

- 1 A remote-controlled toy car moves up a ramp and travels across a gap to land on another ramp, as illustrated in Fig. 1.1.

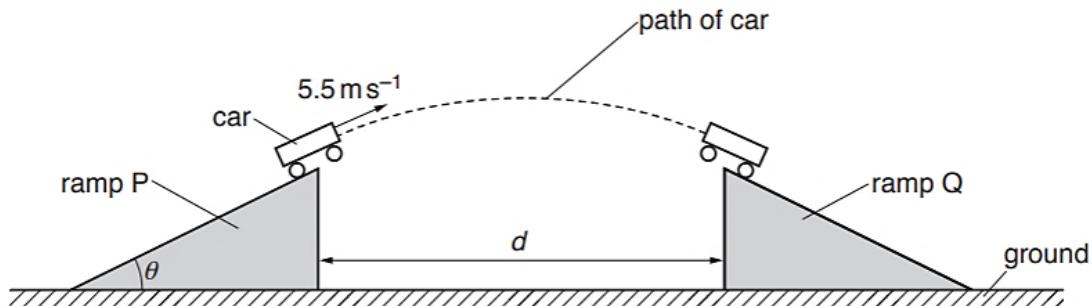


Fig. 1.1

The car leaves ramp P with a velocity of 5.5 m s^{-1} at an angle $\theta = 33^\circ$ to the horizontal. The car lands at the top of ramp Q. The top of both ramps are at the same height and the ramps are a distance d apart.

Air resistance is negligible.

- (a) (i) Determine the time taken for the car to travel across the gap.

$$\text{time taken} = \dots \text{ s} \quad [2]$$

- (ii) Calculate the horizontal distance d .

$$d = \dots \text{ m} \quad [1]$$

- (iii) The percentage uncertainty in the time is $\pm 2.0\%$. The actual uncertainty in the measurement of the speed of the car is $\pm 0.2 \text{ m s}^{-1}$.

Calculate the percentage uncertainty in d .

$$\text{percentage uncertainty} = \dots \dots \dots \% \quad [2]$$

- (iv) Use your answers in (ii) and (iii) to determine the value of d , with its actual uncertainty to an appropriate number of significant figures.

$$d = \dots \dots \dots \pm \dots \dots \dots \text{ m} \quad [1]$$

- (v) Calculate the ratio

$$\frac{\text{kinetic energy of the car at its maximum height}}{\text{kinetic energy of the car as it leaves ramp P}}$$

ratio = [2]

- (b) Ramp Q is removed. The car leaves ramp P with the same velocity as before and now lands directly on the ground. The car leaves ramp P at time $t = 0$ and lands on the ground at time $t = T$.

On Fig.1.2, sketch the variation with time t the vertical component v_y of the car's velocity from $t = 0$ to $t = T$. The numerical values of v_y and t are not required.

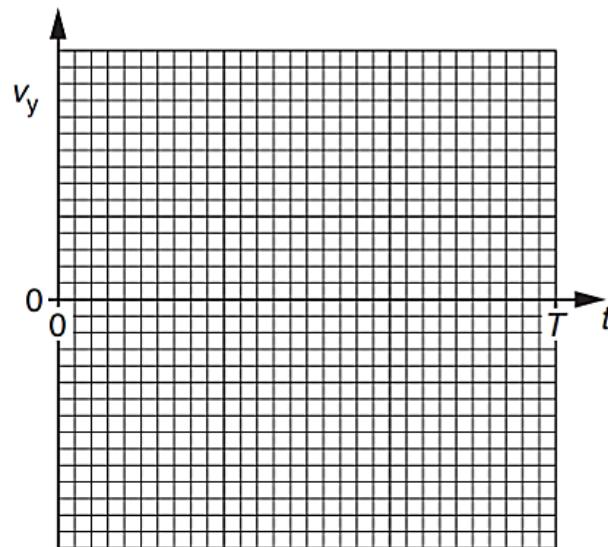


Fig. 1.2

[2]

[Total: 10]

Please turn over for Question 2.

