Answers Tut 3

3.1

a) 192 L

b) T_o = 40°C i.e. 50% saving in heating costs

c) $V_{min@x=0.48}$ = 128 L, Preheat inlet to 48°C

d) Cool intermediate stream from about 68°C to about 42°C i.e Q = 108.7 kW (Cp_A = 1255 kJ/kmol.K). V reactor 2 = 640 L

e) x_B = 0.23

f) x_A = 0.33 (T_o = 41.14°C)

3.2

b) E = 40.1 kJ/mol

c) K_c = 20 l/mol, K = 3

d) ΔH = -70 kJ/mol (if based on Kc) ΔH = -63.4 kJ/mol (if based on K_{eq}) – use ΔH = -70 kJ/mol for further calculations

e) x = 0.77 (EB: $T = T_o + 200x$)

f) T = 406,6 K (with ΔH = -70 kJ/mol)

g) Fao = Fbo = 3 mol/s then W = 8.6 kg

h) x_{max} = 0.27

i) T_o = 566 K, -ra = 0.27 $mol.kg^{-1}K^{-1}$

h) W = 92.2 kg