CHEMWHIZ QUICK REFERENCE

TOPIC 10

Stoichiometry

Mole ratios, mass-to-mass, limiting reactant, excess, and percent yield.

01 Balance first — CORE RULE

Balance the equation before any calculation. The coefficients are the source of every mole ratio you will use.

02 Mole ratio (stoichiometric factor) — CORE RULE

Coefficients give the conversion factor between substances. The factor from A to B is (coefficient of B) / (coefficient of A).

03 Convert to moles first — CORE RULE

Anything not in moles must become moles before the ratio: mass ÷ molar mass; gas at STP ÷ 22.4 L/mol; particle count ÷ N_a.

04 Mass-to-mass (four steps) — METHOD

mass A → mol A (÷ MM_A) → mol B (× stoichiometric factor) → mass B (× MM_B). Carry units so they cancel.

05 Find the limiting reactant — METHOD

When both reactant amounts are given: convert each to moles, divide each by its coefficient; the smaller quotient is the limiting reactant. (Or compute product from each; the smaller wins.)

06 Use the limiting reactant — CORE RULE

Compute product from the limiting reactant's moles only (never the excess): × stoichiometric factor × product molar mass.

07 Excess reactant remaining — CORE RULE

Consumed excess = mol LR × (excess coeff / LR coeff) × MM_excess. Remaining = initial excess − consumed. A negative result means the LR was misidentified.

08 Percent yield — CORE RULE

Percent yield = (actual / theoretical) × 100. Theoretical comes from the limiting reactant at 100% conversion.

09 Theoretical from a known yield — CORE RULE

Given actual amount and percent yield: theoretical = (actual × 100) / percent yield.

10 Reverse-yield (work backwards) — METHOD

Given actual product + percent yield, find reactant needed: actual → theoretical (via % yield) → mol product → mol reactant (ratio) → mass reactant (× MM).

11 Gas at STP — CORE RULE

At STP (273.15 K, 1 atm) one mole of any ideal gas occupies 22.4 L. Use 22.4 L/mol to convert moles ↔ volume for gas-phase species only (not liquids/solids).

12 Mass-balance check — WATCH OUT

Conservation of mass: total mass of reactants consumed = total mass of products formed. Use it as an independent check on the answer.