

# *Chemistry 3A*

## Introductory General Chemistry

### *Experiment 4b*

# Rolling for Compound Initiative

# Introduction

The “Language of Chemistry” is our purpose here


Decahedral (10-sided) and Icosahedral (20-sided) dice will be used to generate names for chemical compounds in this experiment

These are actually online dice provided by Google



**Opaque White Dice**

\$0.56

 Dice Game Depot

Free delivery on \$50+

7-day returns



**Opaque Black D20  
Chessex Dice**

\$0.56

 Dice Game Depot


Free delivery on \$50+

7-day returns



**Opaque 20mm Chessex  
Dice**

\$0.56

 Dice Game Depot

Free delivery on \$50+

7-day returns

# Background: Identify Compound Type

We talked about chemical compound naming in lecture. In this experiment, your knowledge & learning are reinforced.

## Identifying Compound Type

- **Ionic compound**

- metal elements are the **cations** (positively charged ions)
- nonmetal elements are the **anions** (negatively charged ions)
- They are **ionic compounds** because the **bonds** are **ionic**
- Ions can be
  - ❑ **Monatomic** (single element):  $Na^+, Cl^-, Fe^{3+}$ , etc.
  - ❑ **Polyatomic** (many elements):  $NH_4^+, NO_3^-, PO_4^{3-}, C_2H_3O_2^-$ , etc.

# Background: Identify Compound Type

## Identifying Compound Type (cont.)

- **Molecular Compound**

- In contrast to **ionic compounds**, these are not electrically charged (not ions!)
- Composed of **nonmetal** element bonded to each other by the **sharing** of valence shell electrons (**covalent** bonds)

- **Acid**

- **Acids** are substances that can **donate protons** (**H<sup>+</sup> ions**)

*This is the definition of Bronsted-Lowry. There is another definition called a Lewis acid, which an element/compound that can accept an electron pair, but you don't need to know this*

- The reaction is **HA  $\leftrightarrow$  H<sup>+</sup> + A<sup>-</sup>**, where **A** is a nonmetal or polyatomic substance that will be an anion

# Background: Rules for Naming

# Ionic compounds

- Type I metal cations + polyatomic cation**
  - all Group 1 and 2 elements
  - Group 13:  $\text{Al}^{3+}$ ,  $\text{Ga}^{3+}$  (gallium),  $\text{In}^{3+}$  (indium)
  - Group 12:  $\text{Zn}^{2+}$ ,  $\text{Cd}^{2+}$
  - Group 11:  $\text{Ag}^{+}$
  - Polyatomic: ammonium
- With monatomic and polyatomic anions
  - Monatomic:
    - Nonmetal stem + **-ide**
  - Polyatomic:
    - suffix usually **-ite** or **-ate**

# Background: Rules for Naming

## **Ionic compounds**

- *Type II metal cations*
  - All metal elements NOT a Type I cation
  - Element name + Roman numeral for charge
- With monatomic and polyatomic anions
  - Monatomic: Nonmetal stem + **-ide**
  - Polyatomic: suffix usually **-ite** or **-ate**

# Background: Rules for Naming

## Molecular compounds

- Add a prefix indicating count of element atoms to the first and second elements

Number	Prefix		Number	Prefix
1	*mono-		6	hexa-
2	di-		7	hepta-
3	tri-		8	octa-
4	tetra-		9	nona-
5	penta-		10	deca-

- 2<sup>nd</sup> element gets suffix -ide
- \* mono- prefix omitted for 1<sup>st</sup> element name

# Background: Rules for Naming

## Protic Acids with Monatomic Anions

(acids donating  $\text{H}^+$ )

- Add the prefix **hydro-**
- Then add root name of (nonmetal) element
- Then add suffix **-ic** followed by word **acid**

Hydrochloric acid, hydrobromic acid, hydroiodic acid

## Oxyacids in polyatomic anions

- Polyatomic anion ends in **-ate**:

Change suffix to **-ic** add **acid**



- Polyatomic anion ends in **-ite**:

Change suffix to **-ous** add **acid**



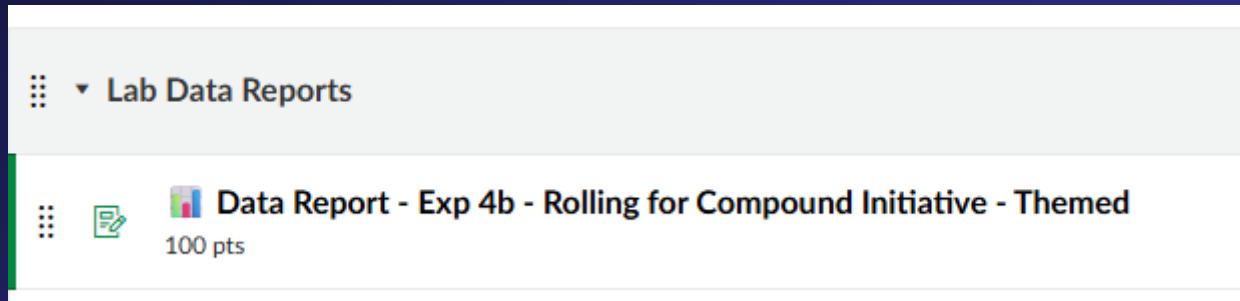


# Equipment You Will Use

- None of the usual equipment and consumables of the chemistry laboratory will be utilized in this experiment
- You will use your Canvas account to find the Experiment 4b Assignment and go through the feature to assist you in completing the report


# Canvas-Find Assignment

- In Canvas, look in **Assignments** for **Lab Data Reports**, and look for **Data Rep**
- Select (click on) the assignment



# Canvas-Open First View

- The first page just tells you about the experiment and it provides links to your textbook if you wish to use it and to the Google dice roller, which will be demonstrated to you

 **Data Report - Exp 4b - Rolling for Compound Initiative - Themed**  
Score: 0/100   Answered: 0/30

Intro / Instructions ▾ < >


Welcome, brave alchemists! The realm of Chemistria is in peril, and only those who can master the arcane art of nomenclature can hope to restore balance. Your journey begins now—gather your party, roll the dice, and decipher the elements that hold the key to victory!



The pursuit of knowledge is a sacred quest, but beware—those who stray from the path of honor and consult forbidden tomes (unauthorized materials) risk invoking the wrath of the Alchemical Council. Such treachery may doom your entire party to the Curse of the Null Grade, a fate most dire!



Stay true to the allowed scrolls and artifacts (course materials), rely on the wisdom of your fellowship, and prove your worth through your own cunning and skill. Only those who embrace the true challenge shall emerge victorious and unscathed!

**Allowed Scrolls and Artifacts:**

- Yellow Sheets
- Green Sheets
- Class Lecture Notes
- Class Textbook

 **Resources**

Textbook  

Roll Dice  

[Next Page](#)

- The subsequent pages will be interactive forms that allow you to put dice rolls values into entries to generate random cations and/or anions. You will use these to build chemical formulas and to test your ability to name compounds
- The form will check/validate your responses as correct

You can use [Google](#) to roll two 20-sided dice.

- Click on the 20 sided die, twice, to add it to the screen
- Click on the default 6-sided die to remove it.

### Phase 1: Ionic Compounds

As you traverse the treacherous Labyrinth of Elements, an ancient riddle appears before you. Solve it correctly, and you may proceed unharmed. Fail, and you risk an alchemical mishap!

The first die is the "Cation", the second die is the "Anion".

#### Question 1

0.3/3 pts 4-5 4 Details

Part 1 of 2

Roll two 20-sided dice: One for the cation, one for the anion. Enter the numbers you rolled below:

- Cation:  ✓ ♂
- Anion:  ✓ ♀

Part 2 of 2

Your cation is:  $\text{Al}^{3+}$

Your anion is:  $\text{Cl}^-$

What is the name of the ionic compound formed between these two ions?

What is the chemical formula of the ionic compound formed between these two ions?

Submit Question

#### Question 2

0/3 pts 5 4 Details


Part 1 of 2

Roll two 20-sided dice: One for the cation, one for the anion. Enter the numbers you rolled below:

- Cation:
- Anion:

Submit Part

- As you work through the pages of the form, you will record your results in your regular lab manual
- There are some things you need to fill out that are not in the form, such as Type I or Type II cations, and other data

 **Data Report - Exp 4b - Rolling for Compound Initiative - Themed** Progress

Score: 0.3/100   Answered: 0/30

● Phase 2: Acids   Answered: 0/9   < >

### Phase 2: Acids

You arrive at the Alchemist's Tower, where an old sage demands proof of your knowledge. He hands you a mysterious formula—decipher its true name to earn his favor.

● Question 13

0/3 pts   5   4   Details

Part 1 of 2

Roll one 20-sided dice for the anion. Enter the number you rolled below:

• Anion:

**Submit Part**

● Question 14

0/3 pts   5   4   Details

Part 1 of 2

Roll one 20-sided dice for the anion. Enter the number you rolled below:

• Anion:

**Submit Part**

# Clean Up

- No clean up was required for this experiment