Motion – 2022 June O Level 5054

1. June/2022/Paper_11/No.2

A driver drives a car at uniform velocity along a road.

The driver sees a hazard and applies the brakes.

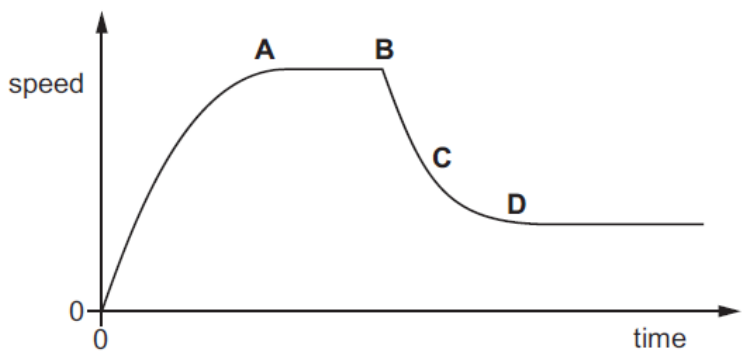
What is the car's motion as it moves through the thinking distance and as it moves through the braking distance?

	motion through the thinking distance	motion through the braking distance
A	deceleration	deceleration
B	deceleration	uniform velocity
C	uniform velocity	deceleration
D	uniform velocity	uniform velocity

2. June/2022/Paper_12/No.3

The graph shows the speed–time graph for a parachutist who jumps from a plane but does not open his parachute immediately.

At which point does he open his parachute?



3. June/2022/Paper_21/No.7

Fig. 7.1 shows a toy helicopter. It can hover and travel through the air.

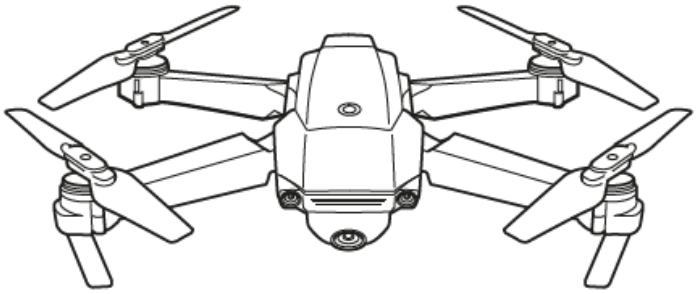


Fig. 7.1

A student flies the toy helicopter on a journey from A to B to C to D at a constant height.

Fig. 7.2 is a scale drawing of the path of the helicopter, viewed from above.

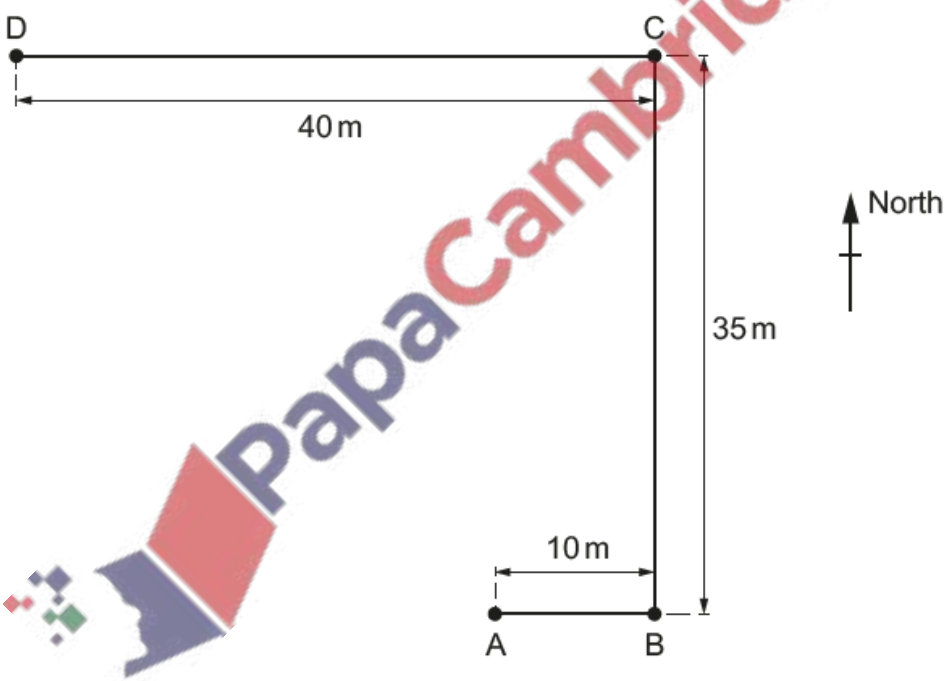


Fig. 7.2 (to scale)

(a) (i) Determine the total distance travelled by the toy helicopter.

..... [1]

(ii) The toy helicopter makes the journey in 40 s.

Calculate its average speed during the journey.

speed = ... [2]

(b) (i) State the difference between distance and displacement.

.....

..... [1]

(ii) Determine the scale used to construct Fig. 7.2 and complete the sentence.

1 cm on the diagram represents ..... on the path. [1]

(iii) Using Fig. 7.2, determine the size of the displacement of point D from point A.

Show your working.

size of displacement = ... [2]

(iv) Determine the angle between North and the direction of the displacement of point D from point A.

angle = ... [1]

(v) State what is meant by velocity.

..... [1]

(vi) Another toy helicopter flies directly from point A to point D in 40 s.

Explain why the magnitude of the velocity of this toy helicopter is smaller than the answer in **(a)(ii)**.

.....

..... [1]

(c) When the toy helicopter hovers at D, its motor fails and it falls. It reaches terminal velocity as it falls.

Explain, in terms of the forces and acceleration, what happens as the helicopter falls and reaches terminal velocity.

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.....

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.....

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..... [5]

[Total: 15]

4. June/2022/Paper_22/No.7

Fig. 7.1 shows the speed–time graph for a car travelling on a straight horizontal road.

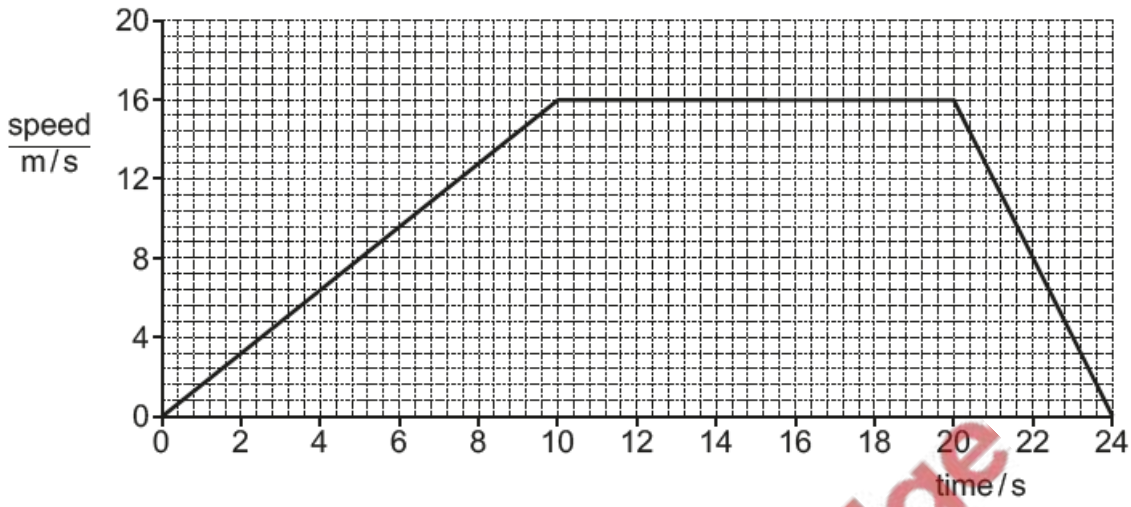

Fig. 7.1

(a) (i) Describe the motion of the car.

.....

.....

.....

.....

..... [3]

(ii) Using Fig. 7.1, calculate the distance travelled by the car during the 24 s of its motion.

Show your working.

distance = ... [3]

(iii) Calculate the average speed of the car during its motion.

average speed = ... [2]

(iv) A second car travels at a steady speed. It travels the same distance as the first car in the 24 s of the journey.

On Fig. 7.1, draw the speed–time graph for the second car. [2]

(b) The thinking distance is the distance travelled by a car between the time that a hazard is seen and the time that the brakes are applied.

The braking distance is the distance travelled while the car slows down to rest.

Table 7.1 shows the thinking and braking distances for an alert driver when the car travels at different speeds.

Table 7.1

$\frac{\text{speed}}{\text{km/h}}$	thinking distance / m	braking distance / m
20	9	2
40	18	9
60		20
80	36	36
100	45	56

(i) Complete Table 7.1. [1]

(ii) The time it takes for the driver to react to the hazard is constant at different speeds.

Explain how the table shows this.

.....

.....

.....

..... [2]

(iii) State what happens to the thinking distance and the braking distance when the driver is tired.

thinking distance .....

braking distance .....

[2]

[Total: 15]