

8MA0 Unit Test

Mechanics – Constant acceleration

Time allowed: 45 minutes

Centre:

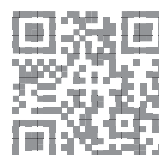
Name:

Teacher:

Question	Points	Score
1	7	
2	8	
3	9	
4	12	
5	14	
Total:	50	

How I can achieve better:

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1. A car is initially travelling with a constant velocity of 15ms^{-1} for T s. It then decelerates at a constant rate for $\frac{T}{2}$ s, reaching a velocity of 10ms^{-1} . It then immediately accelerates at a constant rate for $\frac{3T}{2}$ s reaching a velocity of 20ms^{-1} .

(a) Sketch a velocity-time graph to illustrate the motion. [3]

(b) Given that the car travels a total distance of 1312.5 m over the journey described, find the value of T . [4]

Total: 7

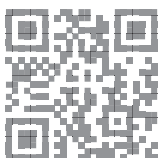


2. A racing car starts from rest at the point A and moves with constant acceleration of 11 ms^{-2} for 8 s. The velocity it has reached after 8 s is then maintained for T s. The racing car then decelerates from this velocity to 40 ms^{-1} in a further 2 s, reaching point B .

(a) Sketch a velocity-time graph to illustrate the motion of the racing car. Include the top speed of the racing car in your sketch. [5]

(b) Given that the distance between A and B is 1404 m, find the value of T . [3]

Total: 8



3. A cyclist is descending down a mountain with constant acceleration. She passes through three checkpoints, P , Q and R , with velocity 6 ms^{-1} , $x \text{ ms}^{-1}$, and 20 ms^{-1} respectively. The time taken to travel from P to R is 35 s.

(a) Find the acceleration of the cyclist. [2]

Given that $\frac{t_1}{t_2} = \frac{4}{3}$, where t_1 s is the time taken to travel from P to Q and t_2 s is the time taken to travel from Q to R .

(b) Find the value of x . [5]

(c) Find the distance between P and R . [2]

Total: 9



4. A particle P passes through point A with velocity 2.8 ms^{-1} and constant acceleration 0.12 ms^{-2} . Three seconds later a second particle Q passes through A with velocity 2.4 ms^{-1} and constant acceleration 0.2 ms^{-2} .

(a) Write down expressions for the displacements of P and Q from A , in terms of t , where t s is the time after P passed through A , [4]

(b) Show that, when the particles meet, $2t^2 - 50t - 315 = 0$. [3]

(c) Find the distance from A when the two particles meet. [5]

Total: 12



5. A ball is thrown vertically upwards with a speed of 16 ms^{-1} from a point 80 m above the ground.

(a) Find the speed with which the ball strikes the ground. [4]

(b) Find the total time that the ball is more than 85 m above the ground. [6]

When the ball strikes the ground it rebounds with $\frac{1}{5}$ of the speed with which it strikes the ground.

(c) Find the greatest height reached by the ball when it rebounds from the floor. [4]

Total: 14

