

9: Standardizing Bases

- Using NaOH
- CO₂ interference in bases
- Wt % calculation



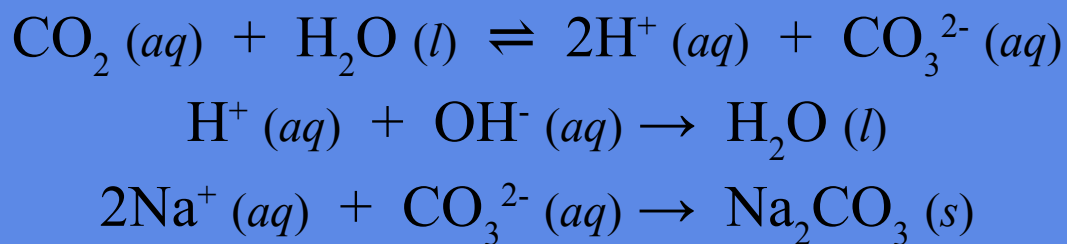
Sodium Hydroxide (NaOH)

- Solid pellets or flakes
- Very hygroscopic
 - Solid always contains water
 - Cannot be used as primary standard
 - Must standardize solutions



Sodium Hydroxide (NaOH)

- In solution, reacts with dissolved CO₂



- Na+ AND OH- consumed
- White precipitate forms



Using NaOH Solutions

- Boil water to remove CO₂ first
- Store in air-tight container
- Plastic is preferred
 - NaOH slowly etches glass
 - Na₂CO₃ will seize glass stopper
- Must periodically re-standardize
- Make standards from concentrated solutions



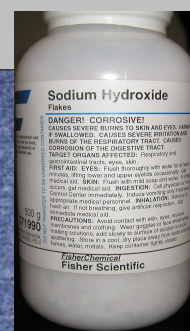
Lab 9 Today's Titrant: NaOH

Needed: 500 mL of 0.025M
 $0.5 \text{ L} \times 0.025 \text{ mol/L} = 0.0125 \text{ mol NaOH}$

$$\text{wt \%} \times \text{density} \times 1/\text{MW} \times \text{Vol} = \text{Moles}$$

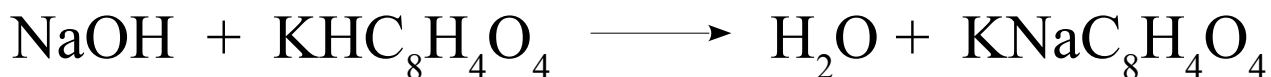
$$\frac{0.5}{\left(\frac{\text{g}_{\text{solute}}}{\text{g}_{\text{soln}}}\right)} \times \frac{1.5}{\left(\frac{\text{g}_{\text{soln}}}{\text{mL}_{\text{soln}}}\right)} \times \frac{1}{\left(\frac{\text{mol}_{\text{solute}}}{\text{g}_{\text{solute}}}\right)} \times \text{Vol} \left(\text{mL}_{\text{soln}}\right) = 0.0125 \text{ mol} \left(\text{mol}_{\text{solute}}\right)$$

Vol = 0.67 mL of 50% NaOH 1 L soln



Lab 9 Today's Standard

Potassium hydrogen phthalate (KHP)



Notice:

1 mole NaOH : 1 mole $\text{KHC}_8\text{H}_4\text{O}_4$

Lab 9 Today's Standard

Potassium hydrogen phthalate (KHPH)



Needed: Mass of KHPH to react with ~25 mL of 0.025 M NaOH

$$25 \text{ mL} \times 0.025 \text{ mol/L} = 0.625 \text{ mmol NaOH}$$

$$0.625 \text{ mmol NaOH} \times \frac{1 \text{ mol KHPH}}{1 \text{ mol NaOH}} = 0.625 \text{ mmol KHPH}$$

$$0.625 \text{ mmol KHPH} \times 204.22 \text{ g/mol} = 127 \text{ mg} = 0.13 \text{ g}$$

Lab 9 Today's Titration

- Potassium hydrogen phthalate
 - Solid acid analyte; Primary Standard
 - Acid solution will NOT have CO_2
- Sodium hydroxide titrant
 - Boil water first to remove CO_2
- **NO** boiling at end point
- Phenolphthalein endpoint



Lab 10a: Steel Sample Prep

$$\text{total mass} \times \text{wt \%} = \text{mass of component}$$

Find mass of steel containing 4mg Mn if wt% of Mn in steel is 0.6%

$$\text{Mass of steel} \times 0.006 = 4 \text{ mg}$$

$$\text{Mass of steel} = 4 \text{ mg} / 0.006 = 667 \text{ mg}$$

$$\approx 0.67 \text{ g}$$