

CHEMISTRY PH WORKSHEET

Name: Key Date: _____ Block: _____

Equations *
 ① $pH = -\log [H^+]$
 ② $pOH = -\log [OH^-]$
 ③ $pH + pOH = 14$
 ④ $[H^+][OH^-] = 1.0 \times 10^{-14}$

1. Calculate pH and pOH for the following solutions :

- a) $[H^+] = 1.0 \times 10^{-5} M$ $pH = 5.0$
 $pOH = 9.0$
- b) $[OH^-] = 3.0 \times 10^{-8} M$ $pOH = 7.52$
 $pH = 6.48$
- c) $[H^+] = 2.5 \times 10^{-2}$ $pH = 1.6$
 $pOH = 12.4$
- d) $[OH^-] = 7.5 \times 10^{-3} M$ $pOH = 2.12$
 $pH = 11.88$
- e) $[H^+] = 1.2 \times 10^{-14} M$ $pH = 13.92$
 $pOH = 0.08$
- f) $[H^+] = 6.0 M$ $pH = 6$
 $pOH = 8$

2. Calculate $[H^+]$ and $[OH^-]$ for the following :

- a) $pH = 3.0$
 $[H^+] = 1.0 \times 10^{-3}$
 $[OH^-] = 1.0 \times 10^{-11}$
- b) $pOH = 4$
 $[OH^-] = 1.0 \times 10^{-4}$
 $[H^+] = 1.0 \times 10^{-10}$
- c) $pOH = 5$
 $[OH^-] = 1.0 \times 10^{-5}$
 $[H^+] = 1.0 \times 10^{-9}$
- d) $pH = 8.0$
 $[H^+] = 1.0 \times 10^{-8}$
 $[OH^-] = 1.0 \times 10^{-6}$
- e) $pOH = 13$
 $[OH^-] = 1.0 \times 10^{-13}$
 $[H^+] = 1.0 \times 10^{-1}$
- f) $pH = 2.00$
 $[H^+] = 1.0 \times 10^{-2}$
 $[OH^-] = 1.0 \times 10^{-12}$

3. Calculate the $[H^+]$ if $[OH^-] = 2.0 \times 10^{-7}$

$$[H^+][OH^-] = 1.0 \times 10^{-14}$$

$$[H^+][2.0 \times 10^{-7}] = 1.0 \times 10^{-14}$$

$$[H^+] = 5.0 \times 10^{-8}$$

4. Complete the following equations and identify each reactant as an acid or a base.

- a. $HCl + H_2O \rightarrow Cl^- + H_3O^+$
 (Acid: HCl, Base: H₂O)
- b. $NH_3 + H_2O \rightarrow NH_4^+ + OH^-$
 (Base: NH₃, Acid: H₂O)
- c. $NaOH + H_2O \rightarrow Na^+ + OH^- + H_2O$
 (Spectator: Na⁺, H₂O)
- d. $Mg(OH)_2 + 2HBr \rightarrow MgBr_2 + 2H_2O$ * neutralization rxn

5. Solution 1 has $[H^+] = 1.7 \times 10^{-2}$ and solution 2 has $[H^+] = 4.3 \times 10^{-4}$. Which solution is more acidic? Which solution has a higher pH?

* Sol'n 1 = higher concentration of $[H^+] =$
more acidic

* Sol'n 2 = higher pH (less acidic)

6. Find $[OH^-]$ and the pH of a solution made with 0.25g KOH dissolved in enough water to make 655mL of solution

$$M = \frac{\text{mol}}{L}$$

①

$$\frac{0.25 \text{ g KOH}}{56.11 \text{ g}} \times \frac{1 \text{ mol}}{1} = 0.0045 \text{ mol KOH}$$

$$M = \frac{0.0045 \text{ mol}}{0.655 \text{ L}} = 0.0068 = [OH^-]$$

②

$$pOH = -\log [OH^-]$$
$$pOH = -\log [0.0068]$$
$$pOH = 2.16$$
$$pOH + pH = 14$$
$$2.16 + pH = 14$$

$$pH = 11.84$$