PEARSON EDEXCEL GCSE PHYSICS (HIGHER) · 1PH0

PHYSICS



EXAM QUESTION PACK

TOPIC 9: FORCES AND THEIR EFFECTS (PACK 2)

SCORE	PERCENTAGE
/67	%

STEMUP

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Q1.

Figure 2 shows an open door.

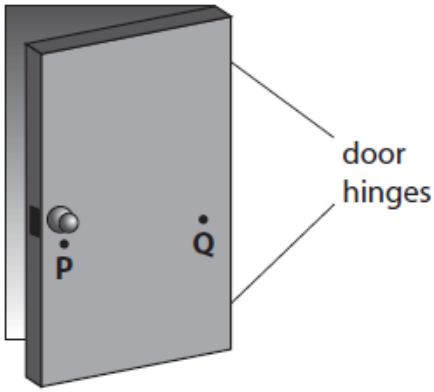


Figure 2

Explain why it is easier to close the door by pushing at point **P** rather than pushing at point **Q**.

(2)

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.....

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.....

(Total for question = 2 marks)

Q2.

Figure 7 shows a person trying to lift a large rock using a metal bar.

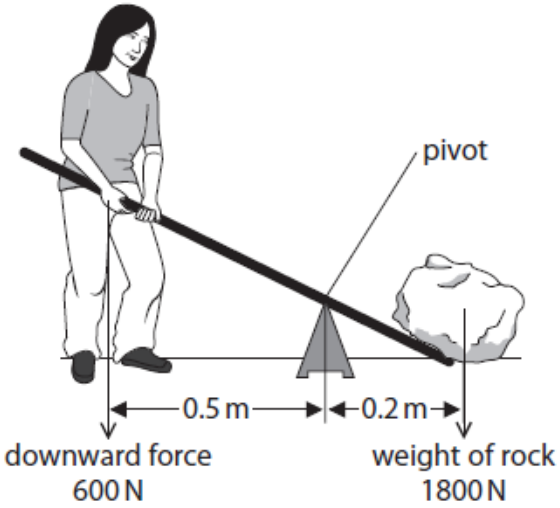


Figure 7

The rock weighs 1800 N.

The person can only produce a downwards force of 600 N.

The person cannot lift the rock.

(i) Explain, using calculations, why the person cannot lift the rock.

(3)

.....

.....

.....

.....

.....

.....

(ii) Explain **one** change to the arrangement that will make it possible for this person to lift the rock.

(2)

.....

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.....

(Total for question = 5 marks)

Q3.

(i) Figure 14 shows the vertical forces on an aeroplane.

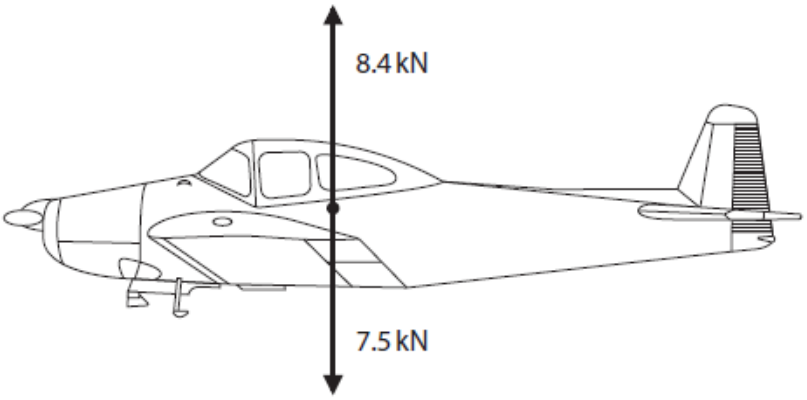


Figure 14

Use information from the diagram to determine the size and direction of the resultant vertical force on the aeroplane.

(2)

size = ... kN, direction is .....

(ii) The aeroplane is descending.

Figure 15 shows a diagram of the resultant vertical and horizontal forces on the aeroplane as it is descending.

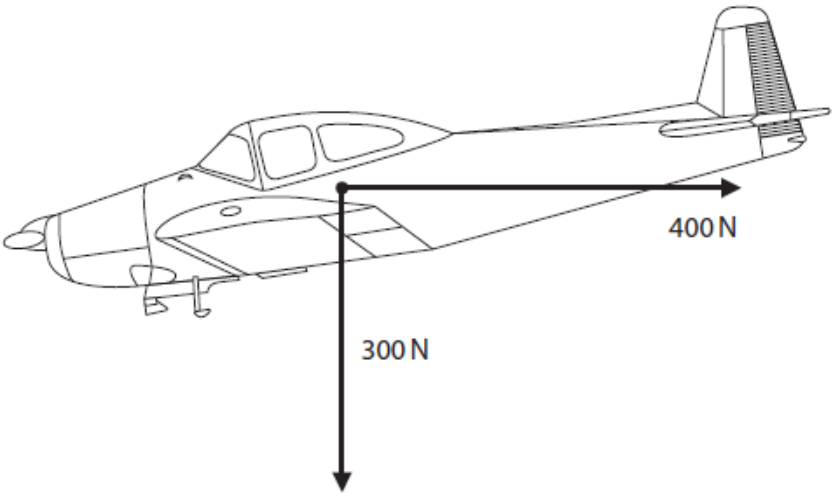


Figure 15

Complete the diagram to show the resultant of these two forces.

(1)

(iii) The mass of the aeroplane is 750 kg.

Calculate the change in gravitational potential energy of the aeroplane as it descends from 1300

m to the ground.

Gravitational field strength (g) = 10 N/kg

(2)

energy = ... J

(Total for question = 5 marks)

Q4.

(i) Figure 14 shows the vertical forces on an aeroplane.

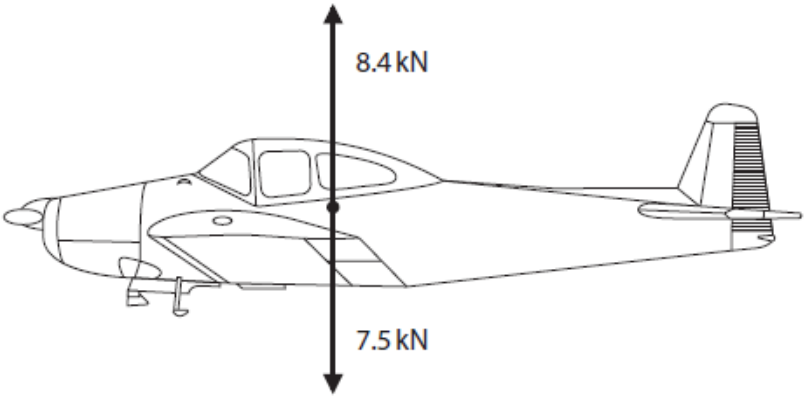


Figure 14

Use information from the diagram to determine the size and direction of the resultant vertical force on the aeroplane.

(2)

size = ... kN, direction is .....

(ii) The aeroplane is descending.

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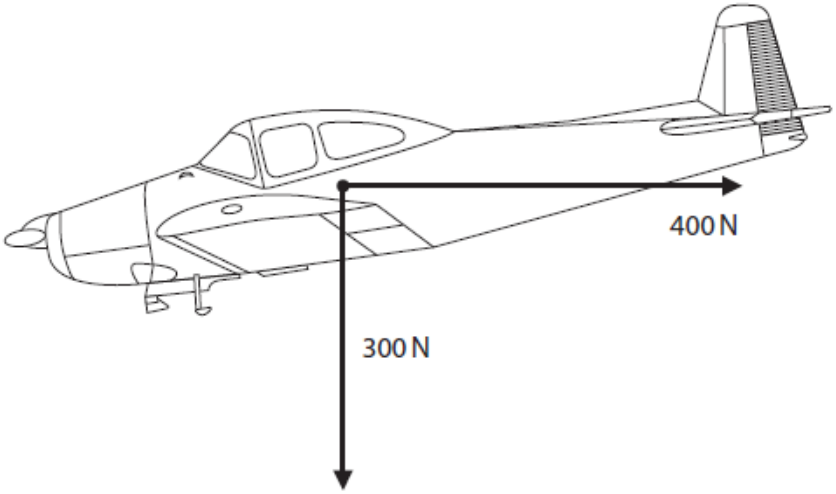


Figure 15

Complete the diagram to show the resultant of these two forces.

(1)

(iii) The mass of the aeroplane is 750 kg.

Calculate the change in gravitational potential energy of the aeroplane as it descends from 1300 m to the ground.

Gravitational field strength (g) = 10 N/kg

(2)

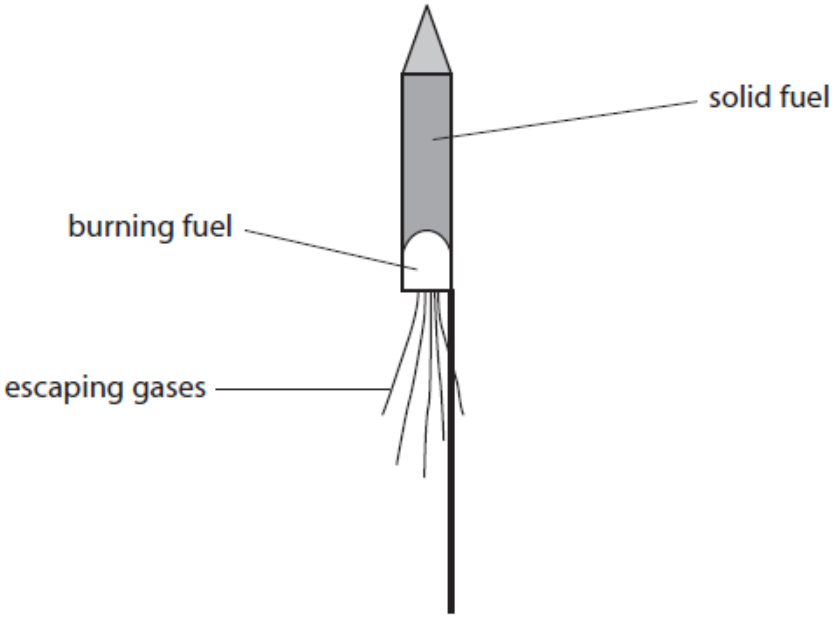
energy = ... J

(Total for question = 5 marks)

Q5.

A firework rocket contains a solid fuel inside a cardboard tube.

The burning of the fuel creates a thrust to propel the rocket upwards.



(i) Scientists can refer to several different quantities when describing the motion of the rocket.

mass	energy	speed	force

Only one of these quantities is a vector.

Complete this sentence using **one** of the words from the box.

(1)

The vector quantity is .....

(ii) Before the fuse is lit, the total weight of a rocket including fuel is 0.7N.

The gravitational field strength is 10 N/kg.

Complete the sentence by putting a cross (☒) in the box next to your answer.

The total mass of the rocket including fuel is

(1)

☒ **A** 0.007 kg

☒ **B** 0.07 kg

☒ **C** 0.7 kg

☒ **D** 7 kg

(iii) There is a resultant force on the rocket of 0.5 N upwards when it takes off.

The arrow on the diagram shows the size and direction of the force of gravity acting on the rocket when it takes off.



Add another arrow to the diagram to show the thrust produced by the burning fuel at the time the rocket takes off.

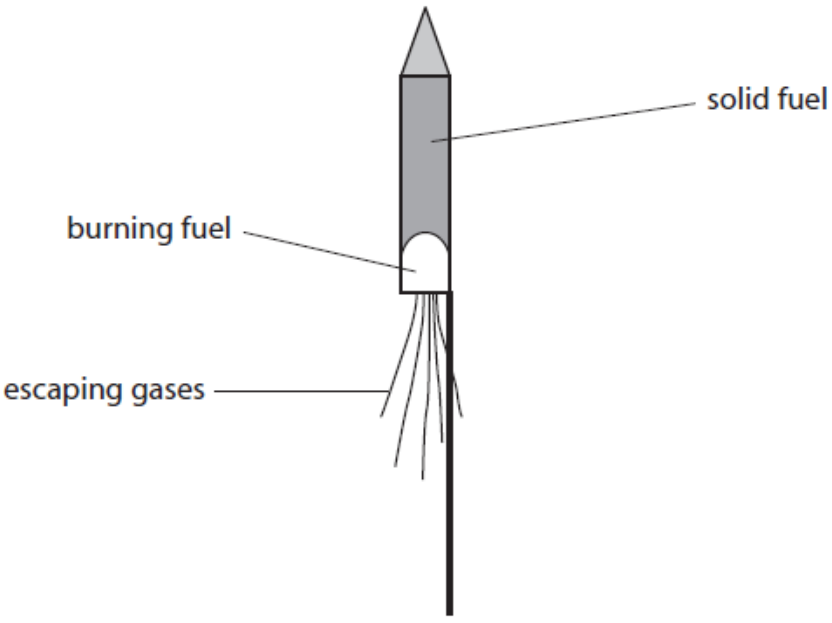
You should label the arrow with the size of the thrust.

(2)

Q6.

A firework rocket contains a solid fuel inside a cardboard tube.

The burning of the fuel creates a thrust to propel the rocket upwards.



(i) Scientists can refer to several different quantities when describing the motion of the rocket.

mass	energy	speed	force

Only one of these quantities is a vector.

Complete this sentence using **one** of the words from the box.

(1)

The vector quantity is .....

(ii) Before the fuse is lit, the total weight of a rocket including fuel is 0.7N.

The gravitational field strength is 10 N/kg.

Complete the sentence by putting a cross (☒) in the box next to your answer.

The total mass of the rocket including fuel is

(1)

☒ **A** 0.007 kg

☒ **B** 0.07 kg

☒ **C** 0.7 kg

☒ **D** 7 kg

(iii) There is a resultant force on the rocket of 0.5 N upwards when it takes off.

The arrow on the diagram shows the size and direction of the force of gravity acting on the rocket when it takes off.



Add another arrow to the diagram to show the thrust produced by the burning fuel at the time the rocket takes off.

You should label the arrow with the size of the thrust.

(2)

Q7.

Answer the question with a cross in the box you think is correct ☒ . If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒ .

Two cyclists ride on a hilly road and go through points P, Q, R and S.

The diagram in Figure 16 shows how the vertical height of the road changes during the journey from P to S.

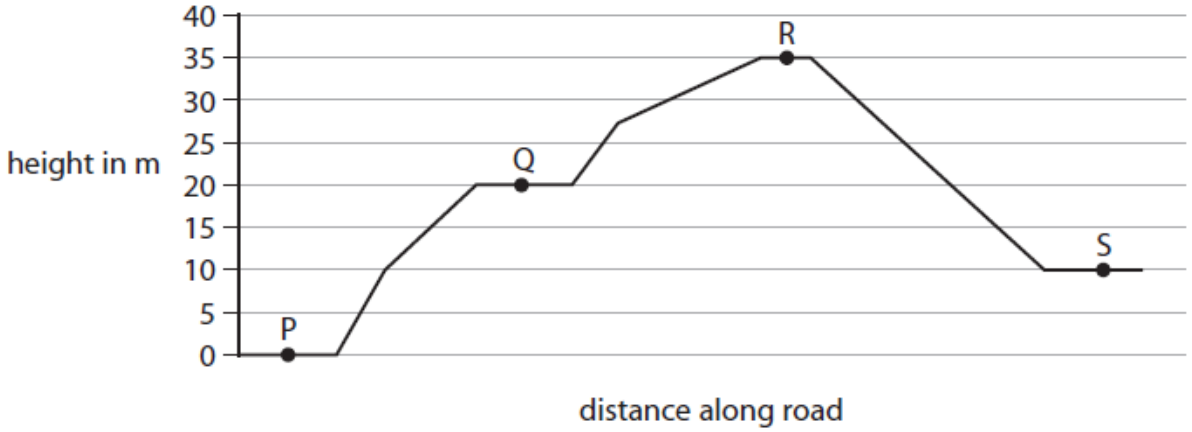


Figure 16

(i) The greatest overall change in gravitational potential energy for each cyclist is between which two points on the journey?

(1)

☒ **A** P and Q

☒ **B** Q and R

☒ **C** P and S

☒ **D** R and S

(ii) The total weight of one cyclist and bicycle is 700 N.

Calculate the total amount of work done against gravity when the cyclist travels from point P to point Q in the journey.

(2)

work done = ... J

(iii) The gravitational potential energy of the other cyclist changes by 11 250 J when travelling from point Q to point R.

Calculate the mass of this cyclist.

Gravitational field strength = 10 N / kg

Use the equation

$$\Delta GPE = m \times g \times \Delta h$$

(2)

mass = ... kg

(iv) Explain why the total amount of work done by a cyclist between points Q and R is different from the change in gravitational potential energy of the cyclist between points Q and R.

(2)

.....

.....

.....

.....

(v) The cyclists lubricated the chains and the wheel bearings of their bicycles before setting off.

Lubricating the chains and wheel bearings helps to

(1)

☒ **A** decrease the amount of work done against gravity

☒ **B** decrease the efficiency of the cyclist and bicycle

☒ **C** increase the efficiency of the cyclist and bicycle

☒ **D** increase the overall amount of energy transferred by the cyclist

(Total for question = 8 marks)

Q8.

Answer the questions with a cross in the boxes you think are correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Two cyclists ride on a hilly road and go through points P, Q, R and S.

The diagram in Figure 7 shows how the vertical height of the road changes during the journey from P to S.

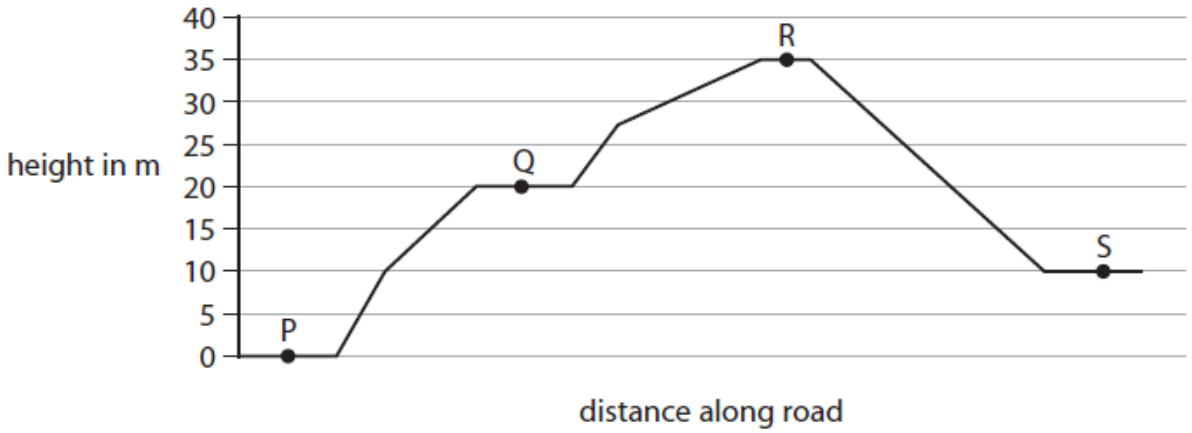


Figure 7

(i) The greatest overall change in gravitational potential energy for each cyclist is between which two points on the journey?

(1)

☒ **A** P and Q

☒ **B** Q and R

☒ **C** P and S

☒ **D** R and S

(ii) The total weight of one cyclist and bicycle is 700 N.

Calculate the total amount of work done against gravity when the cyclist travels from point P to point Q in the journey.

(2)

work done = ... J

(iii) The gravitational potential energy of the other cyclist changes by 11 250 J when travelling from point Q to point R.

Calculate the mass of this cyclist.

Gravitational field strength = 10 N / kg

Use the equation

$$\Delta GPE = m \times g \times \Delta h$$

(2)

mass = ... kg

(iv) Explain why the total amount of work done by a cyclist between points Q and R is different from the change in gravitational potential energy of the cyclist between points Q and R.

(2)

.....

.....

.....

.....

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Lubricating the chains and wheel bearings helps to

(1)

☒ **A** decrease the amount of work done against gravity

☒ **B** decrease the efficiency of the cyclist and bicycle

☒ **C** increase the efficiency of the cyclist and bicycle

☒ **D** increase the overall amount of energy transferred by the cyclist

(Total for question = 8 marks)

Q9.

Explain how unwanted energy transfers may be reduced in mechanical systems.

(2)

.....

.....

.....

.....

(Total for question = 2 marks)

Q10.

Explain how unwanted energy transfers may be reduced in mechanical systems.

(2)

.....

.....

.....

.....

(Total for question = 2 marks)

Q11.

Figure 6 shows a book resting on a table with some forces involved.

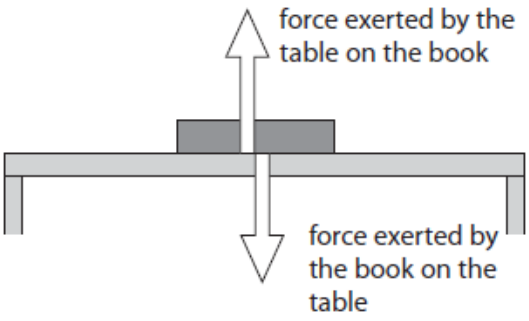


Figure 6

State why this diagram is **NOT** a free body force diagram.

(1)

.....

.....

(Total for question = 1 mark)

Q12.

Figure 3 shows a book resting on a table with some forces involved.

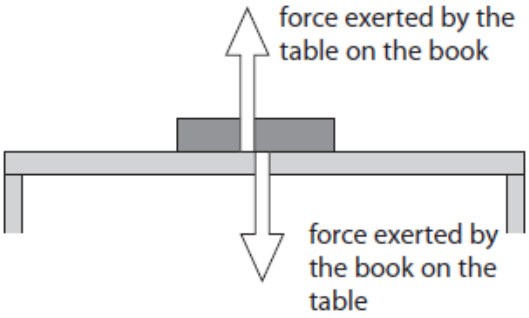


Figure 3

State why this diagram is **NOT** a free body force diagram.

(1)

.....

.....

(Total for question = 1 mark)

Q13.

In which of the following situations is a non-zero resultant force acting?

(1)

☒ **A** a book rests on a table

☒ **B** a car travels along a road at a constant speed

☒ **C** a javelin moves through the air after leaving an athlete's hand

☒ **D** a steel ball bearing descends through some car oil at a constant velocity

(Total for question = 1 mark)

Q14.

In which of the following situations is a non-zero resultant force acting?

(1)

☒ **A** a book rests on a table

☒ **B** a car travels along a road at a constant speed

☒ **C** a javelin moves through the air after leaving an athlete's hand

☒ **D** a steel ball bearing descends through some car oil at a constant velocity

(Total for question = 1 mark)

Q15.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

The magnitude and direction of a force can be represented by a vector.
Figure 22 shows the forces acting on four identical trolleys. The arrows show the magnitude and direction of the forces.

Which diagram shows a pair of forces that will produce zero acceleration?

(1)

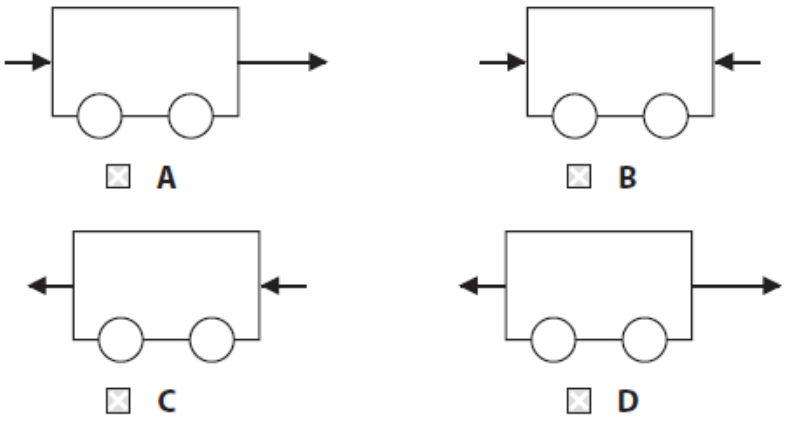


Figure 22

(Total for question = 1 mark)

Q16.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

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Figure 13 shows the forces acting on four identical trolleys. The arrows show the magnitude and direction of the forces.

Which diagram shows a pair of forces that will produce zero acceleration?

(1)

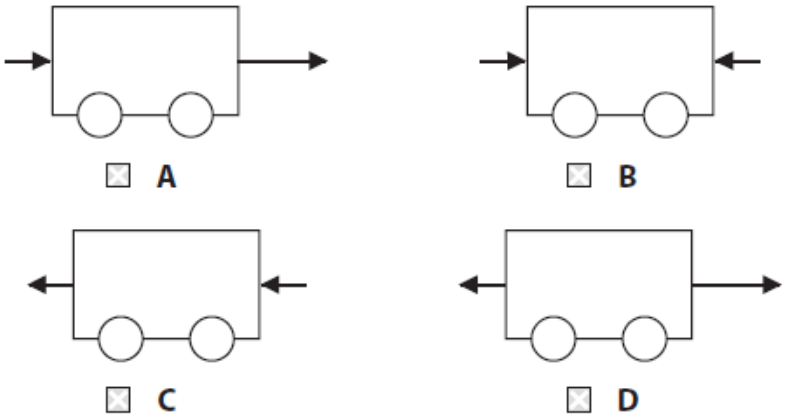


Figure 13

(Total for question = 1 mark)

Q17.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Figure 6 shows four forces, P, Q, R and S, acting on a rod.

The rod can rotate around an axle.

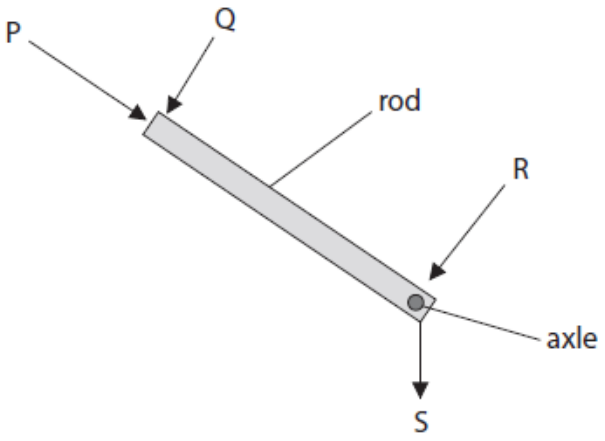


Figure 6

Which force will make the rod rotate about the axle?

(1)

☒ **A** P

☒ **B** Q

☒ **C** R

☒ **D** S

(Total for question = 1 mark)

Q18.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Figure 1 shows some forces acting on a seesaw.

The forces shown have the same magnitude but act in different directions.

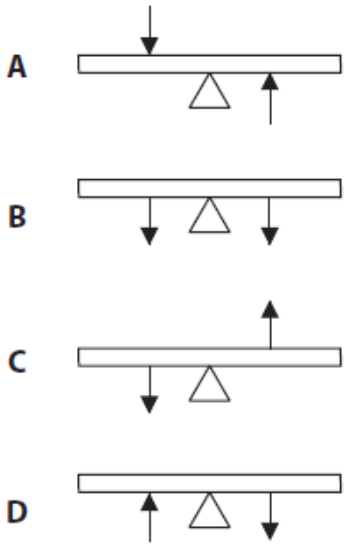


Figure 1

In which of these could the forces acting on a seesaw be in equilibrium?

(1)

- ☒ **A**
- ☒ **B**
- ☒ **C**
- ☒ **D**

(Total for question = 1 mark)

Q19.

A student investigates the relationship between the magnetic flux density and the electromagnetic force on a current-carrying wire.

The student has the equipment shown in Figure 19.

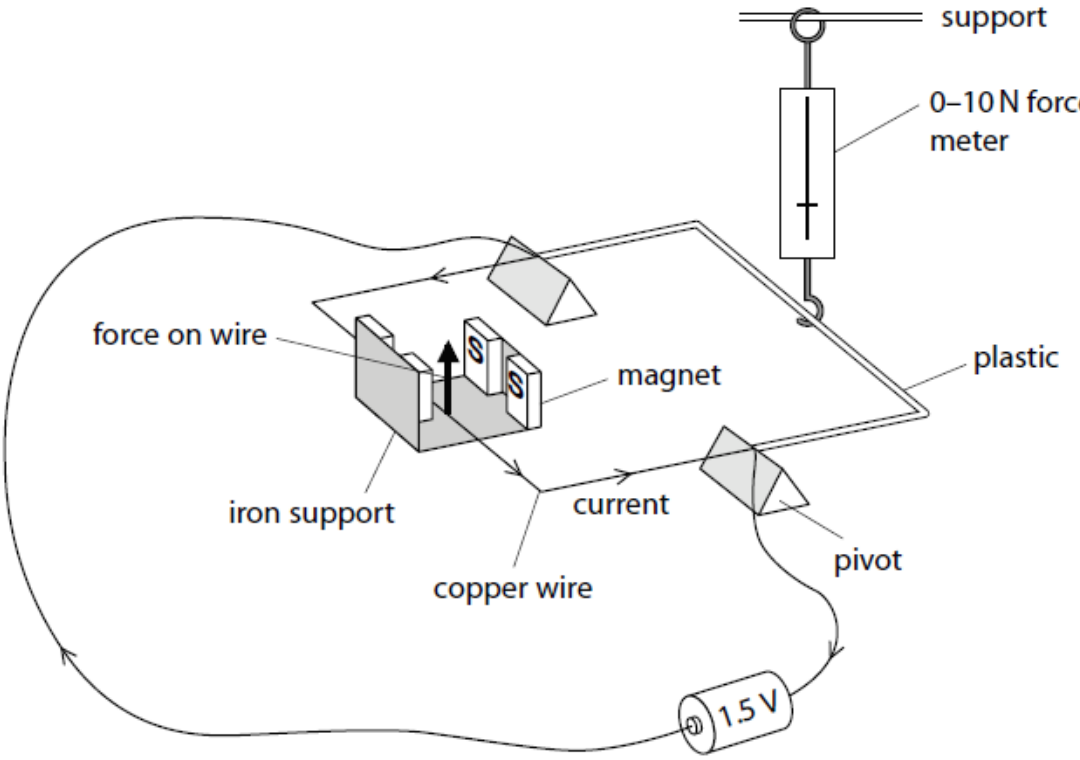


Figure 19

The student varies the number of magnets and measures the force on the wire using the force meter.

The results are shown in Figure 20.

number of pairs of magnets	reading on force meter (N)
1	0.0
2	0.0
3	0.1

Figure 20

The student decides that his equipment is not sufficiently sensitive.

Give **three** ways the student should develop his investigation to improve the quality of his results.

(3)

1 .....

.....

2 .....

.....

3 .....

.....

(Total for question = 3 marks)

Q20.

A student investigates the forces between the trucks in the toy railway.

She places four trucks in a row.

She pulls truck **Z** in the direction shown by the arrow.

The whole train travels at a constant speed as shown in Figure 17.

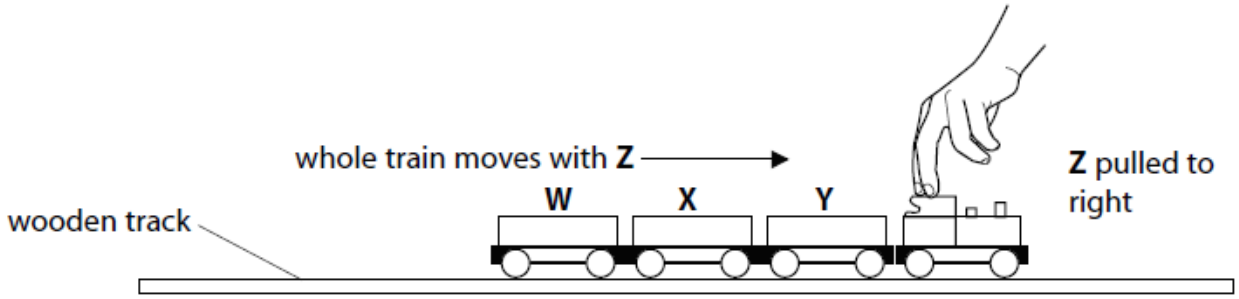


Figure 17

The student repeats this method of adding trucks and pulling the train each time.

When there are seven trucks in total, the train comes apart between **Y** and **Z** when tested as shown in Figure 18.

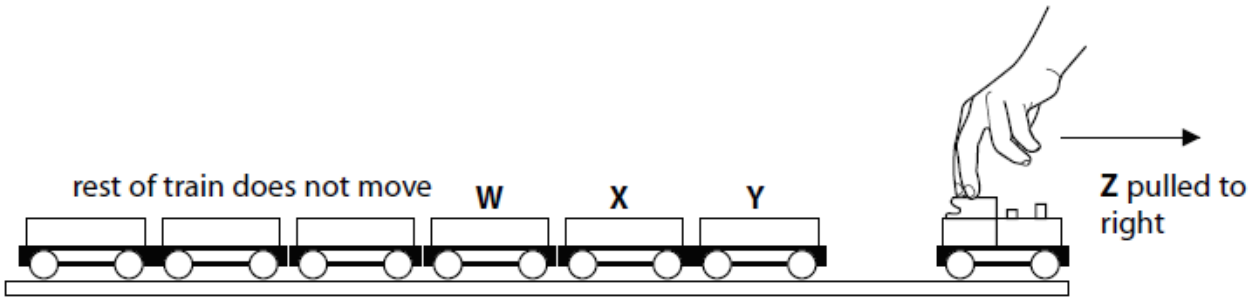


Figure 18

(i) Explain why the train acts in this way by considering the forces involved.

(2)

.....

.....

.....

.....

(ii) Devise an experiment to investigate the horizontal force needed to separate the trucks from the engine.

(3)

.....

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(iii) Explain why a larger force is needed to separate the trucks from the engine if the force is applied at an angle to the horizontal.

(2)

.....

.....

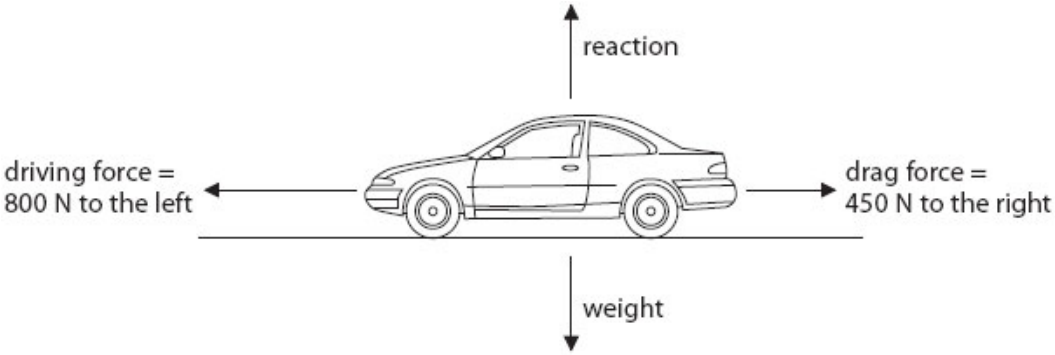
.....

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(Total for question = 7 marks)

Q21.

The diagram shows the forces acting on a car which is travelling along a flat straight road.



(i) The size of the resultant force on the car is 350 N.

In which direction is the resultant force acting?

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

(1)

☒ **A** down ↓

☒ **B** to the left ←

☒ **C** to the right →

☒ **D** up ↑

(ii) Complete the sentence by putting a cross (☒) in the box next to your answer.

The car is

(1)

☒ **A** accelerating

☒ **B** decelerating

☒ **C** moving at a constant speed

☒ **D** not moving

(2)

(iii) The mass of the car is 625 kg.

Calculate the weight of the car.

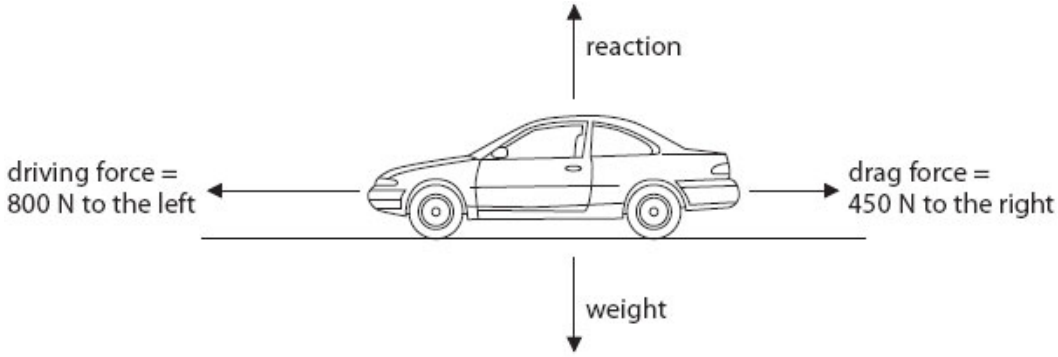
gravitational field strength = 10N/kg

(2)

weight of car = ...N

Q22.

The diagram shows the forces acting on a car which is travelling along a flat straight road.



(a) (i) The size of the resultant force on the car is 350 N.

In which direction is the resultant force acting?

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

(1)

☒ **A** down ↓

☒ **B** to the left ←

☒ **C** to the right →

☒ **D** up ↑

(ii) Complete the sentence by putting a cross (☒) in the box next to your answer.

The car is

(1)

☒ **A** accelerating

☒ **B** decelerating

☒ **C** moving at a constant speed

☒ **D** not moving

(2)

(iii) The mass of the car is 625 kg.

Calculate the weight of the car.

gravitational field strength = 10N/kg

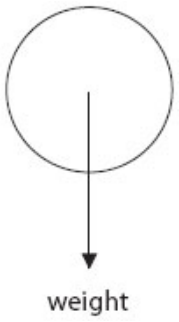
(2)

weight of car = ...N

(b) Forces also act on objects when they fall through the air.

There are two forces acting on this ball as it falls through the air.

The weight is shown on the diagram.



(i) Draw and label an arrow on the diagram to show the other force acting on the ball.

(2)

(ii) Use words from the box to complete the sentences.

(2)

balanced	changing	greater	smaller	zero

After a short time the ball falls at a steady speed.

The forces acting on the ball are now .....**.**

The acceleration of the ball is now .....**.**

(Total for Question is 8 marks)

Q23.

Figure 8 shows a box sliding down a slope in the direction shown.

(3)

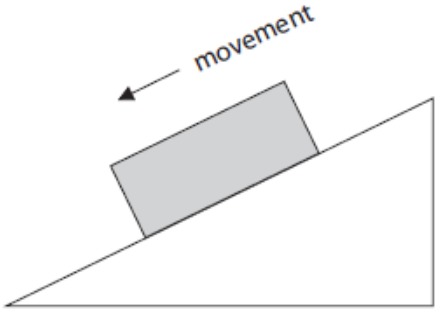


Figure 8

Draw two vector arrows on this diagram showing the 'normal contact force' and 'friction' acting on the box.
Label these two forces.

(Total for question = 3 marks)

Q24.

Figure 5 shows a box sliding down a slope in the direction shown.

(3)

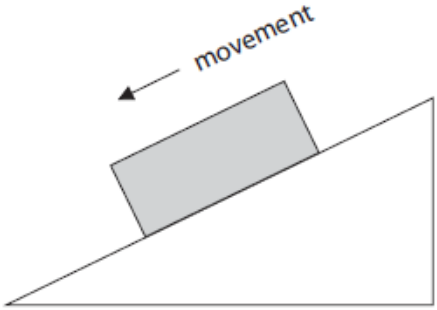


Figure 5

Draw two vector arrows on this diagram showing the 'normal contact force' and 'friction' acting on the box.
Label these two forces.

(Total for question = 3 marks)

Q25.

A student investigates moments of forces.

Figure 14 shows the apparatus used.

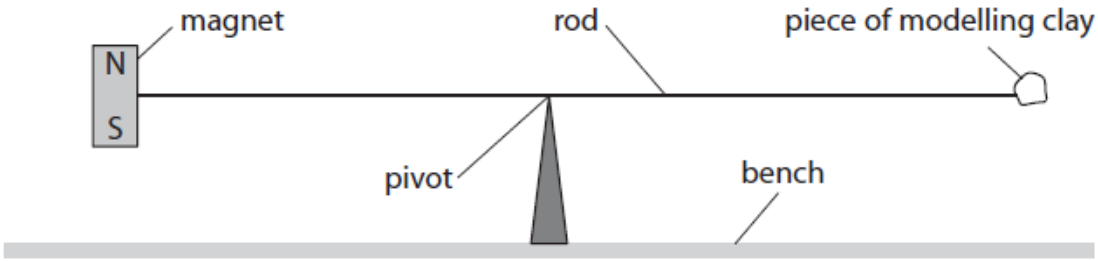


Figure 14

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.

State the relationship between the moment of the weight of the magnet and the moment of the weight of the piece of modelling clay about the pivot.

(1)

.....

.....

(Total for question = 1 mark)

Q26.

Figure 10 shows an arrangement of gears.

Each gear turns around a fixed axle.

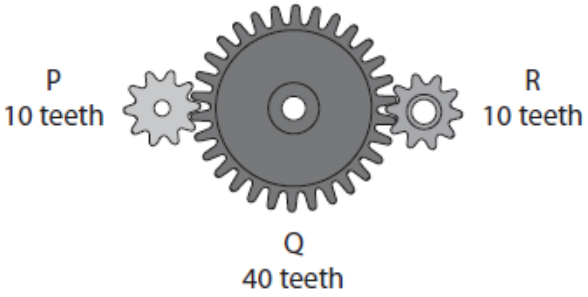


Figure 10

Gear P is turned through one complete revolution per second.

(i) Which of the following describes the motion of gear R?

(1)

		speed (revolutions per second)	direction of rotation
☒	**A**	4	same as P
☒	**B**	1	same as P
☒	**C**	4	opposite to P
☒	**D**	1	opposite to P

(ii) Figure 11 shows the same arrangement with gear R replaced by a rack.

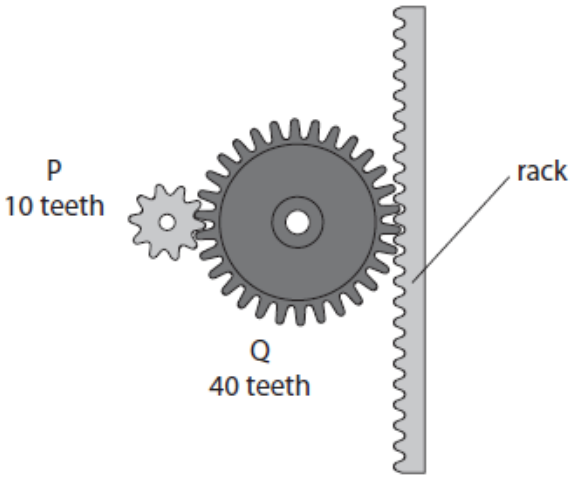


Figure 11

The rack can move up or down when the gears turn.

The teeth on the rack are 2 mm apart.

Calculate how far the rack moves when P turns through to one complete revolution.

(2)

distance = ... mm

(Total for question = 3 marks)

Q27.

Figure 24 shows a submarine underwater.

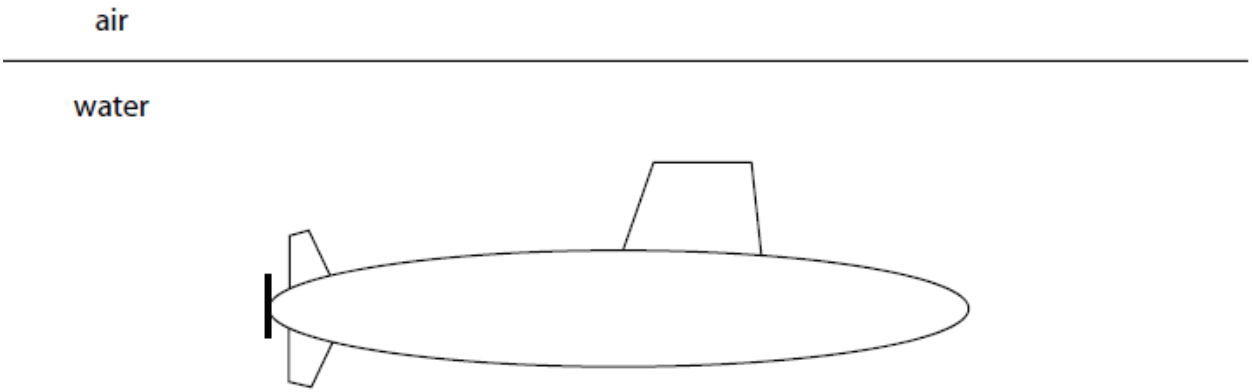


Figure 24

The motor in the submarine turns the gear wheels shown in Figure 25.

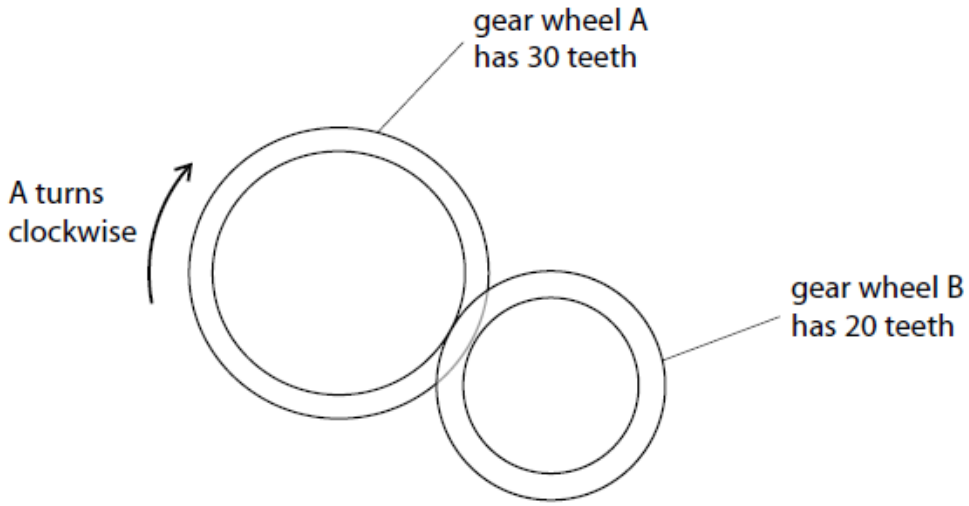


Figure 25

Gear wheel A rotates clockwise through one complete turn.

Which of these is correct for gear wheel B?

(1)

	amount that gear wheel B rotates	direction gear wheel B rotates
☒ **A**	1½ turns	clockwise
☒ **B**	1½ turns	anticlockwise
☒ **C**	⅔ of a turn	clockwise
☒ **D**	⅔ of a turn	anticlockwise

(Total for question = 1 mark)

Q28.

Some questions must be answered with a cross in a box (☒). If you change your mind about an answer, put a line through the box (☒) and then mark your new answer with a cross (☒).

Which of these is a vector quantity?

(1)

☒ **A** acceleration

☒ **B** speed

☒ **C** time

☒ **D** distance

(Total for question = 1 mark)