

March 8, 2002

✓ **Exam #2**

✓ Conflict? Email me *today* to schedule alternate time

✓ Old exam #2 answers now online

✓ **Sunday Review Session**

4:30 - 6:00 pm, B203 Angell

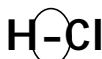
✓ **REMINDER:** no office hours today ☹

✓ *Quiz Today!*

1

Effect of Structure on Acid/Base Strength

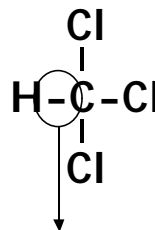
- Consider the following two compounds in an *aqueous* solution:



- ✓ Polar bond
✓ *Strong Acid*

Hypothesis: *Bond polarity can be related to acidity*

versus



- ✓ Nonpolar bond
✓ *Not acidic*

2

Bond Polarity versus Acidity

■ Bond polarity for *hydrogen halides*:

(most polar) H-F > H-Cl > H-Br > H-I (least polar)

	565	427	363	295	kJ/mol
$K_a =$	10^{-3}	10^7	10^9	10^{11}	

➤ But, *bond energies* increase with increasing polarity

➤ So *acidity* decreases with increasing polarity

3

Oxyacid Acid Strengths

<u>Oxyacid</u>	<u>Structure</u>	<u>K_a</u>
HClO (Hypochlorous Acid)	H-O-Cl	3.5×10^{-8}
HClO ₂ (Chlorous Acid)	H-O-Cl-O	1.2×10^{-2}
HClO ₃ (Chloric Acid)	$\begin{array}{c} \text{H-O-Cl-O} \\ \\ \text{O} \end{array}$	~ 1
HClO ₄ (Perchloric Acid)	$\begin{array}{c} \text{H-O-Cl-O} \\ / \quad \backslash \\ \text{O} \quad \text{O} \end{array}$	$\sim 10^7$

4

In General

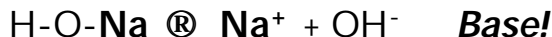
For compounds like:



- Increasing *electronegativity* of **X** **weakens** the H-O bond
- Increases compound acidity

➤ What if EN of X is *small*?

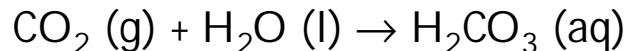
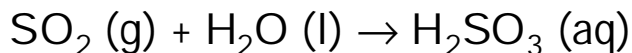
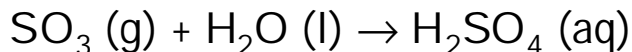
- O-X bond will be *ionic* and will dissociate in water:



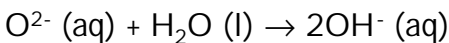
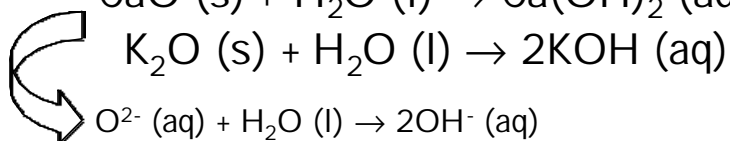
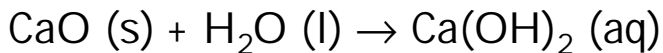
5

Oxides

■ Acidic Oxides (covalent oxides)



■ Basic Oxides (ionic oxides)



6