VulaLearn

Physical Sciences, Grade 10, Kinematics

Questions

1. Define the following terms:
   a) Displacement
   b) Velocity
   c) Acceleration

2. A car travels 100 km in 2 hours. What is its average speed in m/s?

3. An object is thrown vertically upwards with an initial velocity of 20 m/s.
   a) How long does it take to reach the highest point?
   b) What is the maximum height reached?

4. A ball is dropped from a height of 30 m. How long does it take to reach the ground?

5. An object moves with constant acceleration of 3 m/s2. If its initial velocity is 5 m/s,
   find its velocity after 4 s and the displacement covered.

6. A car decelerates from 30 m/s to rest in 5 seconds.
   What is its acceleration and stopping distance?

7. A motorbike starts from rest and accelerates uniformly at 2.5 m/s2 for 8 seconds.
   Find the final velocity and total displacement.

8. A rock is thrown downwards from a cliff with a velocity of 5 m/s. If it hits the ground after 3 s, calculate its final velocity and the height of the cliff.

9. An object is thrown upwards with 15 m/s. How high does it go and how long is it in the air?

Memo / Full Written Answers

1. a) Displacement is the change in position of an object from its initial to final point, and it is a vector quantity.
b) Velocity is the rate of change of displacement with respect to time, including direction, and is a vector.
c) Acceleration is the rate at which velocity changes over time, also a vector quantity.

2. Convert 100 km to meters: 100 x 1000 = 100,000 m
Convert 2 hours to seconds: 2 x 3600 = 7200 s
Average speed = total distance/total time = 100,000/7200 = 13.89 m/s

3. a) At the highest point, final velocity v = 0 m/s
Using v = u + at: 0 = 20 - 9.8t

t = 2.04 s

b) Use x = ut + 1/2at^2: x = 20(2.04) - 0.5(9.8) (2.04)2 = 20.4 m

4. Initial velocity u = 0, a = 9.8 m/s2, displacement x = 30 m
Use x = 1/2at^2: 30 = 0.5(9.8)t^2

t^2= 60/9.8

t^2 = 6.12

t = 2.47 s

5. v = u + at = 5 + 34 = 17 m/s
x = ut + 12at2 = 54 + 0.5316 = 20 + 24 = 44 m

6. a = (v - u)/t = (0 - 30)/5 = -6 m/s2 (negative indicates deceleration)
Use x = ut + 12at2: x = 305 + 0.5(-6)25 = 150 - 75 = 75 m

7. u = 0, a = 2.5 m/s2, t = 8 s
v = u + at = 0 + 2.58 = 20 m/s
x = ut + 12at2 = 0 + 0.52.564 = 80 m

8. u = 5 m/s, a = 9.8 m/s2, t = 3 s
v = u + at = 5 + 9.83 = 34.4 m/s
x = ut + 12at2 = 53 + 0.59.89 = 15 + 44.1 = 59.1 m

9. At the top, v = 0 m/s, a = -9.8 m/s2, u = 15 m/s
Time to top: t = v - u / a = (0 - 15)/(-9.8) = 1.53 s
Total time = 2 x 1.53 = 3.06 s
x = ut + 12at2 = 151.53 - 0.59.8(1.53)2 = 11.5 m