

Name of the Student: _____

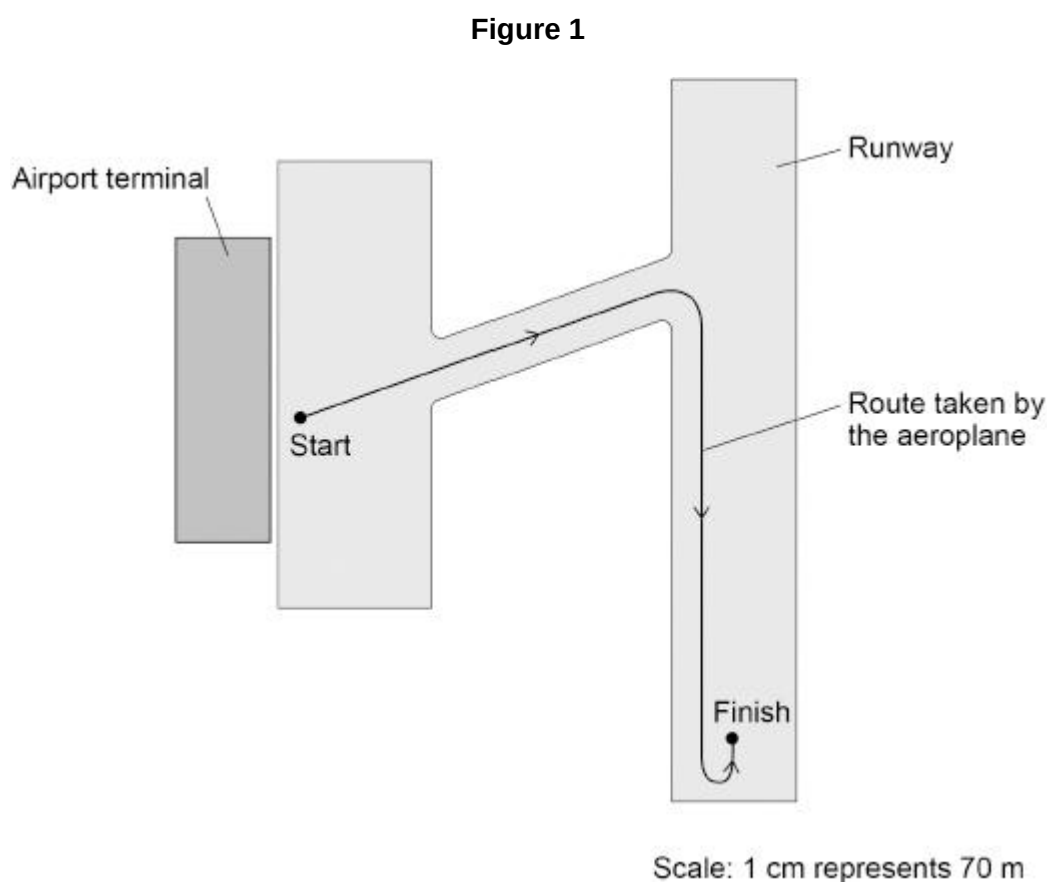
Max. Marks : 23 Marks

Time : 23 Minutes

Q1.

Figure 1 shows the route an aeroplane takes as it travels from an airport terminal to the runway.

Figure 1 has been drawn to scale.



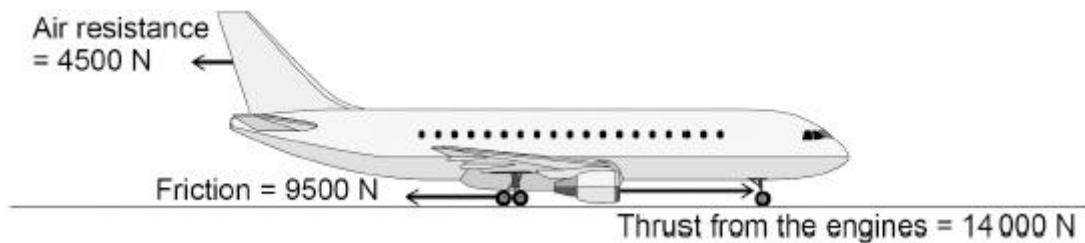
- (a) Determine the magnitude of the aeroplane's displacement from the start point to the finish point on **Figure 1**.

Displacement = _____ m

(2)

Figure 2 shows the direction of the horizontal forces acting on the aeroplane as it moves in a straight line towards the runway.

Figure 2



- (b) Determine the magnitude of the resultant horizontal force on the aeroplane.

Resultant horizontal force = _____ N

(1)

- (c) Describe the motion of the aeroplane as it moves towards the runway.

(1)

- (d) Air resistance and friction are contact forces.

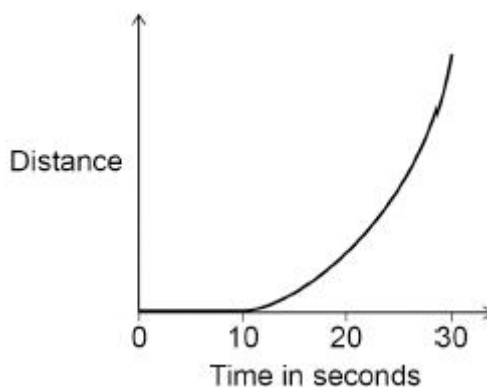
Give **one** other example of a contact force.

(1)

- (e) The aeroplane stops for a short time and then accelerates along the runway.

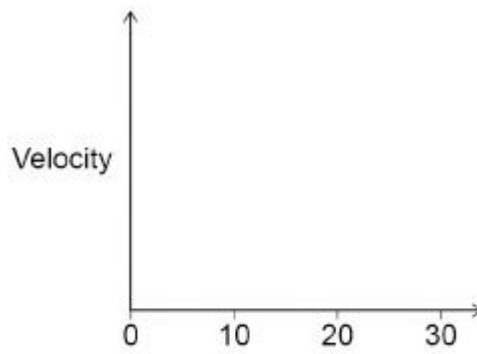
Figure 3 shows a distance–time sketch-graph for this stage of the journey.

Figure 3



Draw the velocity–time sketch-graph for this stage of the journey on **Figure 4**.

Figure 4

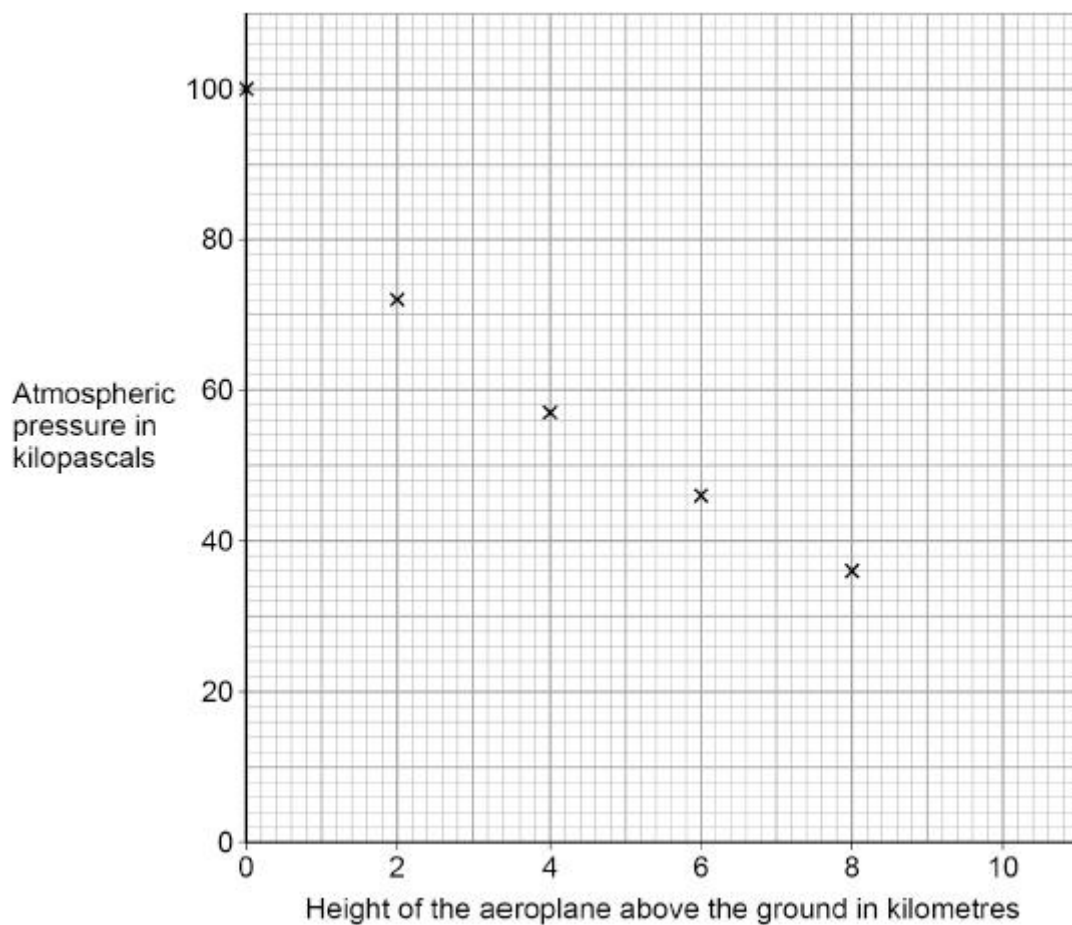


(2)

- (f) The aeroplane takes off from the runway, so its height above the ground increases.

Figure 5 shows how atmospheric pressure varies with the height of the aeroplane above the ground.

Figure 5



Estimate the atmospheric pressure when the height of the aeroplane above the ground is 10 km.

Atmospheric pressure = _____ kPa

(2)

- (g) What happens to the air surrounding the aeroplane as the height of the aeroplane above the ground increases?

Tick (✓) **one** box.

The average density of the air above the aeroplane decreases.

☐

The mass of air above the aeroplane increases.

☐

The temperature of the air increases.

☐

The volume of air below the aeroplane decreases.

☐

(1)

(Total 10 marks)

Q2.

The figure below shows an electric super-car.



- (a) The battery in an electric car needs to be recharged.

Suggest **two** factors that affect the distance an electric car can travel before the battery needs to be recharged.

1. _____
2. _____

(2)

Use the Physics Equations Sheet to answer parts (b) and (c).

- (b) Write down the equation which links acceleration (a), change in velocity (Δv) and time taken (t).

(1)

- (c) The maximum acceleration of the car is 20 m/s^2 .

Calculate the time taken for the speed of the car to change from 0 m/s to 28 m/s at its maximum acceleration.

Time taken = _____ s

(3)

- (d) In a trial run, the car accelerates at 10 m/s^2 until it reaches its final velocity.

distance travelled by the car = 605 m

initial velocity of the car = 0 m/s

Calculate the final velocity of the car.

Use the Physics Equations Sheet.

Final velocity = _____ m/s

(3)

Use the Physics Equations Sheet to answer parts (e) and (f).

- (e) Write down the equation which links distance (s), force (F) and work done (W).

(1)

- (f) When travelling at its maximum speed the air resistance acting on the car is 4000 N.

Calculate the work done against air resistance when the car travels a distance of 7.5 km at its maximum speed.

Work done = _____ J

(3)

(Total 13 marks)