Renewable Energy A First Course 2nd edition Ehrlich Test Bank

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Instructor Test Bank

Chapter 1 – Introduction

- It is determined that 1,200 Joules of work needs to be done on a crate in order to push the crate on a level floor for 1.5 meters. What is the force needed to do this amount of work?
  [Ans: 800 N]

- What is the kinetic energy of a 30 gram ball moving at 200 meters per second?
  [Ans: 600 J]

- How much work is needed to be expended in order to raise a 50 kg box to a height of 1.5 meters above the floor?
  [Ans: 740 J]

- What is the efficiency of a Carnot engine if the $T_c = T_h$?
  [Ans: 0%]

- What must the T_c temperature be in order to obtain a 100% efficient Carnot engine?
  [Ans: 0 K]

- Consider a fluid in an enclosed vessel. What is the change in energy of the fluid if the work done on the fluid in the tank is 4000 kJ and the energy transferred to the air is 2000 kJ.
  [Ans: 2000 kJ]

Chapter 2 – Fossil Fuels

- A coal fired power plant burns at 825 K and uses a reservoir at 300 K. What is the maximum efficiency of this power plant?
  [Ans: 64%]

- A gasoline fueled automobile is burning at 400 K. What is the maximum efficiency of the internal combustion engine if the ambient temperature is 290 K?
  [Ans: 27.5%]

- How much coal is required for a 1 GW coal burning electrical power plant? Assume it takes 3 times the thermal energy to produce the electrical energy; and, express your answer in kilograms per year.
  [Ans: 5×10^9 kg/year]

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- A 750 MW power plant burns 500 tons of coal every hour. If the energy content of its coal is 7500 Btu/lb; what is the efficiency of the power plant?
  [Ans: 34%]

Chapter 3 – Nuclear Power (Basic Science)

- Calculate the energy density of ^{235}U given that one atom will produce about 200 MeV of energy; and, one mole is 0.24 kg.
  [Ans: 8×10^{13} J/kg]

- What is the yield of a nuclear bomb whose shock wave generates a pressure of 10^3 N/m2 across a volume of 4×10^9 m^3?
  [Ans: 4×10^{12} J or about 1 kiloton equivalent]

Chapter 4 – Nuclear Power (Technology)

- How much fuel will a 1 GW nuclear power plant require per year? Assume the uranium fuel is only 5% of the uranium and the energy density of ^{235}U is that as calculated in the problem section of Chapter 3. Also, how much uranium is this expressed in tons?
  [Ans: 2×10^4 kg/yr; 20 tons]

- If you were located 100 km from a 1 GW nuclear power plant, what would the neutrino flux be at your location? Assume that a 1 GW nuclear power plant releases 10^{21} neutrinos per second; and, you present a 1 square meter surface to the neutrino flux.
  [Ans: 10^{10} neutrinos per second per square meter]

Chapter 5 – Biofuels

- How much Btu could be generated in a year in the USA if all biomass waste were incinerated for heat energy. Assume that there is 1000 lbs of biomass waste per person per year and the energy content is 4300 Btu/lb of biomass waste. Approximately what percentage of the total energy consumption of the USA does this biomass waste heat generated represent?
  [ANS: 1.3×10^{15}; 1%]

- How much corn field area would be required if you were to replace all of the oil consumed in the USA with ethanol from corn? Use the following assumptions: a corn field is 1.5% efficient at converting radiant energy into stored chemical potential energy; conversion from corn to ethanol is 17% efficient; assume a 1.2:1 ratio for farm equipment to energy production; a 50% growing season; and, 200 W/ m^2 solar insolation. What would the length of each side of a square be to have such an area?
  [ANS: 5×10^{12} m^2; 2200 km on a side]

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