Acceleration Notes

ACCELERATION (a) - the rate of change in velocity during a time interval or the rate which an object speeds up or slows dow.

Acceleration is calculated by dividing the change in velocity by the time interval – $\mathbf{a = \Delta v/\Delta t}$. The units are those of velocity over units of time. The units of acceleration are commonly expressed as units of distance over units of time squared (do the fractions yourself to see why). It is important to remember the time interval, a change in velocity by itself is not sufficient to describe the acceleration of the motion.

In everyday language, when there is an increase in speed, we say 'acceleration'; a decrease in speed, we say 'deceleration'. In scientific language both are simply accelerations. An important concept to help understand acceleration is the idea of positive v. negative acceleration. Recall that positive and negative simply represent directions. In displacement and velocity they directly represent the direction of the motion itself. However, since acceleration is a rate of change in the motion itself the direction represented is the direction of the change in the motion. The following are the four cases of +/- acceleration in linear motion: **(a) a positive acceleration on a positive moving object indicates an increase in speed, (b) a positive acceleration on a negative moving object indicates an decrease in speed, (c) a negative acceleration on a positive moving object indicates an decrease in speed, (d) a negative acceleration on a negative moving object indicates an increase in speed.**

FREEFALL - this is a special case of uniform acceleration that occurs with objects falling near the surface of the earth. In order to simplify the study of accelerated motion we will often ignore any outside effects, such as friction. When an object falls here on earth there is friction between it and the air which changes as the object accelerates. This changing acceleration is more difficult to deal with mathematically and conceptually and will be reserved for later. We can, however, closely approximate the "constant" acceleration of an object near the earth's surface if we neglect the air friction. Although this sounds ridiculous, many common objects falling a short distance experience such small amounts of air friction it has little effect on the objects' motion. For example, a golf ball, tennis ball, and a bowling ball will all fall at the same rate (~9.8 m/s^2) from a height of one to two meters.

Graphs of an object in freefall: