

Oxides Worksheet

1. What is an oxide? Any element chemically combined with oxygen.
2. Metal oxides and water form bases and non-metal oxides and water form acids.

3. Complete the following table:

Element	Is the element a metal or a non-metal?	Is the oxide solution dissolved in water, acidic or basic?
Sulfur	<u>non-metal</u>	<u>acidic</u>
Carbon	<u>non-metal</u>	<u>acidic</u>
Magnesium	<u>metal</u>	<u>basic</u>
Iron	<u>metal</u>	<u>basic</u>

4. Use your conclusions in Question 2 to predict whether the oxide of each element below forms an acidic or basic solution.

- a) calcium basic      d) lithium acidic  
 b) sulphur acidic      e) nitrogen acidic  
 c) phosphorus acidic      f) sodium basic

5. Write the correct formula for each oxide.

- a) carbon monoxide CO      d) aluminum oxide Al<sub>2</sub>O<sub>3</sub>  
 b) diphosphorus pentoxide P<sub>2</sub>O<sub>5</sub>      e) nitrogen dioxide NO<sub>2</sub>  
 c) sulfur dioxide SO<sub>2</sub>      f) barium oxide BaO

6. Write in words the products of the following reactions. Then write in the balanced chemical equations for each reaction below the word equation.

- a) nitrogen dioxide plus water produces hydrogen nitrate (nitric acid).



- b) lithium oxide plus water produces Lithium hydroxide.



- c) magnesium oxide plus water produce magnesium hydroxide.



- d) carbon dioxide plus water produce carbonic acid (hydrogen carbonate)



Acids and Bases Worksheet**7. Strength of acids and bases on the pH scale.**

- a) Base #1 has a pH of 9. Base #2 has a pH of 13. Which has the greater concentration of  $H^+$  ions? #1 Which is more basic? #2 How many more times basic is your choice?  $10^4$  or 10000 X
- b) Lemon juice has a pH of 2. Vinegar has a pH of 5. Which has the greater concentration of  $H^+$  ions? lemon juice Which is more acidic? lemon juice How many more times acidic is your choice?  $10^3$  or 1000 X

**8. Neutralization of acids and bases.**

Write in the products for each of the following neutralization reactions and identify the salt produced. Balance the chemical equation.

- a) 2  $HCl(aq)$  + 1  $Ca(OH)_2(aq)$   $\rightarrow$  2  $H_2O$  + 1  $CaCl_2$  (salt) calcium chloride
- b) 1  $H_2SO_4(aq)$  + 2  $LiOH(aq)$   $\rightarrow$  2  $H_2O$  + 1  $Li_2SO_4$  lithium sulfate
- c) 1  $H_2CO_3(aq)$  + 2  $KOH(aq)$   $\rightarrow$  2  $H_2O$  + 1  $K_2CO_3$  potassium carbonate
- d) 2  $H_3PO_4(aq)$  + 3  $Ba(OH)_2(aq)$   $\rightarrow$  6  $H_2O$  + 1  $Ba_3(PO_4)_2$  barium phosphate
- e) 1  $HNO_3(aq)$  + 1  $NaOH(aq)$   $\rightarrow$  1  $H_2O$  + 1  $NaNO_3$  sodium nitrate

9. You are required to make the salt  $CaSO_4$  in the lab, but are given only the following chemicals:

$BaO$   
 $Li_2O_2$

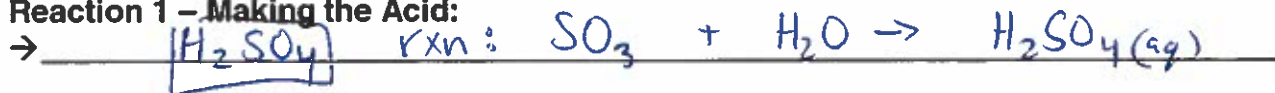
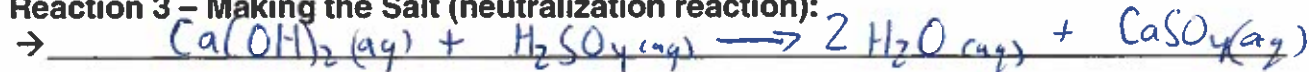
~~$CaO$~~   
 $K_2O$

$SO_4$   
 $H_2O$

$CO_3$   
 $SO_2$

~~$SO_3$~~   
 $CO_2$

Use balanced chemical reactions to make the necessary acid and the base. You will then use a balanced chemical reaction to show how your acid and base can be used to make  $CaSO_4$

**Reaction 1 – Making the Acid:****Reaction 2 – Making the Base:****Reaction 3 – Making the Salt (neutralization reaction):**

# Acid and Base Worksheet

SNC 2DI

Name: ANSWERS

**Goal • Check your understanding of acid and base terms and reinforce some of the concepts that relate to the strength of acids and bases.**

**What to Do:** Answer each question in the space provided.

1. Compare and contrast the following terms in (a) and (b). Define (c)

(a) strong acid, weak acid (give an example of each)

→ ↳ completely ionizes in solution i.e.  $\text{HCl}_{(aq)} \rightarrow \text{H}^+_{(aq)} + \text{Cl}^-_{(aq)}$

→ weak → partially ionizes in solution i.e.  $\text{CH}_3\text{COOH}_{(aq)} \leftrightarrow \text{H}^+_{(aq)} + \text{CH}_3\text{COO}^-_{(aq)} + \text{CH}_3\text{COOH}_{(aq)}$

(b) concentrated base, dilute base

→ ↳ includes little  $\text{H}_2\text{O}$  and a ~~high~~ low concentration of  $\text{H}^+$

→ dilute → contains much more  $\text{H}_2\text{O}$

(c) percent ionization of an acid or a base

→ The percentage of the acid or base that separates

→ into its ions when put into solution

2. What is the percent ionization in each solution below?

(a) solution 1: 10 out of 100 molecules of acid ionize

→  $10/100 = 0.1 \times 100\% = 10\%$

(b) solution 2: 500 out of 1000 molecules of acid ionize

→  $500/1000 = 0.5 \times 100\% = 50\%$

(c) solution 3: 100 out of 500 molecules of base ionize

→  $100/500 = 0.2 \times 100\% = 20\%$

(d) solution 4: 3 out of 100 molecules of base ionize

→  $3/100 = 0.03 \times 100\% = 3\%$

3. Based on your answers for question 2, answer the following questions. Assume that all the solutions are equally concentrated.

(a) Which solution has the lowest pH (highest concentration of  $\text{H}^+$ )?

→ #2

(b) Which solution has the highest pH (lowest concentration of  $\text{H}^+$ )?

→ #3

4. a) Name two qualitative properties that are the same for water and very concentrated sulfuric acid.

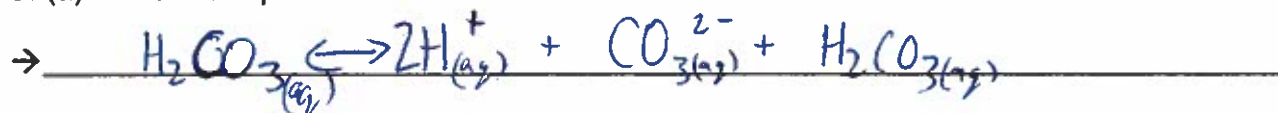
→ clear, colourless, liquids

→ Keep phenolphthalein clear

(b) Name one qualitative property that is different for water and very concentrated sulfuric acid.

→ water → BTB stays blue    acid → BTB turns yellow

5. (a) Write the equations that show the ionization of carbonic acid. It is a weak acid.



(b) Why is it appropriate to use double arrows in the equations for part (a)?

→ because the solution alternates between the (2) sides of the reaction.

(c) Why is carbonic acid a weak acid compared with hydrochloric acid?

→ It partially ionizes while HCl completely ionizes in solution