

Kinematics

MCQ

Equations of Motion

1 A car is travelling with uniform acceleration along a straight road. The road has marker posts every 100 m. When the car passes one post, it has a speed of 10 m s^{-1} and, when it passes the next one, its speed is 20 m s^{-1} . What is the car's acceleration?

- A 0.67 m s^{-2} B 1.5 m s^{-2} C 2.5 m s^{-2} D 6.0 m s^{-2}

2 A car, initially at rest, travels 20 m in 4.0 s along a straight line with constant acceleration. What is the car's acceleration?

- A 0.40 m s^{-2} B 1.3 m s^{-2} C 2.5 m s^{-2} D 4.9 m s^{-2}

3 An object falls 10 m from rest before entering some water. Assuming negligible air resistance, what is the time taken to reach the water and the speed with which the object reaches the water?

	<i>time/s</i>	<i>speed/m s⁻¹</i>
A	1.0	10
B	1.0	14
C	1.4	10
D	1.4	14

4 A lunar landing module is descending to the Moon's surface at a steady velocity of 10 m s^{-1} . At a height of 120 m, a small object falls from its landing gear. Taking the Moon's gravitational acceleration as 1.6 m s^{-2} , at what speed does the object strike the Moon?

- A 30 m s^{-1} B 22 m s^{-1} C 20 m s^{-1} D 17 m s^{-1}

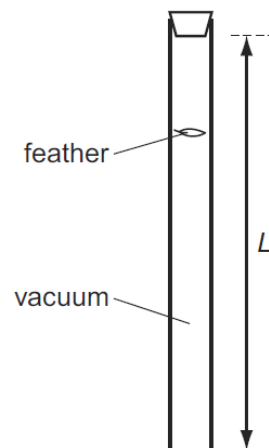
5 An object is thrown with velocity 5.2 m s^{-1} vertically upwards on the Moon. The acceleration due to gravity on the Moon is 1.62 m s^{-2} . What is the time taken for the object to return to its starting point?

- A 2.5 s B 3.2 s C 4.5 s D 6.4 s

- 6 A man stands on the edge of a cliff. He throws a stone upwards with a velocity of 19.6 m s^{-1} at time $t = 0 \text{ s}$. The stone reaches the top of its trajectory after 2.00 s and then falls towards the bottom of the cliff. Air resistance is negligible. Which row shows the correct velocity v and acceleration a of the stone at different times?

	t/s	$v/\text{m s}^{-1}$	$a/\text{m s}^{-2}$
A	1.00	9.81	9.81
B	2.00	0	0
C	3.00	9.81	-9.81
D	5.00	-29.4	-9.81

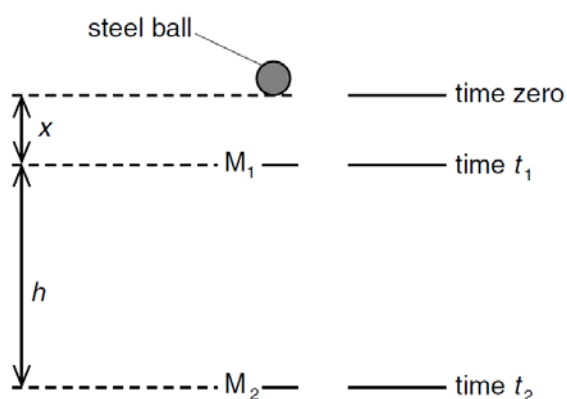
- 7 A stone is dropped from the top of a tower of height 40 m . The stone falls from rest and air resistance is negligible. What time is taken for the stone to fall the last 10 m to the ground?
- A 0.38 s B 1.4 s C 2.5 s D 2.9 s
- 8 A bicycle brakes so that it undergoes uniform deceleration from a speed of 8.0 m s^{-1} to 6.0 m s^{-1} over a distance of 7.0 m . If the deceleration of the bicycle remains constant, what further distance will it travel before coming to rest?
- A 7.0 m B 9.0 m C 16 m D 21 m
- 9 The diagram shows a laboratory experiment in which a feather falls from rest in a long evacuated vertical tube of length L .



The feather takes time T to fall from the top to the bottom of the tube. How far will the feather have fallen from the top of the tube in time $0.50 T$?

- A 0.13 L B 0.25 L C 0.38 L D 0.50 L

- 10** Two markers M_1 and M_2 are set up a vertical distance h apart. When a steel ball is released from rest from a point a distance x above M_1 , it is found that the ball takes time t_1 to reach M_1 and time t_2 to reach M_2 . Which expression gives the acceleration of the ball?



- A $\frac{2h}{t_2^2}$ B $\frac{2h}{(t_2 + t_1)}$ C $\frac{2h}{(t_2 - t_1)^2}$ D $\frac{2h}{(t_2^2 - t_1^2)}$

Structured Questions

- 11** A boy throws a ball vertically upwards and catches it 3.0 s later at the same location. Neglecting air resistance,
- find the speed with which the ball leaves his hand,
 - find the maximum height to which it rises.
- 12** A ball is dropped from a height of 6.0 m. Assume that there is negligible air resistance.
- Find the velocity of the ball just before it hits the ground
 - Find the time taken by the ball to reach the ground after release.
- 13**
- An MRT train accelerates uniformly from rest for 8.0 s until its velocity reaches 20 m s^{-1} . Find
 - its initial acceleration,
 - its distance travelled from rest.
 - The MRT train then travels for another 30 s at this constant velocity of 20 m s^{-1} . Calculate the additional distance travelled for this section of its journey.
 - The MRT train then decelerates uniformly to come to rest in a further 10 s. Find
 - its deceleration over this section of its journey,
 - the additional distance travelled for this section of its journey.

Answers

MCQ

Equations of motion

BCDBD DABBD

Structured Questions

- 11 (a) 15 m s^{-1}
(b) 11 m
- 12 (a) 11 m s^{-1}
(b) 1.1 s
- 13 (a) (i) 2.5 m s^{-2}
(ii) 80 m
(b) 600 m
(c) (i) 2.0 m s^{-2}
(ii) 100 m