Recommendation: Work together in groups of 3–4 people at the board.

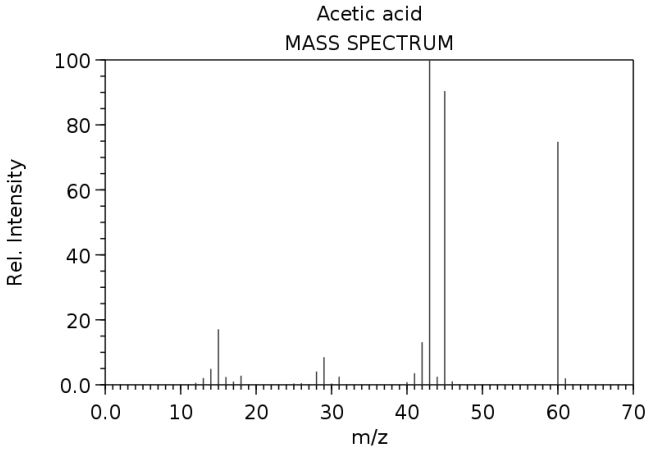
1. Balance these reactions:

$$\_\_\_\_ H_2 + \_\_\_\_ N_2 \rightarrow \_\_\_\_ NH_3$$

$$\_\_\_\_ PCl_5 + \_\_\_\_ AsF_3 \rightarrow \_\_\_\_ PF_5 + \_\_\_\_ AsCl_3$$

2. How many electrons are in a coin that contains 0.059 mol of pure silver?

3. The percent composition of acetic acid is 39.9% C, 6.7% H, and 53.4% O. Its mass spectrum is shown on the right.
   a. Using the data provided, determine the molecular formula of acetic acid.



The following bubbly reaction takes place between acetic acid and sodium bicarbonate:

$$NaHCO_3\ (s) + CH_3COOH\ (l) \rightarrow CH_3COONa\ (s) + H_2O\ (l) + CO_2\ (g)$$

   b. If we poured 25. g of CH_3COOH onto 30. g of $NaHCO_3$, predict the amount of gas (in moles) that would be produced.

   c. If 12.0 g of gas were produced, what would be the percent yield of this reaction?

4. A compound with only C, H, and N was found to be 74.1% C and 8.70% H by mass.
   a. Determine its empirical formula.

   b. In a different experiment, 0.123 moles of the compound was determined to have a mass of 19.94 g. Calculate the molar mass and the molecular formula of the compound.

5. Dr. G did a demonstration with the touch-sensitive reactant NI_3, which formed a deep purple vapor.
   a. Guess the two gaseous products formed during the explosion.

   b. Write down a balanced chemical equation that reflects the hypothetical explosion.

   c. The lecture room has a volume of 1.0×10^6 L. How many grams of NI_3 would have to explode to fill the entire lecture room with the purple vapor? (Note: 1 mol of any gas occupies 22.4 L)

6. Commercial iron is formed by reacting hematite, a common mineral, with carbon monoxide:

$$\_\_\_\_ Fe_2O_3\ (s) + \_\_\_\_ CO\ (g) \rightarrow \_\_\_\_ Fe\ (s) + \_\_\_\_ CO_2\ (g)$$

   a. If 433.2 g of Fe_2O_3 react with 250. L CO (the density of CO is 1.145 g/L), what is the theoretical yield of iron metal?

   b. Would any of the starting materials be left after the reaction? If so, how much?