Acids and Bases Worksheet

1. Identify the following as properties of acids, bases, or both.
   a. bitter __________________________
   b. sour ___________________________
   c. may conduct electricity __________
   d. slippery ________________________
   e. reacts with metals while producing hydrogen gas ________________
   f. neutralized by an acid to produce salt and water ___________________
   g. turns pH paper red ______________
   h. turns pH paper blue ______________

2. The concentration of hydrogen ion in a solution is measured to be 1.0 x 10^{-4} M.
   a. What is the hydroxide ion concentration?
   b. What is the pH of the solution?
   c. Is the solution acidic or basic?

3. The concentration of hydrogen ion in a solution is measured to be 1.0 x 10^{-9} M.
   a. What is the hydroxide ion concentration?
   b. What is the pH of the solution?
   c. Is the solution acidic or basic?

4. The concentration of hydrogen ion in a solution is measured to be 3.2 x 10^{-11} M.
   a. What is the hydroxide ion concentration?
   b. What is the pH of the solution?
   c. Is the solution acidic or basic?

5. The concentration of hydrogen ion in a solution is measured to be 0.016 M.
   a. What is the hydroxide ion concentration?
   b. What is the pH of the solution?
   c. Is the solution acidic or basic?

6. Label these solutions as acidic, neutral, basic.
   a. pH = 2.6 _______________________
   b. pH = 7.0 _______________________
   c. pH = 10.5 ______________________
   d. [H^+] = 3.2 x 10^{-2} M __________
   e. [H^+] = 1.0 x 10^{-7} M __________
   f. [OH^-] = 5.7 x 10^{-5} M __________
   g. [OH^-] = 2.2 x 10^{-10} M __________

7. What is the definition of an acid?

8. What is the definition of a base?

9. Circle the acidic hydrogen or hydrogens in the following acids. Example: HCl
   a. HBr
   b. HNO_3
   c. H_2SO_4
   d. CH_3CO_2H
   e. HCO_2H
   f. H_2CO_3
   g. H_2NCH_2CO_2H
10. Circle the atom which is the hydrogen ion acceptor in the following bases.
   a. NaOH
   b. KOH
   c. Mg(OH)₂
   d. NH₃
   e. CH₃NH₂
   f. H₂NCH₂CO₂H

11. Which reaction is equivalent to:
    HIO₃ + H₂O → H₃O⁺ + IO₃⁻
   a. HIO₃ → H⁺ + IO₃⁻
   b. HIO₃ + H₂O → H⁺ + IO₃⁻
   c. HIO₃ → H₃O⁺ + IO₃⁻
   d. HIO₃ + H₃O⁺ → H₂O + IO₃⁻

12. Write the chemical reaction which shows how ammonia produces hydroxide ion.

14. Calculate the hydrogen ion concentration from the following pH values. Identify the solution as acidic, neutral or basic.
   a. A N B pH = 7.0 ______________
   b. A N B pH = 2.7 ______________
   c. A N B pH = 13.0 ______________

15. Write equations showing how each substance produces either H⁺ or OH⁻. Label the substance as an acid or a base.
    Example: A B HCO₂H → H⁺ + HCO₂⁻
   a. A B HCl ______________
   b. A B HNO₃ ______________
   c. A B H₂SO₄ ______________
   d. A B H₂CO₃ ______________
   e. A B KOH ______________
   f. A B Ca(OH)₂ ______________
   g. A B NH₃ ______________
   h. A B HCO₂H ______________
   i. A B CH₃CO₂H ______________
   j. A B CH₃NH₂ ______________

16. Complete the following reactions. Make sure the equations are balanced.
    Example: HCl + NaOH → NaCl + H₂O
   a. H₂SO₄ + Mg(OH)₂ → ______________
   b. CH₃CO₂H + NaOH → ______________
   c. HCl + NaHCO₃ → ______________
   d. CH₃NH₂ + HCl → ______________
   e. H₂NCH₂CO₂H + HCl → ______________
   f. H₂NCH₂CO₂H + NaOH → ______________