

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

## GOOGLE IT! Investigating the Families of Elements

The periodic table is arranged in horizontal rows called periods and vertical columns called groups. Each element in a group of the periodic table demonstrates properties similar to the other elements in that group. Groups are often referred to as Families of Elements due to their similar properties.

Using your textbook or other outside reliable resources (which must be cited) investigate the properties of each of the following groups of elements.

### Topic #1 – Active Metals

1. Identify the family names for the Group 1 and Group 2 Elements.

a. Group 1: Alkali Metals

b. Group 2: Alkaline Earth Metals

2. List the general properties of the pure metals in these groups. Include information related to reactivity, conductivity, melting point, hardness and luster.)

#### Group 1 Properties

- highly reactive with air + water
- not found in nature in free (uncombined) state
- low density
- low melting point
- good conductors
- soft

#### Group 2 Properties

- react w/ water to form basic (alkaline) solutions
- extracted from minerals (not found uncombined in nature)
- harder than Alkali Metals
- tarnish in air

3. Identify one element from each group and provide a use for that element.

{ Misc. answers }

4. Compare and contrast the reactivity of Group 1 and Group 2 elements. Provide evidence in your comparison.

Both Alkali + Alkaline earth metals are reactive metals that are not found in nature in the uncombined state. However, Group 1 elements are more reactive and are stored under oil to prevent reactivity with moisture + air.

## Topic #2 – Transition Elements

5. List the general properties of the elements in this section of the periodic table. Include information related to malleability, ductility, conductivity, hardness, luster and reactivity.)

### Transition Element Properties

- malleable + ductile
- relatively hard (compared to groups 1+2)
- high luster
- lower reactivity
- good conductors

6. Explain why salts and solutions containing transition elements are easily distinguishable from compounds containing representative elements.

Compounds containing transition elements typically are brightly colored.

7. Identify three transition elements and provide a use for each element.

{ Misc. answers }

## Topic #3: Groups 13-16 (aka Groups 3A to 6A)

8. Label the type of element (metal, nonmetal, metalloid) for each element in the group.

Group 13		Group 14		Group 15		Group 16	
B	Metalloid	C	Nonmetal	N	Nonmetal	O	Nonmetal
Al	Metal	Si	Metalloid	P	Nonmetal	S	Nonmetal
Ga	Metal	Ge	Metalloid	As	Metalloid	Se	Nonmetal
In	Metal	Sn	Metal	Sb	Metalloid	Te	Metalloid
Tl	Metal	Pb	Metal	Bi	Metal	Po	Metal

9. Why do properties vary among these groups of elements more than others?

Properties vary within these groups b/c they consist of different types of elements (metals, nonmetals + metalloids)

10. Make a generalization of how properties change from top to bottom down these groups.

Metallic properties increases while moving down a group.

11. Identify one element from each group and a use for that element.

{ Misc. Answers }

#### Topic #4: Group 17

Halogen

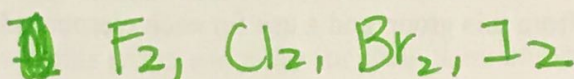
12. What is the family name given to this group? \_\_\_\_\_
13. List the general properties of the elements in this group of the periodic table. Include information related to reactivity and solubility.)

##### Group 17 Properties

- do not exist in nature in free (uncombined state)
- reactive nonmetals

14. Each of the elements in this group exists as a diatomic element. What does it mean to be diatomic?

Diatomic = 2 atoms bonded



15. Identify the state of matter (solid, liquid, gas) that each of the elements exists in at STP.

Element	State at STP
$F_2$	gas
$Cl_2$	gas
$Br_2$	liquid
$I_2$	solid

} yellow / yellow-green gases

(purple vapor when it sublimates)

#### Topic #5: Hydrogen

16. Explain why hydrogen is a unique element.

Hydrogen can behave as both a metal + nonmetal while bonding. It has 1 valence e- though it is not metallic. It also acts as a halogen.

17. Is hydrogen part of the alkali metals? Why or why not? Provide evidence.

Hydrogen is not an alkali metal. Despite its one valence e- it is not a metal. Hydrogen behaves more like a halogen.

18. List the properties and uses of hydrogen.

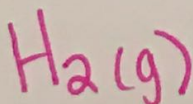
##### Properties

- diatomic
- colorless
- reactive
- odorless
- combustible
- gas

##### uses

- combines w/ halogens to form acids
- water
- combines w/ carbon

19. Pure hydrogen is a diatomic element. Write the formula for pure hydrogen gas.



Topic #6: Group 18

20. What is the family name given to this group?

Noble Gases

21. List the general properties of the elements in this group of the periodic table.

Include information related to reactivity and state of matter at STP.

Group 18 Properties

- gases
- monatomic
- unreactive

22. Identify two elements from this group and a use for each element identified.

{ MISC. ANSWERS }

23. The elements in this group have been called rare, inert and noble. Explain the origin of each of these terms as related to this group of elements. Are any of these terms misleading based on what is now known about these elements?

Noble: unreactive + tend to be separate from other atoms.

Rare: occur in small quantities in the atmosphere

Inert: thought to be unable to combine w/ other elements.

\* It is now known that noble gases, specifically xenon can form a compound in the lab ( $\text{XeF}_4$ ).

Noble gases are unreactive in nature but can react w/ certain elements under specific laboratory conditions.