Chemistry 20 - Unit C - pH and pOH Practice

Name: _____

1) Calculate the pH of each of the following solutions.
   a) A solution of acetic acid has a hydronium ion concentration of 0.016 M.

$$pH = -\log(0.016) = 1.80$$

   b) A bottle of household bleach has a hydronium ion concentration of 1.0×10^{-13} M.

$$pH = -\log(1.0 \times 10^{-13}) = 13.00$$

2) Calculate the pOH of each of the following solutions.
   a) A solution of sodium hydroxide has a hydroxide ion concentration of 0.105 M.

$$pOH = -\log(0.105) = 0.979$$

   b) A solution of calcium hydroxide has a hydroxide ion concentration of 0.454 mmol/L.

$$pOH = -\log(0.000454) = 3.343$$

3) Calculate the hydronium ion concentration for each of the following pH readings.
   a) 12.86

$$[H_3O^+] = 10^{-12.86} = 1.4 \times 10^{-13}\ M$$

   b) 5.432

$$[H_3O^+] = 10^{-5.432} = 3.70 \times 10^{-6}\ M$$

4) Calculate the hydroxide ion concentration for each of the following pOH readings.
   a) 13.92

$$[OH^-] = 10^{-13.92} = 1.2 \times 10^{-14}\ M$$

   b) 8.796

$$[OH^-] = 10^{-8.796} = 1.60 \times 10^{-9}\ M$$

5) A soft drink was put on the market [H+] = 1.4 x 10^{-5} M. What is its pH?

$pH = -\log(1.4 \times 10^{-5}) = 4.85$

6) A certain brand of beer had a hydrogen ion concentration equal to 1.9 x 10^{-5} mol/L.

i) What is the pH of this beer?

$pH = -\log(1.9 \times 10^{-5}) = 4.72$

7) A solution was made by dissolving 0.837g $Ba(OH)_2$ in 100 ml final volume. If $Ba(OH)_2$ is fully broken up into its ions, what is the pOH and the pH of this solution?

$M_{Ba(OH)_2} = \frac{mol}{L} = 0.837g \times \frac{1mol}{171.35g} \times \frac{1}{0.100L} = 0.0488M$

$pOH = -\log(0.0977) = 1.010$ $pH = 14 - pOH = 12.990$

8) A sodium hydroxide solution is prepared by dissolving 6.0 ~~g NaOH in 1.00~~ L of solution. Assuming that 100% dissociation occurs, what is the pOH and the pH of this solution?

$[OH^-] = 6.0g \times \frac{1mol}{40.00g} \times \frac{1}{1.00L} = 0.15M$

$pOH = -\log(0.15) = 0.82$ $pH = 14 - pOH = 13.18$

9) Calculate the $[H_3O^+]$, $[OH^-]$, pH and pOH of these solutions;

~~a) 1.5 x 10^{-4} M KOH~~

$[OH^-] = 1.5 \times 10^{-4}M$ $pOH = -\log(1.5 \times 10^{-4}) = 3.82$

$[H_3O^+] = 10^{-pH} = 10^{-10.18} = 6.7 \times 10^{-11}M$ $pH = 14 - pH = 10.18$

b) A solution prepared by dissolving ~~0.040 g NaOH in 2.0 L of solution~~

$[OH^-] = 0.040g \times \frac{1mol}{40.00g} \times \frac{1}{2.0L} = 0.00050M$ $pOH = 3.30$

$[H_3O^+] = 10^{-10.7} = 2.0 \times 10^{-11}M$ $pH = 14 - 3.3 = 10.70$

c) A solution prepared by diluting 1.0 mL of 0.20 M HCl to a total ~~volume of 5.0 L~~

$C_{New} = 0.20M \times \frac{0.0010L}{5.0L} = 0.000040M$ $[H_3O^+] = 4.0 \times 10^{-5}M$

$pH = -\log(4.0 \times 10^{-5}) = 4.40$ $pOH = 14 - 4.40 = 9.60$ $[OH^-] = 10^{-9.60} = 2.5 \times 10^{-10}$