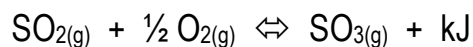


Wkst 2.3: Le Châtelier

1-



Equilibrium Stress	[SO ₂]	[O ₂]	[SO ₃] + kJ	Effect on K _{eq}
Add SO ₂	↑↓	↓ →	↑	No change
Remove O ₂	↑	↓↑ ←	↓	No change
Raise Temp.	↑	↑ ←	↓ ↑	Decrease
Add SO ₃	↑	↑ ←	↑↓	No change
Increase volume	↓↑	↓↑ ←	↓	No change

≡ ↓ P
≡ ↓ C

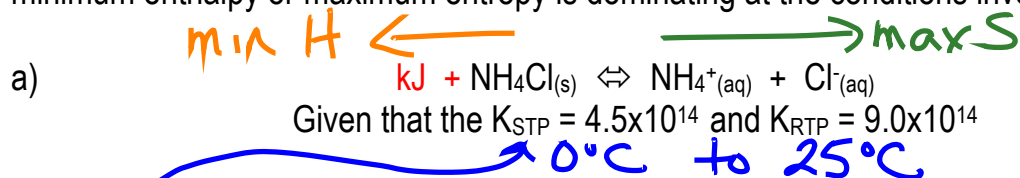
Shifts to side of MORE moles

2-



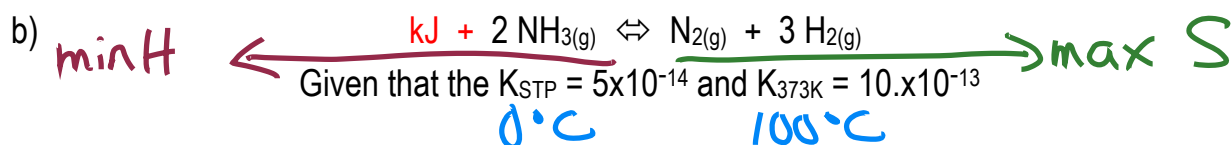
Equilibrium Stress	[PCl ₅] + kJ	[PCl ₃]	[Cl ₂]	Effect on K _{eq}
Remove PCl ₅	↓↑ ←	↓	↓	No change
Lower volume	↑ ←	↑↓	↑↓	No change
Add Cl ₂	↑ ←	↓	↑↓	No change
Lower Temp.	↑ ↓ kJ ←	↓	↓	Decrease
Remove PCl ₃	↓ →	↓↑	↑	No change
Increase pressure by adding helium	No change	No change	No change	No change

3- Determine if the following reactions are exothermic or endothermic. Also state whether minimum enthalpy or maximum entropy is dominating at the conditions involved.



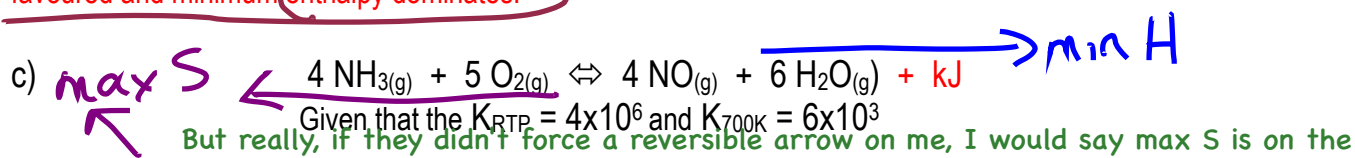
When T increases, K increases \therefore endothermic reaction.

Minimum enthalpy favours reactants and maximum entropy favours products; since $K \gg 1$, products are favoured and maximum entropy dominates.



When T increases, K increases \therefore endothermic reaction.

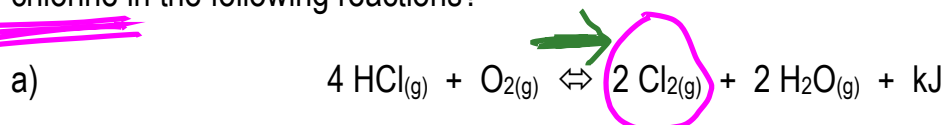
Minimum enthalpy favours reactants and maximum entropy favours products; since $K \ll 1$, reactants are favoured and minimum enthalpy dominates.



When T increases, K decreases \therefore exothermic reaction.

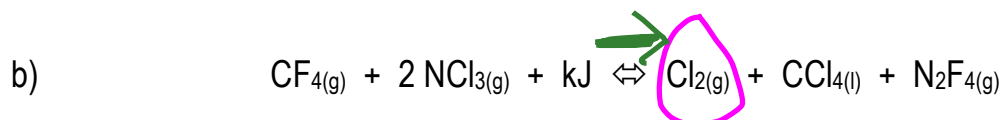
Minimum enthalpy favours products and maximum entropy favours reactants; since $K \gg 1$, products are favoured and minimum enthalpy dominates.

4- How would you utilise concentration, temperature and pressure to maximise the yield of chlorine in the following reactions?



Lower the temperature, add HCl, add O_2 , remove Cl_2 , remove H_2O , lower the volume.

$\equiv \uparrow$ Overall pressure



Raise the temperature, add CF_4 , add NCl_3 , remove Cl_2 , remove N_2F_4 .

Pressure/Volume changes will NOT affect CCl_4 but

$\therefore \downarrow V$ (which $\equiv \uparrow P$) then it will SHIFT to the RIGHT (the side of less moles OF GAS!!!)