Test Date Wed May 15th

Unit 3 : Energy Work & Power Review

Key Topics

Work

Mechanical Energy

Power

Thermal Energy

Nuclear Energy

Efficiency

Word Problems

Work and Mechanical Energy

Example : Calculate the energy required to lift a 505 kg roller coaster to the top of a 89m hill (assuming no friction). What would the kinetic energy be at the bottom of the first hill if the drop was 75m (again assuming no friction)?

Power

Example : If it took 1.5 minutes to get to the top of the hill, what power was used to move the coaster to the top?

Efficiency

Example : If the actual energy used to get to the top of the hill was 5.0×10^5J (due to losses due to friction), calculate the efficiency of the coaster lift mechanism.

Thermal Energy

Example : If 3.0 kg of methyl alcohol at 50°C is added to 2.0 kg of water at 20°C, what is the equilibrium temperature (methyl alcohol c=2,460 J/kg°C, water c=4,180 J/kg°C)? Which substance gained or lost the most energy?

Other stuff to know ☺….

Convert from kWh to J ___________________________________

Convert from g to kg _______________________________________

Freezing and Boiling Points of Water ________________________ , density of water ___________________

Units (MKS) ____

Review Mechanical Energy Quiz

Practice Problems

See back of this page and the following text book problems : page 186 #4, 8, 9, 11, 12, 18, 25, 27, 28, 29

Unit #3 Energy Work and Power

Review Questions

#1. A student uses a force of 10.0 N to push her physics textbook a distance of 0.50 m across a table. Calculate the amount of work she does on the book.

#2. A wrestler lifts his opponent of mass 110 kg to a height of 2.8 m above the floor of the wrestling ring. How much work did the wrestler do on his opponent?

#3. A child pulls his wagon a distance of 15 m across the garden while applying a force of 160 N on the wagon's handle. How much work did the child do on the wagon?

#4. What is the kinetic energy of a 1000 kg car travelling at 25 m/s (assume 2 sig digits)?

#5. A man does 50 J of work to push a 3.0 kg shopping cart out of his way. If the cart started from rest, what was its speed immediately after this push? (assume there is no friction and that there are 2 sig digits)

#6. A 65 kg diver is standing on a diving platform 10.0 m above the water below.
a. What is the gravitational potential energy of the diver with respect to the water's surface?
b. What is her speed just as she strikes the water?

#7. A student pours 1.0 kg of water at 7^{o}C into a kettle. Calculate the amount of heat energy needed to bring this water to a boil. The specific heat capacity for water is 4180 J/kg^{o}C.

#8. A block made of an unknown substance has a mass of 1.5 kg and a temperature of 15^{o}C. When 2.6 x 10^4 J of heat is added to the block, its temperature rises to 90^{o}C. Calculate the specific heat capacity of the unknown substance.

#9. Calculate the amount of heat energy required to melt a 10.0 kg block of ice at 0^{o}C into liquid water at 0^{o}C. The latent heat of fusion for water is 3.34x10^5 J/kg.

#10. What is the energy required to raise the temperature of 275 g of ice at -6.0ºC to water at 78ºC. The specific heat capacity of ice is 2100 J/kg ^{o}C, specific heat capacity of water is 4180 J/kg ^{o}C, latent heat of fusion of water is 3.34x10^5 J/kg, latent heat of vaporization of water is 2.26x10^6 J/kg.

#11. An elevator motor lifts the elevator full of passengers a height of 12 m in 30 s. If the mass of the elevator and passengers is 1000 kg, what is the power developed by the motor (assume 2 sig digs)?

#12 What is the equilibrium temperature when 125 grams of silver at 97^{o}C are added to 2.5 litres of water at 21 ^{o}C? The specific heat capacity of water is 4180 J/kg ^{o}C and the specific heat capacity of silver is 240 J/kg ^{o}C.

#13. The efficiency of an incandescent light bulb is only 4.0%. Calculate the amount of electric energy that must be input to the bulb in order to get 100 J of light energy from the bulb.

Answers:
1. W = 5.0 J, **2.** W = 3.0 × 10^3 J, **3.** W = 2.4 × 10^3 J, **4.** Ek = 3.1 × 10^5 J, **5.** v_2 = 5.8 m/s
6a. Ep = 6.4 × 10^3 J, **6a.** v = 14 m/s, 7. Q = 3.9 × 10^5 J, 8. c = 231 J/kg · °C, **9.** Q = 3.34 × 10^6 J,
10. Q = 1.9x10^5J, **11.** P = 3900 W, **12.** T= 21.2 °C , **13.** Ein = 2500 J