

- Obtain a gas burette and add 10 mL of water. Place a stopper tightly into the top and invert the burette. If the water level is measurable proceed to step 3.
- If the volume is not measurable, add 5 additional mL of water and recheck. Repeat until the volume is measurable. Record the total amount of water used.
- Empty the burette. Pour 5 mL of 1M  $\text{CoCl}_2$  (aq) into the burette (or half of the total volume of water used in step 2).
- Under the hood, add 5 mL of 6 M  $\text{NH}_3$  (or half of the total volume of water used). This should be done quickly but carefully. Immediately stopper the burette.
- Mix the reactants by tipping the burette back and forth. Allow the sides to drain and then record the volume of trapped gas in the burette.
- Fill a large graduated cylinder, nearly to the top with water. Place the burette into the cylinder.
- Allow the solution to react with the oxygen in the trapped air for at least 10 minutes. From time to time, remove the burette from the cylinder and hold it nearly horizontal, allowing the solution to reach almost to the top of the burette, but **without** touching the stopper. Then replace it in the cylinder. When the solution has been reacting for nearly 10 minutes, measure the temperature of the water.
- Invert the burette into the cylinder and, with the top under the surface of the water, remove the stopper.
- Move the burette up and down until the level of liquid inside the burette is even with the level of water in the cylinder. This will make the inside pressure equal to the atmospheric pressure.
- Record the volume of trapped gas in the burette.
- Rinse the solution down the drain and clean the burette with HCl and then lots of water.
- Record the atmospheric pressure in the lab.

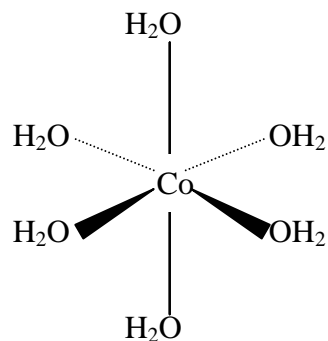
## Calculations:

Using the data you have collected, calculate the mole percent oxygen in both:

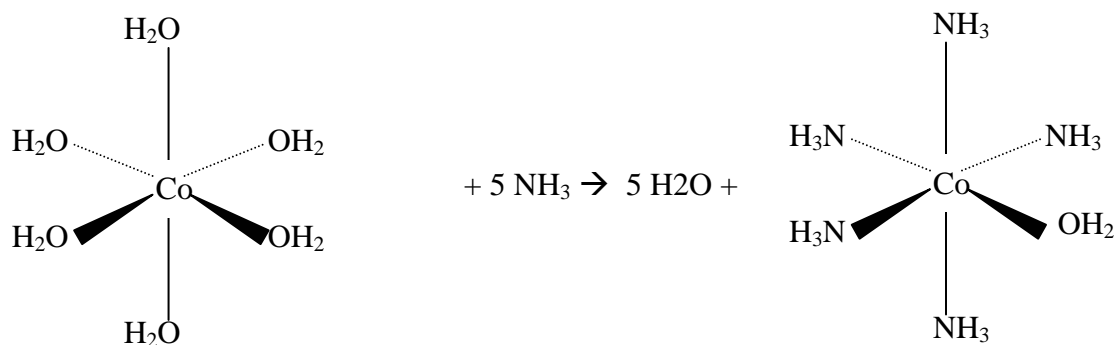
- air saturated with water vapor; and
- air from which the water vapor has been removed.

Vapor Pressure of water	
Temperature, °C	Pressure, mm Hg
14	11.99
15	12.79
16	13.63
17	14.53
18	15.48
19	16.48
20	17.54
21	18.65
22	19.83
23	21.07
24	22.38
25	23.76
26	25.21
27	26.74
28	28.35

Cobaltous chloride, when in dilute solution, forms the complex ion hexaaquacobalt (II) ion, as seen here.



When ammonia is added to the solution the ammonia molecules quickly replace most of the water molecules forming a series of cobalt (II) – amine complexes. The conditions we will be using encourages the formation of the ion with 5 ammonia molecules and one water:



This ion reacts quickly with oxygen to form the ion  $[(\text{NH}_3)_5\text{Co}-\text{O}_2-\text{Co}-(\text{NH}_3)_5]^{+4}$

