What are Acids, Bases, and Salts?

The Swedish chemist Svante Arrhenius introduced the theory of ionization and used this theory to explain much about the behavior of acids and bases.

♦ An Arrhenius acid is defined as any compound that dissociates in aqueous solution to form ____________ ions.

\[
\text{HNO}_3(aq) \rightarrow \text{H}^+ \text{(aq)} + \text{NO}_3^- \text{(aq)}
\]

\[
\text{HCl} \text{(aq)} \rightarrow \text{________________________}
\]

♦ An Arrhenius base is defined as any compound that dissociates in aqueous solution to form ____________ ions.

\[
\text{KOH} \text{(aq)} \rightarrow \text{K}^+ \text{(aq)} + \text{OH}^- \text{(aq)}
\]

\[
\text{NaOH} \text{(aq)} \rightarrow \text{________________________}
\]

♦ Salts are compounds that dissociate in aqueous solution releasing neither ____________ ions nor ____________ ions.

\[
\text{KCl} \text{(aq)} \rightarrow \text{K}^+ \text{(aq)} + \text{Cl}^- \text{(aq)}
\]

\[
\text{NaCl} \text{(aq)} \rightarrow \text{________________________}
\]

Using the Arrhenius definition, classify the following examples as acids, bases, or salts:

- HBr
- KCl
- Mg(OH)$_2$
- H$_3$PO$_4$
- HCl
- HClO
- KNO$_2$
- Al(OH)$_3$
- HFO$_4$
- KC$_2$H$_3$O$_2$
- Ba(OH)$_2$
- NaCl
Acids and bases can also be identified using an operational definition. Operational definitions are simply a list of properties.

**ACIDS:**
- A ____________ taste is a characteristic property of all acids in aqueous solution.
- Acids react with some metals to produce ____________ gas.
- Because aqueous acid solutions conduct electricity, they are identified as ____________.
- Acids react with bases to produce a ____________ and water.
- Acids turn ____________ different colors.

**BASES:**
- Bases tend to taste ____________ and feel ____________.
- Like acids, aqueous basic solutions conduct ____________, and are identified as ____________.
- Bases react with ____________ to produce a salt and ____________.
- Bases turn ____________ different colors.

**Naming Acids, Bases, and Salts**

Since bases and salts are ____________ compounds, they are named in the usual way:

- \( \text{KNO}_3 \) ____________ \( \text{NH}_4\text{OH} \) ____________
- \( \text{KNO}_2 \) ____________ \( \text{Al(OH)}_3 \) ____________

- **Binary acids** consist of ____________ elements, the first being ____________.
  Binary acids are named using the format:
  
  \( \text{hydro} \text{(root word of second element)} \text{ic acid} \)

- **Ternary acids** consist of ____________ elements. Do NOT use a prefix. Simply change the ending of the polyatomic ion’s name and add the word “acid”:
  
  - **-ate becomes** ____________ and **-ite becomes** ____________

Name the following acids:

- \( \text{H}_3\text{PO}_3 \) ____________ \( \text{HC}_2\text{H}_3\text{O}_2 \) ____________
- \( \text{H}_2\text{CO}_3 \) ____________ \( \text{HClO}_2 \) ____________
- \( \text{HF} \) ____________ \( \text{H}_2\text{SO}_3 \) ____________