# Predicting Acid–Base Reactivity

For each of the following, decide if the acid and the base will react with each other. If a reaction occurs, then write a balanced reaction; if a reaction will not occur, then simply write NR.

(a) $HF(aq) + BrO^-(aq) \rightarrow HBrO(aq) + F^-(aq)$

(b) $NH_4^+(aq) + ClO^-(aq) \rightarrow NR$

(c) $HClO(aq) + NH_3(aq) \rightarrow NH_4^+(aq) + ClO^-(aq)$

(d) $HCO_3^-(aq) + NH_3(aq) \rightarrow NR$

Some acids can donate more than one proton and some bases can accept more than one proton; we call these acids and bases multiprotic. For each of the following, decide if the multiprotic acid or the multiprotic base will donate or accept more than one proton when it is allowed to react with a large excess of a monoprotic base or monoprotic acid—in each case, the second reagent is present in excess—and write a balanced reaction.

(e) $H_3PO_4(aq) + 2NH_3(aq) \rightarrow 2NH_4^+(aq) + HPO_4^-(aq)$

(f) $H_3PO_4(aq) + F^-(aq) \rightarrow HF(aq) + H_2PO_4^-(aq)$

(g) $CO_3^{2-}(aq) + 2HIO_3(aq) \rightarrow 2IO_3^-(aq) + H_2CO_3(aq)$

(h) $CO_3^{2-}(aq) + HBrO(aq) \rightarrow BrO^-(aq) + HCO_3^-(aq)$

Some species, such as water, behave as acids or as bases; we call such a species amphoteric. Using $H_2PO_4^{2-}$ as an example, which of these reactions is likely to occur

(i) $H_2PO_4^-(aq) + H_2PO_4^-(aq) \rightarrow NR$

(j) $H_3PO_4(aq) + HPO_4^{2-}(aq) \rightarrow 2H_2PO_4^{2-}(aq)$