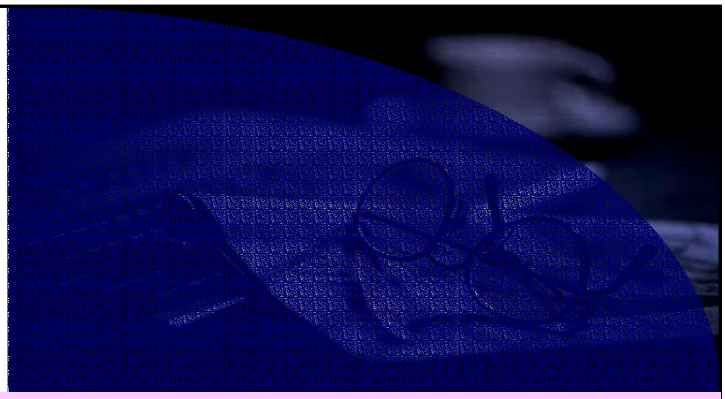
assessment for learning

year 9



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9K Speeding up

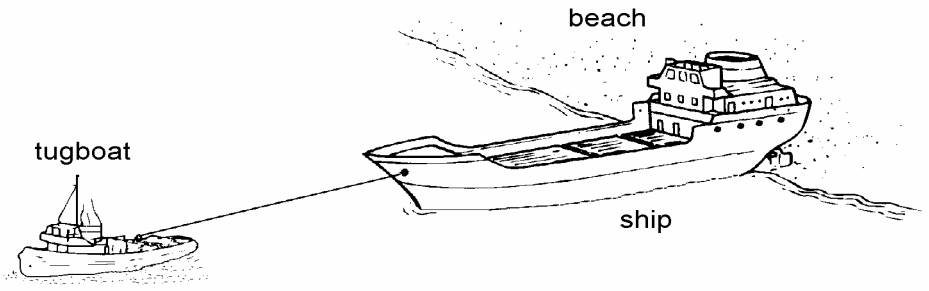
Assessment for learning...year 9 (level 3-6)

Answer all questions:

Total marks	**24**
Time allowed	**25 mins.**

Question 1:

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

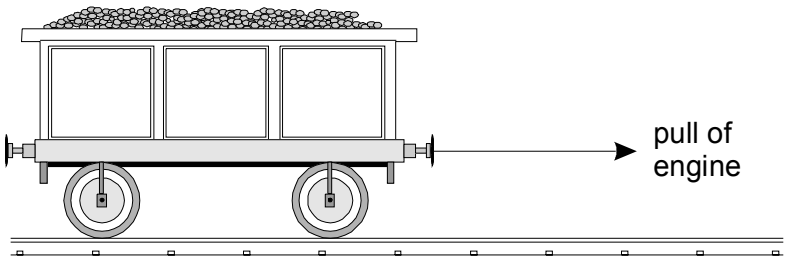
(iii) The ship is towed to the north. What is the direction of the frictional force acting on the ship?

.....

1 mark

Maximum 5 marks

Question 2:



(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.

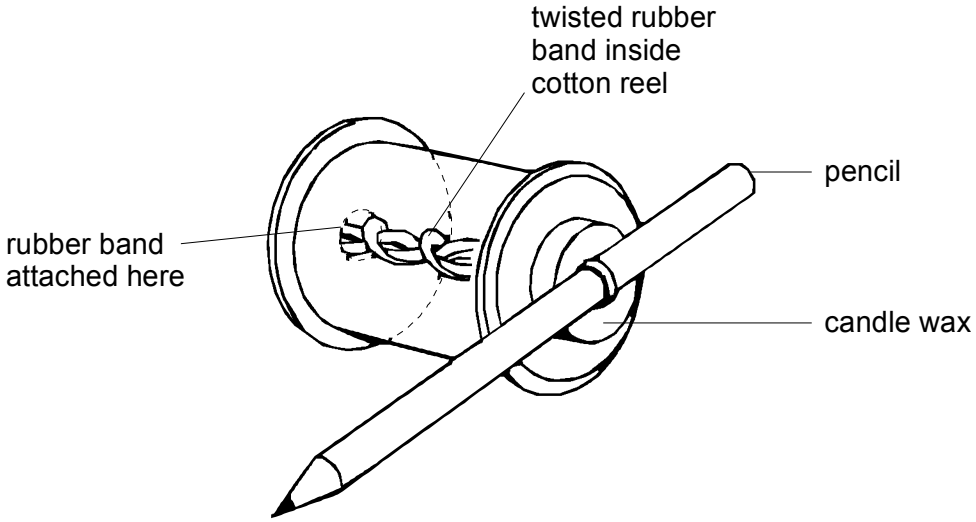
zero	☐
between 0 and 5000 N	☐
5000 N	☐
more than 5000 N	☐

1 mark

Maximum 5 marks

Question 3:

Sarah made a cotton reel vehicle like the one shown in the diagram. The pencil is wound round and round so that it winds up the rubber band.A piece of candle wax next to the cotton reel lets the rubber band slowly unwind.



(a) As the rubber band unwinds, the candle wax slips and the cotton reel turns. Name the force which acts between the cotton reel and the candle wax.

.....

1 mark

(b) Sarah tested the vehicle by letting it run along a horizontal table top.

(i) She noticed that the vehicle gradually slowed down.
Give the reason for this.

.....

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1 mark

(ii) Describe what Sarah could do to make the rubber band move this vehicle faster.

.....

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1 mark

Maximum 3 marks

Question 4:

A video recorder is loaded with a tape which plays for 180 minutes.
The length of the tape is 260 m.

(a) (i) Calculate the speed of the tape, in metres per minute.

……

…… m/min

1 mark

(ii) What is the speed of the tape in metres per second?

…… m/s

1 mark

(b) To rewind the tape quickly, a different motor is used, which rewinds the tape at a maximum speed of 1.08 m/s.

(i) At this speed, how long would it take to rewind the tape completely?
Give the units.

……

……

1 mark

(ii) In fact, it takes slightly longer than this to rewind the tape.
Explain why.

……

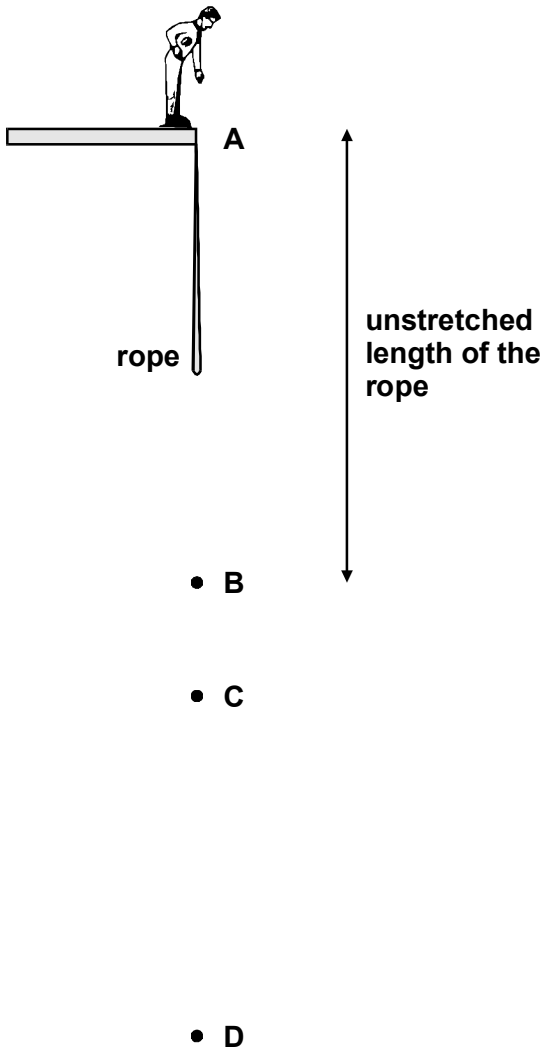
……

1 mark

Maximum 4 marks

Question 5:

A man does a 'bungee jump' over a lake. He jumps from point A with an elasticated rope tied to his ankles. The rope reaches down to point B when it is not being stretched.



The man falls past B, and the rope begins to stretch. He falls past point C to point D, which is the lowest point he reaches. Then he begins to move upwards again. Eventually he comes to rest at point C.

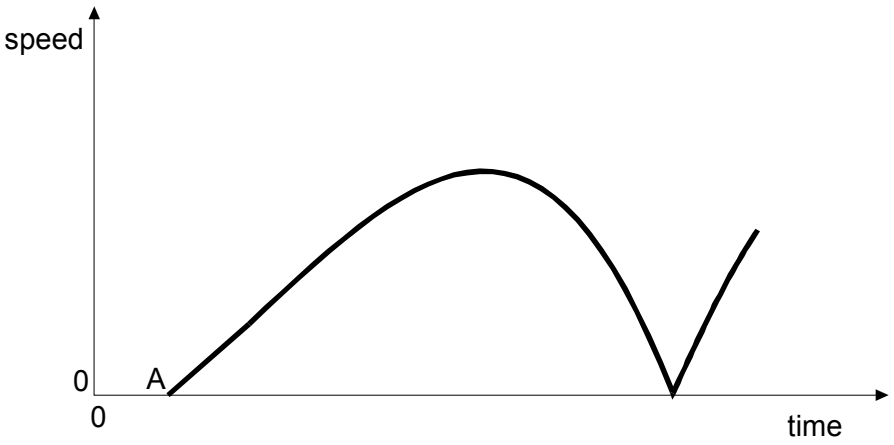
(a) (i) At which point, A, B, C or D, is the man when the tension in the rope is greater than his weight? .....

1 mark

(ii) At which point, A, B, C or D, is the man when the tension in the rope is equal to his weight? .....

1 mark

(b) The graph shows how the man's speed varies with time as he falls from point A to point D and bounces back upwards.



The point when the man jumped from A has been labeled on the curve. Label the points on the curve when the man was at points B, C and D as he fell.

3 marks

(c) The total energy of the man and the rope includes the man's potential energy, his kinetic energy, and the elastic (strain) energy stored in the stretched rope.

Describe how the elastic (strain) energy in the rope changes as the man falls from point A to point D.

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2 marks

Maximum 7 marks