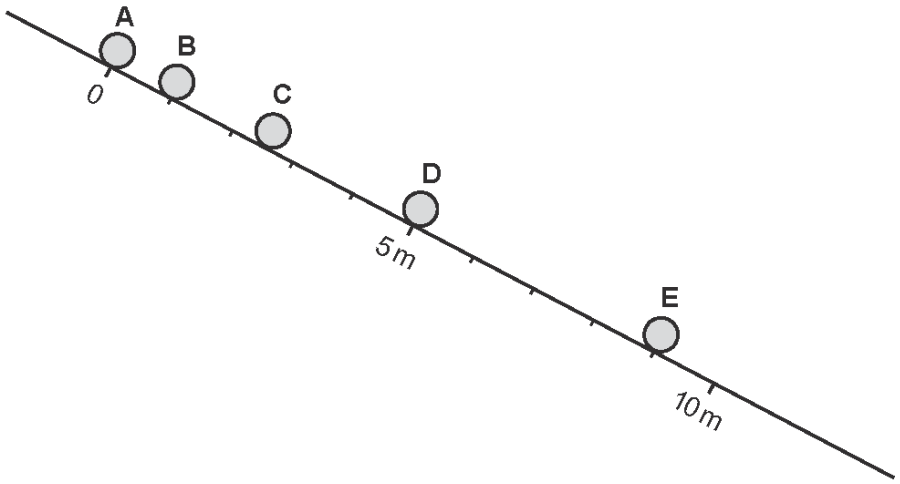
WJEC Physics GCSE
Topic 2.1: Distance, speed and acceleration
Questions by topic

1.



The diagram shows the positions of a ball at 0.5s intervals as it rolls down a 10m track. It took 0.5s to roll from **A** to **B**, then another 0.5s to roll from **B** to **C** and so on.

(a) (i) Write down the distance travelled by the ball from **A** to **E**. [1]

distance = ... m

(ii) Write down the time taken for the ball to travel from **A** to **E**. [1]

time = ... s

(b) Use the equation:

$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

to calculate the mean speed as the ball rolled from **A** to **E**. [1]

speed = ... m/s

(c) State how the diagram shows that the ball is accelerating as it moves. [1]

.....

.....

(d) Describe how the positions of the ball would be different if the track was less steep. [1]

.....

.....

5

2.

A car is travelling at 15 m/s and decelerates to 0 m/s in 5 s on a dry road.

(i) Use an equation from page 2 to calculate the deceleration of the car. [2]

deceleration = ... m/s^2

(ii) (I) Use the equation:

$$\text{mean speed} = \frac{(\text{initial speed} + \text{final speed})}{2}$$

to calculate the mean speed of the car as it decelerates. [2]

mean speed = ... m/s

(II) Explain how the mean speed of the decelerating car travelling at 15 m/s would have changed (if at all) if the road had been icy instead of dry. [2]

.....

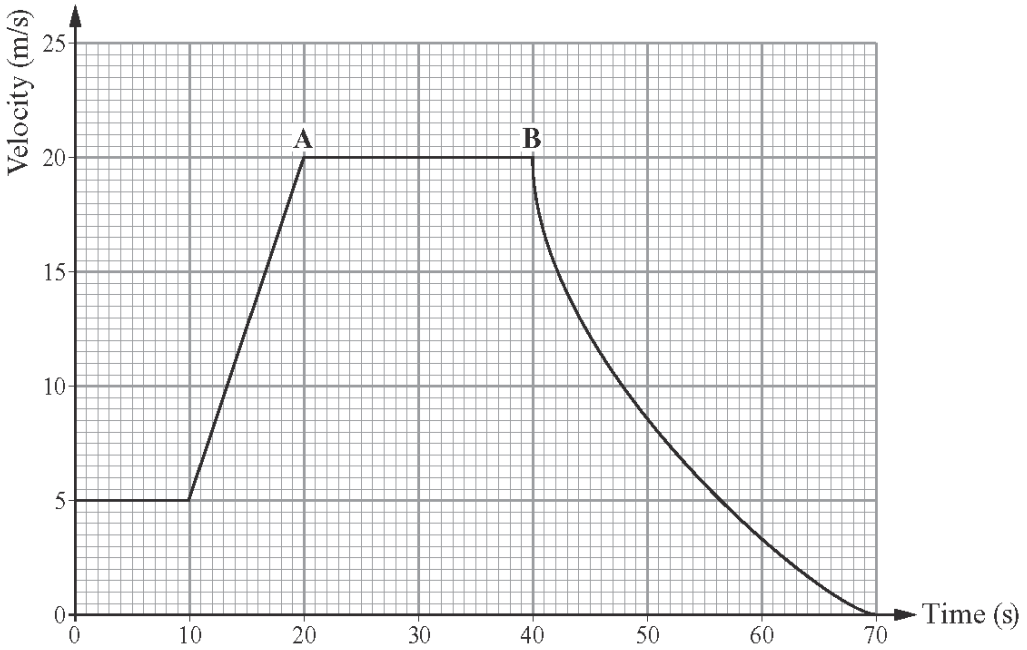
.....

.....

6

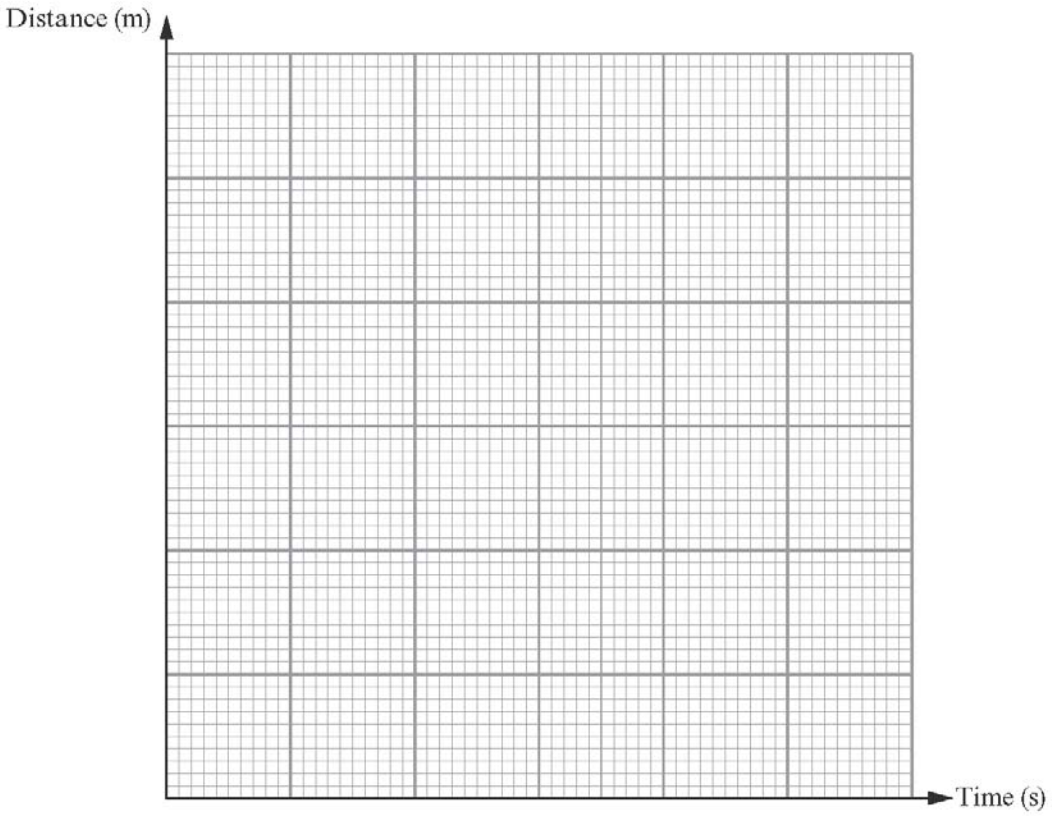
3 (part (iii) HIGHER).

The velocity-time graph for part of a journey of a bus is shown below.



(i) Using data from the graph, describe the motion of the bus during the 70 s shown.
[6 QWC]

(ii) During the first 10 s, the bus travels 50 m. Use this information to construct a distance-time graph for the **first 10 s only** on the grid below. [3]



(iii) Use the equation:

$$\text{distance} = \text{speed} \times \text{time}$$

to calculate the distance travelled by the bus between **A** and **B** on the graph opposite. [3]

Distance travelled = ... m

12

4.

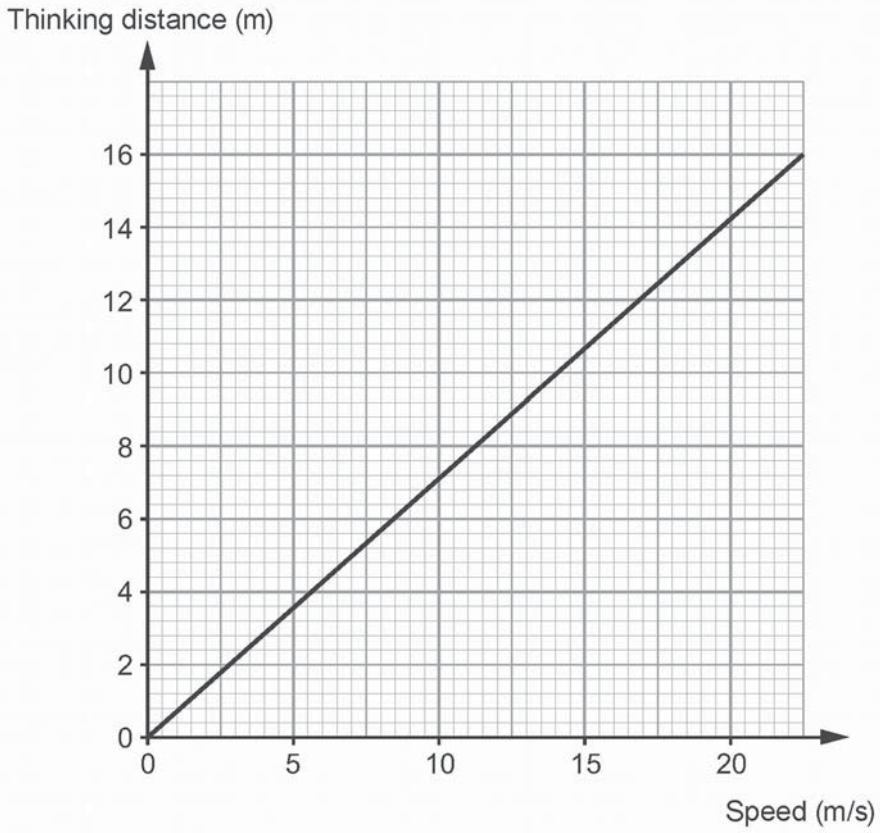
Two things happen when a car driver does an emergency stop.

- The driver sees a hazard and thinks what to do.
- The driver's foot presses the brake to stop the car.

(a) **Complete** the word equation. [1]

Overall stopping distance = Thinking distance + ...

(b) The graph below shows how thinking distance changes with speed for a **tired** driver.



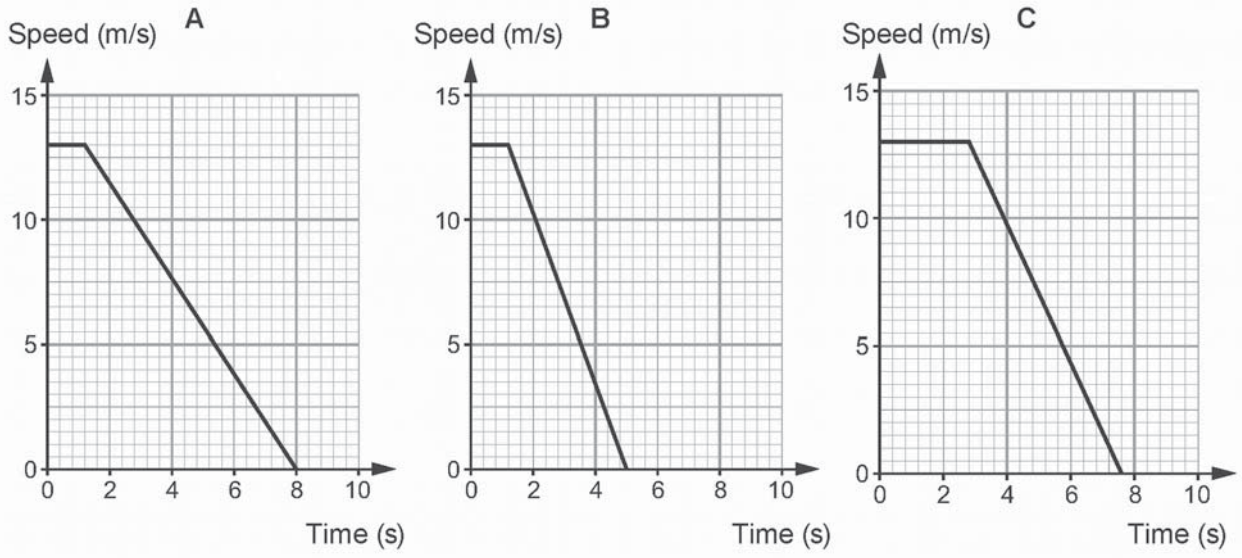
(i) Describe how thinking distance depends on speed. [2]

.....

.....

(ii) **Add a line** to the graph above for an **alert** driver. [1]

(c) Three cars, **A**, **B** and **C**, are travelling towards traffic lights. The graphs below show how the speed of each car changes **after** the drivers see the lights turn to red. [2]



(i) Which graph shows the car driven by a tired driver? .....

(ii) Which graph shows the car with badly worn tyres? .....

5.

The government is considering increasing the motorway speed limit from 70 miles per hour (mph) to 80 mph.
Standard thinking distances and braking distances for a variety of speeds are given in the table below. They apply to an alert driver on a dry day.

Speed (mph)	Thinking Distance (m)	Braking Distance (m)	Total Stopping Distance (m)
60	18	55	73
70	21	75	
80	24	97.5	

Discuss the advantages and disadvantages for taking a journey of 280 miles at 80 mph compared with 70 mph.
Include in your answer information from the table above and your knowledge on the topic.
You should use the equation: time = $\frac{\text{distance}}{\text{speed}}$ to help in part of your answer.

[6 QWC]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

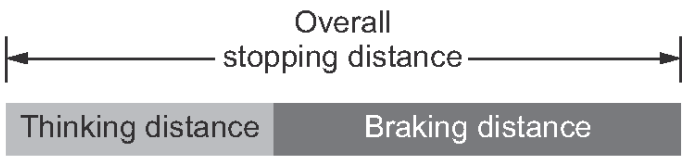
.....

.....

.....

6.

The Highway Code provides information about stopping distances.



The **overall stopping distance** is divided into two parts, **thinking distance** and **braking distance.**

Some of the factors which affect the **overall stopping distance** are shown in the table below.

Column A	Column B	Column C
speed of the vehicle	condition of the brakes **or** road surface conditions	alcohol **or** tiredness

Choose **one factor** from **each column** of the table and describe fully how **the chosen factors** affect the distances described above. [6 QWC]

In your answer, include the following:

- the **three** factors you have chosen;
- for **each** factor refer to the thinking distance, braking distance and overall stopping distance;
- describe clearly whether these distances are **increased, decreased** or **unaffected** by the factor.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

6

7.

The table shows the typical thinking and braking distances for a car at different speeds.

Speed in miles per hour (mph)	Thinking distance (m)	Braking distance (m)
20	6	6
30	9	14
40	12	24
50	.....	38
60	18	56
70	21	75

(a) (i) **Complete the table.** [1]

(ii) Calculate the overall stopping distance at 40 mph. [1]

stopping distance = ... m

(iii) Explain why the thinking distance changes as the speed increases. [2]

.....

.....

.....

(b) The data in the table applies to an alert driver on a dry day. Describe how the data would compare if the driver is tired. [2]

.....

.....

.....

To improve motorway safety, some motorways have chevron markers. The gap between one chevron marker and the next is 40 m. Drivers are instructed to keep at least **two chevron gaps** away from the car in front.

(c) Calculate how long it will take to travel 2 chevron gaps at the motorway speed limit of 31 m/s (70 mph) using the equation: [3]

$$\text{time} = \frac{\text{distance}}{\text{speed}}$$

time = ... s

(d) Explain why the data in the table opposite shows the two chevron rule may not keep motorists safe even if they are travelling in a car at the motorway speed limit. [2]

.....

.....

.....