13. The pH of a solution is 6.7. By this statement alone, can one conclude that the solution is acidic?

14. Define pOH and write an equation relating pH and pOH.

18. Calculate the pH of the following solutions:
   (a) \(2.8 \times 10^{-4}\) M Ba(OH)\(_2\):
   (b) \(5.2 \times 10^{-4}\) M HNO\(_3\):

20. Calculate the [H\(^+\)] for these solutions:
   (a) A solution whose pH = 5.20
   (b) A solution whose pH = 16.00
   (b) A solution whose OH\(^-\) concentration is \(3.7 \times 10^{-9}\) M

25. How much NaOH (in grams) is needed to prepare 546 mL of solution with a pH of 10.00?
26 A solution is made by dissolving 18.4 g of HCl in 662 mL of water. Calculate the pH of solution.

29 What are the strongest acid and strongest base that can exist in water?

31 In the following diagrams, \( \text{red} \) represents an acid, \( \text{green} \) represents the unprotonated conjugate base, and \( \text{blue} \) represents the hydronium ion. Water molecules are omitted for clarity.

Which diagram represents a strong acid, such as HCl, dissolved in water?

Which diagram represents a weak acid?

Which diagram represents a very weak acid?

33 Use Table 15.2 to classify each of the following species as a weak or strong acid:
(a) HNO₃:
(b) HF:
(c) H₂SO₄
(d) HSO₄⁻:
(e) H₂CO₃:
(f) HCO₃⁻:
(g) HCl:
(h) HCN:
(i) HNO₂:

34 Use Table 15.2 to classify each of the following species as a weak or strong base:
(a) LiOH:
(b) CN⁻:
(c) H₂O:
(d) ClO₄⁻:
(e) NH₂⁻:
35 Which of the following statements is/are true regarding a 0.10M solution of the weak acid HA: 

\[ \text{HA} \rightleftharpoons \text{H}^+ + \text{A}^- \]

(a) The pH = 1.00
(b) \([\text{H}^+] \gg [\text{A}^-]\)
(c) \([\text{H}^+] = [\text{A}^-]\)
(d) The pH is less than 1.

Explain:

37 Predict the direction that predominates in this reaction:

\[ \text{F}^-(aq) + \text{H}_2\text{O}(l) \rightleftharpoons \text{HF}(aq) + \text{OH}^-(aq) \]

Base acid conj acid conj base

Explain:

38 Determine the products and predict whether the following reaction will proceed from left to right to any measurable extent:

\[ \text{CH}_3\text{COOH}(aq) + \text{Cl}^-(aq) \rightarrow \]

Explain: