**Student Worksheet**

**Practical 10: Factors affecting equilibrium:**

**Equipment/materials**

* Ammonium chloride
* 3 syringes of NO2
* 0.1M cobalt (II) sulphate
* Conc HCl
* Ceramic wool
* Spatulas
* Pipettes

**The reactions:**

Use the following reactions and Le Chatelier’s Principle to explain your observations:

1. **Cobalt (II) ions:**

Co(H2O)62+   +    4Cl-(aq)     CoCl42-(aq)  +    6H2O(aq)

Pink                                Blue

1. **NO2 gas – changing pressure:**

   N2O4(g)****2NO2(g)

Colourless           Brown

1. **NO2 gas – changing temperature:**

   N2O4(g)****2NO2(g)      H  =  +58KJ Mol-1

Colourless           Brown             Endothermic

1. **Ammonium chloride – changing temperature:**

NH4Cl(s)          NH3(g)     +       HCl(g) Endothermic

**Safety**

* Wear goggles.
* Do not open the gas syringes as NO2 is harmfull
* Conc HCl is corrosive.
* Ammonium chloride and cobalt sulphate is an irritant.

**Procedure**

1. **Cobalt (II) ions – changing concentration:**
2. Add about a cm depth of cobalt (II) ions (sulphate) to a test tube.
3. Add Conc hydrochloric acid drop-wise until you notice a colour change **CARE**
4. Now add water drop-wise until you see a colour change.
5. **NO2 gas – changing pressure:**
6. In a fume cupboard look at the gas syringe that is not in ice or warm water.
7. Push in the plunger quickly to increase the pressure. The colour will intensify due to decreasing the volume (therefore increasing concentration) but what happens after that? Record your observations.
8. **NO2 gas – changing temperature:**
9. In a fume cupboard look at 2 gas syringes. One is in ice, the other in warm water.
10. Record the intensity of the colours in ice and in warm water.
11. **Ammonium chloride – changing temperature:**
12. Add a heaped spatula of ammonium chloride in a boiling tube and plug loosely with ceramic wool.
13. Heat gently for ~5 mins with a Bunsen burner turning the flame down and the air hole half open.
14. Record your observations (note the top of the tube).



Harmful



Irritant



Corrosive

**Objective**

* Understand that some equilibrium can be influenced.
* Understand Le Chatelier’s principle.

**Questions**

1. Explain your observations using Le Chatelier’s Principle.