Friday Worksheet **Name: …….**

Chemical equilibria worksheet 9

1) Consider the reaction given by the equation below.

$a(aq) + 2b(aq) \rightleftharpoons ab_2(aq)$

2.00 mol of a and 3.00 m ol of b were placed in in a vessel containing 100.0 mL of distilled water at 50°C and allowed to reach equilibrium. At equilibrium it was found that 1.00 mol of ab_2 was present.

a) What is the value of the equilibrium constant for this reaction?

Step 1 find the mol and concentration of each reactant present at equilibrium

=> mol of a = 1.00 mol => [a] = 1.00/0.100 = 10.0M

mol of b = 1.00 mol => [b] = 1.00/0.100 = 10.0M

mol of ab_2 = 1.00 mol => $[ab_2]$ = 1.00/0.100 = 10.0M

$[10.0]/[10.0]^2\ [10.0] = 0.0100\ M^{-2}$

b) A change to the system took place while at 50°C and the following concentrations were recorded a short time after the change.

[a] = 0.400M, [b] = 0.300M, $[ab_2\}$ = 0.200M

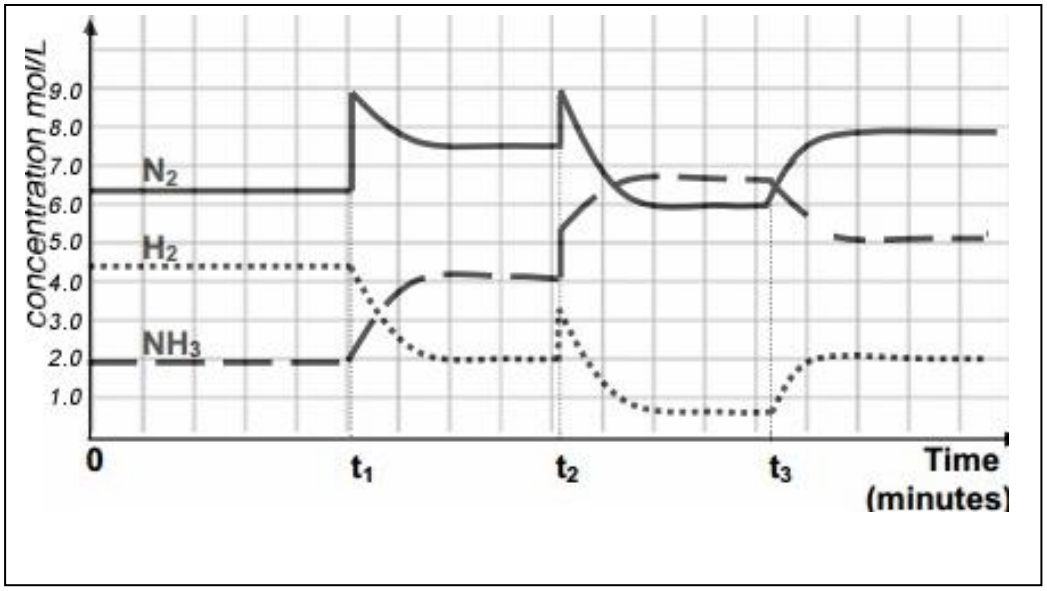
Discuss how the system will respond.

The value of the equilibrium constant at this point is

$=> [0.200]/[0.300]^2\ [0.400] = 5.56M^{-2}$

The value is higher than $0.01M^{-2}$ hence the system, since temperature has not changed, will move to the left to decrease the value of the equilibrium constant back to $0.01M^{-2}$

2) The graph below shows the variation in concentration of reactant and products as a function of time for the following system $3H_2(g) + N_2(g) \rightleftharpoons 2HN_3(g)$ *ΔH= -ve*



a) Discuss what happened at

i. t_1 = nitrogen gas was introduced and the equilibrium position of the system shifted to the right to partially undo the change.

b) ii. t_2 = volume was reduced and pressure increased. The equilibrium position of the system shifted to the right to partially undo the increase in pressure by reducing the number of particles present.

iii. t_3 = temperature was increased hence the systems shifts to the left to partially undo the removal of energy.

c) What is the equilibrium constant as the reaction reaches equilibrium after t_3

$K = [NH_3]^2/[H_2]^3[N_2] = [5.0]^2/[2.0]^3\ [8.0] = 0.39M^{-2}$