Balance	Funnel	Graduated Cylinder	Distilled H_2O	Ring, Stand	0.20 M $BaCl_2$	Beaker	Unknown Sulfate Salt	Stirring Rod	Filter Paper

2. A student is performing an experiment to determine the mass percent of sulfate in an unknown soluble sulfate salt. The equipment shown above is available for the experiment. A drying oven is also available. Note: barium sulfate is insoluble in water.

a. Briefly list the steps needed to carry out this experiment. [2 points] *(―distilled over "carry")*

1) Add unknown salt, H_2O + $BaCl_2$ into beaker → Stir to react.

2) Measure mass of filter paper, then filter precipitate.

3) Dry precipitate to constant mass, measure mass of precipitate + filter paper.

4) Determine mass of precipite by subtracting away mass of filter paper.

b. What experimental data needs to be collected to calculate the mass percent of sulfate in the unknown? [2 points]

- mass of unknown salt
- mass of dry filter paper
- mass of dried filter paper + precipitate

oops ↓

c. Starting with an initial sulfate salt sample of 8.52 g, the student is able to recover 7.52 g of barium sulfate. What is the mass percent of sulfate in the original sample? [3 points]

$$7.52 \text{ g } BaSO_4 \times \frac{1 \text{ mol } BaSO_4}{233.39 \text{ g } BaSO_4} \times \frac{1 \text{ mol } SO_4^{2-}}{1 \text{ mol } BaSO_4} \times \frac{96.06 \text{ g } SO_4^{2-}}{1 \text{ mol } SO_4^{2-}} = 3.10 \text{ g } SO_4^{2-}$$

$$\% \ SO_4^{2-} = \frac{3.10 \text{ g } SO_4^{2-}}{8.52 \text{ g (original sample)}} \times 100 = \boxed{36.3\% \ SO_4^{2-}}$$

d. If the student fails to dry the barium sulfate sample to constant mass, would this cause the calculated mass percent of sulfate to be less than, equal to, or greater than the actual mass percent? Justify your answer. [1 point]

This error would cause the calculated % by mass of sulfate to be greater than the actual: the calculated mass of the precipitate would be too high since it would include both H_2O molecules and precipitate.