PEARSON EDEXCEL GCSE PHYSICS (HIGHER) · 1PH0

PHYSICS



EXAM QUESTION PACK

TOPIC 9: FORCES AND THEIR EFFECTS (PACK 1)

SCORE	PERCENTAGE
/78	%

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Q1.

A student investigates moments of forces.

Figure 14 shows the apparatus used.

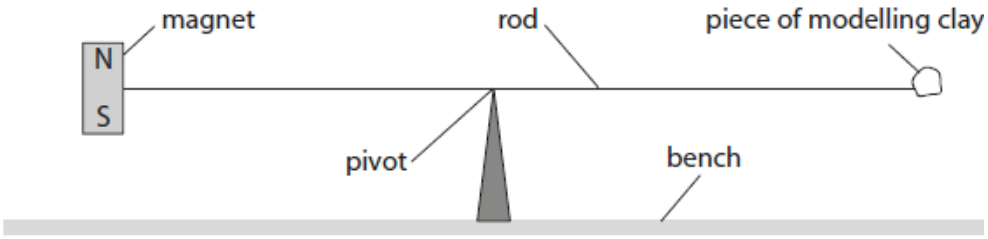


Figure 14

The pivot is under the centre of the rod.

A magnet is fixed to one end of the rod.

A piece of modelling clay is fixed to the other end of the rod.

The system is in equilibrium.

(a) The student fixes a coil to the bench under the magnet as shown in Figure 15.

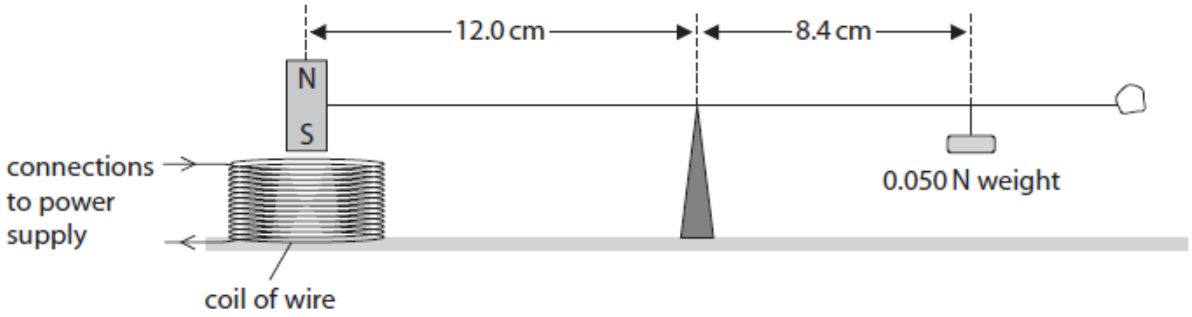


Figure 15

The coil of wire is connected to a d.c. power supply so that there is a current in the coil.

To bring the system back into equilibrium, the student hangs a 0.050 N weight on the rod, 8.4 cm away from the pivot, as shown in Figure 15.

Calculate the size of the force between the magnet and the coil.

(3)

force = ... N

(b) Describe how the student could develop the investigation to determine if the size of the force between the magnet and the coil is directly proportional to the size of the current in the coil.

(4)

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(Total for question = 7 marks)

Q2.

Figure 14 show a rack and pinion system, used on a mountain railway.

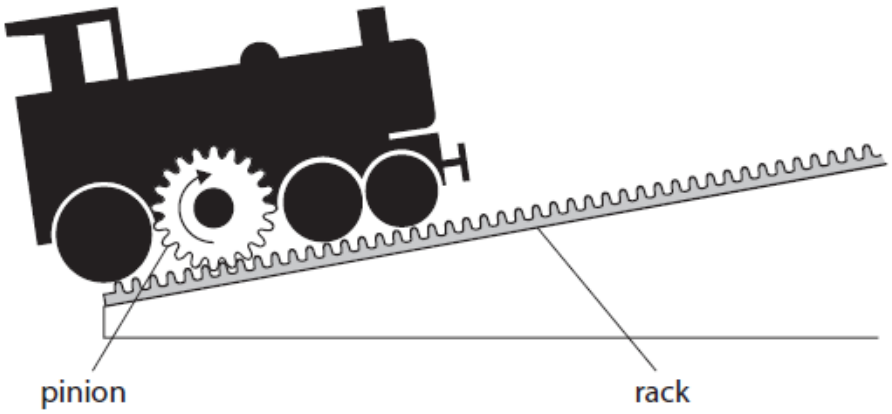


Figure 14

The teeth on the rack are 8.0 cm apart.

Calculate how far along the rack the train moves when the pinion turns through one complete revolution.

(2)

distance = ... m

(Total for question = 2 marks)

Q3.

Figure 3 is a diagram of the forces acting on a swing.

The swing is not moving.

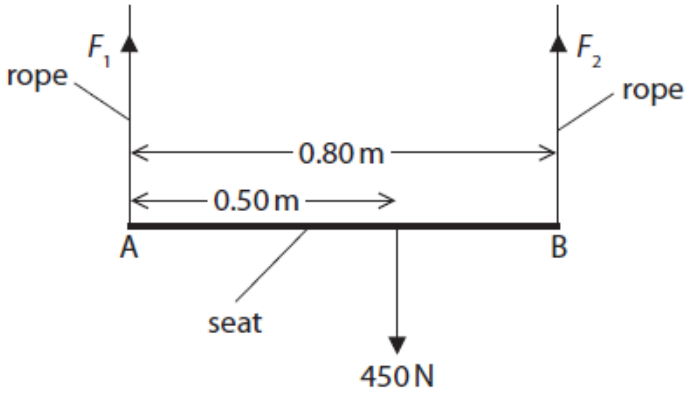


Figure 3

The seat of the swing, AB, is 0.80 m long.

A person of weight 450 N sits on the seat.

The person's weight acts at a distance of 0.50 m from A as shown in Figure 3.

Ignore the weight of the seat.

The upward forces exerted by the ropes on the seat are F_1 and F_2.

Calculate the force F_2 by taking moments about A.

(3)

force F_2 = ... N

(Total for question = 3 marks)

Q4.

Figure 8 shows a bicycle.

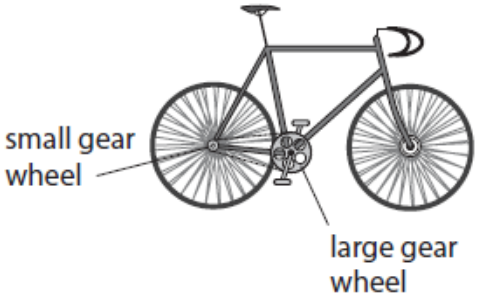


Figure 8

(i) The rider uses the pedals to make the large gear wheel turn.

The large gear wheel moves the chain.
The chain turns the small gear wheel.

The large gear wheel has 48 teeth.

The small gear wheel has 12 teeth.

The large gear wheel turns 2 times each second.

Calculate the number of times that the small gear wheel turns each second.

(2)

..... turns each second

(ii) Oil is applied to the wheel of a bicycle at the point shown in Figure 9.

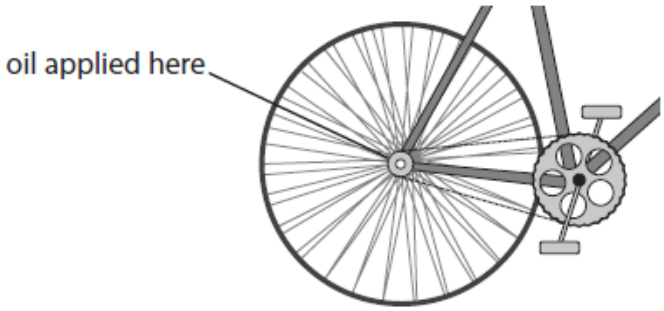


Figure 9

Explain how the oil improves the efficiency of the bicycle.

(3)

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(Total for question = 5 marks)

Q5.

Figure 13 shows a toy that a student makes for a nursery school.

for a nursery school. The rod hangs by a string from the ceiling.

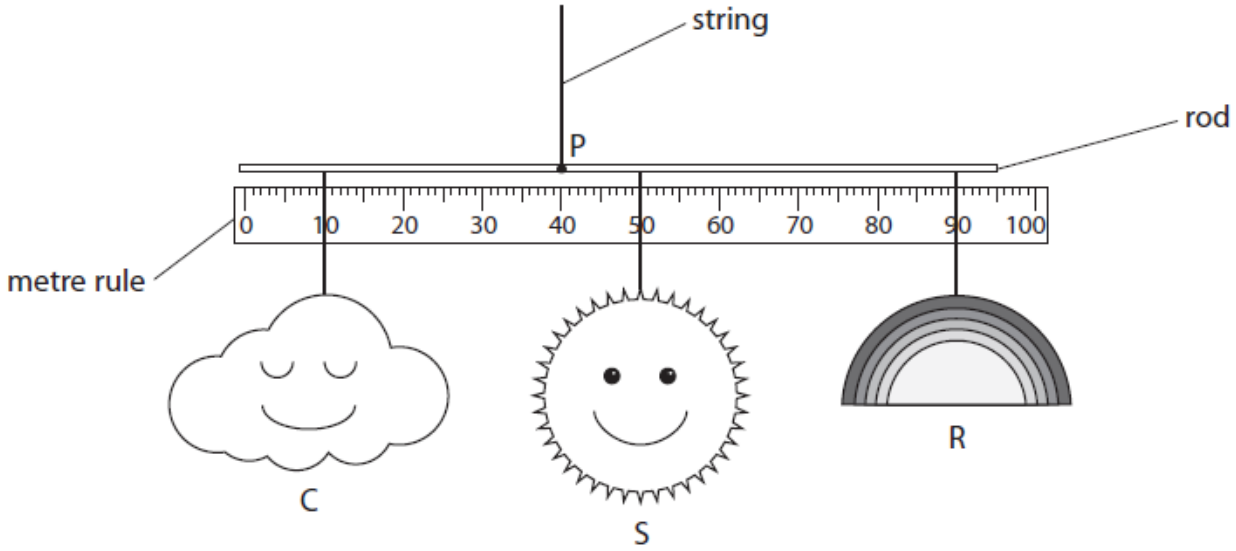


Figure 13

(i) The moment of C about point P is 0.60 Nm.

Calculate the weight of C.

Use the equation

$$\text{moment} = F \times d$$

(2)

weight of C ..... N

(ii) Show that the total moment of S and R about P is 0.70 N m.

(2)

(iii) Using the data in the question and the principle of moments, determine if the toy shown in Figure 13 is in equilibrium.

The rod is very light so its weight can be ignored.

(3)

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(Total for question = 7 marks)

Q6.

Figure 12 shows three toy animals hanging from a rod.

The rod hangs from the ceiling by a string tied to the centre of the rod.

The system is in equilibrium.

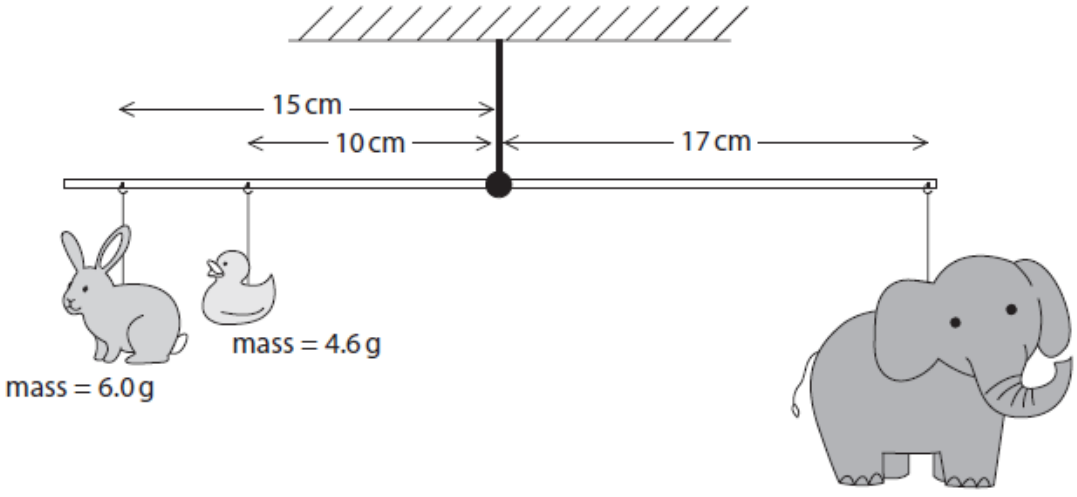


Figure 12

Use the principle of moments to calculate the mass of the toy elephant.

(4)

mass = ... g

(Total for question = 4 marks)

Q7.

Figure 14 shows a demolition ball of mass 400 kg.

The ball is used to demolish a wall.

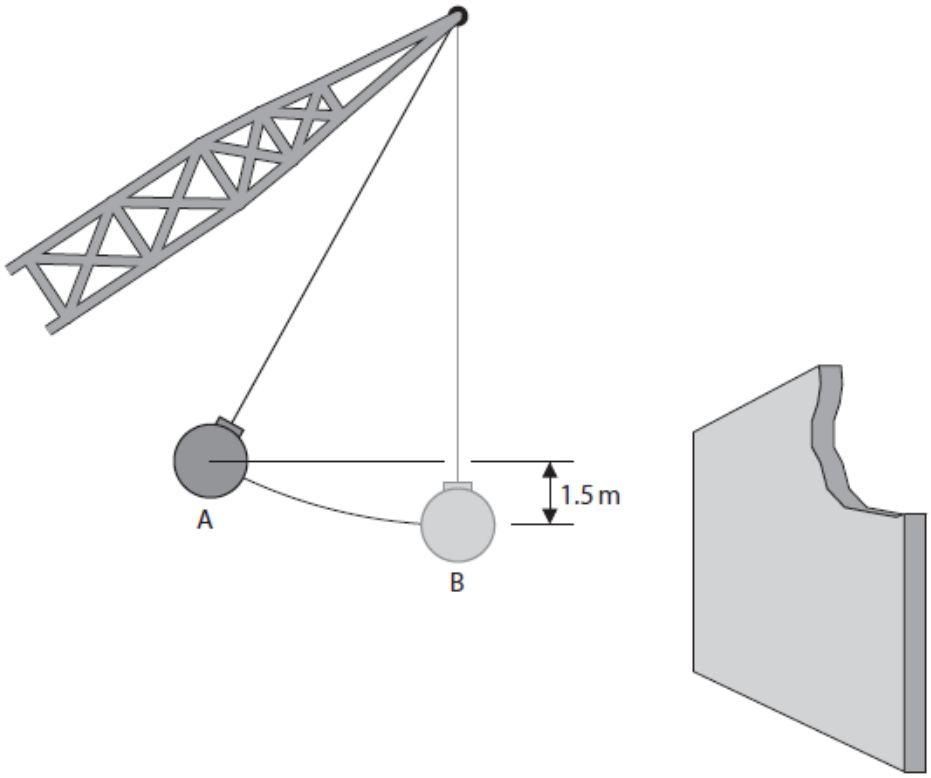


Figure 14

As the ball swings from A to B, it moves through a vertical height of 1.5 m.

(i) Calculate the change in gravitational potential energy.

Take gravitational field strength, g, to be 10 N/kg.

(3)

(ii) The heavy ball comes to rest soon after smashing into the wall. In doing this, the temperatures of the ball, wall and surroundings all increase slightly.

Explain this observation.

(2)

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(iii) Which of these quantities of the ball changes in **both** magnitude and direction while the ball is swinging?

Put a cross (☒)in the box next to your answer.

(1)

☒ **A** gravitational potential energy

☒ **B** velocity

☒ **C** the gravitational force acting

☒ **D** kinetic energy

(Total for question = 6 marks)

Q8.

Figure 8 shows a demolition ball of mass 400 kg.

The ball is used to demolish a wall.

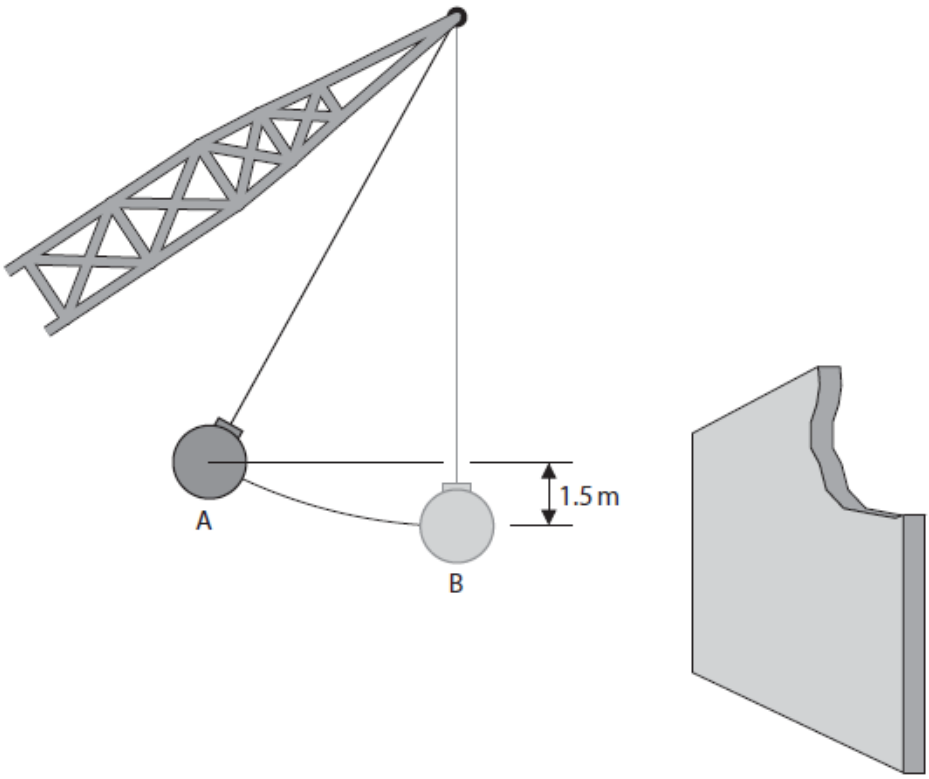


Figure 8

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(3)

(ii) The heavy ball comes to rest soon after smashing into the wall. In doing this, the temperatures of the ball, wall and surroundings all increase slightly.

Explain this observation.

(2)

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(iii) Which of these quantities of the ball changes in **both** magnitude and direction while the ball is swinging?

Put a cross ☒ in the box next to your answer.

(1)

☒ **A** gravitational potential energy

☒ **B** velocity

☒ **C** the gravitational force acting

☒ **D** kinetic energy

(Total for question = 6 marks)

Q9.

Some forces act at a distance.

One example is the gravitational attraction between the Moon and the Earth.

Describe an example of another type of force acting at a distance, where the force is **not** gravitational.

(2)

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(Total for question = 2 marks)

Q10.

Some forces act at a distance.

One example is the gravitational attraction between the Moon and the Earth.

Describe an example of another type of force acting at a distance, where the force is **not** gravitational.

(2)

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(Total for question = 2 marks)

Q11.

A student investigates moments of forces.

Figure 14 shows the apparatus used.

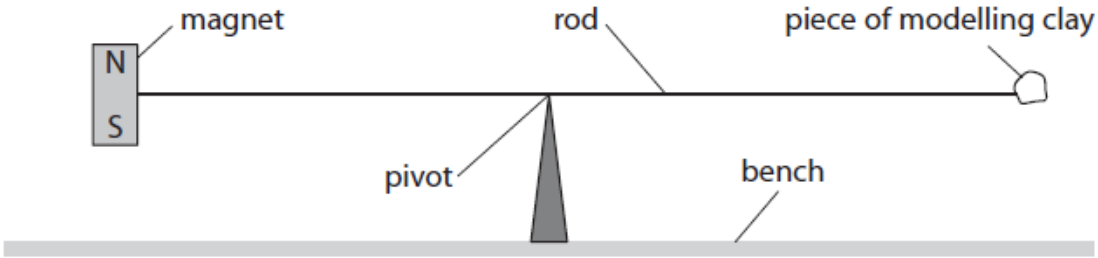


Figure 14

The pivot is under the centre of the rod.

A magnet is fixed to one end of the rod.

A piece of modelling clay is fixed to the other end of the rod.

The system is in equilibrium.

The student reverses the direction of the current in the coil.
Describe how the student can bring the system back into equilibrium without making any changes to the magnet.

(2)

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(Total for question = 2 marks)

Q12.

Figure 7 shows a drone.



© Liubov Kotliar/123RF

Figure 7

The drone has four spinning blades.

The upward force produced enables the drone to rise in the air.

The speed at which the blades spin is measured in turns per minute.

Figure 8 shows how the upward force produced by the four blades depends on the speed at which the blades spin.

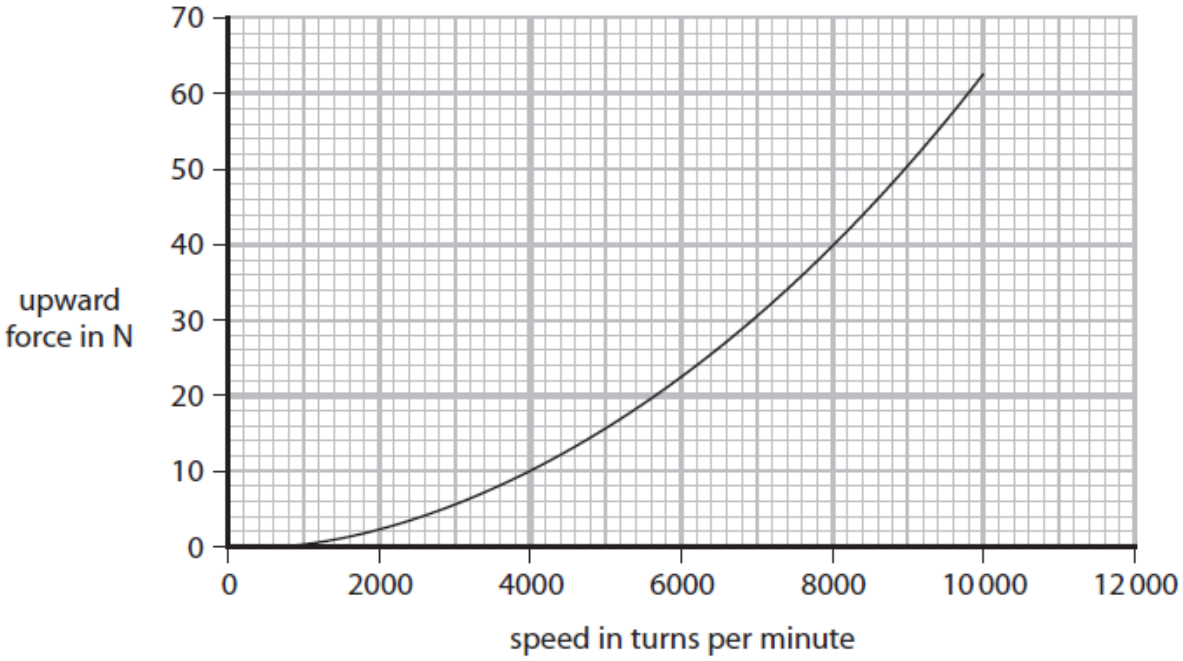


Figure 8

Describe the relationship between upward force and speed shown by this graph.

(2)

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(Total for question = 2 marks)

Q13.

Figure 4 shows a drone.



© Liubov Kotliar/123RF

Figure 4

The drone has four spinning blades.

The upward force produced enables the drone to rise in the air.

The speed at which the blades spin is measured in turns per minute.

Figure 5 shows how the upward force produced by the four blades depends on the speed at which the blades spin.

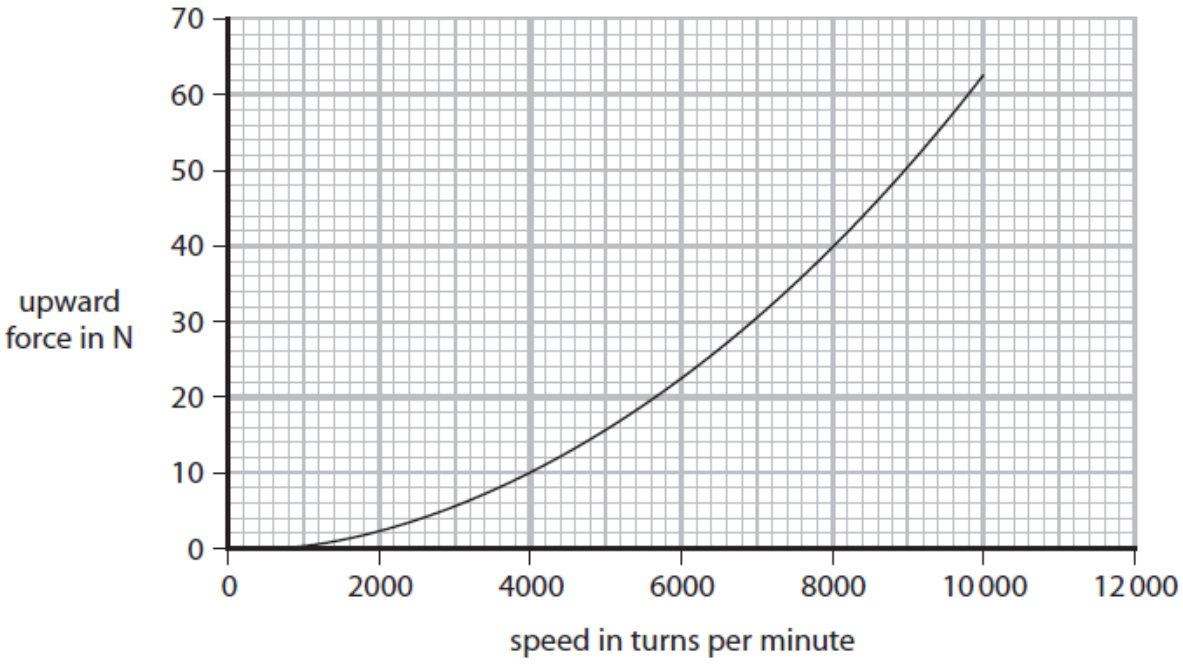


Figure 5

Describe the relationship between upward force and speed shown by this graph.

(2)

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(Total for question = 2 marks)

Q14.

Figure 23 shows two small boats pulling a much larger ship.

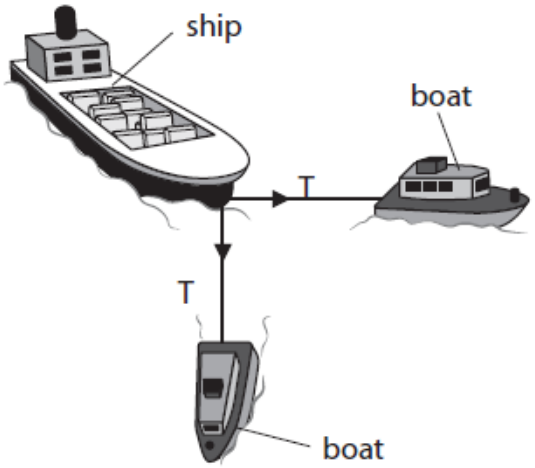


Figure 23

The ship is connected to the boats with ropes.

The tension, T, in each of the ropes has a magnitude of 20 kN.

The ropes are at right angles to each other.

Draw a vector diagram and use it to determine the resultant force that the boats exert on the ship.

(4)

magnitude of resultant force on the ship = ... kN

(Total for question = 4 marks)

Q15.

Figure 14 shows two small boats pulling a much larger ship.

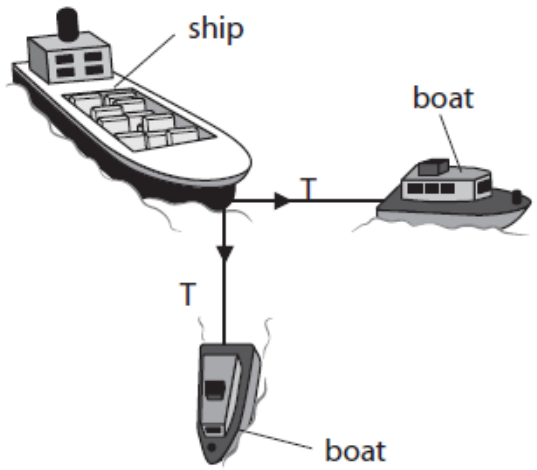


Figure 14

The ship is connected to the boats with ropes.

The tension, T, in each of the ropes has a magnitude of 20 kN.

The ropes are at right angles to each other.

Draw a vector diagram and use it to determine the resultant force that the boats exert on the ship.

(4)

magnitude of resultant force on the ship = ... kN

(Total for question = 4 marks)

Q16.

Figure 7 shows two astronauts in space pushing at a satellite.

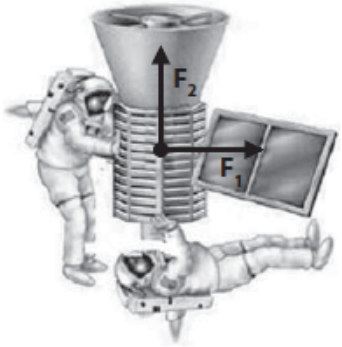
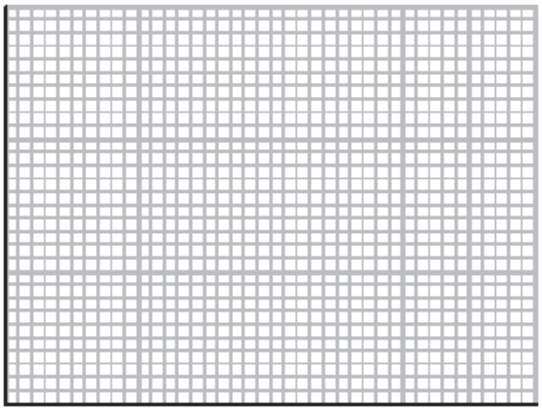


Figure 7

(i) The force F_1 is 3.0 N and the force F_2 is 2.0 N, acting at right angles to each other.

Draw a vector diagram to scale showing these forces.

(2)



(ii) Use the diagram in (i) to estimate the magnitude of the resultant force acting on the satellite.

(2)

resultant force = ... N

(Total for question = 4 marks)

Q17.

Figure 4 shows two astronauts in space pushing at a satellite.

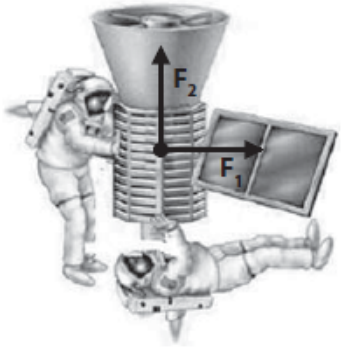
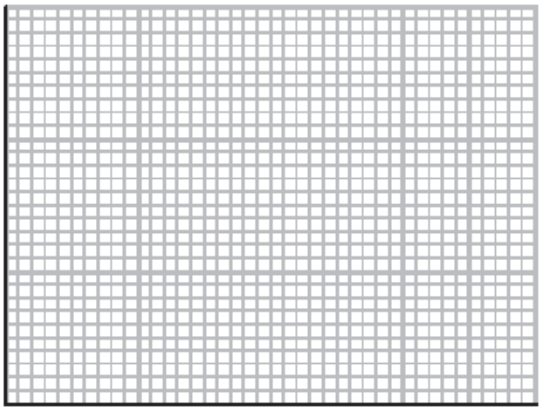


Figure 4

(i) The force F_1 is 3.0 N and the force F_2 is 2.0 N, acting at right angles to each other.

Draw a vector diagram to scale showing these forces.

(2)



(ii) Use the diagram in (i) to estimate the magnitude of the resultant force acting on the satellite.

(2)

resultant force = ... N

(Total for question = 4 marks)

Q18.

*Figure 24 shows a wooden block connected to a weight by a string.
The string goes over a pulley.

The surfaces of the table and the wooden block are both rough.

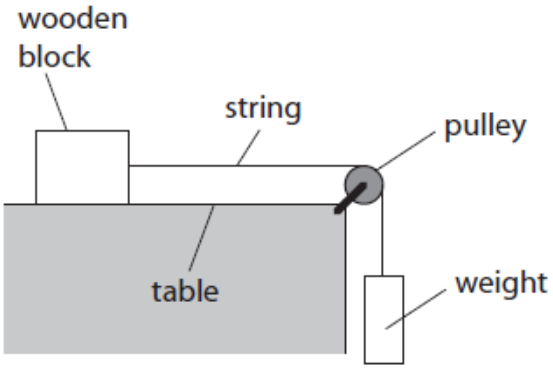


Figure 24

The wooden block moves across the table at a constant horizontal velocity.

Several vertical and horizontal forces act on the wooden block as it moves.

Explain how the forces keep the wooden block moving across the table at a constant horizontal velocity.

Your answer should refer to all forces acting on the wooden block.

You may add to the diagram to help with your answer.

(6)

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(Total for question = 6 marks)

Q19.

Figure 15 shows a wooden block connected to a weight by a string.
The string goes over a pulley.

The surfaces of the table and the wooden block are both rough.

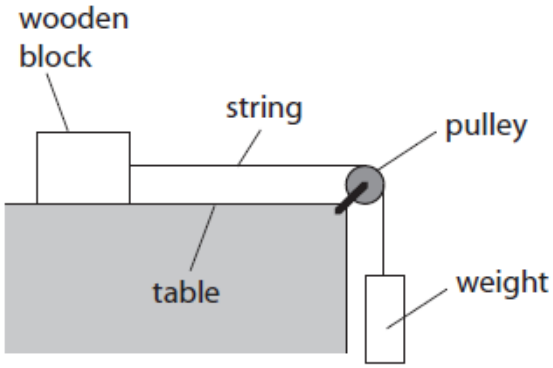


Figure 15

The wooden block moves across the table at a constant horizontal velocity.

Several vertical and horizontal forces act on the wooden block as it moves.

Explain how the forces keep the wooden block moving across the table at a constant horizontal velocity.

Your answer should refer to all forces acting on the wooden block.

You may add to the diagram to help with your answer.

(6)

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(Total for question = 6 marks)