M	T	W	Th	F
28-Nov A-Day • Notes 6.2 • HW 6.2	29-Nov B-Day • Notes 6.2 • HW 6.2	30-Nov A-Day • Lab 6.3 CoE • Notes 6.3 • HW 6.3	1-Dec B-Day • Lab 6.3 CoE • Notes 6.3 • HW 6.3	2-Dec B-Day • Notes 6.4 • Lab 6.4 • HW 6.4 • T6 Review
5-Dec A-Day • Notes 6.4 • Lab 6.4 • HW 6.4 • T6 Review	6-Dec B-Day • Review	7-Dec A-Day • Review	8-Dec B-Day • TEST 6	9-Dec A-Day • TEST 6
12-Dec A-Day • Correct Tests • Review for Final	13-Dec B-Day • Correct Tests • Review for Final	14-Dec C-Day • ?	15-Dec FINALS	16-Dec FINALS

Work/Energy

The use of kinematic equations is banned until further notice. The use of a kinematic equation in solving a problem will result in **double points** being deducted!!!!

Work

- Work is done when a force moves an object through a distance against another force.
  - For example, when I lift a book I do work against gravity.
  - If I push the book along the tabletop, I do work against friction.
- Work = Force · distance ("dot product")
- **$W = F \cdot d$ $W = F\|d$ $W = Fd\cos\theta$**
  - "Visual Trig"
  - Vector Addition

Work

- **$W = F \cdot d$**
- Since $\Sigma F = ma$, we can substitute "ma" into the work equation for "F", giving us
- **W = mad**

Sample

- It takes 1,875 J of work to move a box 15 meters. How much force was needed?

$$W = F \cdot d$$

$$1875\,J = F \cdot 15m$$

$$F = 125\,N$$

Sample

- How much work is done if a 1500 kg car accelerates at a rate of 3.0 m/s^2 for a distance of 100 meters.

$$W = F \cdot d = ma \cdot d$$

$$W = (1500kg)(3.0m/s^2) \cdot 100m$$

$$W = 450{,}000J$$

Energy

- Energy is the ability to do work. In other words, it is work waiting to happen.
- Types of Energy—**some** examples are ….
  - Kinetic—energy of motion (KE)
  - Gravitational potential—energy given an object when you lift it up (It can fall) (PE_G)
  - Elastic or spring potential—stored in a spring or rubber band when you stretch or compress it (PE_S)
  - Heat (Q)
  - Chemical potential
  - Nuclear
  - Sound
  - Light

Kinetic Energy
Gravitational Potential Energy

- ***Kinetic Energy (KE)*** **- the ability of an object to do work because of its motion.**

$$KE = \tfrac{1}{2}mv^2$$

Gravitational Potential Energy (PE_G) **- the ability of an object to do work because of its position in a gravitational field**

$$PE_G = mgh$$

Sample

- What is the kinetic energy of a 30 kg gazelle running at 20 m/s?

$$KE = \frac{1}{2}mv^2$$

$$KE = \frac{1}{2}(30kg)(20m/s)^2$$

$$KE = 6{,}000J$$

Sample

- What is the gravitational potential energy of a 30 kg gazelle that is standing at the edge of a 15 meter high cliff?

$$PE = mgh$$

$$PE = (30kg)(9.8m/s^2)(15m)$$

$$PE = 4410J$$

Practice

1. If it takes 1500 J of work to stop a 50 kg running gazelle, how fast was the gazelle initially running?

2. 4500 J of work are done to lift a 10 kg baby gazelle to the top of a cliff. How high is the cliff?