Name:_____
Period:_____

Topic 8.3 – HW set 2
READ p. 355-359 and complete exercises #9-15 on p.360

Exercises

9 What happens to the pH of an acid when 10 cm^3 of it is added to 90 cm^3 of water? goes up 1 unit

10 Beer has a hydrogen ion concentration of 1.9×10^{-5} mol dm^{-3}. What is its pH? 4.72

11 An aqueous solution has a pH of 9 at 25 °C. What are its concentrations for H^+ and OH^-? $[H^+] = 1 \times 10^{-9} M$

$[OH^-] = 1 \times 10^{-5} M$

12 For each of the following aqueous solutions, calculate $[OH^-]$ from $[H^+]$ or $[H^+]$ from $[OH^-]$. Classify each solution as acidic, basic, or neutral at 298 K.

(a) $[H^+] = 3.4 \times 10^{-9}$ mol dm^{-3} a) $[OH^-] = \frac{K_w}{[H^+]} = \frac{1 \times 10^{-14}}{3.4 \times 10^{-9}} = 2.94 \times 10^{-8} M$ pH = 8.47 basic

(b) $[OH^-] = 0.010$ mol dm^{-3} b) $[H^+] = \frac{1E^{-14}}{0.01} = 1 \times 10^{-12} M$ pH = 12 basic

(c) $[OH^-] = 1.0 \times 10^{-10}$ mol dm^{-3} c) $[H^+] = \frac{1E^{-14}}{1 \times 10^{-10}} = 0.0001 M$ pH = 4 acidic

(d) $[H^+] = 8.6 \times 10^{-5}$ mol dm^{-3} d) $[OH^-] = \frac{1 \times 10^{-14}}{8.6 \times 10^{-5}} = 1.16 \times 10^{-10} M$ pH = 9.94 basic

13 What is the pH of 0.01 mol dm^{-3} solution of HCl which dissociates fully?

$pH = -\log[0.01] = 2$ $\quad HCl(aq) \rightarrow H^+(aq) + Cl^-(aq)$

14 For each of the following biological fluids, calculate the pH from the given concentration of H^+ or OH^- ions.

(a) bile: $[OH^-] = 8 \times 10^{-8}$ mol dm^{-3} a) $-\log\left(\frac{1 \times 10^{-14}}{8 \times 10^{-8}}\right) = 6$

(b) gastric juice: $[H^+] = 10^{-2}$ mol dm^{-3} b) pH = 2

(c) urine: $[OH^-] = 6 \times 10^{-10}$ mol dm^{-3} c) $-\log\left(\frac{1 \times 10^{-14}}{6 \times 10^{-10}}\right) = 4.78$

15 A solution of sodium hydroxide is prepared by adding distilled water to 6.0 g NaOH to make 1.0 dm^3 of solution. What is the pH of this solution? Assume that NaOH dissociates completely in solution:

$NaOH(aq) \rightarrow Na^+(aq) + OH^-(aq)$

$$\frac{6.0\,g\,NaOH \mid \frac{1\ mol}{40\,g} \mid \frac{1}{dm^3}}{} = 0.15\,mol\,dm^{-3}$$

$$pH = -\log\left(\frac{1 \times 10^{-14}}{0.15}\right)$$

$$= 13.2$$

Name:_____
Period:_____

pH AND pOH

Name _____

The pH of a solution indicates how acidic or basic that solution is.

pH range of 0 - 7 acidic
7 neutral
7-14 basic

Since $[H^+]\,[OH^-] = 10^{-14}$ at 25° C, if $[H^+]$ is known, the $[OH^-]$ can be calculated and vice versa.

$pH = -\log [H^+]$ So if $[H^+] = 10^{-6}$ M, pH = 6.
$pOH = -\log [OH^-]$ So if $[OH^-] = 10^{-8}$ M, pOH = 8.
Together, pH + pOH = 14.

Complete the following chart.

	$[H^+]$	pH	$[OH^-]$	pOH	Acidic or Basic
1.	10^{-5} M	5	10^{-9} M	9	Acidic
2.	10^{-7} M	7	10^{-7} M	7	neutral
3.	10^{-10} M	10	10^{-4} M	4	basic
4.	10^{-2} M	2	10^{-12} M	12	acidic
5.	10^{-3} M	3	10^{-11} M	11	acidic
6.	10^{-12} M	12	10^{-2} M	2	basic
7.	10^{-9} M	9	10^{-5} M	5	basic
8.	10^{-11} M	11	10^{-3} M	3	basic
9.	10^{-1} M	1	10^{-13} M	13	acidic
10.	10^{-6} M	6	10^{-8} M	8	acidic

Name:_____
Period:_____

PROBLEMS: Show all work and circle the final answer.

1. Determine the pH of a 0.010 M HNO_3 solution.

$pH = -\log(0.01) = 2$

2. What is the pH of a 2.5×10^{-6} M solution of HCl?

$pH = -\log(2.5 \times 10^{-6}) = 5.6$

3. Calculate the pH of a solution of 0.0025M H_2SO_4. (assume dissociates to $H^+ + HSO_4^-$)

$pH = -\log(0.0025) = 2.60$

4. Calculate the pH of a 0.0010 M NaOH solution.

$pH = -\log\left(\frac{1 \times 10^{-14}}{0.001}\right) = 11$

5. What is the pH of a 0.020M $Sr(OH)_2$ solution?

$pH = -\log\left(\frac{1 \times 10^{-14}}{(2 \times 0.02)}\right) = 12.6$

6. a) What is the hydrogen ion concentration of an aqueous HCl solution that has a pH of 3.0?

$[H^+] = 10^{-pH} = 10^{-3} = 1 \times 10^{-3}$ M or $mol\,dm^{-3}$

b) What is the hydroxide ion concentration of this same solution?

$[OH^-] = \frac{Kw}{10^{-3}} = 10^{-11}$ M or $mol\,dm^{-3}$

c) Which ion, H+ or OH, is in greater concentration? H^+

d) Is this solution acidic or basic? acidic

7. Find the $[H^+]$ and the $[OH^-]$ of a solution with a pH of 3.494.

$[H^+] = 10^{-3.494} = 3.21 \times 10^{-4}$ $mol\,dm^{-3}$

$[OH^-] = \frac{1 \times 10^{-14}}{3.21 \times 10^{-4}} = 3.11 \times 10^{-11}$ $mol\,dm^{-3}$

Is this solution acidic or basic? acidic

Name:_____
Period:_____

HW set 3 -- READ p. 360-363 and complete exercises #16-18 on p. 363

Exercises

16 Which of the following 1 mol dm^{-3} solutions will be the poorest conductor of electricity?

A HCl **B** CH_3COOH not dissociated **C** NaOH **D** NaCl completely dissociate

17 Which methods will distinguish between equimolar solutions of a strong base and a strong acid?

✓ I Add magnesium to each solution and look for the formation of gas bubbles.
✓ II Add aqueous sodium hydroxide to each solution and measure the temperature change.
III Use each solution in a circuit with a battery and lamp and see how brightly the lamp glows.

A I and II only **B** I and III only **C** II and III only **D** I, II, and III

18 Which acid in each of the following pairs has the stronger conjugate base?

(a) H_2CO_3 or H_2SO_4
(b) HCl or HCOOH

weaker acid has stronger conjugate base

a) HCO_3^- or HSO_4^-
because H_2CO_3 weaker than H_2SO_4

b) HCl or $HCOOH$ ($COOH^-$)
Cr
because HCOOH is weaker