

## SUVAT Equations

S=Displacement

U=Initial Velocity

V=Final Velocity

A=Acceleration

T=Time

All the equations are:

$$1. \quad v = u + at$$

$$2. \quad s = ut + \frac{1}{2}at^2$$

$$3. \quad v^2 = u^2 + 2as$$

$$4. \quad s = \frac{v+u}{2}t$$

$$5. \quad s = vt - \frac{1}{2}at^2$$

Definition of all terms:

**Displacement:** It is the shortest distance between the initial and final position of an object and is typically measured in units of length such as meters or feet. Displacement is different from distance, which is the total distance an object has traveled, regardless of its starting or ending point. **SI unit is meters.**

So if a person walks from A->B and from B->A, their displacement is 0 because point A was their starting point and A was their finishing point.

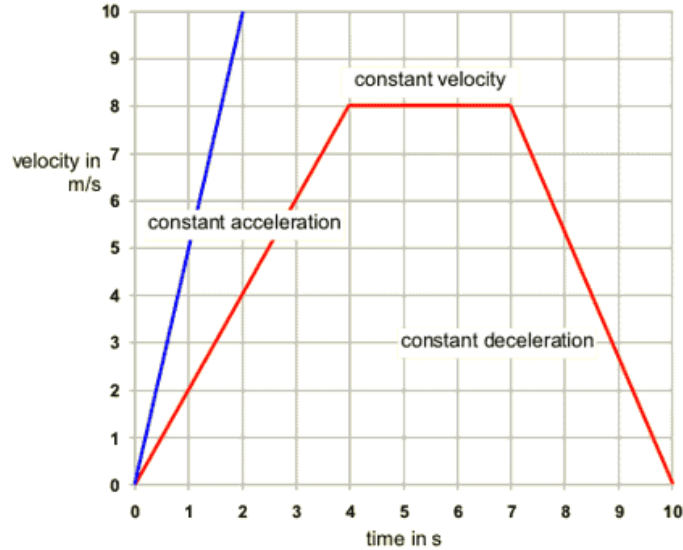
**Velocity:** Velocity is a measure of an object's distance traveled with respect to time, velocity is broken up into two parts; initial and final velocity. Initial velocity is the velocity of an object before it goes through change between a certain time. Final velocity is the velocity of an object after it goes through change. **SI unit is m/s.**

**Acceleration:** Acceleration is the rate of change of velocity with respect to time. This can be measured by using the formula for acceleration is  $\frac{\Delta V}{\Delta T}$  and the **SI unit for acceleration is m/s<sup>2</sup>.**

**Time:** In physics, time is a scalar quantity that describes the progression of events. It is a measure of an event's duration and typically measured in seconds.

## Practice questions:

1. A hamster in it's ball starts at rest and accelerates to  $3\text{ m s}^{-1}$  in 6 seconds.
  - a. What was the distance the hamster travelled?
  - b. What was the acceleration?
2. A ball is dropped from rest. The acceleration due to gravity is  $10\text{ m s}^{-2}$  and the time it takes for the ball to reach the ground is 5 seconds. What was the velocity of the ball just before it hit the ground?
3. A train slows down from  $40\text{ m s}^{-1}$  to  $10\text{ m s}^{-1}$  in 60 seconds, how far does it travel in that time?
4. A particle is accelerated uniformly from rest, so that after 10 seconds it has achieved a speed of  $15\text{ m s}^{-1}$ . Find its acceleration and the distance it has covered?
5. A car accelerates uniformly from rest and after 12 seconds has covered 40m. What are its acceleration and its final velocity?
6. A car is being driven along a road at  $25\text{ m s}^{-1}$  when the driver suddenly notices that there is a fallen tree blocking the road 65m ahead. The driver immediately applies the brakes giving the car a constant deceleration of  $5\text{ m s}^{-2}$ . How far in front of the tree does the car come to rest?
7. A car accelerates uniformly from  $5\text{ m s}^{-1}$  to  $15\text{ m s}^{-1}$  taking 7.5 seconds. How far did it travel during this period.
8. If a ball is dropped from rest and falls 8m to the ground, what is the speed just before it hits the ground? (Take acceleration due to gravity to be  $10\text{ m s}^{-2}$ )
9. A cyclist is traveling at  $7\text{ m s}^{-1}$ , then accelerates at  $2.5\text{ m s}^{-2}$  for 15 seconds.
  - a. How far did they travel during this time
  - b. What was the final speed after 15 seconds?
10. What acceleration would be needed by a car speeding up from  $10\text{ m s}^{-1}$  to  $15\text{ m s}^{-1}$  in 80m?
11. If an object is dropped from rest and falls 16m before hitting the floor, how long does it fall for? (Take acceleration due to gravity to be  $10\text{ m s}^{-2}$ )
12. In travelling the 70cm along a rifle barrel, a bullet uniformly accelerates from rest to a velocity of  $210\text{ m s}^{-1}$ . Find the acceleration involved and the time taken for which the bullet is in the barrel.
13. A train travels along a straight piece of track between 2 stations A and B. The train starts from rest at A and accelerates at  $1.25\text{ m s}^{-2}$  until it reaches a speed of  $20\text{ m s}^{-1}$ . It then travels at this speed for a distance of 1560m and then decelerates at  $2\text{ m s}^{-2}$  to come to rest at B. Find
  - a. Distance from A to B
  - b. Total time taken for the journey



Under the velocity line of a velocity time graph displacement is displayed.

Gravity and mass will be constant, and mass will be constant for person to person. Gravity on earth is 9.807 and based on your mass, mass is measured in kilograms, and you multiply your mass by ten to find your weight on earth.

Gravity on the moon is  $1/6^{\text{th}}$  to that of the earth, so if it comes up in a question, you will know what to do.

If a question asks why there is no oxygen on the moon but there is oxygen on earth(Answer Below)

Because the moon's gravity is so low that the escape velocity is lower than that of earth, therefore, particles can escape the moon because their acceleration is greater than that of the gravitational acceleration on the moon. However, on the earth only a few excited gases can escape the atmosphere because the gravitational acceleration is substantially higher therefore, the particles cannot outpace the gravitational acceleration and will remain in the atmosphere.