

## UNIT 4 STUDY GUIDE/PRACTICE TEST

Name Key

Use this packet to help prepare for your upcoming test on the Periodic Table. It will be collected the day of the test – MONDAY DECEMBER 4<sup>th</sup>. Key is located on my website ([missvirga.weebly.com](http://missvirga.weebly.com)).

### TOPIC 4.1: DEVELOPMENT & ORGANIZATION OF PERIODIC TABLE

- The Periodic Table is organized into rows and columns.
  - The rows are called **periods**
    - Elements in the same period have the same number of occupied energy levels/shells
  - The columns are called **groups**
    - Elements in the same group have the same number of valence electrons
    - Elements in the same group have similar chemical properties
    - Fill in the table below with the names of each group. **Memorize these.**

Group #	Group Name
1	Alkali Metals
2	Alkaline Earth Metals
3-12	Transition Metals
17	Halogens
18	Noble Gases

- We can tell a lot about an element by checking out the Periodic Table and Table S.

#### Practice Questions

- 1) Name two elements that share similar chemical properties with calcium.

Beryllium, magnesium (also - strontium, barium, radium)

- 2) Why will those elements react similarly?

Same # of valence electrons

- 3) The order of elements from left to right on the Periodic Table is determined by what?

atomic #

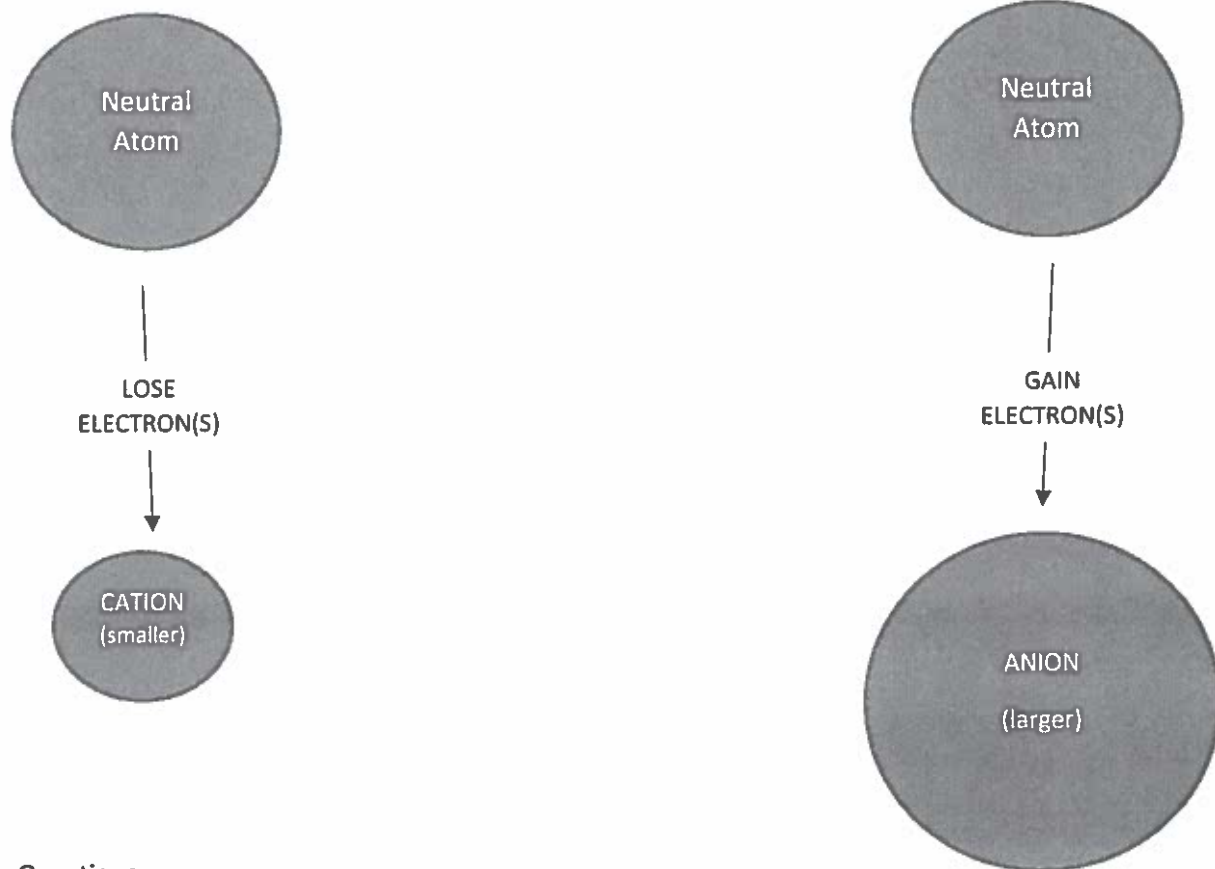
- 4) What happens to the number of occupied energy shells as you...

- a. Move across a period: stays the same
- b. Move down a group: increases

- 5) What happens to the number of valence electrons as you...

- a. Move across a period: increases
- b. Move down a group: stays the same

## TOPIC 4.2: IONS & OCTET RULE & IONIC RADIUS



### Practice Questions

- 1) What is the charge of a cation (positive or negative)? positive
- 2) What is the charge of an anion (positive or negative)? negative
- 3) Why do ions form?  
To gain a full valence shell - which makes them stable.
- 4) What happens to the size of an element that loses electrons to become a cation? decreases
- 5) What happens to the size of an element that gains electrons to become an anion? increases
- 6) Draw the Lewis Dot Structures of both a fluorine atom and a fluorine ion.



- 7) Draw the Lewis Dot Structures of both magnesium atom and a magnesium ion.



## TOPIC 4.3: ATOMIC RADIUS

ATOMIC RADIUS FOR EVERY ELEMENT CAN BE FOUND ON TABLE S

1 H 1.0079																	2 He 4.0026						
3 Li 6.941	4 Be 9.0122																	5 B 10.811	6 C 12.011	7 N 14.007	8 O 15.999	9 F 18.998	10 Ne 20.180
11 Na 22.990	12 Mg 24.305																	13 Al 26.982	14 Si 28.086	15 P 30.974	16 S 32.065	17 Cl 35.453	18 Ar 39.948
19 K 39.098	20 Ca 40.078	21 Sc 44.956	22 Ti 47.887	23 V 50.942	24 Cr 51.996	25 Mn 54.938	26 Fe 55.845	27 Co 58.933	28 Ni 58.693	29 Cu 63.546	30 Zn 65.38	31 Ga 69.723	32 Ge 72.630	33 As 74.922	34 Se 78.96	35 Br 79.904	36 Kr 83.80						
37 Rb 85.468	38 Sr 87.62																	49 In 114.818	50 Sn 118.710	51 Sb 121.757	52 Te 127.60	53 I 126.905	54 Xe 131.29
55 Cs 132.91	56 Ba 137.33	57-70 * Lanthanides	71 Lu 174.967	72 Hf 178.49	73 Ta 180.948	74 W 183.84	75 Re 186.207	76 Os 190.23	77 Ir 192.22	78 Pt 195.084	79 Au 196.967	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po 209	85 At 210	86 Rn 222					
87 Fr 223	88 Ra 226	89-102 * Actinides	103 Lr 260	104 Rf 261	105 Db 262	106 Sg 263	107 Bh 264	108 Hs 265	109 Mt 266	110 Uun 267	111 Uuu 268	112 Uub 269											

**Hint: A result of stronger nucleus-electron attractions and building layers of electrons**

increases

TREND? Atomic Radius

### Practice Problems

1. Which atom has the largest atomic radius?

- A) potassium                      B) rubidium  
 C) francium                      D) cesium

**DON'T GUESS, USE TABLE S**

2. Which ion has the *smallest* radius?

- A)  $O^{2-}$     B)  $S^{2-}$     C)  $Se^{2-}$     D)  $Te^{2-}$

3. As the elements in Period 3 are considered in order of increasing atomic number, there is a general *decrease* in

- A) atomic mass  
 B) atomic radius  
 C) electronegativity  
 D) first ionization energy

Base your answers to questions 4 and 5 on the information below and on your knowledge of chemistry.

Potassium phosphate,  $K_3PO_4$ , is a source of dietary potassium found in a popular cereal. According to the Nutrition-Facts label shown on the boxes of this brand of cereal, the accepted value for a one-cup serving of this cereal is 170 milligrams of potassium. The minimum daily requirement of potassium is 3500 milligrams for an adult human.

4. Compare the radius of a potassium ion to the radius of a potassium atom.

$K^+$  ion is smaller than K atom.

5. Identify the noble gas whose atoms have the same electron configuration as a potassium ion.

Argon (2-8-8)

## TOPIC 4.4: FIRST IONIZATION ENERGY

FIRST IONIZATION ENERGY FOR EVERY ELEMENT CAN BE FOUND ON TABLE S

1	H
3	Li
11	Na
19	K
37	Rb
55	Cs
87	Fr

**Hint: Energy required to remove an electron from outermost shell**

2	He
4	Be
10	Ne
18	Ar
36	Kr
54	Xe
86	Rn

21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36							
Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr							
39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54							
Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe							
57	58	59-102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118				
La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn

**TREND?** First Ionization Energy

**Practice Problems**

- |  |  |
|--|--|
| <p>1. In the ground state, an atom of each of the elements in Group 2 has a different</p> <p>A) oxidation state<br/> <input checked="" type="radio"/> B) first ionization energy<br/>         C) number of valence electrons<br/>         D) number of electrons in the first shell</p> <p>2. Which atom in the ground state requires the <i>least amount of energy to remove its valence electron?</i></p> <p>A) lithium atom <span style="color: blue;">520</span>    B) potassium atom <span style="color: blue;">419</span><br/> <input checked="" type="radio"/> C) rubidium atom <span style="color: blue;">403</span>    D) sodium atom <span style="color: blue;">496</span></p> | <p>3. As the first five elements in Group 15 are considered in order of increasing atomic number, first ionization energy</p> <p><input checked="" type="radio"/> A) decreases<br/>         B) increases<br/>         C) decreases, then increases<br/>         D) increases, then decreases</p> <div style="margin-top: 20px;"> <p style="color: blue; font-size: 1.2em;">N 1402</p> <p style="color: blue; font-size: 1.2em;">P 1012</p> <p style="color: blue; font-size: 1.2em;">As 944</p> <p style="color: blue; font-size: 1.2em;">Sb 831</p> <p style="color: blue; font-size: 1.2em;">Bi 703</p> </div> |
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**DON'T GUESS, USE TABLE S**

## TOPIC 4.5: ELECTRONEGATIVITY

ELECTRONEGATIVITY FOR EVERY ELEMENT CAN BE FOUND ON TABLE S

**Hint: Tendency of an atom to attract electrons**

**TREND?** Electronegativity

1 H																	2 He		
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne		
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar		
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr		
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe		
55 Cs	56 Ba	* La	57 Lu	58 Hf	59 Ta	60 W	61 Re	62 Os	63 Ir	64 Pt	65 Au	66 Hg	67 Tl	68 Pb	69 Bi	70 Po	71 At	72 Rn	
87 Fr	88 Ra	** Ac	89-102 Lr	103 Rf	104 Db	105 Sg	106 Bh	107 Hs	108 Mt	109 Uun	110 Uuu	111 Uub	112 Uuq	113 Uuq	114 Uuq	115 Uuq	116 Uuq	117 Uuq	118 Uuq

### Practice Problems

1. Which list of elements is arranged in order of increasing electronegativity?

- A) Be, Mg, Ca       B) F, Cl, Br  
 C) K, Ca, Sc       D) Li, Na, K

2. Which statement describes the general trends in electronegativity and atomic radius as the elements in Period 2 are considered in order from left to right?

- A) Both electronegativity and atomic radius increase.  
 B) Both electronegativity and atomic radius decrease.  
 C) Electronegativity increases and atomic radius decreases.  
 D) Electronegativity decreases and atomic radius increases.

3. Which atom has the greatest attraction for the electrons in a chemical bond?

- A) hydrogen       B) oxygen  
 C) silicon       D) sulfur

DON'T GUESS, USE TABLE S

## TOPIC 4.6: METALLIC CHARACTER

1 H 1.008																	2 He 4.0026	
3 Li 6.941	4 Be 9.0122											5 B 10.811	6 C 12.011	7 N 14.007	8 O 15.999	9 F 18.998	10 Ne 20.180	
11 Na 22.990	12 Mg 24.305											13 Al 26.982	14 Si 28.086	15 P 30.974	16 S 32.065	17 Cl 35.453	18 Ar 39.948	
19 K 39.098	20 Ca 40.078	21 Sc 44.956	22 Ti 47.88	23 V 50.942	24 Cr 51.996	25 Mn 54.938	26 Fe 55.845	27 Co 58.933	28 Ni 58.693	29 Cu 63.546	30 Zn 65.38	31 Ga 69.723	32 Ge 72.64	33 As 74.922	34 Se 78.96	35 Br 79.904	36 Kr 83.80	
37 Rb 85.468	38 Sr 87.62	39 Y 88.906	40 Zr 91.224	41 Nb 92.906	42 Mo 95.94	43 Tc 98.906	44 Ru 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.6	53 I 126.91	54 Xe 131.29	
55 Cs 132.91	56 Ba 137.33	57-70 * * La 138.91	71 Lu 174.967	72 Hf 178.49	73 Ta 180.948	74 W 183.84	75 Re 186.207	76 Os 190.23	77 Ir 192.22	78 Pt 195.084	79 Au 196.967	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po 209	85 At 210	86 Rn 222
87 Fr 223	88 Ra 226	89-102 * * Ac 227	103 Lr 260	104 Rf 261	105 Db 262	106 Sg 263	107 Bh 264	108 Hs 265	109 Mt 266	110 Ds 267	111 Uu 268	112 Uub 269	113 Uut 270	114 Uuq 271				

**Hint: Defined as the ability of an atom to lose an electron, forming a positive ion**

**TREND?** \_\_\_\_\_

**ChemGeeks.COM**

- Characteristics of Metals
  - tend to lose electrons (low first ionization energy and low electronegativity)
  - **ARE LOCATED TO THE LEFT OF THE STAIRCASE ON THE P.T.**
- Characteristics of Nonmetals
  - tend to gain electrons (high first ionization energy and high electronegativity)
  - **ARE LOCATED TO THE RIGHT OF THE STAIRCASE ON THE P.T.**
- Metalloids
  - have physical and chemical properties of both metals and nonmetals
  - **KNOW THE 7 METALLOIDS AND WHERE THEY ARE LOCATED ON THE PERIODIC TABLE**
    - B, Si, Ge, As, Sb, Te, At (border the bolded staircase)

## TOPIC 4.7: REACTIVITY

- Metals
  - react by **losing** electrons during a chemical reaction
  - MOST reactive metal is cesium/francium
  - Trends in reactivity
    - increases as you go down a group
    - decreases as you go across a period
- Nonmetals
  - react by **gaining** electrons during a chemical reaction
  - MOST reactive nonmetal is fluorine
  - trends in reactivity
    - decreases as you go down a group
    - increases as you go across a period
- Noble Gases
  - **NOT REACTIVE** (unreactive or inert)
  - are stable because of their 8 valence electrons