Some Equilibrium Revision Questions

1) For the equilibrium $X(g) \rightleftharpoons Y(g) + Z(g)$, a 500 cm^3 flask contains 1 mol X, 1·5 mol Z and 2·5 mol Y in equilibrium together at 0°C. Find K_p for the reaction. If a second equilibrium mixture at the same temperature has $P_x = 10$ atm and $P_y = 6$ atm, find P_z.

2) In an experiment conducted at a certain temperature, some HBr was admitted into an evacuated 2000 cm^3 vessel and when equilibrium was attained some had decomposed yielding 6·32 mol of bromine as one product.

$$2HBr(g) \rightleftharpoons H_2(g) + Br_2(g)$$

The equilibrium constant was 7.50.

i) What was the concentration of each species present at equilibrium?

ii) What mass of HBr was originally let into the vessel?

3) At elevated temperatures, aluminium chloride, Al_2Cl_6, reacts to form Al_3Cl_9 according to the equation:

$$3Al_2Cl_6(g) \rightleftharpoons 2Al_3Cl_9(g)$$

In an experiment at 454 K, the equilibrium partial pressure of Al_2Cl_6 is 1·00 atm, and the equilibrium partial pressure of Al_3Cl_9 is $1{\cdot}02\times10^{-2}$ atm. Calculate the equilibrium constants, K_p and K_c of the above reaction at 454 K