

Name: \_\_\_\_\_

Mods: \_\_\_\_\_

## UNIT 5 - Periodic Table

Date	Agenda	Homework
Fri 11/14	Periodic Puzzle – activity and discussion	Study trends Make sure element cards are up to date
Mon 11/17	Puzzle Quiz Relate element cards to periodic trends Relate electron configuration and the periodic table – write electron configuration on element cards	Read pgs 123-126 Problems pg 409 #10-16 Finish electron configuration
Tues 11/18	Start Posters – organize by # protons (look for trends) **Goal – to get all cards taped down properly	Read pg 391-396
Wed 11/19	PPT Notes Trends- <ul style="list-style-type: none"> <li>• charges, electron configuration</li> <li>• group/period</li> <li>• group names</li> </ul> Work on Posters	Problems pg 129 # 47-49
Thurs 11/20	PPT Notes Trends con - Atomic Radius, Ionization Energy, and Electronegativity Worksheet #1- Circle the Trends	Read pgs 398-406 Problems pg 409 # 17-27 Finish Worksheets
Fri 11/21	Go over HW Worksheet #2 - Periodic Puzzle A Work on Posters	Worksheet #3 - Periodic Puzzle B
Mon 11/24	Go over Periodic Puzzle B Worksheet #4 - Periodic Puzzle C	Worksheet #4 (Puzzles C)
Tues 11/25	Go over Periodic Puzzles C Worksheet #5 - Review Periodic Trends (pgs 6-8)	Study for Test Worksheet #5 - Review Periodic Trends (pgs 6-8)
Wed 11/26 (1/2 Day)	Finish Posters Mythbusters, if time	Posters due at end of period
Thurs 11/27 and 11/28	No School - Thanksgiving	
Mon 12/1	Go over Review Worksheet #5	Study for Test tomorrow
Tues 12/2	Test – Periodic Table	
Wed 12/3	Lab – Metal Reactivity (if time)	TBA
Thurs 12/4	Lab – Metal Reactivity (if time)	TBA

## Worksheet #1:

# Atomic Radius, Ionization Energy, Electronegativity Worksheet

Circle the one with:

1. The HIGHER ionization energy

- |             |             |
|-------------|-------------|
| A. Mg or S  | B. Mg or Sr |
| C. Br or K  | D. Br or I  |
| E. Li or Rb | F. As or N  |
| G. O or Te  | H. Cu or Fe |

2. The HIGHER electronegativity

- |             |             |
|-------------|-------------|
| A. Sr or Mg | B. Cl or Br |
| C. K or Ge  | D. P or Sb  |
| E. Ag or Sr | F. Se or O  |
| G. Ga or B  | H. Cs or Na |

3. The LARGER radius

- |             |             |
|-------------|-------------|
| A. Li or K  | B. I or F   |
| C. Ca or Ga | D. O or S   |
| E. Co or Ir | F. Ne or Xe |
| G. Cs or Na | H. Sn or C  |

4. The LOWER ionization energy

- |             |             |
|-------------|-------------|
| A. N or As  | B. Br or F  |
| C. Ca or Be | D. Al or Cl |
| E. Cs or Po | F. N or P   |

5. The LOWER electronegativity

- |             |             |
|-------------|-------------|
| A. Rb or Sn | B. Br or At |
| C. Ca or Ni | D. Mg or S  |
| E. Cl or P  | F. Al or Ga |

6. The SMALLER radius

- |             |             |
|-------------|-------------|
| A. Cs or K  | B. Ba or Ca |
| C. N or As  | D. Cl or I  |
| E. Cr or Cu | F. Ag or Mo |

## Worksheet #2: Periodic Trends Puzzle A

I	II	III	IV	V	VI	VII	VIII

Use the code letters A to Z and the clues below to fill in the periodic table above.

1. The following elements belong together in families  
JFU – RHIG – QKZ – COL – WAP – TMB – SNV – XDYE
2. I and D represent an entire period
3. R has one electron in its outermost shell
4. K is a halogen with the smallest radius
5. J has 14 protons
6. U is the least metallic element in its family
7. The electrons of A end  $2s^2 2p^3$
8. X is more closely related to D than the other elements in its family are
9. A neutral atom of O has 8 electrons
10. G has the largest radius in its family
11. V is the most metallic alkaline earth
12. N has the highest ionization energy in its family
13. H has 4 neutrons
14. Q has the lowest electronegativity in its family
15. Y is the most metallic member of its family
16. W is more metallic than P
17. M has the largest atomic mass in its family
18. C is a liquid and L is a solid
19. The electrons of B are distributed over three energy levels

## Worksheet #3: Periodic Trends B

I	II	III	IV	V	VI	VII	VIII

Use the code letters A to Z and the clues below to fill in the periodic table above.

1. The following elements are grouped together as families  
UON—PRV—KMEA—DBL—YWG—XCT—QHJS—FIZ
2. C has 7 protons
3. P is an alkaline earth metal
4. L is a halogen
5. K and S make up an entire period
6. S is the least metallic element in the entire table
7. E is the most metallic element in the entire table
8. The most common oxidation state for W is 3+
9. G has the lowest ionization energy in its family
10. T is more metallic than X
11. D has the largest radius in its family
12. Y has the smallest atomic mass in its family
13. The electrons of A are distributed over 2 main energy levels
14. U commonly forms 2- ions
15. N has the highest ionization energy in its family
16. Z has 7 neutrons
17. F is less metallic than I
18. O is a liquid and U is a solid
19. V has the largest radius in its family
20. R is more closely related to P than to V
21. The electron configuration of H has a filled third energy level
22. Q is the most metallic member of its family
23. B is a gas and L is a liquid

## Worksheet #4: Periodic Trends Puzzle C

I	II	III	IV	V	VI	VII	VIII

Use the code letters A to Z and the clues below to fill in the periodic table above.

1. The following elements belong in the same families  
BFT---DGLZ JNV CMS QXY AEO IPH UKWR
2. The charge on an ion of H is +4 and -4
3. A neutral atom of C contains 8 electrons
4. G is a noble gas
5. U is an alkali metal
6. E has 5 electrons in its outermost shell
7. N is an alkaline earth metal
8. T has 3 electrons in the fourth energy level
9. Q is a halogen
10. F has the smallest atomic mass in its family
11. T is more metallic than B
12. J has 20 protons
13. P has the lowest ionization energy in its family
14. N has 6 neutrons in its nucleus
15. S's atomic radius is greater than that of C
16. C is more closely related to S than to M
17. Y is a liquid whereas Q is a gas
18. X has the lowest electronegativity in its family
19. K has the largest radius in its family
20. W is a gas
21. R has a higher ionization energy than U
22. Atom Z has 2 neutrons
23. D contains 10 protons
24. The electrons of atom G are distributed over 3 energy levels
25. H is the least metallic element in its group
26. The electrons of atom O are distributed over 3 energy levels
27. A is more metallic than either O or E

# Worksheet #5: Review - PERIODIC TRENDS

## Identify the group for each element

- |                    |                         |
|--------------------|-------------------------|
| 1. beryllium _____ | a) halogen              |
| 2. fluorine _____  | b) transition metal     |
| 3. neon _____      | c) noble gas            |
| 4. copper _____    | d) alkaline earth metal |
| 5. potassium _____ | e) alkali metal         |

## Identify the following as a

- |                   | a) metal | b) non metal | c) metalloid |
|-------------------|----------|--------------|--------------|
| 6. calcium _____  |          |              |              |
| 7. sulfur _____   |          |              |              |
| 8. boron _____    |          |              |              |
| 9. chlorine _____ |          |              |              |
| 10. zinc _____    |          |              |              |

## Identify the element:

- |  |       |
|--|-------|
| 11. Which element has 2 electrons in the second energy level | _____ |
| 12. Which element has 8 electrons in the third energy level  | _____ |
| 13. Which element has 7 electron in the third energy level   | _____ |
| 14. Which element has 1 electron in the first energy level   | _____ |
| 15. Which element has 6 electrons in the second energy level | _____ |

**Matching:**

metal  
ion  
noble gas  
group

non-metal  
alkali metal  
electronegativity  
period

ionization energy  
halogen  
atomic radius  
alkaline earth metal

16. \_\_\_\_\_ Name for elements in group 2
17. \_\_\_\_\_ A charged atom
18. \_\_\_\_\_ Name for elements in group 8
19. \_\_\_\_\_ A horizontal row on the periodic table
20. \_\_\_\_\_ A vertical column on the periodic table
21. \_\_\_\_\_ Name for elements in group 7
22. \_\_\_\_\_ Name for elements in group 1

**Circle the atom that:**

23. is SMALLER

Ca            or            K

Pb            or            C

Ni            or            Pt

24. has the highest ionization energy?

Mg            or            Na

Br            or            Cl

K             or            Ca

25. has the smallest electronegativity.

Cl            or            I

Cu            or            Fe

Li            or            K

# Periodic Puzzle D

I	II	III	IV	V	VI	VII	VIII

## Hints:

- The following elements are grouped together as families

UZHE, FTB, QXY, MSC, RWJ, DIG, KNV, LOAP

- A neutral atom of A contains 1e-
- B has 4 electrons in its outer shell
- C has 5 electrons in its outer shell in the second energy level
- D is an alkaline earth metal
- X is in the third group
- F has the highest ionization energy of its family
- G is the most metallic alkaline earth
- H is a gas
- I is more closely related to D than to G
- V is a chalcogen
- J is a gas at room temperature whereas W is a liquid and R is a solid
- K has the largest radius in its family
- M has a lower ionization energy than S
- N has the smallest radius of its family
- O has electrons spread over 4 main energy levels
- L is more closely related to P than to O
- A neutral atom of Q contains 21 electrons
- T is the most metallic of its family
- U has 10 protons
- X has a larger radius than that of Y
- Z has the highest atomic mass of its family

# Lab: Exploring Relative Reactivity of Metals

## BACKGROUND INFORMATION

The relative reactivity of a group of metals can be established by comparing the reaction of each metal with a given reagent. A metal might react with a specific reagent or no reaction may occur. On the other hand, a given metal might react with a specific reagent at a different rate than some other metal.

### Demonstration of Alkali Metal Reactivity:

We will start with a beaker of water that contains the acid/base indicator phenolphthalein. This indicator turns pink in the presence of a base.

What color is the water after the indicator is added? \_\_\_\_\_

*We will add a small piece of lithium metal to the water and make some observations:*

*We will add a small piece of sodium metal to the water and make some observations:*

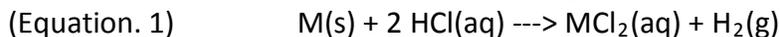
*We will add a small piece of potassium metal to the water and make some observations:*

*Based on these observations, rank the metals by increasing reactivity:*

*How does this ranking compare with the location of these metals on the periodic table?*

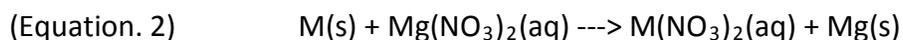
## Exploring Relative Reactivity of Metals

In this experiment, the reaction of a group of metals with dilute hydrochloric acid will be used to determine the **relative reactivity** of the metals. Some metals react with dilute hydrochloric acid as shown in Equation:



The rate at which different metals react with dilute hydrochloric acid will vary. Thus, from the laboratory observations as to whether a gas is formed and if so at what rate the gas is evolved, the relative reactivity of the metal can be determined.

A second reaction to be studied in this experiment is the reaction of each of a group of metals with solutions of their corresponding salts. Some metals will react with a solution of a salt of another metal as indicated in Equation:



In this case, the fact that a metal does or does not react with a solution of another metallic salt can be used to establish the **order of reactivity** of a group of metals.

One way to determine if a reaction occurs when a metal is added to a reactant is to note the initial appearance of the metal and the reactant. After a period of time, the final appearance of the metal and the reactant is noted. Any **change of the appearance** of the metal and the reactant would suggest that a reaction has occurred. In addition, a **color change**, the **formation of a precipitate**, or the **evolution of a gas** would also suggest that a reaction has occurred.

---

### EXPERIMENTAL PROCEDURE:

#### A. Initial Appearance of Metals

Examine a sample of magnesium, of zinc, and of copper. Record on the data sheet the observations such as color, texture, and luster.

Metal	Observations
Mg	
Zn	
Cu	

---

### B. Reaction of Metals with Dilute Hydrochloric Acid

1. Place one piece of each metal in the individual wells of a microplate.
2. Place the microplate on a piece of white paper to better see a reaction.
3. Add enough hydrochloric acid to cover the metal.
3. Record the observations on the data sheet.
4. Place any unreacted metal and solution in the chemical waste container designated by the lab instructor.

Metal	Initial Observations	Observations after 5 minutes
Mg		
Zn		
Cu		

---

### C. Reaction of Metals with Solutions of Salts

1. Add one small piece of each metal (copper, magnesium and zinc) in individual wells of a microplate in an arrangement that matches the data table shown below.
2. Place the microplate over a piece of white paper to better see the reaction.
3. Following the pattern on the data table, add enough of each of the solutions to just cover the piece of metal.
4. Wait about 5 minutes and then record your observations. If there is no visible evidence of a chemical reaction, write "NR" in the corresponding space.
5. Place any unreacted metal and solution in the chemical waste container designated by the lab instructor.

	$Mg(NO_3)_2$	$Cu(NO_3)_2$	$Zn(NO_3)_2$
Mg	_____		
Cu		_____	
Zn			_____

---

**QUESTIONS:**

1. On the basis of the relative rate of reaction of the three metals with dilute HCl, arrange the metals in **decreasing** order of reactivity toward dilute HCl.

\_\_\_\_\_ > \_\_\_\_\_ > \_\_\_\_\_

2. On the basis of the reaction of the three metals with the salt solutions, arrange the three metals **decreasing** order of reactivity.

\_\_\_\_\_ > \_\_\_\_\_ > \_\_\_\_\_

3. How do these rankings compare with the location of the metals on the periodic table?

4. A student was given four metals, A, B, C, and D, and solutions for their corresponding salts, AZ, BZ, CZ, and DZ. The student was asked to determine the relative reactivity of the four metals by reacting them with the solutions.

The results of the laboratory observations of the student are given in Table 1. Arrange the four metals on decreasing order of reactivity.

**Table 1**

<b>Metal</b>	<b>AZ</b>	<b>BZ</b>	<b>CZ</b>	<b>DZ</b>
<b>A</b>	NR	NR	NR	NR
<b>B</b>	R	NR	R	NR
<b>C</b>	R	NR	NR	NR
<b>D</b>	R	R	R	NR

*R = reaction; NR= no reaction*

**Reactivity** (in decreasing order):

\_\_\_\_\_ > \_\_\_\_\_ > \_\_\_\_\_ > \_\_\_\_\_