South Pasadena • Chemistry Name_____ Period___

4 • Classifying Chemicals

1 • pH and pOH

Fill in the missing information:

$[H^+]$	pH	pOH
1×10^{-5}	**5**	**9**
1×10^{-3}	3	**12**
1×10^{-12}	**12**	2
* 2.5×10^{-3}	**2.6**	**11.4**
1×10^{-6}	6	**8**
1×10^{-13}	**13**	1

***use your calculator pH = -log(2.5×10^{-3})**

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2 • [H⁺] and [OH⁻]

Fill in the missing information:

$[H^+]$	$[OH^-]$
1×10^{-4}	**1×10^{-10}**
1×10^{-6}	1×10^{-8}
1×10^{-10}	**1×10^{-4}**
1×10^{-12}	1×10^{-2}
2×10^{-6}	**5×10^{-9}**
3×10^{-8}	3.3×10^{-7}
4.8×10^{-3}	**2.1×10^{-12}**
6.25×10^{-14}	1.6×10^{-1}

Remember: [H+] x [OH-] = 1×10^{-14}

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4 • Classifying Chemicals

3 • ACIDS, BASES, and SALTS

State whether each chemical is an acid, a base, or a salt.

If it is an <u>acid or a base</u>, state whether it is strong or weak:

1.	H_2SO_4	**acid**	**strong**
2.	$Mg(OH)_2$	**base**	**weak**
3.	KBr	**salt**	
4.	HI	**acid**	**strong**
5.	$HC_2H_3O_2$	**acid**	**weak**
6.	NH_4OH	**base**	**weak**
7.	HNO_3	**acid**	**strong**
8.	Li_2CO_3	**salt**	
9.	NaOH	**base**	**strong**
10.	HF	**acid**	**weak**

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4 • MOLARITY

Calculate the concentration of each of these mixtures:

KOH = 56.1 g/mole NaOH = 40.0 g/mol

1. 4 moles KOH in enough water to make 2 L of solution. $\frac{4\text{ mol}}{2\text{ L}}$ = **2 <u>M</u>**

2. 0.1 mole NaOH in enough water to make 0.05 L of solution. $\frac{.1\text{ mol}}{.05\text{ L}}$ = **2 <u>M</u>**

3. 0.25 mole KOH in enough water to make 500 mL of solution. $\frac{.25\text{ mol}}{.5\text{ L}}$ = **.5 <u>M</u>**

4. 60 grams of NaOH in enough water to make 800 mL of solution. $\frac{1.5\text{ mol}}{.8\text{ L}}$ = **1.875 <u>M</u>**

   Convert 60 g NaOH to moles using molar mass.

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5 • DILUTION PROBLEMS

Answer the following problems about diluting solutions:

$$V \cdot \underline{M} = V \cdot \underline{M}$$

1. A 50 mL sample of 6 M HCl is diluted to a volume of 250 mL. What is the new concentration?

   (50 mL)(6 M) = (250 mL)(x) **x = 1.2 M**

2. What volume of 18.0 M H_2SO_4 is needed to make 100 mL of a 1.5 M H_2SO_4 solution?

   (x)(18 M) = (100 mL)(1.5 M) **x = 8.3 mL**

3. Calculate the concentration of a solution made by diluting 30 mL of 12 M HCl to a volume of 900 mL.

   (30 mL)(12 M) = (900 mL)(x) **x = 0.4 M**

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6 • PROPERTIES OF ACIDS & BASES

Use the following key:

a) Acid
b) Base
c) Both Acid and Base

_**B**_1. tastes bitter
_**C**_2. electrolyte
_**B**_3. increases $[OH^-]$
_**A**_4. turns cabbage pink
_**A**_5. neutralizes NaOH
_**A**_6. increases $[H^+]$
_**A**_7. tastes sour
_**B**_8. neutralizes HCl
_**B**_9. feels slippery
_**A**_10. decreases $[OH^-]$
_**B**_11. turns cabbage blue/green
_**A**_12. proton donor
_**B**_13. decreases $[H^+]$
_**C**_14. corrosive
_**B**_15. proton acceptor

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7 • ACID-BASE NEUTRALIZATION

Write balanced equations showing how the following acids and bases neutralize each other:

1. $HCl + NaOH \rightarrow$ ___**H_2O**___ + ____ **NaCl**___

2. $H_2SO_4 + 2\,KOH \rightarrow$ ____ **$2\,H_2O$** ___ + ___ **K_2SO_4**____

3. **2** $HCl + Mg(OH)_2 \rightarrow$ ___ **$2\,H_2O$** ____ + ___ **$MgCl_2$**____

4. $HC_2H_3O_2 + NaOH \rightarrow$ ____ **H_2O** ___ + ____ **$NaC_2H_3O_2$**___

5. $HNO_3 + NH_4OH \rightarrow$ ____ **H_2O** ___ + ____ **NH_4NO_3** ___

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8 • DISSOCIATION EQUATIONS

Consider the following dissociation equation: $H_2SO_4 \rightarrow 2\,H^+ + SO_4^{2-}$

Write the ions into which the following compounds dissociate:

1. $HCl \rightarrow$ **$H^+ + Cl^-$**

2. $NaOH \rightarrow$ **$Na^+ + OH^-$**

3. $Ca(OH)_2 \rightarrow$ **$Ca^{2+} + 2\,OH^-$**

4. $HC_2H_3O_2 \rightarrow$ **$H^+ + C_2H_3O_2^-$**

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9 • COMMON CHEMICALS

Match these substances with their chemical formulas:

_**l**_1.	table salt	a)	HCl
_**c**_2.	milk of magnesia	b)	$CaCO_3$
_**f**_3.	water	c)	$Mg(OH)_2$
_**a**_4.	stomach acid	d)	H_2O_2
_**h**_5.	sugar	e)	$HC_2H_3O_2$
_**i**_6.	limewater	f)	H_2O
_**g**_7.	household ammonia	g)	NH_4OH
_**d**_8.	hydrogen peroxide	h)	$C_{12}H_{22}O_{11}$
_**b**_9.	chalk	i)	$Ca(OH)_2$
_**k**_10.	drain cleaner (lye)	j)	H_2SO_4
_**e**_11.	vinegar	k)	$NaOH$
_**j**_12.	battery acid	l)	$NaCl$