所別：化學工程與材料工程學系碩士班 不分組　科目：化工熱力學及化學反應工程

A: 熱力學部分

(A 1) 舉出至多 **17** 個 熱力學性質之： 1)名稱, 2)定義, 3)應用 (應用至多舉 **2** 項即可)。各個性質標出號碼，盡量以數學式表達。(50 分)

B: 化學反應工程

(B1)

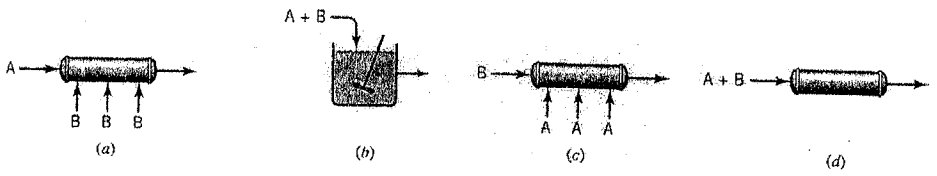
For the gaseous reaction A → R, second-order kinetics, and C_{A0} = 1 mol/liter, we get 25% conversion after 1 hour in a batch reactor. What will be the conversion and concentration of A after 3 hours if C_{A0} = 4 mol/liter? (10%)

(B2)

The elementary irreversible aqueous-phase A+B → R+S is carried out isothermally as follows. Equal volumetric flow rates of two liquid streams are introduced into a 5-liter mixing tank. One stream contains 4 mol A/ liter, the other 0.04 mol B/liter. The mixed stream is then passed through a 15-liter plug flow reactor. We find that some R is formed in the mixing tank, its concentration being 0.005 mol/liter.
Assuming that the mixing tank acts as a mixed flow reactor,
Find the concentration of R at the exit of the plug flow reactor. (7%)
And, the fraction of initial B that has been converted of the system. (8%)

(B3)

Consider the multiple reactions A + B → R, $-r_1 = k_1C_AC_B$; R + B → S, $-r_2 = k_2C_RC_B$, where R is the desired product and is to be maximized. Rate the following four schemes either "good" or "not so good". Please reason it out. (12%)



(B4)

(a) Sketch the relations between conversions (x_A), temperatures (T) and rates ($-r_A$) with x_A **vs.** **T** plots for irreversible, reversible endothermic and reversible exothermic reactions, respectively. (7%)

(b) Sketch the optimum temperature progression in each case to obtain the maximum rate during the course of the reaction, if the allowable maximum temperature is T_{max}. (6%)