

**GCSE Physics A (Gateway)**

**J249/04 Physics A P5-P8 and P9 (Higher Tier)**

**Question Set 11**

1 (a) Fig. 1.1 is a speed-time graph for car P.

The driver of car P reacts to a traffic light at time = 0.00 s, then presses the brakes at time = 0.50 s.

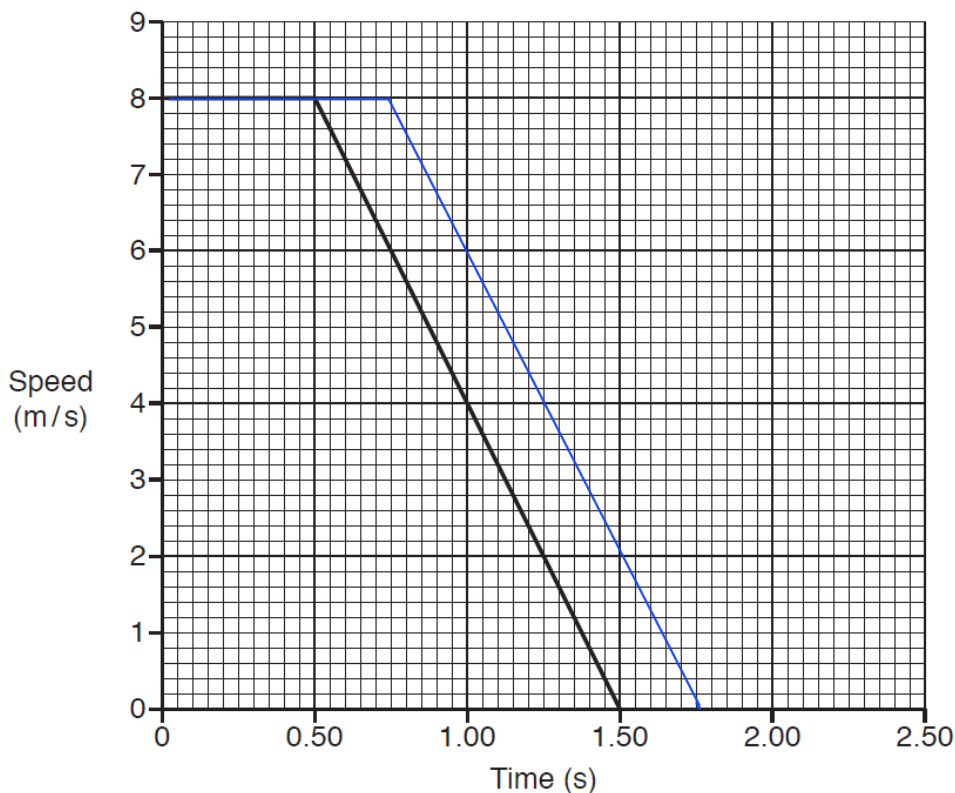


Fig. 1.1

(i) The braking distance is the same size as the thinking distance.

Explain how the graph in Fig. 1.1 shows this.

The area under the graph between 0 to 0.5 seconds (thinking period) is equal to the area under the graphs between 0.5 to 1.5 seconds (braking period), Area = distance.

[1]

(ii) Add another line to the graph in Fig. 1.1 to show the journey of car Q.

- Car Q is travelling at 8 m / s.
- The driver of car Q reacts, then presses the brakes after 0.75 s.
- Car Q decelerates at the same rate as car P.

Same gradient

[2]

(b) Driver P measures the reaction time of driver Q using a 30 cm ruler.

Driver P drops a 30 cm ruler vertically and driver Q catches it.

(i) Explain how the ruler can be used to estimate reaction time.

Use distance ÷ speed to estimate reaction time. Distance is the length at which driver Q catches it. Speed is worked out using acceleration as g.

[1]

(ii) State one precaution they can use to get accurate results.

- The ruler must be dropped, when 0cm is level with the top of driver Q's hand.
- The ruler must be dropped under free fall.

[1]

- (c) In the brakes of a car there are brake pads and a brake disc, as shown in Fig. 1.2.

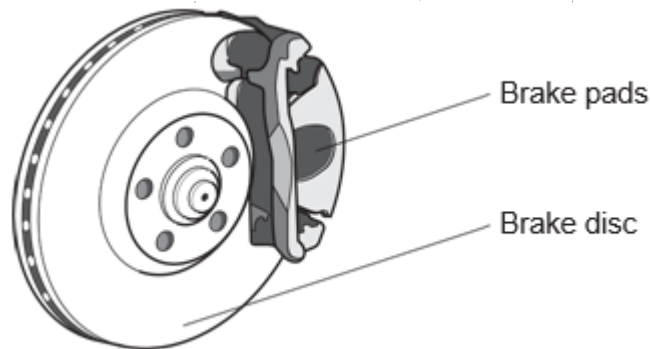


Fig. 1.2

When a car stops, energy transfers between stores.

The brake pads squeeze the brake disc and cause a friction force.

- (i) Explain how braking stops the car.

Include ideas about **energy stores** in your answer.

*KE from the moving car is transferred to thermal energy via friction. This causes the car to slow down.*

[2]

- (ii) High speed cars have ventilated brakes with air holes in the disc, as shown in Fig. 1.3.

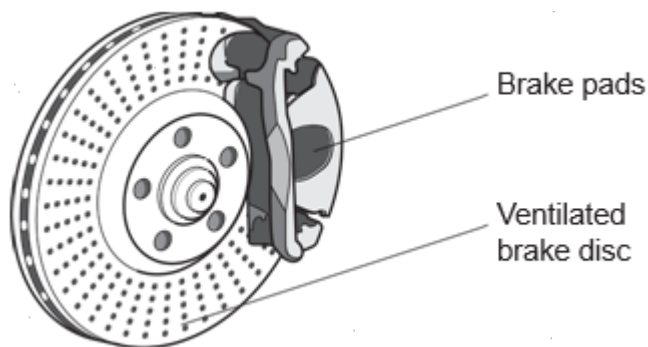


Fig. 1.3

The air holes allow more air to circulate around the disc.

Suggest how these brakes can reduce braking distances.

*It allows the thermal energy caused by the brakes, to ventilate out of the disc / braking system. This means the brakes won't overheat and therefore reducing braking distances.*

[1]

**Total Marks for Question Set 11: 8**

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