

## pH and pOH

- pH is a way of indicating the concentration of hydrogen ions present in a solution
- likewise, pOH indicates the concentration of hydroxide ions present in a solution

$$\text{pH} = -\log [\text{H}^{+1}]$$

$$\text{pOH} = -\log [\text{OH}^{-1}]$$

- To convert pH into a corresponding  $[\text{H}^{+1}]$ ,  
 $[\text{H}^{+1}] = 10^{-\text{pH}}$
- To convert pOH into a corresponding  $[\text{OH}^{-1}]$ ,  
 $[\text{OH}^{-1}] = 10^{-\text{pOH}}$

$K_w = [\text{H}^{+1}] \times [\text{OH}^{-1}]$ , if we take the  $-\log$  of both sides:

$$-\log(1 \times 10^{-14}) = -\log [\text{H}^{+1}] + -\log [\text{OH}^{-1}]$$

$$\mathbf{14 = pH + pOH}$$
 (this formula allows us to convert between pH and pOH and between  $[\text{H}^{+}]$  and  $[\text{OH}^{-}]$ )

### The pH Scale

Acidic solution       $\text{pH} < 7$

Basic solution       $\text{pH} > 7$

Neutral solution     $\text{pH} = 7$

## Answer the following:

1. Calculate the pH, pOH and  $[\text{OH}^{-1}]$  of each of the following solutions.
  - a. 0.006 mol/L HI(aq)
  - b. 0.025 mol/L HNO<sub>3</sub>(aq)
  - c. 0.01 mol/L HCl(aq)
2. To clean a clogged drain, 26 g of sodium hydroxide is added to water to make 150 mL of solution. What are the pH and pOH values for this solution?
3. What mass of potassium hydroxide is contained in 500 mL of solution that has a pH of 11.5?
4. Calculate the pH of a 0.15 M sodium hydroxide solution.
5. Calculate the pH of a 0.032 M Ba(OH)<sub>2</sub>(aq) solution.
6. A solution is made by dissolving 0.8 g of calcium hydroxide in water to make 100 mL of final solution. Calculate the pH of the solution.

### Answers:

- 1a) pH = 2.2, pOH = 11.8,  $[\text{OH}] = 2 \times 10^{-12}$  M  
1b) pH = 1.6, pOH = 12.4,  $[\text{OH}] = 4 \times 10^{-13}$  M  
1c) pH = 2.0, pOH = 12.0,  $[\text{OH}] = 1 \times 10^{-12}$  M  
2) pH = 14.64, pOH = -0.64  
3) m = 0.09 g  
4) pH = 13.18  
5) pH = 12.81  
6) pH = 13.33