PHYSICS

EFFICIENCY and COST

EFFICIENCY

As we have seen energy is conserved when it changes from one form to another. However, most of the time when this occurs, wasted energy (in the form of heat, sound, vibrations, etc.) is a portion of this converted energy.

Ex: An engine will produce wasted energy (**thermal**, sound, vibrations, etc.) as it converts chemical potential energy to kinetic energy. (~ 85% - 92% Wasted)

Ex: A light bulb will produce wasted thermal energy as it converts electrical energy to radiant energy. (~ 95% Wasted)

Because not all of the input energy is converted to useful output energy systems that produce a lot of waste energy are said to be ***inefficient***.

An ***Efficient*** system is one that has an output energy very close to its input energy:

$$Efficiency = \frac{E_{out}}{E_{in}} \times 100$$

PHYSICS

EFFICIENCY and COST

Ex: What is the efficiency of a pulley system if it takes a person inputs 19 300 J of energy to lift a 20kg mass 7.5 m above the floor?

PHYSICS

EFFICIENCY and COST

Ex: A 1000 kg roller coaster travelling at 2m/s is at the top of a 30 m tall hill. It then rolls down the hill and heads for the 15 m tall loop. In order to safely go around the loop, the coaster must have a speed of 10 m/s at the top of the loop. The efficiency of the roller coaster is 67% (33% wasted). Will the coaster make the loop?

PHYSICS

EFFICIENCY and COST

Energy Costs

The company that provides electricity (Energy) to your home will charge you a fee every month for the usage of their energy.

Because your home uses so much energy in a month, a larger unit than the joule was needed.

The Kilowatt Hour

The kilowatt hour (kW·h) is a unit of work/energy
(***like the joule only bigger***)

Ex: How much energy is required to power a 3800 W dryer for 1.5 hours:

a) In joules?

b) In kilowatt hours?

PHYSICS

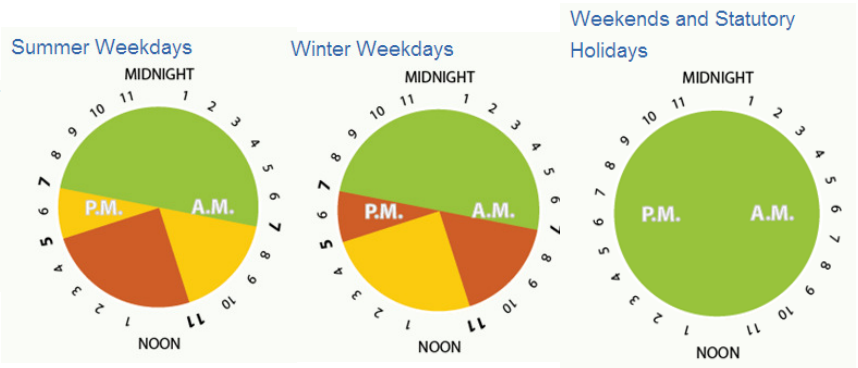
EFFICIENCY and COST

In our area, the energy company uses a tiered system for their energy rates:

Current rates per kilowatt hour*

6.3¢	Off-peak
9.9¢	Mid-peak
11.8¢	On-peak

*Prices effective May 1, 2012.



To calculate the cost for energy:

$$\text{COST} = \text{Energy Used} \times \text{Rate}$$

$$C = (\Delta E)(R)$$

Ex: **a)** How much does it cost to keep a 100W light bulb on all day from 7:00 am to 11:00 pm during the winter?

b) What is the cost if you have 10 of these 100W light bulbs on all day?

c) What is the cost if you repeated this everyday for a 30 day month?

PHYSICS

EFFICIENCY and COST

CLASS WORK

Pg. 243 #1,2 (Efficiency)
Pg. 249 #1-3 (Efficiency)

Pg. 253 #1 (Cost)
Pg. 254 # 4,5 (Cost)