

Lesson 2

Constant Acceleration Kinematics Applied Mathematics (Mechanics) Year 1

2.1 Horizontal Launch Kinematics

In Lesson 3 we will look at questions in which particles are thrown vertically upwards. In such questions we have to consider the importance of gravity.

In this Lesson, however, we shall focus on horizontal motion in which gravity does not come into the method of solution.

2.2 Exercise

Question 1

M1 Examination Question, May 2002, Q1

A car moves with constant acceleration along a straight horizontal road.

The car passes the point A with speed 5 ms^{-1} and 4 s later it passes the point B
 $AB = 50 \text{ m}$.

(a) Find the acceleration of the car

[3 marks]

When the car passes the point C , it has speed 30 ms^{-1}

(b) Find the distance AC

[3 marks]

Question 2

M1 Examination Question, June 2005, Q1

In taking off, an aircraft moves on a straight runway AB of length 1.2 km

The aircraft moves from A with initial speed 2 ms^{-1}

It moves with constant acceleration and 20 s later it leaves the runway at C with a speed 74 ms^{-1}

Find

(a) the acceleration of the aircraft

[2 marks]

(b) Find the distance BC

[4 marks]

Question 3

M1 Examination Question, Mock Paper 2000, Q1

An aircraft moves along a straight runway with constant acceleration.

It passes a point *A* on the runway with speed 16 ms^{-1}

It then passes the point *B* on the runway with speed 34 ms^{-1}

The distance from *A* to *B* is 150 m

- (a) Find the acceleration of the aircraft

[3 marks]

- (b) Find the time taken by the aircraft in moving from *A* to *B*

[2 marks]

- (c) Find, to 3 significant figures, the speed of the aircraft when it passes the point mid-way between *A* and *B*

[2 marks]

Question 4

M1 Examination Question, Specimen Paper 2000, Q2

A car starts from rest at a point O and moves in a straight line.

The car moves with constant acceleration 4 ms^{-2} until it passes the point A when it is moving with speed 10 ms^{-1}

It then moves with constant acceleration 3 ms^{-2} for 6 s until it reaches the point B

(a) Find the speed of the car at B

[2 marks]

(b) Find the distance OB

[5 marks]

Question 5

M1 Examination Question, January 2002, Q3

A racing car moves with constant acceleration along a straight horizontal road.

It passes the point O with speed 12 ms^{-1}

It passes the point A 4 s later with speed 60 ms^{-1}

- (a) Show that the acceleration of the car is 12 ms^{-2}

[2 marks]

- (b) Find the distance OA

[3 marks]

The point B is the mid-point of OA

- (c) Find, to 3 significant figures, the speed of the car when it passes B

[3 marks]

Question 6

M1 Examination Question, June 2006, Q3

A train moves along a straight track with constant acceleration.

Three telegraph poles are set at equal intervals beside the track at points A , B and C

$AB = 50 \text{ m}$ and $BC = 50 \text{ m}$

The front of the train passes A with speed 22.5 ms^{-1} and 2 s later it passes B

Find

(a) the acceleration of the train

[3 marks]

(b) the speed of the front of the train when it passes C

[3 marks]

(c) the time that elapses from the instant the front of the train passes B to the instant it passes C

[4 marks]

Question 7

M1 Examination Question, May 2009, Q1

Three posts P , Q and R , are fixed in that order at the side of a straight horizontal road

The distance from P to Q is 45 m and the distance from Q to R is 120m

A car is moving along the road with constant acceleration $a \text{ ms}^{-2}$

The speed of the car, as it passes P is $u \text{ ms}^{-1}$

The car passes Q two seconds after passing P and R four seconds after passing Q

Find

(a) the value of u

(b) the value of a

[7 marks]

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