Lab [20 pts]
Le Châtelier's Principle

Name _____
Lab Partner(s) _____
Period _____ Date _____

Purpose: To do four equilibrium reactions and observe how the equilibrium position shifts due to added "stress" on the system. You will see Le Châtelier's Principle in action.

Write-up: Fill in all charts and answer the post lab questions.

KEY PHRASES for Explanations: *"Shifted... to consume added..."* or *"shifted ... to replenish depleted..."*

System #1: $[Co(H_2O)_6]^{2+}$ **(aq)** + **4** Cl^- **(aq)** + ΔH ⇌ $[CoCl_4]^{2-}$ **(aq)** + **6** H_2O **(l)**

(Done as demo) *pink* *blue*

	Color? ppt forms? ppt gone?	**Equilibrium position shifted to the...**	**Explanation for shift in equilibrium position**
a) Put a dropper-full of 0.1 M $[Co(H_2O)_6]Cl_2$ into a small tt	Pink		$K_{eq} = \frac{[CoCl_4]^{2-}}{[Co(H_2O)_6]^{2+}[Cl^-]^4}$
b) Add drops of 12 M HCl until a color change occurs. → $H^+ + Cl^-$	Blue	Right	Consume added Cl^- $Q<K$
c) Add drops of water until a color change occurs.	Pink	Left	Diluted solution – all [ ] ↓ shifts to more moles of (aq) $Q>K$
d) Observe the specified test tube at **room temp**.	Purple		
e) Observe the test tube after **heating**.	Blue	Right	K_{eq} ↑ Endothermic – T ↑ favors endothermic direction
f) Observe the test tube after **cooling**.	Pink	Left	K_{eq} ↓ T ↓ favor exothermic direction

System #2: (demo)

Eq A: $Ca(OH)_2$ **(s)** ⇌ Ca^{2+} **(aq)** + **2** OH^- **(aq)**
white solid *colorless* *colorless*

Eq B: H^+ **(aq)** + OH^- **(aq)** ⇌ H_2O **(l)**

	Color? ppt forms? ppt gone?	**Equilibrium position shifted to the..**	**Explanation for shift (s) in equilibrium position**
a) Put a dropper-full of saturated solution of $Ca(OH)_2$ in a small tt.	Colorless No ppt		
b) Add drops of 1 M NaOH(aq) until a change is observed. → $Na^+ + OH^-$	Eq A: White ppt	Eq A: Left	Eq A: Consume added OH^- (product) $Q>K$
c) Add drops of 3 M HNO_3 (aq) until a change is observed. *(Stopper test tube and shake.)* → $H^+ + NO_3^-$	*Eq B: can't see change* ---------- *Eq. A:* ppt gone	Eq B: Right ---------- Eq A: Right	Eq B: Added reactant (H^+) $Q<K$ Consume added H^+ *This shift in Eq. B causes* OH^- *to be depleted.* Eq A: $Q<K$ Replenish depleted OH^- (product)