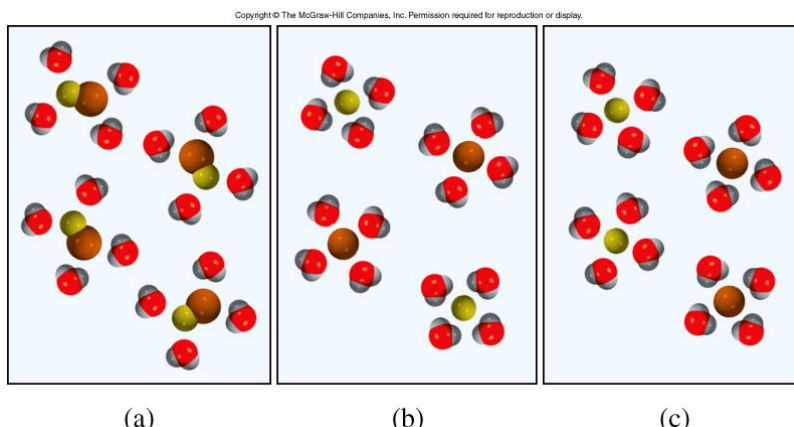


Chem 2 AP Homework #4-1: Problems pg. 151 #4.1, 4.2, 4.3, 4.6, 4.8, 4.9 - 4.12, 4.20

- 1 A solution is a homogeneous mixture created by dissolving a solute, often a crystalline solid such as sodium chloride or sucrose, which is the substance being dissolved, into a solvent liquid such as water or ethanol, which is the substance dissolving the solute.
- 2 A nonelectrolyte is a solute that does not dissociate into ions when dissolved into a solution, so does not make the solution electrically conductive, while an electrolyte is a solute that dissociates into ions when dissolved, making an electrically conductive solution. A weak electrolyte is one that dissolves only slightly, so creates a weakly conductive solution, while a strong electrolyte dissolves completely or almost completely and creates a strongly conductive solution.
- 3 Hydration occurs when water molecules surround ions in aqueous solution. Water is a highly polar molecule, with the negative end of its dipole attracted to cations and the positive end of its dipole attracted to anions.
- 6 The major species present in $\text{LiF}(\text{aq})$ are $\text{Li}^+(\text{aq})$, $\text{F}^-(\text{aq})$ and $\text{H}_2\text{O}(\ell)$.



- 8 When NaCl dissolves in water it dissociates into Na^+ and Cl^- ions. When the ions are hydrated, the water molecules will be oriented so that the negative end of the water dipole interacts with the positive sodium ion, and the positive end of the water dipole interacts with the negative chloride ion. The negative end of the water dipole is near the oxygen atom, and the positive end of the water dipole is near the hydrogen atoms. The diagram that best represents the hydration of NaCl when dissolved in water is choice (c).
- 9 Ionic compounds, strong acids, and strong bases (metal hydroxides) are strong electrolytes (completely broken up into ions of the compound). Weak acids and weak bases are weak electrolytes. Molecular substances other than acids or bases are nonelectrolytes.
(a) H_2O : very weak electrolyte (b) KCl : strong electrolyte (ionic compound)
(c) HNO_3 : strong electrolyte (strong acid) (d) CH_3COOH : weak electrolyte (weak acid)
(e) $\text{C}_{12}\text{H}_{22}\text{O}_{11}$: nonelectrolyte (molecular compound - neither acid nor base)
- 10 Ionic compounds, strong acids, and strong bases (metal hydroxides) are strong electrolytes (completely broken up into ions of the compound). Weak acids and weak bases are weak electrolytes. Molecular substances other than acids or bases are nonelectrolytes.
(a) $\text{Ba}(\text{NO}_3)_2$: strong electrolyte (ionic) (b) Ne : nonelectrolyte
(c) NH_3 : weak electrolyte (weak base) (d) NaOH : strong electrolyte (strong base)

- 11** Since solutions must be electrically neutral, any flow of positive species (cations) must be balanced by the flow of negative species (anions). Therefore, the correct answer is **(d) both cations and anions**.
- 12** **(a) Solid NaCl** does not conduct. The ions are locked in a rigid lattice structure.
(b) Molten NaCl conducts. The ions can move around in the liquid state.
(c) Aqueous NaCl conducts. NaCl dissociates completely to $\text{Na}^+(aq)$ and $\text{Cl}^-(aq)$ in water.
- 20** **Strategy:** Although it is not necessary to memorize the solubilities of compounds, you should keep in mind the following useful rules: all ionic compounds containing alkali metal cations, the ammonium ion, and the nitrate, bicarbonate, and chlorate ions are soluble. For other compounds, refer to Table 4.2 of the text.

Solution:

- (a)** CaCO_3 is **insoluble**. Most carbonate compounds are insoluble.
(b) ZnSO_4 is **soluble**. Most sulfate compounds are soluble.
(c) $\text{Hg}(\text{NO}_3)_2$ is **soluble**. All nitrate compounds are soluble.
(d) HgSO_4 is **insoluble**. Most sulfate compounds are soluble, but those containing Ag^+ , Ca^{2+} , Ba^{2+} , Hg^{2+} , and Pb^{2+} are insoluble.
(e) NH_4ClO_4 is **soluble**. All ammonium compounds are soluble.