

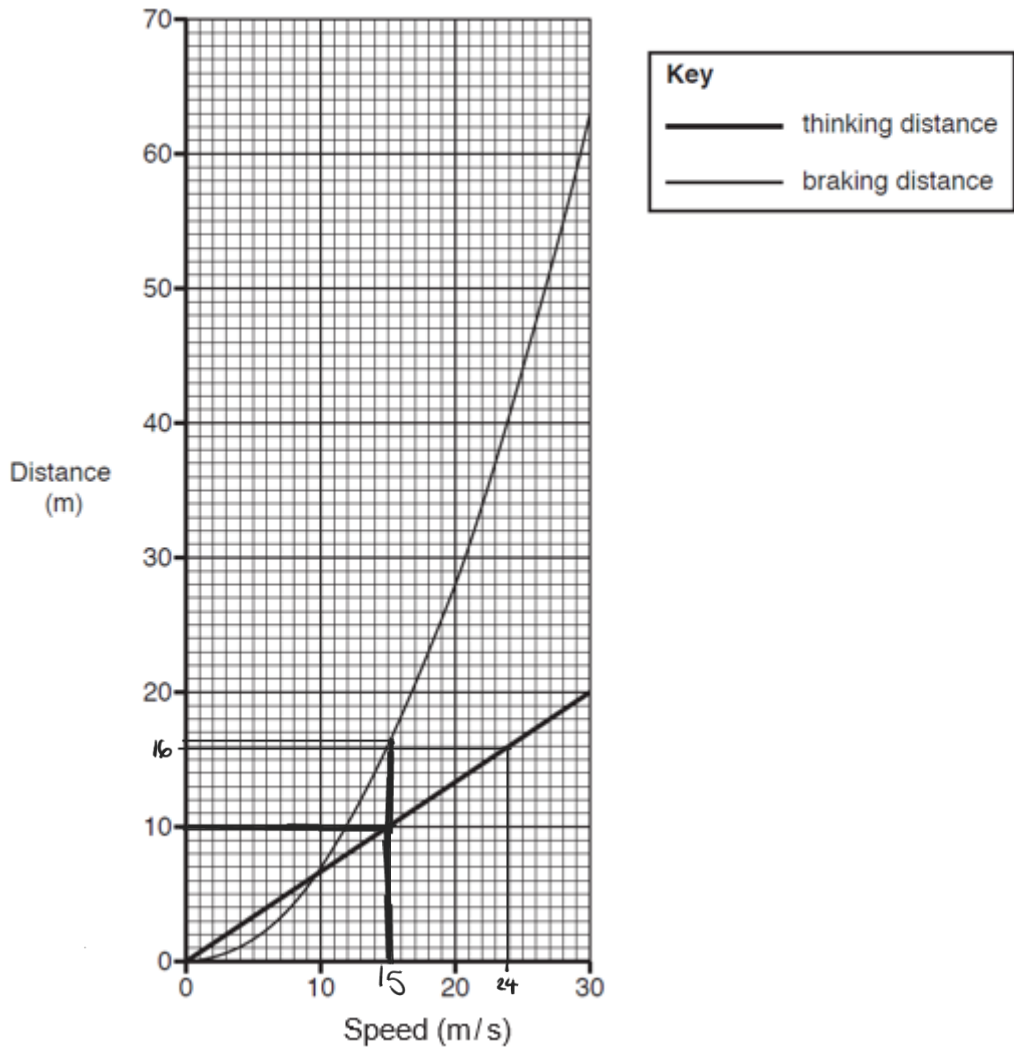
**GCSE Physics A (Gateway)**

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

**Question Set 7**

1

The graph shows thinking and braking distances for a car at different speeds.



(a) (i) Describe how **thinking distance** varies with increasing speed.

Use data from the graph in your answer.

As speed increases, thinking distance increases.  
Thinking distance and speed is directly proportional. → linear graph going through the origin. [2]

(b) (i) Use the graph to find the **thinking distance** at 24 m/s.

Thinking distance = 16 ..... m [1]

(ii) Calculate the **thinking time** at 24 m/s.

Use your answer to (b)(i) and the equation: distance travelled = speed × time

Give your answer to 2 decimal places.

$$\frac{\text{distance}}{\text{speed}} = \text{time} \quad \frac{16}{24} = 0.6\dot{6} \text{ seconds}$$
$$= 0.67 \text{ seconds}$$

(2dp) Thinking time = ... 0.67 ..... s

[3]

(c) (i) State **one** factor that could **increase** thinking distance.

- Drinking alcohol / Take drugs
- Being tired.

[1]

(ii) Calculate the **stopping distance** at 15 m/s.

At 15 m/s: Use the graph to help you.

Thinking distance      Braking distance  
10m                      16.5m

$$10 + 16.5 = 26.5 \quad \text{Stopping distance} = \dots 26.5 \dots \text{ m}$$

[2]

(d) How does the speed affect the **kinetic energy** and **braking distance** of the car?

Use the graph in your answer.

$$KE = \frac{1}{2}mv^2 \quad \therefore KE \propto v^2 \rightarrow \text{if speed doubles, KE quadruples}$$

Therefore if kinetic energy increases (due to speed increasing) [3]  
then braking distance increases, as it will take longer to transfer the KE into thermal (in order to stop the car).

**Total Marks for Question Set 7: 12**

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