

Name: _____

ID#: _____

FSC 401

Fall 2010

Exam No. 3

(Open-everything... except cell-phone lines!)

(7 points each)

Indicate whether the following statements are true (T) or false (F). *If you believe there is room for doubt, provide brief explanations and/or calculations in the margins.*

_____ The efficiency of conversion of electricity to heat is higher than the efficiency of conversion of heat to electricity.

_____ If, in order to keep your home cool in summer, you use three 10,000 BTU/h air conditioners (COP=4.0) during 8 hours every day for 150 days in a year, and if 1 kWh of electricity costs 15 cents, the annual cost of keeping your home cool is less than 400 dollars.

_____ The heat loss from a house in winter increases when the difference between the indoor and outdoor temperatures increases.

_____ An atmospheric concentration of CO₂ of 350 ppm is equivalent to less than 350 mg/m³.

_____ For every 14 pounds of nitrogen in coal, more than 30 pounds of nitric oxide are emitted during coal combustion in air at an equivalence ratio of 0.8.

_____ If the equilibrium mole fractions of C₂H₆, O₂, CO₂ and H₂O are 0.1, 0.1, 0.4 and 0.4, respectively, the equilibrium constant for ethane combustion at a pressure of 5 atm is less than 1000.

_____ If the capital cost of a coal-fired electric power plant (1000 MW(e), CUF=0.8, E=33%) is \$1.5/W(e) and the average price of electricity is \$0.10/kWh, the annual cost of fuel (\$50/ton, 12,000 BTU/lb) is more than 10% of the annual revenue from the sale of electricity.

_____ If the slope of the Arrhenius plot is negative, it describes an endothermic chemical reaction.

_____ If the activation energy of combustion (which occurs above 1500 °C), is 30 kcal/mol, the reaction rate will be doubled if the temperature is raised by at least 150 °C.

_____ If the half-life of plutonium is 24 thousand years, its rate of radioactive decay is greater than 0.003% per year.

(5 points each)

Use the attached tables, which summarize the historic and projected fuel consumption in the USA and the world, to answer whether the following statements are true (T) or false (F). ***If you believe there is room for doubt, provide brief explanations and/or calculations in the margins.***

_____ Between 2007 and 2035, renewable fuel technologies are expected to grow in the U.S. at a faster rate than in the OECD countries of Europe.

_____ In the coming years and decades, the rate of growth of biofuel consumption in the U.S. is expected to be more than 5.5% per year.

_____ In 2035 natural gas is expected to contribute more to total energy consumption in the U.S. than in the world.

_____ Both in the U.S. and in the world the contribution of renewable fuel technologies is expected to exceed 5% of total energy consumption by 2020.

_____ Between 2007 and 2035, nuclear fuel technologies in Asia are expected to grow at more than 5% per year (on average).

_____ Coal consumption is expected to grow at a faster pace in the U.S. than in OECD countries as a whole.