?
Give the letter.

.....

1 mark

- (b) (i) When the plane is flying at a constant height, which **two** forces must be balanced?
Give the letters.

..... and

1 mark

- (ii) When the plane is flying at a constant speed in the direction shown, which **two** forces must be balanced?
Give the letters.

..... and

1 mark

- (c) (i) Just before take-off, the plane is speeding up along the ground.

Which statement is true?
Tick the correct box.

Force B is zero.

☐

Force B is greater than force D.

☐

Force D is equal to force B.

☐

Force D is greater than force B.

☐

1 mark

- (ii) Which statement is true about the plane just as it leaves the ground?
Tick the correct box.

Force C is zero.

☐

Force C is greater than force A.

☐

Force A is equal to force C.

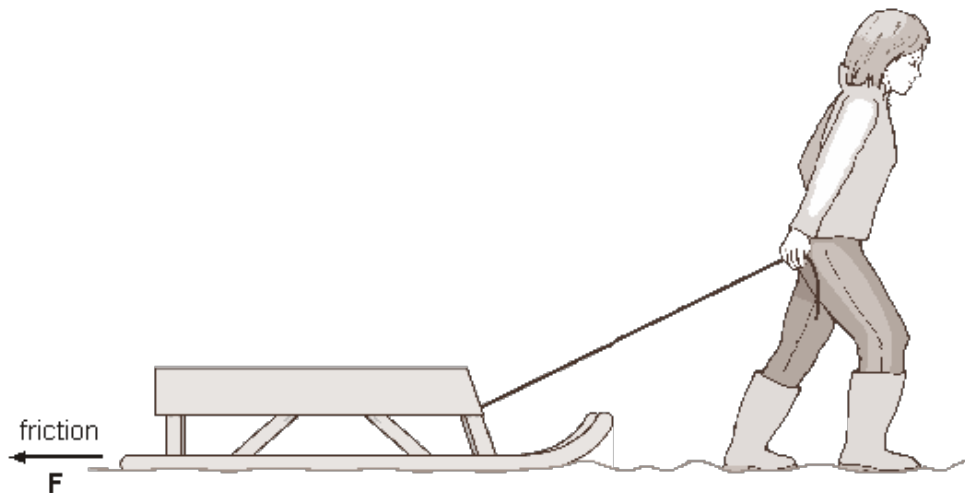
☐

Force A is greater than force C.

☐

1 mark
maximum 5 marks

Q25. Sally pulls a sledge in the snow.



- (a) (i) Draw an arrow on the rope to show the direction of the force of the rope on the sledge.

Label the arrow **R**.

- (ii) Draw an arrow on the diagram to show the direction of the force of gravity on the sledge.

Label the arrow **G**.

2 marks

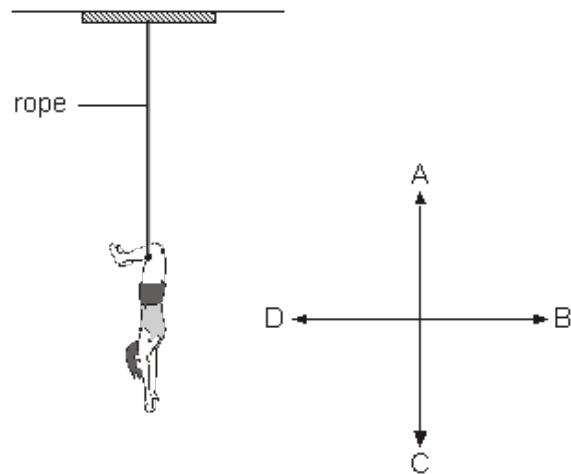
- (b) Force **F** is the friction between the sledge and the snow.
Sally then pulled the sledge over a concrete path.

Friction is less on snow than on concrete.
Give the reason for this.

.....

1 mark
maximum 3 marks

Q26. The diagram below shows Jo hanging on a trapeze (swing) in a circus.



- (a) (i) Which arrow, A, B, C or D, shows the direction of Jo's weight?

.....

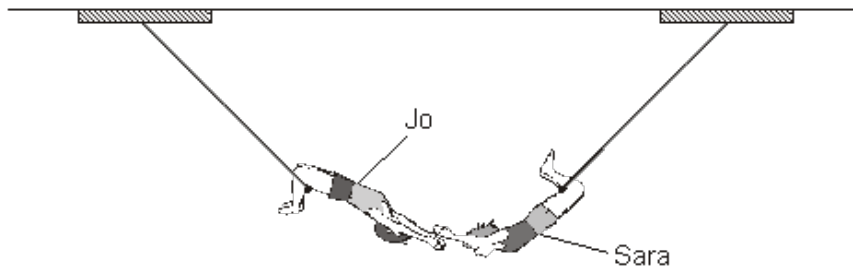
1 mark

- (ii) Which arrow, A, B, C or D, shows the direction of the force of the rope on Jo?

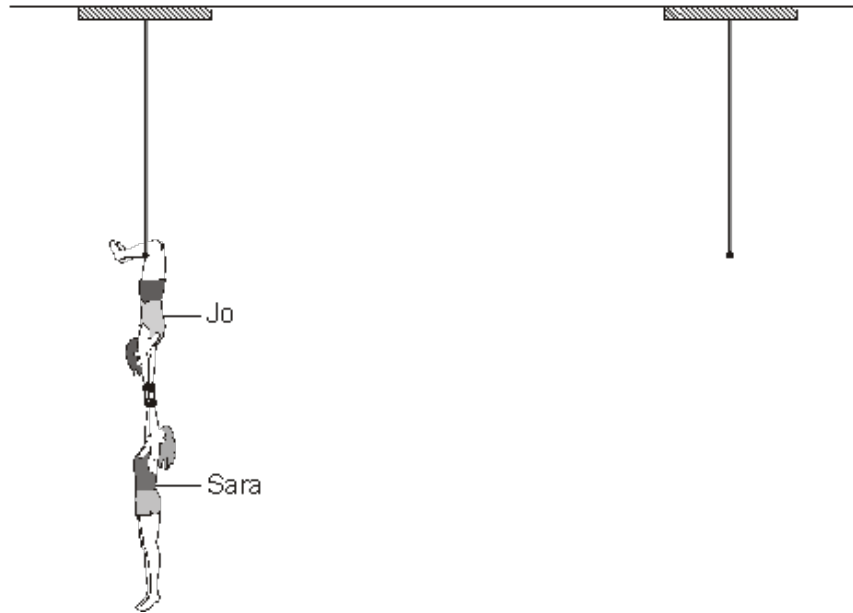
.....

1 mark

- (b) Sara swings towards Jo.



Sara lets go of her trapeze and Jo catches her.



- (i) What happens to the downward force on the rope of Jo's trapeze?
Tick the correct box.

increases

decreases

stays the same

there is **no** force

☐
☐
☐
☐

1 mark

- (ii) Explain your answer.

.....

1 mark

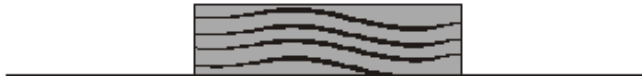
- (c) Jo lets go of the trapeze and both Sara and Jo fall into a safety net below them.

What happens to the downward force on the rope when Jo lets go?

.....

1 mark
maximum 5 marks

- Q27.** (a) Tasha puts a small block of wood on a smooth surface.



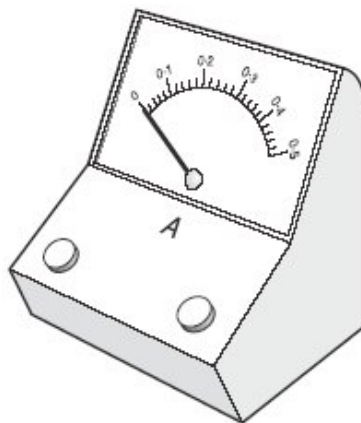
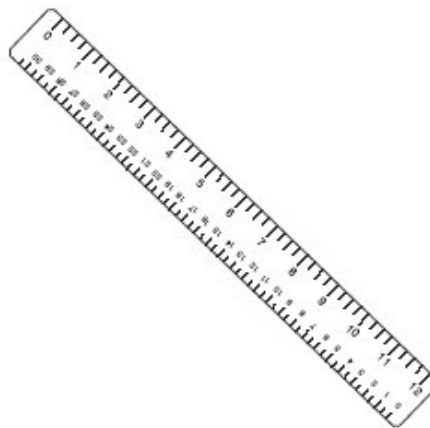
She puts different forces on the block.
The diagrams below show the size and direction of these forces.

Will each block move to the **left**, to the **right** or **stay still**?
Tick the correct box in each row.

forces on block		moves to the left	moves to the right	stays still	
		←	→		
(i)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1 mark
(ii)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1 mark
(iii)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1 mark
(iv)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1 mark

- (b) (i) Which piece of equipment should Tasha use to measure the forces on the block?

Tick the correct box.

☐☐☐☐

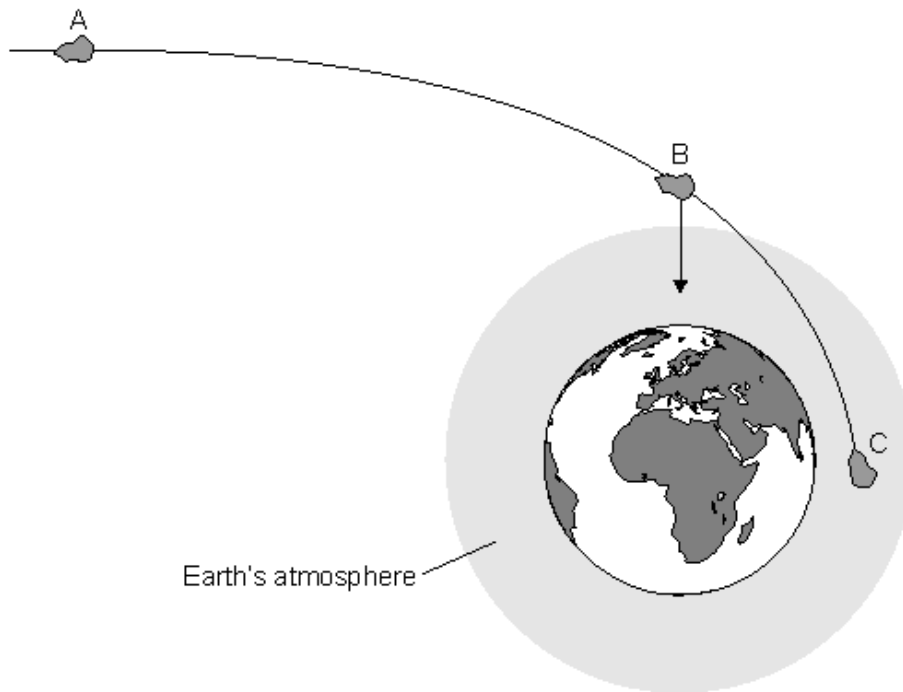
1 mark

- (ii) Give the name of the equipment used to measure force.

.....

1 mark
maximum 6 marks

- Q28.** The diagram below shows the path of a meteor as it gets closer to the Earth. The meteor is shown in three positions: A, B and C.



not to scale

- (a) The path of the meteor is affected by the Earth's gravity.
The arrow shows the direction of the force due to gravity acting on the meteor at B.
- (i) **On the diagram** draw an arrow to show the direction of the force of gravity on the meteor at A.
Use a ruler.
- 1 mark
- (ii) **On the diagram** draw an arrow to show the direction of the force of gravity on the meteor at C.
Use a ruler.
- 1 mark
- (iii) How does the force of gravity on the meteor change as it travels from A to C?
-
- 1 mark
- (b) What happens to the speed of the meteor as it travels from A to B?
-
- 1 mark

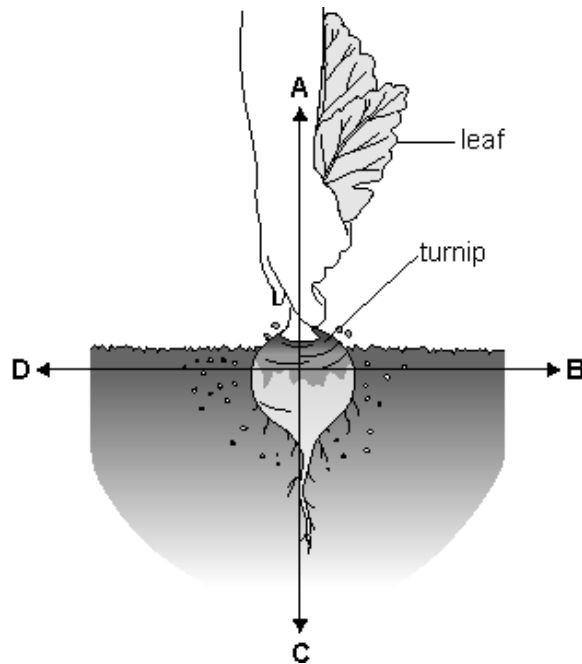
- (c) When the meteor enters the Earth's atmosphere, three forces act on the meteor. Gravity and upthrust are two of these forces.

Give the name of the **other** force.

.....

1 mark
maximum 5 marks

- Q29.** The drawing below shows Rebekah **pulling** a turnip out of the ground.

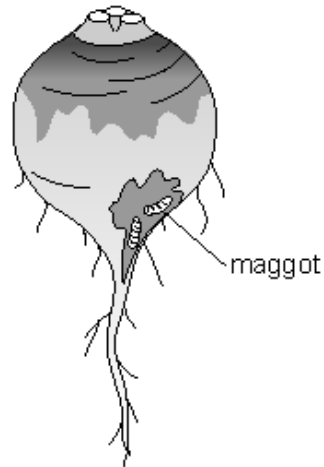


- (a) Which arrow, **A**, **B**, **C** or **D**, shows the direction of force of Rebekah's hand on the turnip?

.....

1 mark

- (b) The drawing below shows root maggots eating a turnip. The maggots damage the roots.



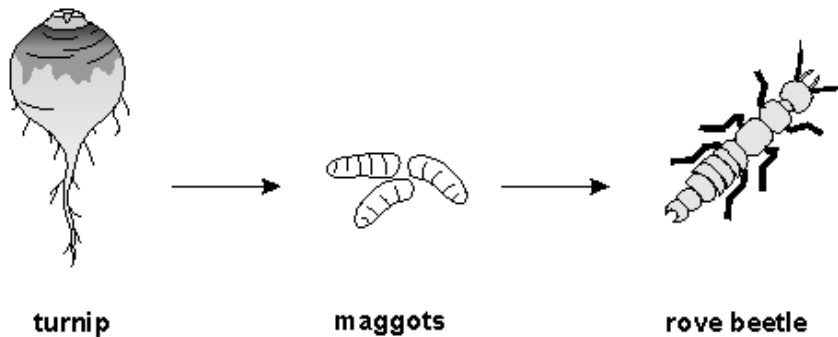
Damaged roots do **not** grow very well.

Complete the sentence below.

Damaged roots **cannot** take up as much and
..... from the soil.

2 marks

- (c) The drawing below shows a food chain including a rove beetle.



not to scale

Which word describes a rove beetle?
Tick the correct box.

herbivore

☐

predator

☐

prey

☐

producer

☐

1 mark

(d) Turnip plants make food by photosynthesis.

(i) Which part of a plant makes food?

.....

1 mark

(ii) What will the turnip plant use stored food for?

.....

1 mark
maximum 6 marks

Q30. A gannet is a type of sea bird.



(a) When a gannet flies at a **constant height** above the sea, there is a downward force of 30N on the gannet.

What is the size of the upward force on the gannet?
Tick the correct box.

less than 30N

☐

exactly 30N

☐

more than 30N

☐

need more information

☐

1 mark

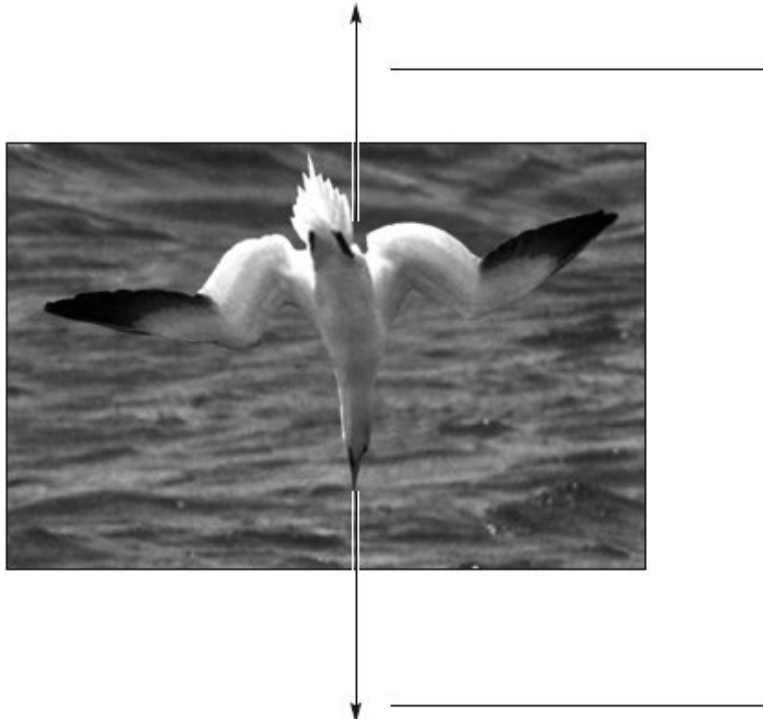
- (b) To catch food, the gannet dives down into the sea.
What is the useful energy transfer when the gannet dives?
Choose words from the box below.

thermal	gravitational potential	sound	kinetic	light
----------------	--------------------------------	--------------	----------------	--------------

When the gannet dives, energy is
transferred to energy.

2 marks

- (c) Label the arrows to show the **names** of the forces acting on the gannet as it dives.



2 marks

- (d) Gannets have pockets of air between their muscles and their skin.
Suggest how this is a good adaptation for gannets when they hit the water at fast speeds.

.....
.....

1 mark

- (e) The gannet releases energy through respiration.
An aeroplane also releases energy when fossil fuels burn.

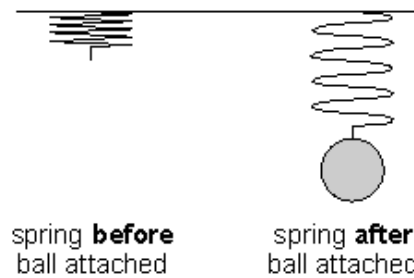
Write **two** other ways that respiration and burning are similar.

1

2

2 marks
maximum 8 marks

- Q31.** (a) John attaches a ball to a spring. The diagram below shows what happens.



- (i) Which arrow shows the direction of the **force of the ball on the spring**?
Tick the correct box.



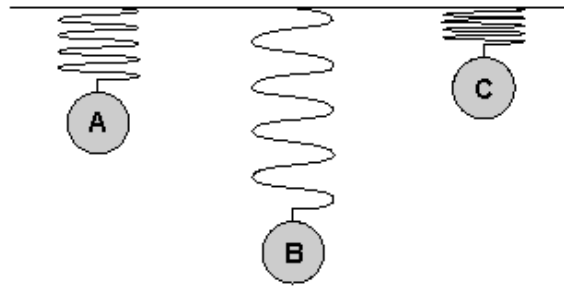
1 mark

- (ii) Which arrow shows the direction of the **force of the spring on the ball**?
Tick the correct box.



1 mark

- (b) The diagram below shows three metal balls attached to **identical** springs.



Which ball is the heaviest?
Write the letter.

.....

1 mark

Explain your answer.

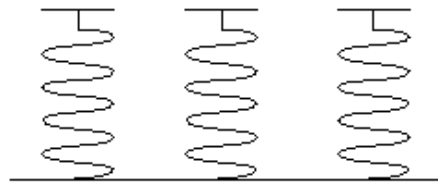
.....

.....

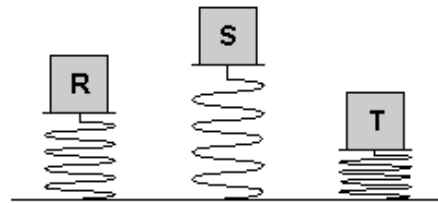
1 mark

- (c) John has another three **identical** springs.
He puts a cube on each spring. Each cube has a different mass.

The diagrams below show the springs before and after John added the cubes.



springs **before** adding the cubes



springs **after** adding the cubes

Which cube is the heaviest?
Write the letter.

.....

1 mark

Explain your answer.

.....

.....

1 mark
maximum 6 marks

