

淡江大學 106 學年度日間部寒假轉學生招生考試試題

14-1

系別：化學工程與材料工程學系三年級 科目：質能均衡

考試日期：1月6日(星期六) 第1節

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1. Please transfer the unit as follows: (10%)
 - 1 pound = _____ kilogram ?
 - 1 inch = _____ centimeter ?
 - 1 gallon = _____ liter ?
 - 1 Mechanical horsepower = _____ watt ?
 - 1 Joule = _____ BTU ?
2. Liquid benzene and liquid *n*-hexane are blended to form a stream flowing at a rate of 700 lb_m/h. An on-line densitometer (an instrument used to determine density) indicates that the stream has a density of 0.850 g/mL. The specific gravities of benzene and *n*-hexane are 0.879 and 0.659, respectively. Please estimate the mass and volumetric feeds of two hydrocarbons to the mixing vessel. (20%)
3. Water enters a 2.00 m³ tank at a rate of 6.00 kg/s and is withdrawn at a rate of 3.00 kg/s. The tank is initially half full. (20%)
 - (a) Is the process continuous, batch or semibatch? Is it transient or ready state?
 - (b) How long will the tank to overflow
4. Ammonia burned to form nitric oxide in the following reaction: (30%)
$$4\text{NH}_3 + 5\text{O}_2 \rightarrow 4\text{NO} + 6\text{H}_2\text{O}$$
 - (a) Calculate the ratio (lb-mole O₂ react / lb-mole NO formed.)
 - (b) If ammonia is fed to a continuous reactor at a rate of 100.0 kmol NH₃/h, what oxygen feed rate (kmol/h) would correspond to 40.0% excess O₂?
 - (c) If 50.0 kg of ammonia and 100.0 kg of oxygen are fed to a batch reactor, determine the limiting reactant, the percentage by which the reactant is in excess, and the extent of reaction (mol) and mass of NO produced (kg) if the proceeds to complete.
5. According to Archimede's principle the mass of floating object equals the mass of the fluid displaced by the object. (20%)
 - (a) A wooden cylinder with 30.0 cm high floats vertically in a tub of water (density = 1.00 g/cm³). The top of the cylinder is 14.1 cm above the surface of the liquid. What is the density of the wood?
 - (b) The same cylinder floats vertically in a liquid of unknown density. The top of the cylinder is 20.7 cm above the surface of the liquid. What is the liquid density?