Ch 3: Newton's 2nd Law of Motion name:

Study Guide format: Honors: 30 mc Q CP: 25 mc Q (\*SKIP)

**Vocab**

 *acceleration mass volume kilogram (kg)*

 *free fall weight terminal speed constant velocity*

 *terminal velocity air resistance/drag Newton's 2nd law g (acceleration due to gravity)*

 *friction inversely proportional directly proportional*

**\*Formulae**; (units)

acceleration: **a =F/M**; (m/s2 or 'meters per second per second')

\*be able to derive F or M from this formula as well

distance formula: **d= ½ gt2**; (m)

1 kg = 10N; g=10m/s2

**Things you MUST know:**

1. Free fall includes gravity but ignores wind resistance.
2. Be able to calculate **acceleration**/force/mass from a set of givens using the F formula.\*
3. Objects in free fall increase their speed ~10m every second.
4. Be able to determine whether the motion of an object is positive or negative given its direction and acceleration .
5. Describe the acceleration of an object in free fall. What happens to its speed? What happens to its acceleration?
6. Understand the ramifications of terminal speed/velocity on an object's speed/acceleration: Object in **free fall**:
	1. As an object in free fall falls, its speed *increases*. Period. (It cannot reach terminal velocity). Why?
	2. As an object in free fall falls, its acceleration *stays the same*. Why?

An object merely **falling in air**:

* + - * 1. As an object falls in air, its speed *increases* until it reaches vterminal.
				2. As an object falls in air, its acceleration *decreases* until the acceleration reaches zero (vterminal.).
	1. At vterminal , the speed of an object is constant (stays the same).
	2. At vterminal , the acceleration of an object is zero. Why?
1. Remember: If an object does not change speed, it's acceleration remains 0 m/s2.
2. Be able to use the distance formula to calculate how far something falls if given the time in seconds.
3. This will come up again & again (& again) in our future: Coach Bowman & Mr.McDougal walk into a physical science classroom and permit Mr. e to stand between them & push each of them with equal F. Which one moves faster? (hint: which one has less inertia?--that's the one)
4. Mass is a measurement of inertia.
5. Apply the acceleration formula to different situations (eg. double Fnet🡪 a? or double mass🡪 a?); use our favorite situation (#9 above) to help you visualize the problem.
6. Be able to convert from mass to F (eg. kg🡪 Newtons).\*
7. Two factors that most determine the amount of air resistance are size (horizontal surface area) and speed of an object.
8. Suppose one drops two objects of differing masses (thus different weights) from the same height:
	1. Which one hits the ground first w/o air resistance?
	2. Which one hits the ground first in the presence of air resistance?
9. If an elephant and a mouse jumped out of a large airplane, which would experience the greater air resistance? Why?