PHYSICS-2
Elementary Physics of Energy

Homework 1
Due Date: APRIL 7, 2010 in class

Problems on page 28 of Ristinen and Kraushaar:

3. If you push a cart along a horizontal surface with a force of 10 pounds, and the cart moves 10 feet, how much work have you done in ft·lbs? In joules?

4. Since energy is conserved, where has the energy gone in question 3? Where did it come from?

7. How many tons of coal would be needed each year to provide for the entire energy needs for the average person in the United States?

8. A bicyclist on a flat road expends energy at a rate of 80 watts. How many calories of energy are expended in five minutes of pedaling?

9. What happens to all the energy radiated by the sun that does not impinge on the earth or other planets?

10. Solar energy is incident on a black parking lot with an intensity of 1000 $\frac{W}{m^2}$ and 90% of it is absorbed. What is this in Btu/hr per square meter? What happens to the other 10%?

11. A windmill produces 1400 watts of electric power that is used to heat water. The efficiency is 100%. How long will it take to raise the temperature of 40 gallons of water by 50 degrees F?

Multiple choice questions on pg. 29-30:

3. A 5 kg mass is attached to the end of a string 2 meters long. The other end of the string is fixed to a hook to make a simple pendulum. Initially, the mass is held so that the string is horizontal. The mass is then released. At the point when the string is vertical, what is the kinetic energy of the mass?
a. 10 joules
b. 49 joules

c. 98 joules
d. cannot be determined because we do not know the velocity

5. A typical U.S. citizen consumes ___ times as much energy as does a typical citizen of India.
a. 6
b. 300
c. 2
d. 25

8. The Principle of Energy Conservation is
a. a possible means for extending our fossil fuel reserves
b. inconsistent with the motion of a pendulum
c. a law of physics often violated in thermodynamic systems
d. a law of physics with no known exceptions
e. obeyed in chemical reactions but not in nuclear reactions

14. Classify the following terms according to whether they represent energy (E), power (P), or neither (N).
a. calorie ___
b. horsepower ___
c. joules/sec ___
d. joule·sec ___
e. kilowatt/hour ___
f. watt ___
g. Btu/hr ___
h. killowatt·hour ___
i. Btu ___
j. horsepower/day ___