Unit 10 Plan: ***Work*** and ***Energy***
Physics1 @ PalmHarborUniversityHigh

Day	Date	Topic	Assignments Due / Schedule
1		Notes on Section 10.1 **CW#1:** 1,2,3,6,9,10,12 p.**261-264**	**Read Section 10.1; finish classwork**
2		Intro Rube Goldberg Project	**HW#1**: 15,17,18,20,21 p.265
3		Simple Machines **CW#2:** 79,80,83,84,85 **p.281**	Read **Section 10.2**; finish classwork
4		Kinetic Energy and Potential Energy **CW#3:** 1,2,5,6 **p.287-291**	Read **Section 11.1** **HW#2:** 54,61,62,64,65 **p.307**
5		Conservation of Energy **CW#4:** 15,17 **p.297**; 73,74,76,77 **p.308**	Read **Section 11.2** **Rube Goldberg proposal due**
6		Rube Goldberg project: Dell Lab	
7		Mechanical Universe Video	TBA
8		Review Problems	TBA
9		Concept Review	
10		Unit Test	

***Note**: Homework is due on the day following the assignment, unless otherwise noted.*

Objectives / **Essential Learnings**: (key terms in **bold**)

1. Determine the amount of **work** done, given the force and the distance moved. Analyze situations to determine whether or not work is done. Use the work formula to solve for force, distance or energy
2. Calculate the amount of work done when a force is applied at an angle.
3. Determine the amount of **power** required, given the work done and the time required.
4. Define **energy** in terms of work. Know the units for work (**joules**), energy (**joules**) and power (**watts**)
5. Distinguish among **mechanical energy**, **potential** energy, and **kinetic** energy.
6. Describe how the kinetic energy of an object depends on the speed of the object, its mass, and/or the net work done on that object.
7. Demonstrate the ability to solve problems using the formulas for kinetic energy and gravitational potential energy.
8. State the **law of conservation of energy**. Demonstrate the ability to solve problems using the law of conservation of energy**.**
9. Understand the concepts of **mechanical advantage** and **efficiency** and use them correctly in solving problems.
10. Explain the difference between mechanical advantage (**MA**) and ideal mechanical advantage (**IMA**).
11. Explain why no machine can have an **efficiency** of 100%.

Work = Force x distance ($W = F d$) for force at an angle **$W = F d \cos\theta$** **Power = work/time $P = W/t$**

$$MA = \frac{F_r}{F_e} \qquad IMA = \frac{d_e}{d_r} \qquad efficiency = \frac{W_o}{W_i} * 100\%$$

Work-Energy theorem: $F\Delta d = \Delta E$
(work done = **change** in energy)

kinetic energy (KE): $KE = \frac{1}{2}mv^2$ **gravitational potential energy (PE)**: $PE = mgh$

Conservation of Energy: $KE_i + PE_i = KE_f + PE_f$

Background: Rube Goldberg was a cartoonist (New York Post) that became famous for drawing very complicated machines that performed very simple tasks. A typical Rube Goldberg device could not perform a job as straightforward as turning on a faucet without the assistance of pulleys, fulcrums, mousetraps, cables, and gears. By the time the cartoonist retired, the term "Rube Goldbergian" had been enshrined in the language to describe anything characterized by excess complexity. For more information, check out the Official Rube Goldberg site at http://www.rube-goldberg.com/ and google "*rube Goldberg physics*" for lots of video examples of actual machines.

For this activity you will create a simulation or "Rube Goldberg Machine (of sorts)" using Interactive Physics. Your mission is

- to create a simulation that demonstrates at least **4 energy transformations** using at least **3 types of simple machines**.
- Work in groups of two (or single if number of machines allow it)
- Turn in a "brain-storming" proposal of who you're working with and what and how you are going to do it (due Day 6)
- Bring a flash drive (if you have one) to the lab to save your document…*I'll have one in case you don't, but to try to save all at one time will be very hard for me to do.*
- Create the "machine" in the Dell Lab
- EACH PERSON shall write a paragraph describing the actions and energy transformations that take place.