Physics on the Move (H)

1. A car travels at a speed of 70 mph (miles per hour).

1 mile is approximately 1600 metres.

Convert 70 mph into m / s (metres per second).

A 2.6 m / s
B 31 m / s
C 112 m / s
D 160 m / s

Your answer [1]

2. Which row in the table shows realistic speeds?

	Speed (m / s)		
	Road cyclist	**Gale force wind**	**Sound in air**
A	40	12	1000
B	6	24	340
C	20	6	760
D	15	55	250

Your answer

[1]

3. An adult on a bicycle travels at 8 m/s on a level road. She sees a hazard and applies her brakes using full force.

Estimate the force of the brakes.

A 5 N
B 50 N
C 500 N
D 5000 N

Your answer [1]

4. A car accelerates from 0 to 60 mph (miles per hour) in about 9 seconds.

Use the relationship: 1 m/s = 2.24 mph

Estimate the acceleration for this car in m/s^2.

A $1\ m/s^2$
B $3\ m/s^2$
C $7\ m/s^2$
D $15\ m/s^2$

Your answer **[1]**

5. A student measures the time it takes for a bicycle to stop in an emergency.

She repeats the measurement to get three results.

The average time for her results is 2.72 s.

The first two results are 2.66 s and 2.60 s.

What is the value of her third result?

A 2.63 s
B 2.66 s
C 2.72 s
D 2.90 s

Your answer **[1]**

6. A scientist uses different drivers to test the stopping distances of the same car.

Look at the results.

Driver	Speed (m/s)	Thinking distance (m)	Braking distance (m)
A	8	6	6
B	16	13	24
C	32	24	96
D	16	12	22
E	8	5	6
F	32	30	120

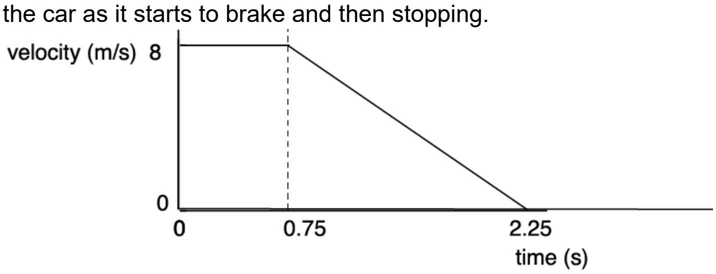
Most of the drivers tested the car on a dry day, on a level road.

Which driver tested the car on an **icy** road?

Driver .... tested the car on an **icy** road. **[1]**

7(a). The car takes 6 m to brake when moving at 8 m/s.

Look at the graph of the car as it starts to brake and then stopping.



Use the graph to show that the braking distance is 6 m.

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____ **[2]**

(b). The table shows the stopping distances for a car.

Speed of car (m/s)	**Thinking distance** (m)	**Braking distance** (m)	**Total stopping distance** (m)
4	3	1.5	4.5
8	6	6	12
16	12	24	36
32	24		

Use the data given to fill in the information missing at a speed of 32 m/s.

[2]

8 (a). A scientist uses different drivers to test the stopping distances of the same car.

Look at the results.

Driver	Speed (m/s)	Thinking distance (m)	Braking distance (m)
A	8	6	6
B	16	13	24
C	32	24	96
D	16	12	22
E	8	5	6
F	32	30	120

Which driver has the **quickest** reaction time?

Driver .... has the **quickest** reaction time.

Calculate their reaction time.

Answer = ______________________________ s **[3]**

(b). Give two drivers that have the **same** reaction time.

Drivers .... have the **same** reaction time.

Explain your answer.

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____ **[2]**

(c). Driver **B** travels at 16 m/s on the road. The thinking distance is 13 m and the braking distance is 24 m.

Driver **B** now drives the car **uphill** at the same speed on the same road.

How will driving the car **uphill** affect thinking, braking and stopping distances?

The reaction time will stay the same.

Complete the sentences.

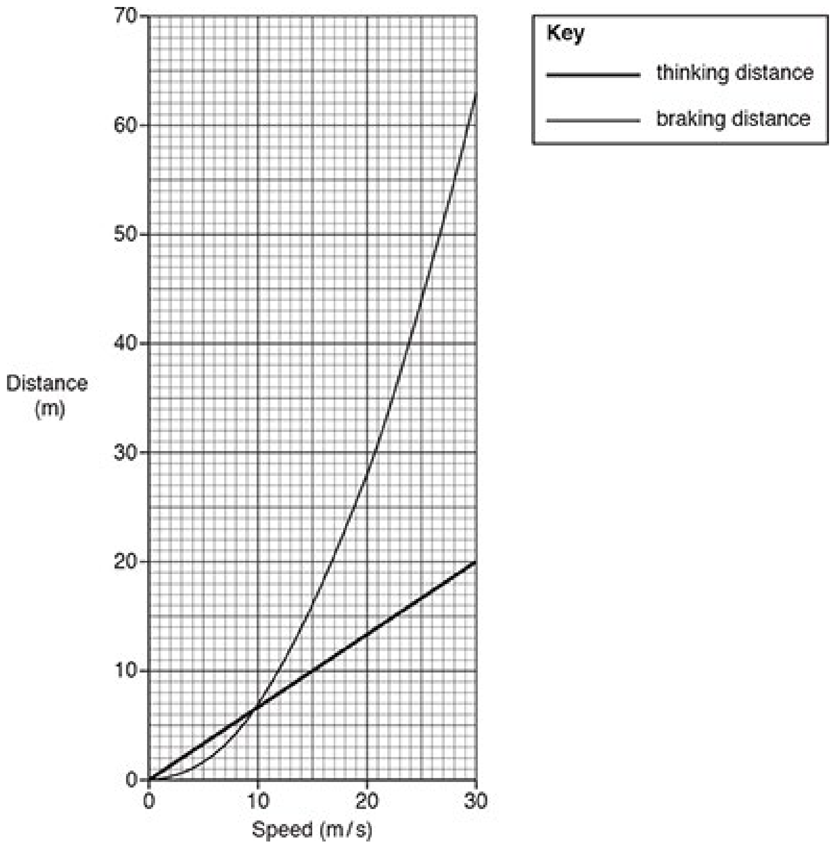
The **thinking distance** will ____

The **braking distance** will ____

The **stopping distance** will ____

[2]

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



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

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

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

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

Give your answer to **2** decimal places.

Thinking time =.................................. s **[3]**

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

Use data from the graph in your answer.

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____ **[2]**

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

Use the graph in your answer.

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____ **[3]**

(d).

i. State **one** factor that could **increase** thinking distance.

____ **[1]**

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

Use the graph to help you.

Stopping distance = ... m **[2]**

10(a). In the brakes of a car there are brake pads and a brake disc, as shown in **Fig. 21.2**.

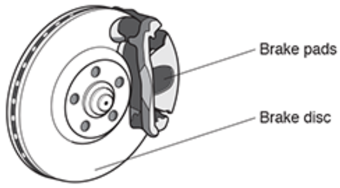

Fig. 21.2

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.

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____ **[2]**

ii. High speed cars have ventilated brakes with air holes in the disc, as shown in **Fig. 21.3.**

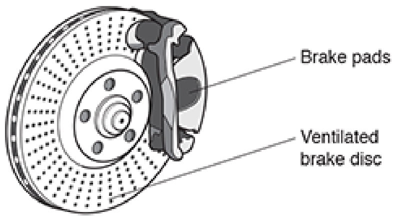

Fig. 21.3

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

Suggest how these brakes can reduce braking distances.

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____ **[1]**

(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.

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____ **[1]**

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

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____ **[1]**

(c). Fig. 21.1 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.

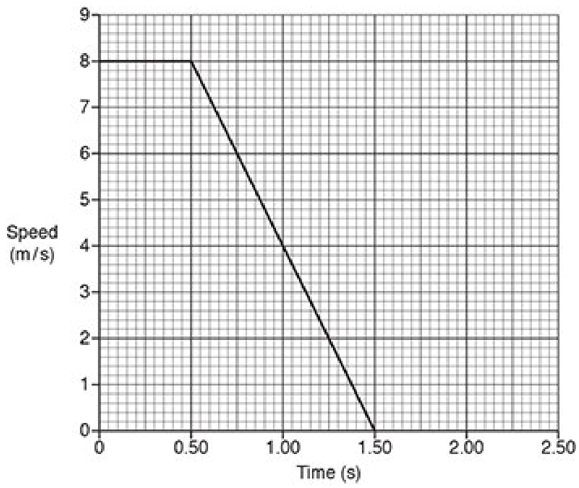

Fig. 21.1

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

Explain how the graph in **Fig. 21.1** shows this.

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____ **[1]**

ii. Add another line to the graph in **Fig. 21.1** 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**.

[2]

END OF QUESTION PAPER