5.6 Stopping Distances

Question Paper
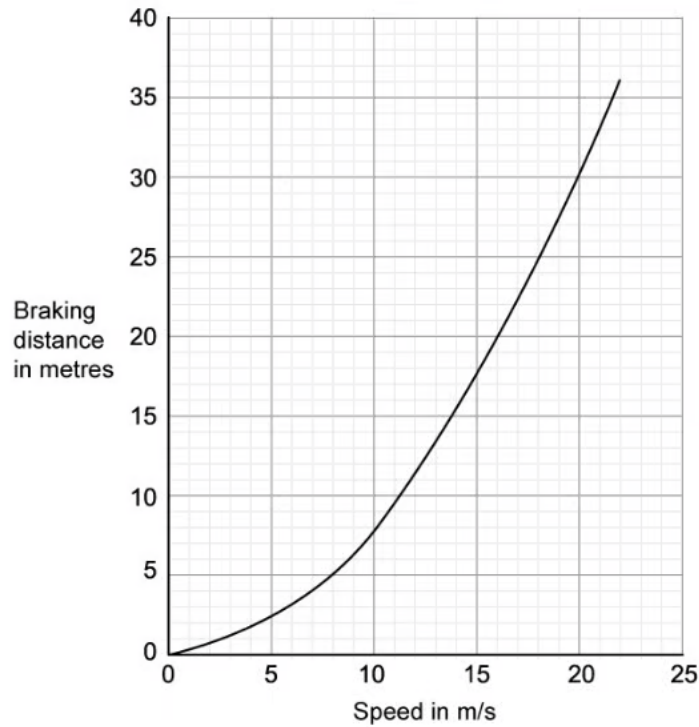
Course	AQA GCSE Physics
Section	5. Forces
Topic	5.6 Stopping Distances
Difficulty	Medium

Time allowed: 40

Score: /32

Percentage: /100

Question 1a

The graph in **Figure 1** shows how the braking distance of a car driven on a dry road changes with the car's speed.

Figure 1

(a)
Draw a new line on **Figure 1** to show how the braking distance of the car on an icy road changes with speed.

[**2 marks**]

[**2 marks**]

Question 1b

Student **A** says that the braking distance can also increase if the driver is intoxicated. Student **B** says the braking distance can also increase if the driver has worn-out tyres.

(b)
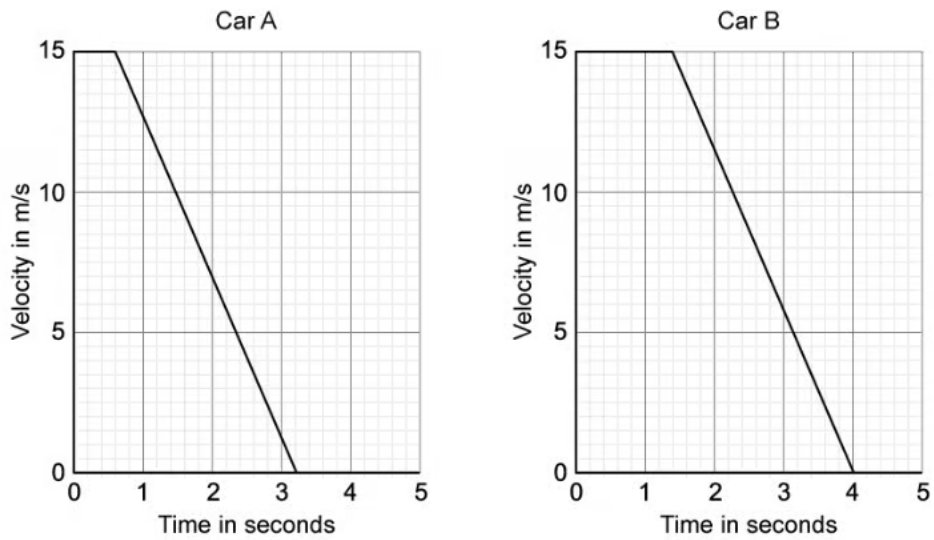Which student is correct? Give a reason for your answer.

[**2 marks**]

[**2 marks**]

Question 2a

The graphs in **Figure 1** show how the velocity of two cars, **A** and **B**, change from the moment the car drivers see an obstacle blocking the road.

Figure 1

(a)
Using **Figure 1**, state and explain which car has a smaller stopping distance.

[2 marks]

[2 marks]

Question 2b

One of the car drivers was on their phone. The other driver is wide awake and alert.

(b)
Determine which driver drove which car.

[2 marks]

[2 marks]

Question 2c

A different driver in car **C** has a stopping distance of 15 m and a thinking distance of 4 m.

(c)
Calculate the braking distance of the driver in car **C**.

[**3 marks**]

[**3 marks**]

Question 3a

Table 1 shows the reaction times of three people driving under different conditions.

Table 1

Car driver	Reaction time	Reaction time in seconds
A	Very tired	1.5
B	Wide awake with no directions	0.6
C	Using a hands-free phone	1.0

Figure 1 show how the thinking distance for the three drivers, **A**, **B** and **C**, depends on how fast they are driving the car.

Figure 1
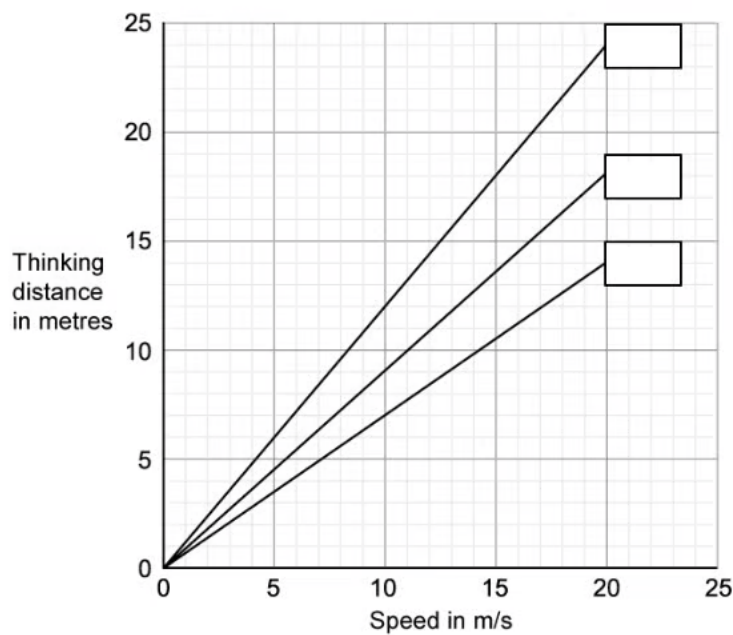
(a)
Match each graph line in **Figure 1** to the correct driver by writing **A**, **B** or **C** in the box next to the correct line.

[**3 marks**]

[**3 marks**]

Question 3b

(b)
Give **two** reasons not mentioned in **Table 1** as to why driver **A** would have the longest reaction time.

[**2 marks**]

[**2 marks**]

Question 3c

Driver **B** travels at 10 m/s.

(c)
Use **Figure 1** to determine the thinking distance of driver **B**. Clearly show your working on the graph.

[**2 marks**]

[**2 marks**]

Question 3d

Driver **B** has a braking distance of 6 m.

(d)
Calculate the stopping distance for driver **B**.

[**2 marks**]

[**2 marks**]

Question 4a

An investigation was carried out to show how thinking distance, braking distance and stopping distance are affected by the speed of a car.

The results are shown in **Table 1** below.

Table 1

Speed in metres per second	Thinking distance in metres	Braking distance in metres	Stopping distance in metres
10		6	12
15	9	14	
20	12	24	36
25	15		53
30	18	55	73

(a)
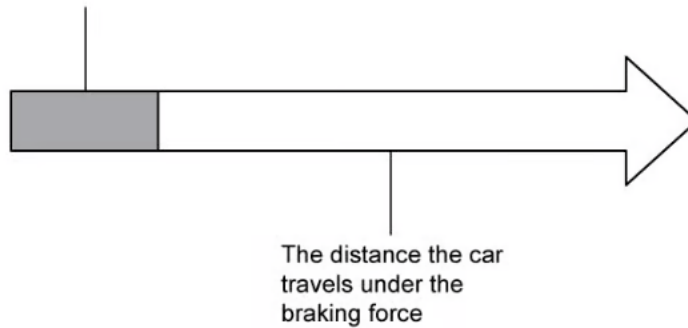Complete **Table 1** by adding in the missing values.

[**3 marks**]

[**3 marks**]

Question 4b

Figure 1 shows the stopping distance for a family car, in good condition, driven at 20 m/s on a dry road. The stopping distance has two parts.

Figure 1

The distance the car travels under the braking force

(b)

Complete **Figure 1** by adding an appropriate label to the first part of the stopping distance and state one factor that changes both the **first** part and the **second** part of the stopping distance.

[**2 marks**]

[**2 marks**]

Question 5a

(a)

Write down the equation relating braking distance, thinking distance and stopping distance.

[**1 mark**]

[**1 mark**]

Question 5b

Midway through a long journey, a lorry driver is travelling along a road at 25 m/s when she spots red traffic lights 200 m ahead.

The lorry driver usually has a reaction time of 0.84 s but she is tired so her reaction time is twice as long.

(b)
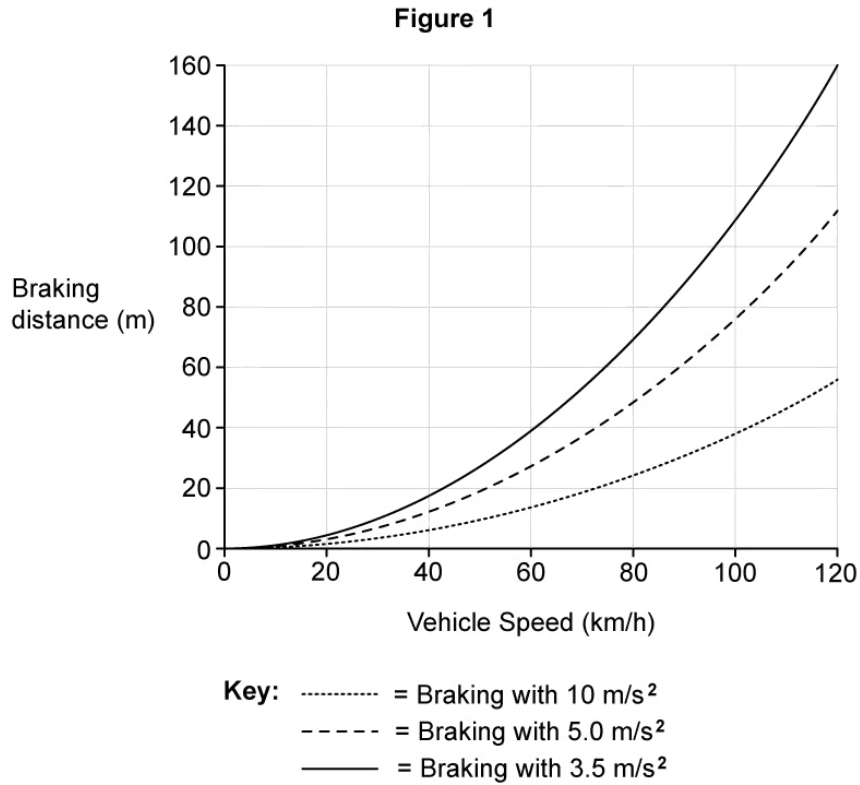Calculate the lorry driver's thinking distance.

[3 marks]

Thinking distance = ... m

[3 marks]

Question 5c

Figure 1 is a graph showing braking distances for the average lorry at different speeds in kilometres per hour (km/h).

Figure 1

(c)

25 m/s is equal to 90 km/h. The lorry's brakes can produce a deceleration of 3.5 m/s^2.

Estimate the stopping distance of the lorry at this speed.

Give your answer to 2 significant figures.

[2 marks]

Stopping distance (2 significant figures) = ... m

[2 marks]

Question 5d

In reality, the lorry comes to a stop only 5 m before the red light, even with brakes being fully applied.

(d)
Suggest two reasons why this may have happened.

[2 marks]

[1 mark]