

Resultant Forces

Question Paper

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Physics
Exam Board	AQA
Topic	6.5 Forces
Sub-Topic	Resultant Forces
Difficulty Level	Gold Level
Booklet	Question Paper

Time Allowed: 28 minutes

Score: /28

Percentage: /100

Grade Boundaries:

Q1. When two objects interact, they exert forces on each other.

- (a) Which statement about the forces is correct?

Tick (✓) **one** box.

	Tick (✓)
The forces are equal in size and act in the same direction.	
The forces are unequal in size and act in the same direction.	
The forces are equal in size and act in opposite directions.	
The forces are unequal in size and act in opposite directions.	

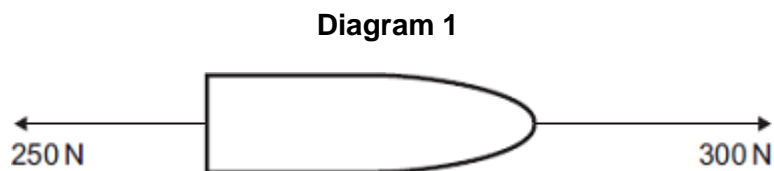
(1)

- (b) A fisherman pulls a boat towards land.

The forces acting on the boat are shown in **Diagram 1**.

The fisherman exerts a force of 300 N on the boat.

The sea exerts a resistive force of 250 N on the boat.



- (i) Describe the motion of the boat.

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.....

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(2)

- (ii) When the boat reaches land, the resistive force increases to 300 N.
The fisherman continues to exert a force of 300 N.

Describe the motion of the boat.

Tick (✓) **one** box.

Accelerating to the right

☐

Constant velocity to the right

☐

Stationary

☐

(1)

(iii) Explain your answer to part (b)(ii).

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(2)

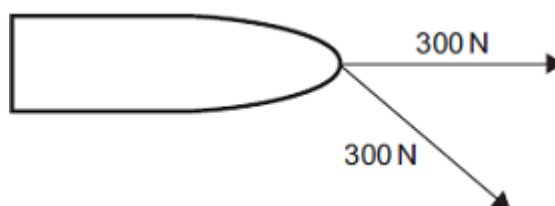
(iv) Another fisherman comes to help pull the boat. Each fisherman pulls with a force of 300 N, as shown in **Diagram 2**.

Diagram 2 is drawn to scale.

Add to **Diagram 2** to show the single force that has the same effect as the two 300 N forces.

Determine the value of this resultant force.

Diagram 2

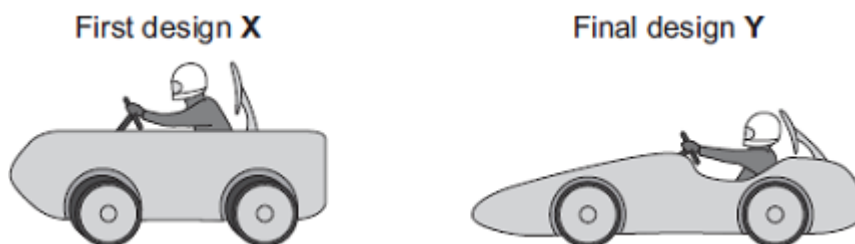


Resultant force = N

(4)

(Total 10 marks)

- Q2.(a)** Some students have designed and built an electric-powered go-kart. After testing, the students decided to make changes to the design of their go-kart.



The go-kart always had the same mass and used the same motor.

The change in shape from the first design (X) to the final design (Y) will affect the top speed of the go-kart.

Explain why.

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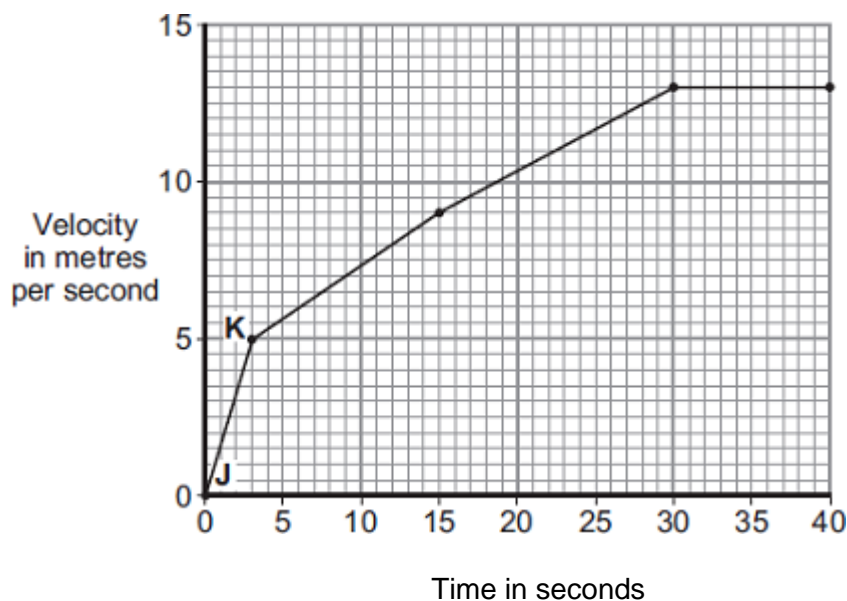
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(3)

- (b) The final design go-kart, Y, is entered into a race.

The graph shows how the velocity of the go-kart changes during the first 40 seconds of the race.



- (i) Use the graph to calculate the acceleration of the go-kart between points **J** and **K**.

Give your answer to **two** significant figures.

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Acceleration = m/s²

(2)

- (ii) Use the graph to calculate the distance the go-kart travels between points **J** and **K**.

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Distance = m

(2)

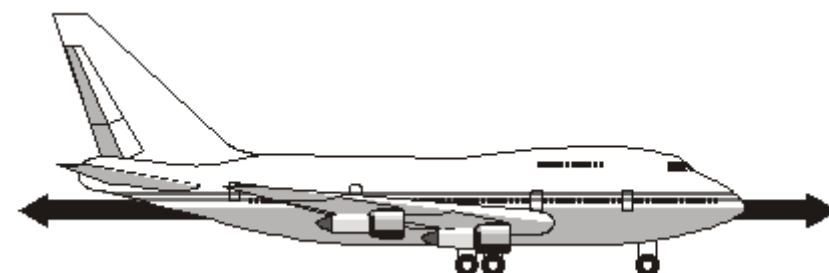
- (iii) What causes most of the resistive forces acting on the go-kart?

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(1)

(Total 8 marks)

- Q3.** (a) The diagram shows an aircraft and the horizontal forces acting on it as it moves along a runway. The *resultant force* on the aircraft is zero.



- (i) What is meant by the term *resultant force*?

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(1)

- (ii) Describe the movement of the aircraft when the resultant force is zero.

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(1)

- (b) The aircraft has a take-off mass of 320 000 kg. Each of the 4 engines can produce a maximum force of 240 kN.

Calculate the maximum acceleration of the aircraft.

Show clearly how you work out your answer and give the unit.

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Acceleration =

(3)

- (c) As the aircraft moves along the runway to take off, its acceleration decreases even though the force from the engines is constant.

Explain why.

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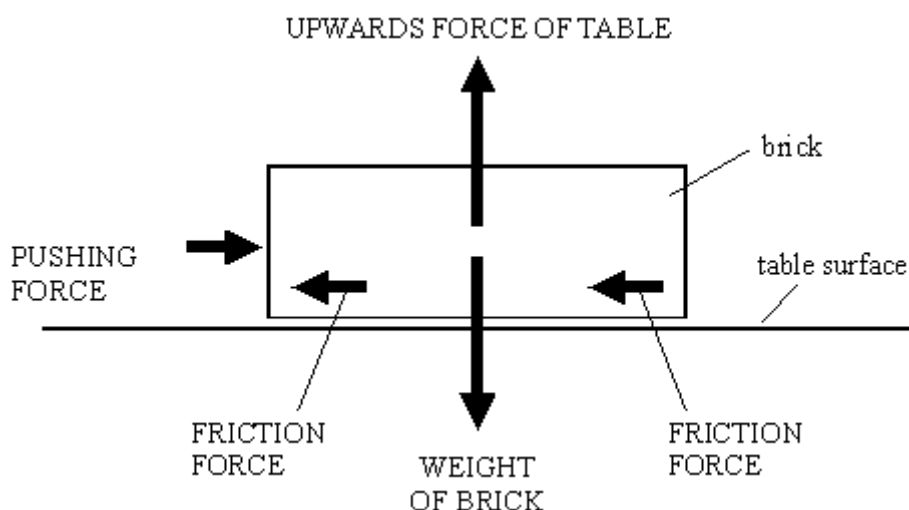
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(2)

(Total 7 marks)

- Q4.** The brick shown in the diagram is being pushed but it is **not** moving.



- (a) The pushing force does **not** make the brick move. Explain why.

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(1)

- (b) The weight of the brick does **not** make it move downwards. Explain why.

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(1)

- (c) A bigger pushing force **does** make the brick slide across the table.
Write down **one** thing that the sliding brick will do to the surface of the table.

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(1)

(Total 3 marks)