

<p>History of Atomic Models Video Notes Watch the three videos linked to the left and look at the one picture linked to the left. Take notes below. Make sure you have the Target in red pen, color annotations, and KCQ Boxes.</p>	<p>#1 - http://tinyurl.com/mazml8v #2 - https://tinyurl.com/krj6ehj #3 - https://tinyurl.com/j9hevr #4 - https://tinyurl.com/y8mvpl7e</p>
<p>#1 – Democritus</p>	<p>#5 – Ernest Rutherford</p>
<p>#2 – Aristotle</p>	<p>#6 – Neils Bohr</p>
<p>#3 – John Dalton</p>	<p>#7 – Schrödinger</p>
<p>#4 – J.J Thomson</p>	<p>#8 – Schrödinger + Chadwick</p>

Atomic Number Practice

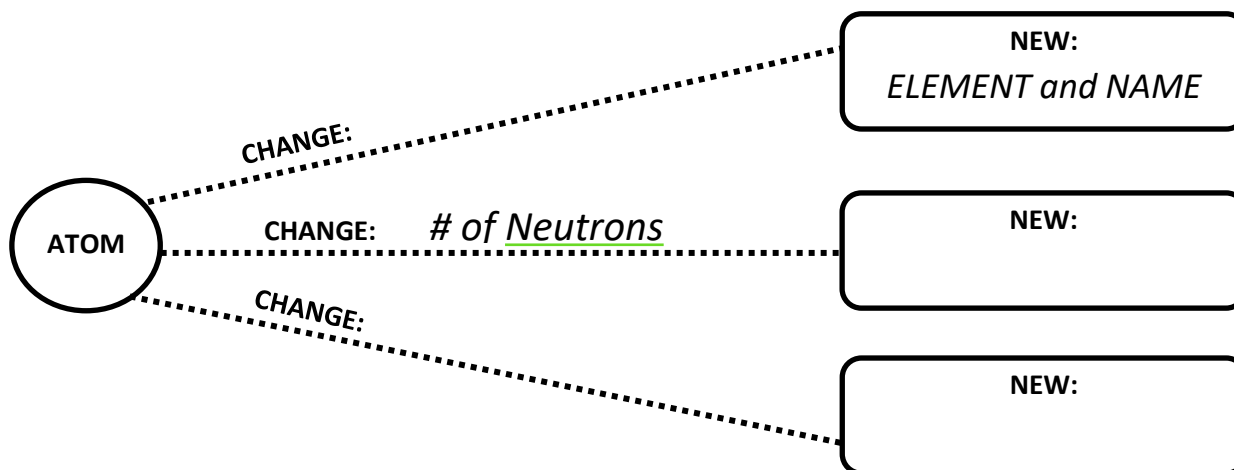
Element Name	Atomic Number	# of Protons	# of Neutrons	# of Electrons	Mass Number
Carbon-					12
	8		8		
Hydrogen-					1
		6			14
Hydrogen-			2		
Nitrogen-					14
			1		2
	92		146		
Cesium-			82		
	11		12		
		47			108
Tungsten-			110		
			45		80
		24			52
			89		152
Silver-					107
	76		114		

Answer on Notebook Paper:

1) How are the atomic number and the number of protons related to each other?	2) How do the number of protons, number of neutrons, and the mass number relate?	3) What is the one thing that determines the identity (name) of an atom?
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Post Online Activity Work

Post-activity Graphic – Fill out the missing parts of the following graphic that explains the difference between elements, isotopes and ions.



Post-activity Reading - Read and “mark-up” the following reading. Circle key terms, underline important facts/statements/claims

In chemical reactions, atoms tend to gain or lose their electrons. If an atom loses or gains electrons and now has an unequal number of protons and electrons, it is called an *ion*. If an atom contains 17 protons, 18 neutrons, and 18 electrons then the atom is a chloride ion because it has an atomic number of 17, but does not have 17 electrons.

Ions are written using the element symbol, with the net number of electrons gained or lost at the top and right corner of the symbol. If the ion has lost electrons, a + sign is put after the number, if the ion has gained electrons a – sign is used. If the ion has lost or gained only one electron, the number 1 is omitted from the ion symbol. The chloride ion, with one extra electron is written Cl^-

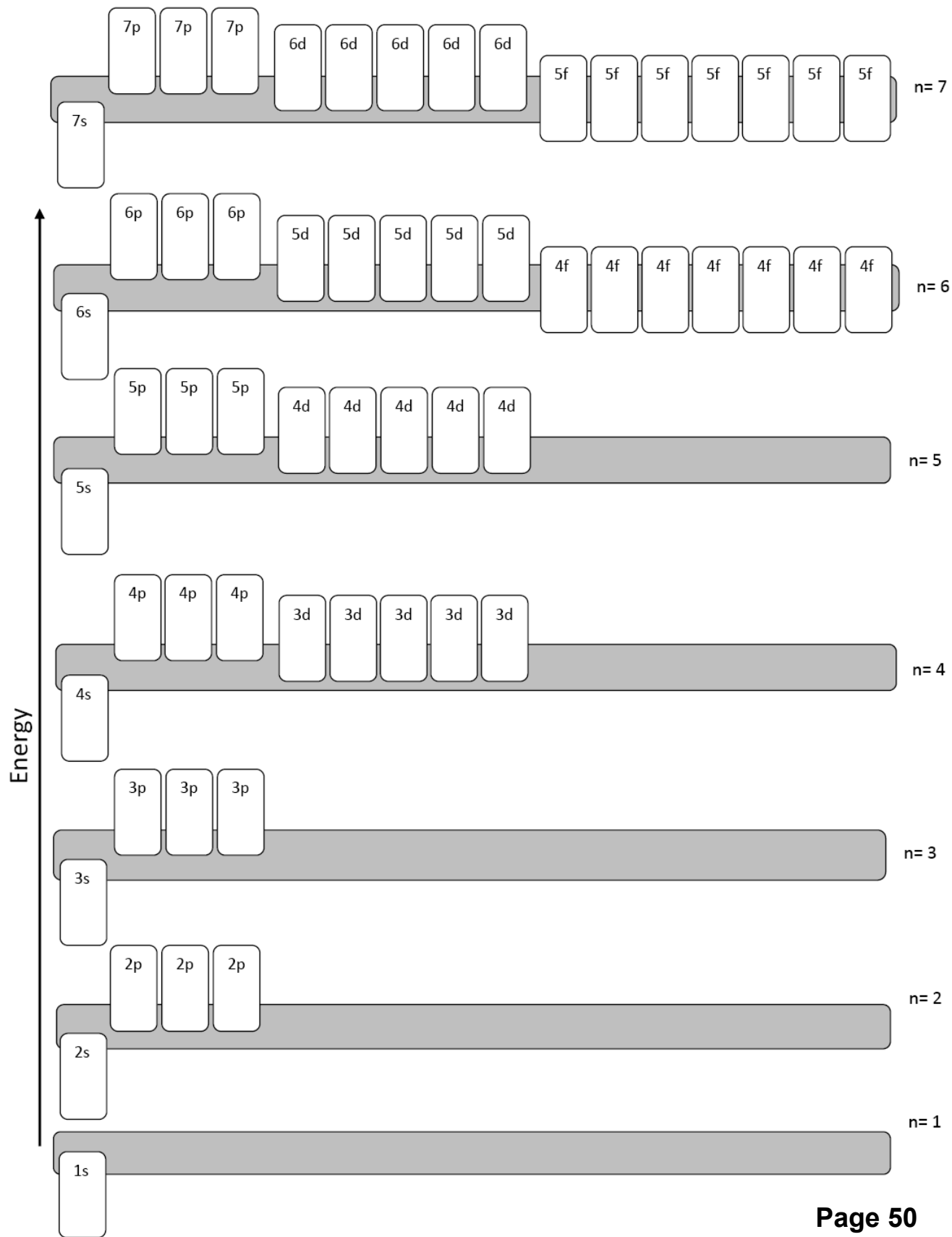
If an atom has 20 protons and 18 electrons then the atom has lost two electrons, then the ion is a calcium atom (atomic number 20) and the electrical charge is $2+$ (20 protons – 18 electrons = $2+$). The ion is written as Ca^{2+}

Post-activity Questions - Write the ion symbols given the following information

1) 23 protons, 27 neutrons and 19 electrons.	3) 37 protons, 48 neutrons, and 36 electrons	5) How many protons, neutrons and electrons does the following have? Sb^{3-} Protons: Neutrons: Electrons:
2) 5 protons, 6 neutrons, and 2 electrons	4) 16 protons, 16 neutrons, and 18 electrons	

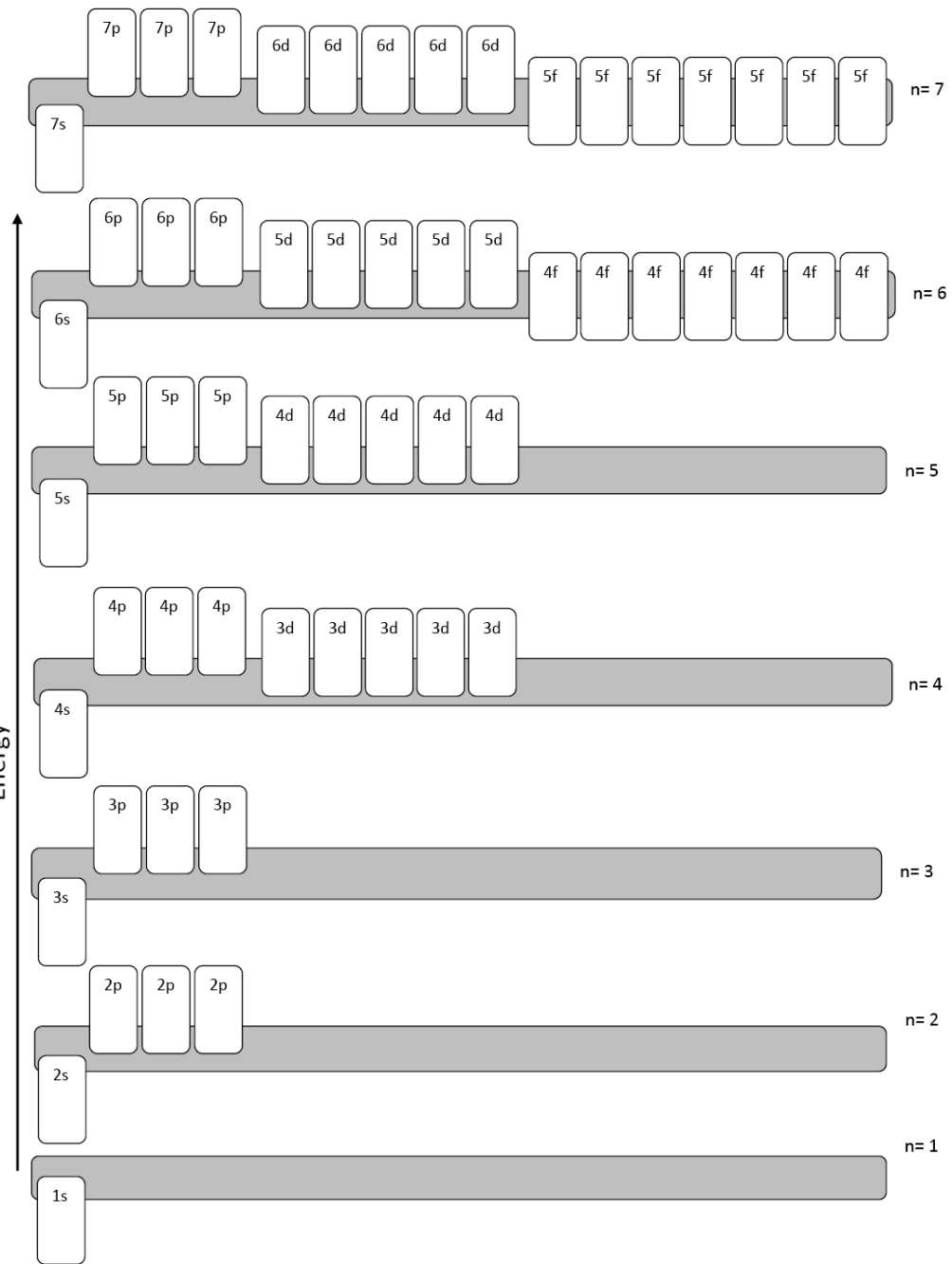
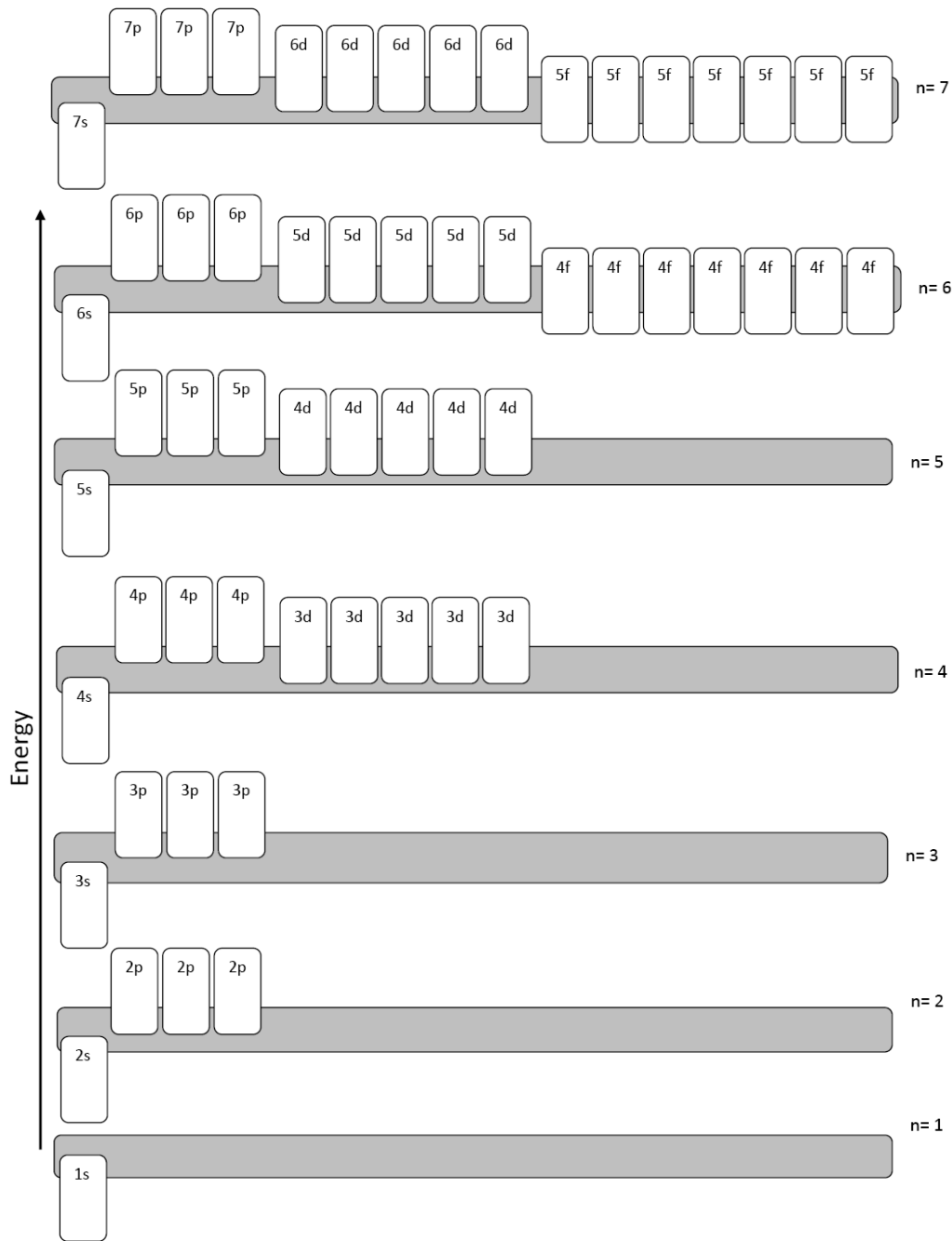
Electron Configuration – an “address” for the electrons in an atom

An Orbital is:		How do we describe orbitals? 1. 2. 3. 4.	
Different orbitals are in different energy levels	Different orbitals have different shapes	Different orbitals have different orientations	Each orbital is only allowed to have two e ⁻ s
Where do e⁻ live? What is the address for one? State -----> Energy level <input type="text"/> City -----> Type/shape of orbital <input type="text"/> Street -----> Orientation or orbital <input type="text"/> House # -----> Spin up or spin down of electron <input type="text"/>		Electron configuration for an electron in the second energy level, inside a p shaped orbital that is lined up on the x axis and is a spin up electron:	
They can get REALLY long $1s_{+\frac{1}{2}}, 1s_{-\frac{1}{2}}, 2s_{+\frac{1}{2}}, 2s_{-\frac{1}{2}}$ $2p_{x+\frac{1}{2}}, 2p_{x-\frac{1}{2}}, 2p_{y+\frac{1}{2}}$ $2p_{y-\frac{1}{2}}, 2p_{z+\frac{1}{2}}, 2p_{z-\frac{1}{2}}$		Want to describe where ALL the e⁻ in an atom were? Shrink it down and only list: 1. 2. 3. Example:	
Steps to finding all the electrons 1. Pick an _____ 2. Find the number of _____ 3. Start putting electrons into the _____ Use an _____ 4. List which _____ you used and _____ electrons in each one			
Rules for putting electrons in an orbital diagram:			
1. Aufbau Principle <i>An electron occupies the lowest energy orbital that it can.</i> Means:	2. Pauli Exclusion Principle <i>No two e⁻s in the same atom can have the same set of 4 quantum numbers</i> Means:	3. Hunds Rule <i>Orbitals of equal energy are each occupied by one e⁻ before any orbital is occupied by a second e⁻.</i> Means:	



Electron Configuration - Class Practice

Element Name	# of electrons	Electron Configuration
Phosphorus		
Sulfur		
Bromine		
Neon		
Lithium		
Strontium		
Aluminum		
Argon		
Helium		
Fluorine		
Nitrogen		
Potassium		
Beryllium		
Calcium		
Iodine		



Using the Periodic Table to Write e-Configurations

Example:

Phosphorus

15 electrons

$1s^2 2s^2 2p^6 3s^2 3p^3$

- 1) Sulfur
- 2) Bromine
- 3) Neon
- 4) Lithium
- 5) Strontium
- 6) Aluminum
- 7) Argon
- 8) Helium
- 9) Fluorine
- 10) Nitrogen
- 11) Potassium
- 12) Calcium
- 13) Iodine
- 14) Vanadium
- 15) Krypton

1A Hydrogen 1 H 1.01															8A Helium 2 He 4.00		
3 Li 6.94	2A Beryllium 4 Be 9.01											3A Boron 5 B 10.81	4A Carbon 6 C 12.01	5A Nitrogen 7 N 14.01	6A Oxygen 8 O 16.00	7A Fluorine 9 F 19.00	10 Ne 20.18
11 Na 22.99	12 Mg 24.31											13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95
19 K 39.10	20 Ca 40.08	3B Scandium 21 Sc 44.96	4B Titanium 22 Ti 47.88	5B Vanadium 23 V 50.94	6B Chromium 24 Cr 52.00	7B Manganese 25 Mn 54.94	8B Iron 26 Fe 55.85	9B Cobalt 27 Co 58.93	10B Nickel 28 Ni 58.69	11B Copper 29 Cu 63.55	12B Zinc 30 Zn 65.39	31 Ga 69.72	32 Ge 72.61	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	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 127.60	53 I 126.90	54 Xe 131.29
55 Cs 132.91	56 Ba 137.33	57 La 138.91	72 Hf 178.49	73 Ta 180.95	74 W 183.84	75 Re 186.21	76 Os 190.23	77 Ir 192.22	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.20	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89 Ac (277)	104 Rf (267)	105 Db (268)	106 Sg (271)	107 Bh (272)	108 Hs (270)	109 Mt (276)	110 Ds (281)	111 Rg (280)	112 Cn (285)	113 Nh (286)	114 Fl (289)	115 Mc (289)	116 Lv (293)	117 Ts (294)	118 Og (294)

*lanthanides

Lanthanum 57 La 138.91	Cerium 58 Ce 140.12	Praseodymium 59 Pr 140.91	Neodymium 60 Nd 144.24	Promethium 61 Pm (145)	Samarium 62 Sm 150.36	Europium 63 Eu 151.97	Gadolinium 64 Gd 157.25	Terbium 65 Tb 158.93	Dysprosium 66 Dy 162.50	Holmium 67 Ho 164.93	Erbium 68 Er 167.26	Thulium 69 Tm 168.93	Ytterbium 70 Yb 173.04	Lutetium 71 Lu 174.97
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**actinides

Actinium 89 Ac (227)	Thorium 90 Th 232.04	Protactinium 91 Pa 231.04	Uranium 92 U 238.03	Neptunium 93 Np (237)	Plutonium 94 Pu (244)	Americium 95 Am (243)	Curium 96 Cm (247)	Berkelium 97 Bk (247)	Californium 98 Cf (251)	Einsteinium 99 Es (252)	Fermium 100 Fm (257)	Mendelevium 101 Md (258)	Nobelium 102 No (259)	Lawrencium 103 Lr (262)
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Flame Test Lab

Directions: Watch the video of the known compounds. Take detailed observations. Then watch the video of the Unknown Compound. Take detailed observations. Compare your observations of the known compounds to the observations of the unknown compound. Use these observations to identify the unknown compound. Then fill out the Claim, Evidence, Reasoning boxes.
USE FULL SENTENCES FOR THE CER PORTION!

Flame Test of Known Compounds:

<https://youtu.be/NEUbBAGw14k>

Flame Test of Unknown Compound:

<https://youtu.be/3hSmDnXJEGA>

Metal Ion	Symbol	Detailed Observations on Color
Lithium	Li ¹⁺	
Sodium	Na ¹⁺	
Potassium	K ¹⁺	
Calcium	Ca ²⁺	
Strontium	Sr ²⁺	
Barium	Ba ²⁺	
Copper	Cu ²⁺	
Unknown		

CER Check List – Instructions on how to do a CER <https://tinyurl.com/ydfytu7y>

Claim	
Evidence	
Reasoning	<i>Hint! You should reference atomic absorption and emission!</i>

STUDY PLAN

I plan to study using these techniques (practice problems, flash cards, having my parents quiz me, study group etc):	These are the things I will need to study with (book, notebook, etc):	I plan to come in and get help from Mrs. Farmer on these days:
These are some things that have worked well for me in the past when studying:	These are some things that I will try differently compared to how I have studied in the past:	I will know I am ready for the benchmark when_____:

EXAM #1 TOPICS *This is not a definitive list. This is just a suggestion to provide general guidance in studying.*

DIRECTIONS: TOPICS IN NO SPECIAL ORDER. Rate each topic on a scale of 1-5 how well you think you understand it.

1 = "We learned this???" 5 = "I know this so well I could teach it to someone else!"

Topic #	Topic	Nt.Bk Pg #	PRE	POST
1	Convert metric units – KHDBdcm.			
2	Convert numbers from scientific notation to standard notation, and vice versa.			
3	Perform single unit Dimensional Analysis problems.			
4	Perform double unit Dimensional Analysis problems.			
5	Know the definition of a mole and how to calculate molar mass			
6	Perform molar conversions.			
7	Be able to describe and distinguish between the seven key Atomic Models that were covered in class including which scientists and experiments led to the various models. Key features, names, etc.			
8	Calculate for protons, neutrons, electrons for neutral atoms.			
9	Know the definition of atomic isotopes and why the periodic table masses are not whole #s			
10	Be able to calculate for protons, neutrons, and electrons for ions.			
11	Know the definition of an orbital, how many electrons are allowed in an orbital, how many of each type of orbital are allowed in an energy level, and how many electrons are allowed in each of those orbital sets			
12	Know how to apply Aufbau, Pauli Exclusion, and Hund's rules to orbital diagrams.			
13	Write an electron configuration with nothing but a standard periodic table.			
14	Know the definition of Atomic Absorption and Emission and evidence that an atom has undergone the processes.			

Exam #1 Practice Problems

- 1) Identify which Exam topic each question refers to – they may not be in perfect order.
- 2) Show all work or a written explanation. All means ALL! Pretend you are showing it on your quiz!
- 3) Highlight each question number on your binder paper, and highlight each numerical answer.

Q #	Topic #	Practice Problems
1		Who were the 10 scientists that were covered in class that contributed to the development of different atomic models? What did they each contribute/discover?
2		Sketch and name the seven atomic models that were covered in class.
3		What is the name of an atom with 23 protons and 52 neutrons?
4		What is the name of an atom with 3 protons and 4 neutrons?
5		How many protons, electrons and neutrons does ^{109}Ag have?
6		How many protons, electrons, and neutrons does ^{40}K have?
7		Proton, electron, and neutron. Which weighs the least? Which two weigh essentially the same?
8		What main colors make up the visible light spectrum? Think rainbow! Which is the highest/lowest energy?
9		Write the electron configuration for potassium
10		Write the electron configuration for Bromine
11		Put 329000 into scientific notation.
12		Put 0.00000896 into scientific notation.
13		Convert 2.7 kg into grams.
14		Convert 854000 kg into grams and put your answer in scientific notation.
15		Which metric prefix is used to designate 100?
16		Which metric prefix is used to designate 1000?
17		Convert 381 m/s into mi/day
18		Convert 12.8 mi/hr into yds/min
19		How many kg are in 9.1 pounds? (1kg = 2.2046 lbs)
20		How many mm are in 4.8 km? Put your answer in scientific notation.
21		How many mm are in 0.024 km? Put your answer in scientific notation.
22		How many inches are in 56 cm? (1in = 2.54cm)
23		How many inches are in 0.03 cm? (1in = 2.54 cm)
24		What is the definition of an orbital?
25		How many orbitals are in a set of s orbitals? In a set of p orbitals? A set of d orbitals? A set of f orbitals?
26		Sketch an s orbital and a p orbital. Sketch a full set of p orbitals.
27		How many electrons can be in a set of s orbitals? In a set of p orbitals? A set of d orbitals? A set of f orbitals?
28		Use an orbital diagram to practice filling it in for the following elements: Be, N, F, Ca, Cu, As
29		Write the ion symbols for the ions that the following elements like to make - K, Cl, O, Mg, P
30		How many protons, neutrons and electrons do the NEUTRAL elements above have? How many protons, neutrons and electrons do the IONS created above have?
31		What is the electron configuration of He, S, K, Cu, Se, H, V, Br,
32		Identify the atoms that have the following configurations: $1s^22s^22p^63s^23p^64s^23d^7$; $1s^22s^22p^63s^23p^64s^23d^{10}4p^1$
33		What is a mole?
34		What is the molar mass of $\text{Ca}(\text{OH})_2$, K_2SO_4 , $(\text{NH}_4)_2\text{S}$, and Ag?
35		Convert 15g of $\text{Ca}(\text{OH})_2$ into moles.
36		Convert 130g of K_2SO_4 into moles.
37		Convert 12.5 moles of $(\text{NH}_4)_2\text{S}$ into grams.
38		Convert 0.045 moles of Ag into grams.
39		Convert 25moles of H_2SO_4 into molecules.
40		Convert 0.63 moles of Zn into atoms.
41		Convert 18g of Li into atoms.
42		Convert 0.054g of $\text{C}_6\text{H}_{12}\text{O}_6$ into molecules.
43		Draw a diagram of absorption, and a diagram of emission.
44		Explain what we can sometimes see during emission.
45		Write a paragraph explaining what you saw in the flame test lab that allowed you to identify various metals. Think about the Bunsen burners and the spectrometers.
46+		Ask Mrs. Farmer for extra problems if you need them!!!

PLEASE make the most of these study problems. Doing them, thinking about them, correcting them, and remembering them will help you get ready for the benchmarks! Do not do them on autopilot...THINK about them. Where do you think I come up with them??? It's almost like I know what's on the exam, huh???

Unit #2 – Nuclear Chemistry

Visual Representation

Key Items

Costa's Questions

Level 3

Level 2

Level 1

Cross Cutting Concepts

Stability and Change	Energy and Matter	

Unit #3 – The Periodic Table

Visual Representation

Key Items

Costa's Questions

Level 3

Level 2

Level 1

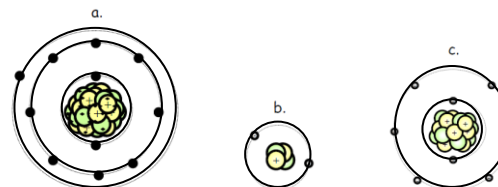
Cross Cutting Concepts

Patterns	Cause and effect	(pick a third cross cutting concept)

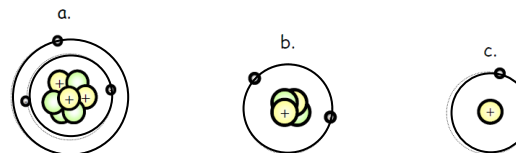
**Fold in half and glue
in like a pamphlet**

Understanding Periods and Groups

- 1) How many periods make up the periodic table?
- 2) How many groups make up the periodic table?
- 3) How many elements make up period one (1)?
Period three (3)? Period six (6)?
- 4) How many elements make up group seven (7)?
Group fourteen (14)? Group eighteen (18)?
- 5) Name the element that resides here:
 - a. Group eighteen (18) - Period five (5)
 - b. Period seven (7) - Group two (2)
 - c. Group one (1) - Period one (1)
 - d. Period three (3) - Group sixteen (16)
 - e. Group ten (10) - Period six (6)
 - f. Period one (1) - Group eight (8)
- 6) Which of the following pairs would most-likely have similar physical and chemical properties? Explain.
 - a. Lithium and Selenium
 - b. Vanadium and Radon
 - c. Sodium and Potassium
- 7) Which of the following represent an atom from period three? Explain your answer.



- 8) Which of the following atoms could reside in the same group? Explain your answer.



Metal	Non-metal		
Metalloid	Examples		
	Metals	Non-metals	Metalloids
Properties of Periods	Properties of Groups		

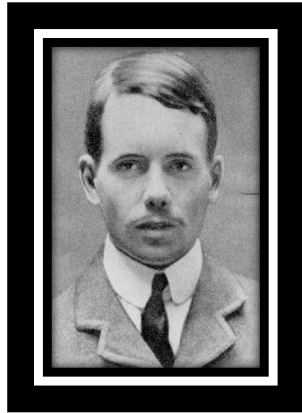
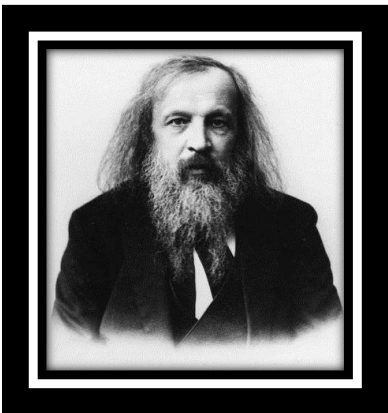


Table 1																Table 2																						
1 H	2 He															18 Ar	19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr				
3 Li	4 Be														13 Al	14 Si	15 P	16 S	17 Cl	18 Ar	19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
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
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	57-70 * Lu	71 Hf	72 Ta	73 W	74 Re	75 Os	76 Ir	77 Pt	78 Au	79 Hg	80 Tl	81 Pb	82 Bi	83 Po	84 At	85 Rn	87 Fr	88 Ra	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		
* Lanthanide series																		57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb							
** Actinide series																		89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No							

Alien Periodic Table

Introduction

- Your task is to arrange the Aliens in some logical pattern so that they form an organized rectangular block.
 - Within each **group**, all the Aliens in that group must be *exactly the same* in some way (the **Key Similarity**), AND must also *share a feature that changes regularly* as you move down the group (the **Varying Trait**).
 - Within each **period**, all the Aliens in the period must be *exactly the same* in some way (the **Key Similarity**), AND must also *share a feature that changes regularly* as you move across the period (the **Varying Trait**).
 - Two Aliens are missing from your set; simply leave empty spaces in your rectangular block for these Aliens.
 - Once you have finished arranging your Aliens, have your teacher check it and to sign your paper.
 - Be prepared to answer any questions the teacher may have about how you arranged the Aliens.
 - Good luck!
-

DECK LETTER:

TEACHER STAMP:



1) How many **groups** of Aliens do you have? _____ How many **periods** of Aliens do you have? _____

2) ALL ABOUT THE MISSING ALIENS

For each Alien that is missing...list five statements describing what it looks like, and draw it neatly.

DESCRIPTION OF MISSING ALIEN #1

DRAWING OF MISSING ALIEN #1

I.

II.

III.

IV.

V.

DESCRIPTION OF MISSING ALIEN #2

DRAWING OF MISSING ALIEN #2

I.

II.

III.

IV.

V.

Periodic Table's Most Wanted



Remember Bohr Diagrams!

Nucleus in the middle

1st Ring = 2 e- max

2nd Ring = 8 e- max

3rd Ring = 18e- max

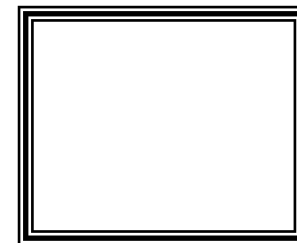
4th Ring = 32e- max

Fold in half and glue in like a
brochure

There is an element on the periodic table that does not want to be located! This element is "hiding out." In an effort to elude you, the element has provided many false identities and it is your job to follow this trail of false identities to locate the element's true name. This element is not as smart as it thinks; we know that all of these false identities are connected to each other. Therefore, providing the identity for each clue will ultimately help lead you to the correct element (this means you should use each answer as a reference to get the next one). So, if you make **just one** mistake it will affect all the clues and identities that follow...thus allowing this perpetrator to get away.

BE SAFE, BE SMART, BE VIGILANT!!!

- 1) Period two, group one is where I sit _____
- 2) The number of valence electrons in the previous answer plus 23 is my atomic number _____
- 3) Five groups to the right of the previous answer, in period five, is my location _____
- 4) The number of neutral particles in the previous answer is my atomic number _____
- 5) If you reverse the atomic number in the previous answer, you will know my mass _____
 - a. Draw a "mug shot" of me (Bohr diagram)
 - b. Write my electron configuration:

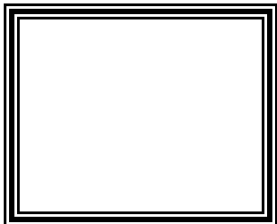


- 6) The number of negative particles in the 2ND energy level of my "mug shot," divided by two and multiplied by 10 is equal to my atomic # _____
- 7) The previous answer's group # represents my atomic mass _____
- 8) The previous answer's group and period six is where I reside _____
- 9) The first # of the previous answer's mass represents my atomic # _____
- Draw the "mug shots" (Bohr diagrams) of my three family members that come directly below me
 - Write the electron configurations of each of these family members

Member #1

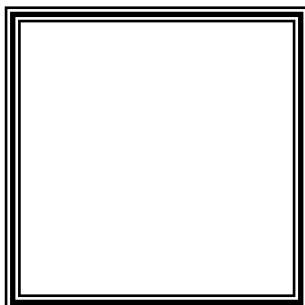
Member #2

Member #3



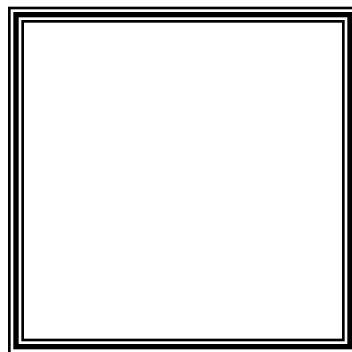
Name:

e- Config:



Name:

e- Config:



Name:

e- Config:

- 10) The total sum of the number of valence electrons for all the three members drawn represents my mass (use your periodic table to find the number of valence e- for each of these members, the Group #'s labeled A match the number of valence electrons – 1A group has 1 valence, 2A has 2, etc) _____
- Calculate the # of protons, neutrons and electrons for the members of the previous answer's group *that reside in periods 4, 5, and 6 if they were all ions with a -3 charge* (meaning, they each have 3 extra electrons than normal. No, they don't all make a -3 charge in real life). Use the table to help you do this.

Period Numbering The periods are numbered straight from top to bottom 1-7, it is not the same as how we number our energy levels for electron configurations! You don't drop down when you get to the d/f blocks. Example: Sc is in period 4

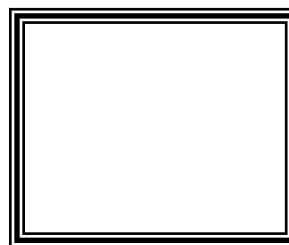
Ion (Symbol with charge)	Protons	Neutrons	Electrons (Don't forget the extra three electrons!)

Sum all numbers in the table (protons + neutrons + Electrons) = _____

- 11) The sum of all the protons, neutrons, and electrons from the table above, divided by four represents my atomic # once you reverse the two digits _____
Based on my atomic number, my name is _____
- 12) Go to the teacher to check your answer to #11. If it is correct you are one step away from finding the true identity of the element and you can ask your teacher for the answer to the next question, #13!
- 13) Based on what your teacher told you, this is how many valence electrons I have. _____
- 14) The number of valence electrons in #13 is my true atomic number.

WHO AM I???

Draw my mug shot and fill out the required information



True Name:

Atomic Number:

Electron Configuration:

"Who Am I?"

Directions: Now that you know how to use your periodic table, identify the following elements.

1. Non-metal; Halogen Family; 35 amu

2. Transition Metal; 25 electrons

3. Gas; 48 Neutrons

4. Period 2; 11 amu

5. Period 3; Non-metal; 32 amu

6. 26 Protons; Period 4; Transition Metal

7. 12 Neutrons; Metal; 11 Electrons

8. 29 Electrons; Period 4

9. 20 amu; Gas

10. Period 5; Transition Metal; 51 Neutrons

11. Transition Metal; 80 Electrons

12. Period 4; Smallest mass in period

13. Metal; Period 4; 20 Electrons

14. Period 6; Gas; 86 Protons

15. 4 Neutrons; Metal

16. Period 4; Metal; 27 Electrons

17. Metal; Period 6; 56 Protons

18. Gas; 16 amu; 8 Neutrons

19. Period 5; Metal; 38 Electrons

20. Less than 30 amu; Noble Gas; Not Neon

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

11. _____

12. _____

13. _____

14. _____

15. _____

16. _____

17. _____

18. _____

19. _____

20. _____

Find someone who...

can tell you the three classes of elements and a characteristic of each.

1.

2.

3.

can tell you the two scientists who have contributed to the creation and revision of the periodic table of elements.

1.

2.

can describe what a group is, how many there are, and why they are also called families.

can describe what a period is and how many there are.

can describe how to calculate the number of protons, neutrons, and electrons while using a periodic table.

Students must initial the answer they give you after you write it down.

Periodic Trends WS #1

#	Question	Answer
1	Where are the most active metals located?	
2	Where are the most active non-metals located?	
3	As you go from left to right across a period, does the atomic size decrease or increase. Why?	
4	As you travel down a group, the atomic size, does decrease or increase. Why?	
5	Is a negative ion larger or smaller than its parent atom?	
6	Is a positive ion larger or smaller than its parent atom?	
7	As you go from left to right across a period, does the first ionization energy generally decrease or increase? Why?	
8	As you go down a group, does the first ionization energy generally decrease or increase? Why?	
9	Where is the highest electronegativity found?	
10	Where is the lowest electronegativity found?	
11	Elements of Group 1A are called	
12	Elements of Group 2A are called	
13	Elements in the middle of the periodic table are called	
14	Group 7A elements are called	
15	Group 8A elements are called	
16	From left to right across the periodic table, do the elements go from (metals to nonmetals) or (nonmetals to metals)?	
17	The most active element in Group 7A is	
18	What orbitals are filling across the Transition Elements?	
19	Elements within a group have the same number of what?	
20	Are the majority of elements in the periodic table metals or non metals	
21	Elements in the periodic table are arranged according to their what?	
22	For each of the following sets of atoms, rank the atoms from smallest to largest atomic radius.	a) Li, C, F b) Li, Na, K c) Ge, P, O d) C, N, Al e) Al, Cl, Cu
23	For each of the following sets of atoms, rank them from lowest to highest ionization energy.	a) Mg, Si, S b) Mg, Ca, Ba c) F, Cl, Br d) Ba, Cu, Ne e) Si, P, He
24	For each of the following sets of atoms, rank them from lowest to highest electronegativity.	a) Li, C, N b) Ne, C, O c) Si, P, O d) Mg, K, P e) S, F, He

Trend	What is it?	What is the Pattern?	Why?	Picture or Analogy
Atomic Radius				
Ionization Energy				
Electro-negativity				
Reactivity				

Periodic Trends Worksheet #3

- 1) Rank the following elements by increasing atomic radius:
calcium, iron, neon, nitrogen, silicon
- 2) Rank the following elements by increasing electronegativity:
calcium, iron, neon, nitrogen, silicon
- 3) Why does iodine have a larger radius than fluorine?
- 4) Which two elements would behave the same? Why? K, P, Br, Na, Fe
- 5) Indicate whether the following properties increase or decrease from left to right across the periodic table.
 - a) atomic radius (excluding noble gases)
 - b) ionization energy
 - c) electronegativity
- 6) What trend in atomic radius occurs down a group on the periodic table? What causes this trend?
- 7) What trend in ionization energy occurs across a period on the periodic table? What causes this trend?
- 8) Circle the atom in each pair that has the largest atomic radius.

a) Al or B	d) Na or Al
b) S or O	e) Br or Cl
c) O or F	f) Mg or Ca
- 9) Circle the atom in each pair that has the greater ionization energy.

a) Li or Be	d) P or Ar
b) Ca or Ba	e) Cl or Si
c) Na or K	f) Li or K
- 10) Define electronegativity.
- 11) Circle the atom in each pair that has the greater electronegativity.

a) Ca or Ga	d) Ba or Sr
b) Br or As	e) Cl or S
c) Li or O	f) O or S

PERIODIC TABLE TRENDS WORKSHEET #2

Circle the correct element.

Li	Si	S	metal
N	P	As	smallest ionization energy
K	Ca	Sc	largest atomic mass
S	Cl	Ar	member of the halogen family
Al	Si	P	greatest electronegativity
Ga	Al	Si	largest atomic radius
V	Nb	Ta	largest atomic number
Te	I	Xe	member of noble gases
Si	Ge	Sn	4 energy levels
Li	Be	B	member of alkali metals
As	Se	Br	6 valence electrons
H	Li	Na	nonmetal
Hg	Tl	Pb	member of transition metals
Na	Mg	Al	electron config. ending in s^2p^1
Pb	Bi	Po	metalloid
B	C	N	gas at room temperature
Ca	Sc	Ti	electron config. ending in s^2d^2

Answers on your notebook page:

1) Rank by increasing atomic radius:

carbon, aluminum, oxygen, potassium.

2) Rank by increasing electronegativity:

sulfur, oxygen, neon, aluminum.

3) Why does fluorine have a higher ionization energy than iodine?

4) Why do elements in the same family generally have similar properties?

5) Rank the sets of atoms from smallest to largest atomic radius.

- a. Li, C, F b. Li, Na, K
c. Ge, P, O d. C, N, Al

6) Rank each set of atoms from lowest to highest ionization energy.

- a. Mg, Si, S b. Mg, Ca, Ba
c. F, Cl, Br d. Ba, Cu, Ne e. Si, P, He

7) Rank each set of atoms from highest to lowest electronegativity.

- a. Li, C, N b. C, O, Ne c. Si, P, O
d. K, Mg, P e. S, F, He

8) Brainstorm a mnemonic to help you remember which way the three trends (radius, ionization energy, electronegativity) increase on the PT (up/down/left/right)

Periodic Trends Lab – Post Lab Questions

1) Which metal reacted faster with water?	2) Which metal reacted faster with acid?
3) Make a statement about the trends in reactivity as you move down the column of alkaline earth metals.	4) Predict the reactivity of strontium and barium, based on your activity in this lab.
5) If sufficient radium could be gathered for a test, predict its reactivity with water and hydrochloric acid. Explain.	6) Why would it be dangerous to handle even a small amount of radium? Your answer should be related to this lab and the concept of reactivity NOT radioactivity.
7) Group VIIA (The halogens – nonmetallic elements) reactivity <i>decreases</i> as the atomic number <i>increases</i> . Why do you think this group of elements is opposite Group IA? Explain. (HINT – think about atomic structure, valence electrons, electronegativity)	
8) Was this a <i>quantitative</i> or <i>qualitative</i> lab? Why?	9) Brainstorm a way that you could add a quantitative aspect to this lab.

Periodic Trends Lab

Purpose:

1. To gather data, and then compare and contrast the properties of Magnesium and Calcium metals as they react with water and hydrochloric acid.
2. To use the data gathered to develop a claim about the pattern/trend of reactivity for metals on the periodic table.
3. To use the claim regarding patterns to predict the behavior of other metals on the periodic table.

Background:

Word Bank: (words can be used more than once, or not used at all!)

- Anions
- Core
- Group
- Ions
- Lose
- Period
- Protons
- Share
- Cations
- Gain
- Inner
- Isotopes
- Neutrons
- Properties
- Row
- Valence

Chemical behavior is based on the number of _____ electrons in atoms.

The _____ electrons determine the _____ of the atom. Everything in the same _____ has the same number of _____ electrons.

Therefore, things in the same _____ exhibit the same behaviors or _____. Some atoms want to gain electrons to form _____ and some atoms want to lose electrons to form _____. Metals want to _____ electrons, and non-metals want to _____ electrons.

Hypothesis: Answer the purpose written above! How do you think the reactions will be different/same? Make sure you are making a hypothesis and not just stating a random guess!

If... [what are you going to do in the lab?]

Then... [what do you expect to see with each thing you do in the lab?]

Because... [tell me what it is about the size of the atoms and the ionization energy of the atoms that is going to explain what you expect to see...you are explaining why your prediction is an EDUCATED guess not just a RANDOM guess!]

If...
Then...
Because...

Materials:

2 pieces of Mg ribbon
2 small chunks of Ca

Distilled H₂O
Phenolphthalein

1.0M HCl
4 beakers

Forceps

Procedure:

- 1. Put on your safety goggles
- 2. Place 1 cm of distilled water in two of the beakers
- 3. Put 1-2 drops of phenolphthalein indicator into each beaker.
(Phenolphthalein turns pink in the presences of a base) **CAUTION:** *Phenolphthalein solution is poisonous and flammable. Do not get it in your mouth; do not swallow any. Be sure there are no flames in the lab when you are using it.*
- 4. Using forceps, put one piece of the Mg ribbon into one of the beakers with water.
- 5. Using forceps put a small chunk of Ca and put it into the other beaker with water
CAUTION: *Do not touch the Ca with your hands.*
- 6. Observe the reactions for several minutes and record the observations in your data table.
- 7. Have the instructor put a small amount of 1.0 M HCl in the two remaining beakers.
- 8. Place the second piece of Mg in one of the beakers with HCl and the second Ca chunk in the other beaker of HCl.
- 10. Observe and record your findings, include how fast the reaction occurred.

Observations		
Metal	Reaction with H ₂ O	Reactions with HCl
Mg		
Ca		



The Periodic Table Review



Use each of the terms below just once to complete the passage. Some may not be used.

Atomic mass	atomic number elements	accepted	Dmitri Mendeliev
Properties	Henry Moseley eight	protons	periodic law

The first periodic table is mostly credited to (1) _____. In his table, the elements were arranged according to increasing (2) _____. One important result of this table was that the existence and properties of undiscovered (3) _____ could be predicted. The elements in the modern periodic table are arranged according to increasing (4) _____, as a result of the work of (5) _____. This arrangement is based on number of (6) _____ in the nucleus of an atom of the element. The modern form of the periodic table results in the (7) _____, which states that when elements are arranged according to increasing atomic number, there is a periodic repetition of their chemical and physical (8) _____.

Glue this part down

Use the information on the left taken from the periodic table to complete the table on the right.

7
N
Nitrogen
14.007
1s ² 2s ² 2p ³

Atomic mass	9.
Atomic Number	10.
Electron Configuration	11.
Chemical Name	12.
Chemical Symbol	13.

For each item in Column A, write the letter of the matching item in Column B:

Column A	Column B
_____ 14) A column on the periodic table	a. metals
_____ 15) A row on the periodic table	b. group
_____ 16) Group B elements	c. period
_____ 17) Elements that are shiny and conduct electricity	d. Transition elements

In the space at the left, write *true* if the statement is true; if the statement is false, change the italicized word or phrase to make it true.

- _____ 18) There are *two* main classifications of elements.
- _____ 19) More than three-fourths of the elements in the periodic table are *nonmetals*.
- _____ 20) Group 1A elements (except for hydrogen) are known as the *alkali metals*.
- _____ 21) *Group 3A* elements are the alkaline earth metals.
- _____ 22) Group 7A elements are highly reactive nonmetals known as *halogens*.
- _____ 23) Group 8A elements are very unreactive elements known as *transition elements*.
- _____ 24) Metalloids have properties of both metals and *transition metals*.

Match each element in Column A with the element in Column B that has the most similar properties.

Column A

- ____ 25) Arsenic (As)
- ____ 26) Bromine (Br)
- ____ 27) Cadmium (Cd)
- ____ 28) Gallium (Ga)
- ____ 29) Germanium (Ge)
- ____ 30) Iridium (Ir)
- ____ 31) Magnesium (Mg)
- ____ 32) Neon (Ne)
- ____ 33) Nickel (Ni)
- ____ 34) Osmium (Os)
- ____ 35) Sodium (Na)
- ____ 36) Tellurium (Te)
- ____ 37) Tungsten (W)
- ____ 38) Yttrium (Y)
- ____ 39) Zirconium (Zr)

Column B

- a. Boron (B)
- b. Cesium (Cs)
- c. Chromium (Cr)
- d. Cobalt (Co)
- e. Hafnium (Hf)
- f. Iodine
- g. Iron (Fe)
- h. Nitrogen (N)
- i. Platinum (Pt)
- j. Scandium (Sc)
- k. Silicon (Si)
- l. Strontium (Sr)
- m. Sulfur (S)
- n. Zinc (Zn)
- o. Xenon (Xe)

40) Why do sodium and potassium have similar chemical properties?

41) How is the energy level of an element's valence electrons related to its period on the periodic table?
Give an example.

42) Into how many blocks is the periodic table divided?

43) What groups of elements does the s-block contain?

44) Why does the s-block portion of the periodic table span two groups?

45) What groups of elements does the p-block contain?

46) Why are members of group 8A virtually unreactive?

47) How many d-block elements are there?

48) What groups of elements does the d-block contain?

49) Why does the f-block portion of the periodic table span 14 groups?

50) What is the electron configuration of the element in period 3, group 6A?

51) Write the electron configurations for the elements in periods 2-4 of group 2A.

52) Determine the group, period, valence electrons and group name of the elements below:

a. $1s^2 2s^2 2p^4$

b. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^1$

c. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^2$

53) Write the electron configuration of the element fitting each of the following descriptions.

a. Group 8A element in the third period.

c. Group 4A element in the fourth period.

b. Halogen in the second period.

d. Group 1A element in the fourth period

54) Atomic radii cannot be measured directly because the electron cloud surrounding the nucleus does not have a clearly defined: a. Charge b. Mass c. Outer edge d. Probability

55) Describe the trend of atomic radii for both groups and periods of the periodic table.

56) The general trend in the radius of an atom moving down a group is partially accounted for by the:

a. Decrease in the mass of the nucleus

b. Increase in the charge of the nucleus

c. Fewer number of filled orbitals

d. Shielding of the outer electrons by inner e's

57) A(n) _____ is an atom, or bonded group of atoms, that has a positive or negative charge.

a. Halogen

b. Ion

c. Isotope

d. Molecule

58) An atom becomes negatively charged by

a. Gaining an e-

b. Gaining a proton

c. Losing an e-

d. Losing a neutron

59) Rank the following atoms in order of decreasing radii.

a. Al, Na, P, S

b. Al, Ga, In

c. As, Ge, Ga

d. Br, Ca, Cl, K

60) Rank the following atoms in order of decreasing electronegativity.

a. Na, Li, K

b. K, Sc, Ca

c. As, Sn, S

Exam #2 Practice Problems

- 1) Identify which Exam topic each question refers to – they may not be in perfect order.
- 2) Show all work or a written explanation. All means ALL! Pretend you are showing it on your quiz!
- 3) Highlight each question number on your binder paper, and highlight each numerical answer.

Q #	Topic #	Practice Problems
1		Sketch a graph of a nuclear decay – include actual numbers (like the m&m lab)
2		Using your graph, tell me what the half life is. Also show me on the graph how you figured this out.
3		What are the symbols for alpha particles, beta particles, and gamma particles?
4		What <i>IS</i> an alpha particle? A beta particle? A gamma particle?
5		What are the masses of alpha, beta, and gamma particles?
6		What are the charges of alpha, beta, and gamma particles?
7		If Plutonium-244 undergoes beta decay, what's the product? (Write an equation to help you)
8		If Bismuth-210 undergoes alpha decay, what is the product? (Write an equation to help you)
9		What is the <i>official</i> definition of half life?
10		Using your <i>own</i> words, what is the definition of half life?
11		A 380 gram sample has a half life of 18 years. How much do you have left after 240 years?
12		You start with 25 grams of a radioactive substance. How much is left after 3.5 half lives?
13		A 40gram sample of radioactive material has a half life of 3 weeks. What percent will be left after 15 weeks?
14		Based on the number of electrons, why would Li, Na, and Rb behave in similar ways?
15		Out of the following list of elements, pick the ones that will behave similarly: S, Ca, P, Cl, Ti, Se, Te
16		How many valence electrons does potassium have?
17		How many valence electrons do the halogens have?
18		Sketch a periodic table and label all the groups with their names.
19		What group are the 2A elements? What group are the 7A elements?
20		Sketch a rectangle representing the periodic table. Sketch arrows on the rectangle that represent the direction in which atomic radius increases.
21		Which would be larger, chlorine or iodine?
22		Sketch a rectangle representing the periodic table. Sketch arrows on it that represent the direction electronegativity incr.
23		Which would be more electronegative, chlorine or iodine?
24		Sketch a rectangle representing the periodic table. Sketch arrows on the rectangle that represent the direction in which ionization energy increases.
25		Which would have the higher ionization energy, chlorine or iodine?
26		Rank the following from largest to smallest radius: oxygen, radium, tungsten, aluminum
27		Rank the following from largest to smallest ionization energy: oxygen, radium, tungsten, aluminum
28		Rank the following from most to least electronegativity: oxygen, radium, tungsten, aluminum
29		How do you use the periodic table to determine how many electrons an atom needs to gain/lose in order to achieve a noble gas configuration?
30		How many electrons does each atom need to gain/lose in order to achieve a noble gas configuration? Mg, Ar, Al, Br, As
31		Explain why electronegativity increases as you go from the LEFT to the RIGHT on the periodic table, and why it increases as you go from the bottom to the top in a group:
32		Explain why ionization energy increases as you go from LEFT to RIGHT on the periodic table, and why it increases as you go from the bottom to the top in a group:
33		Explain why atomic radius increases the way it does going DOWN a group and from LEFT to RIGHT ?
34		Does reactivity of metals increase as you go up or down a column?
35		Does reactivity of non-metals increase as you go up or down a column?
36		What are the three classes of elements and what are some characteristics of each?
37		What is strong force? How is it involved in radioactivity?
38		How do you stop each type of radioactive particle?
39		If you start with Uranium-235 and it undergoes an alpha decay, then a beta decay, then two alpha decays, and one more beta decay, which element are you left with?
40		Describe some things that nuclear chemistry is used for (think about your research topics and the PhET simulations)
41		How did Mendeleev organize his periodic table? How did Moseley organize his table?
42		A radioactive element has a half-life of 10min. How many minutes will it take for the number of atoms present to decay to 1/64th (or 1.5625%) of the initial value?
43		A living creature was been dead for 12,378 years, what amount the of original carbon-14 is still present if you started with 1200grams? (half-life of carbon-14 = 5730 years)
44+		Ask Mrs. Farmer for extra problems if you need them!!!

PLEASE make the most of these study problems. Doing them, thinking about them, correcting them, and remembering them will help you get ready for the benchmarks! Do not do them on autopilot...THINK about them. Where do you think I come up with them??? It's almost like I know what's on the exam, huh??? ☺

Unit #4 – Molecules and Compounds

Visual Representation

Key Items

Costa's Questions

Level 3

Level 2

Level 1

Cross Cutting Concepts

Systems and <u>Models</u>	Structure and function	



STUDY, STUDY, STUDY!
We use this ALL YEAR...



MEMORIZE!!!!	
Name	Formula
Ammonium	$(\text{NH}_4)^{1+}$
Silver	Ag^{1+}
Cadmium	Cd^{2+}
Zinc	Zn^{2+}
Hydride	H^{1-}
Hydroxide	$(\text{OH})^{1-}$
Chlorate	$(\text{ClO}_3)^{1-}$
Chlorite	$(\text{ClO}_2)^{1-}$
Nitrate	$(\text{NO}_3)^{1-}$
Nitrite	$(\text{NO}_2)^{1-}$
Carbonate	$(\text{CO}_3)^{2-}$
Peroxide	$(\text{O}_2)^{2-}$
Sulfate	$(\text{SO}_4)^{2-}$
Sulfite	$(\text{SO}_3)^{2-}$
Phosphate	$(\text{PO}_4)^{3-}$
Phosphite	$(\text{PO}_3)^{3-}$
From Periodic Table	Transition metals
Use periodic table Group 1A makes +1, Group 2A makes +2, etc...	All except Silver, Cadmium and Zinc need roman numerals. <i>Example: Fe⁺² is Iron(II) and Fe⁺³ is Iron(III)</i>
Monoatomic ions	Polyatomic ions
Made of a single <u>type</u> of atom O_2^{2-}	Made of several <u>types</u> of atoms PO_4^{3-}
Cations	Anions
Lose electrons Make pos. charges	Gain electrons Make neg. charges

Will use, don't need to memorize	
Name	Formula
Hydronium	$(\text{H}_3\text{O})^{1+}$
Mercury (I)	$(\text{Hg}_2)^{2+}$
Mercury (II)	$(\text{Hg})^{2+}$
Acetate	$(\text{C}_2\text{H}_3\text{O}_2)^{1-}$
Bromate	$(\text{BrO}_3)^{1-}$
Cyanide	$(\text{CN})^{1-}$
Thiocyanate	$(\text{SCN})^{1-}$
Hydrogen Carbonate (Bicarbonate)	$(\text{HCO}_3)^{1-}$
Hydrogen Sulfate (Bisulfate)	$(\text{HSO}_4)^{1-}$
Hydrogen Sulfite (Bisulfite)	$(\text{HSO}_3)^{1-}$
Hypochlorite	$(\text{ClO})^{1-}$
Perchlorate	$(\text{ClO}_4)^{1-}$
Iodate	$(\text{IO}_3)^{1-}$
Permanganate	$(\text{MnO}_4)^{1-}$
Chromate	$(\text{CrO}_4)^{2-}$
Dichromate	$(\text{Cr}_2\text{O}_7)^{2-}$
Hydrogen Phosphate (Biphosphate)	$(\text{HPO}_4)^{2-}$
Thiosulfate	$(\text{S}_2\text{O}_3)^{2-}$
Borate	$(\text{BO}_3)^{3-}$

CHEMICAL BONDING
An Introductory Webquest

Go to:

<http://tinyurl.com/ionicbondingtutorial>

1) Describe what happens when two negatively charged particles interact with one another. (you can draw a diagram to help illustrate your ideas)

2) When will oppositely charged atoms stick together?

3) A. What is an ion? (Look this up online)

B. What is a **cation** and where can you find it on the periodic table?

C. What is an **anion** and where can you find it on the periodic table?

4) Take a look at the ionic bond formed between Sodium and Chlorine atoms.

A. *Draw* each atom below as it looks like in NaCl on the website.

B. Label the Na and Cl as either + or -. And label each as either Cation or Anion.

Name:	Period:	Seat #:
--------------	----------------	----------------

5) Describe how ionic compounds form crystals:

COVALENT BONDS **Go to:**

<http://tinyurl.com/covalentbondingtutorial>

6) If an atom, such as hydrogen, is able to form a covalent bond, describe what happens when the electron shells of two atoms overlap:

A. What happens when the two atoms are fairly close?

B. What happens when the two atoms are TOO close?

7) What does the nucleus of an atom want to do to its own electrons?

8) What does the nucleus of one atom want to do to the electrons of a nearby atom?

9) Are the atoms really “sharing” electrons?

Bonding and Ionic Naming Worksheet

#	Question	Answer
1	What are the electrons in the outer shell of an atom that form the chemical bonds called?	
2	What are the three main types of bonds?	
3	Using the terms: metal and nonmetal, describe what types of atoms make up each of the three types of bonds mentioned above.	
4	What is the name of the type of chemical bond that is formed when two electrons are shared?	
5	What is different between an ionic bond and the bond in the above question?	
6	How many valence electrons are there in carbon? Where do you look on the periodic table to find out?	
Label the following as ionic, or covalent, compounds/molecules		
7	a) NaCl b) CO ₂ c) K ₃ P d) HBr	e) CCl ₄ f) AlBr ₃ g) H ₂ O
8	How many Carbon atoms are in CO ₂ ? How many oxygen atoms are in CO ₂ ?	
9	How many Nitrogen atoms are in (NH ₄) ₂ S? How many Hydrogen atoms? How many Sulfur atoms	
10	Explain how to name binary ionic compounds	
11	Explain how to name polyatomic ionic compounds	
Name the following ionic compounds:		
12	a) LiOH b) Na ₂ SO ₄ c) SbCl ₃ d) Al(OH) ₃ e) Sb(NO ₃) ₃	f) Al ₂ (SO ₄) ₃ g) HgO h) Fe ₂ S ₃ i) Pb(NO ₃) ₂ j) K ₂ SO ₃

Write NAMES for the following Covalent Molecules:	Write FORMULAS for the following Covalent Molecules
1) CS ₂	13) carbon tetrachloride
2) CO ₂	14) nitrogen trihydride
3) NO ₂	15) dinitrogen pentoxide
4) P ₂ O ₃	16) sulfur trioxide
5) CO	17) sulfur dioxide
6) NO	18) tetraphosphorus decoxide
7) SF ₆	19) disulfur dichloride
8) PCl ₅	20) boron trifluoride
9) N ₂ O ₅	21) iodine pentafluoride
10) SiO ₂	22) carbon disulfide
11) P ₄ O ₁₀	23) diphosphorus trioxide
12) PI ₃	24) carbon tetrabromide

Covalent Naming Covalent compounds contain 2 non-metals. To name covalent compounds:

- 1) Name the first element with the appropriate number prefix (*but never mono-*)
- 2) Name the second element with the appropriate number prefix (*even if it is mono-*)
- 3) Change the ending on the last element to -ide
- 4) Double check any double vowel combinations (*when "ao" or "oo" bump into each other, drop the first one*)

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

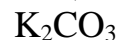
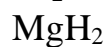
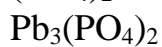
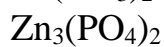
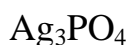
Formula	Ionic or Covalent?	Name of Compound
P ₄ S ₅		
NF ₃		
CO ₂		
SCl ₄		
MgF ₂		
Al ₂ O ₃		
FeBr ₄		
K ₂ O		
Cr ₃ N		
CO		
LiBr		

***Identify if it is ionic or covalent – you can then write the formula for the covalent ones.
I will tell you when you can go back and write the formulas for the ionic ones! Skip them for now!**

Name	Ionic (I) or Covalent (C) ?	If Ionic What are the Charges? <small>Leave blank for Covalent</small>	Formula
calcium sulfide			
hexaboron monosilicide			
lithium phosphide			
dinitrogen trioxide			
chlorine dioxide			
aluminum sulfide			
magnesium hydroxide			
hydrogen monoiodide			
potassium carbonate			
selenium hexafluoride			
strontium nitride			
phosphorus triiodide			
trisulfur pentabromide			

Chemical Formulas and Names

A C E T A H P S O H P M U I S S A T O P D
 S E T A H P S O H P R E V L I S M S F G A
 I E D I X O R D Y H N O R I J L A O N P R
 L A L E A D P H O S P H A T E T G D V X E
 V M Z A C E G I K M O I Q H Z S N I U W T
 E M Y C O P P E R B R O M I D E E U E B A
 R O D F H T L N P O R T N U V X S M D Z H
 H N A C F G I K N M O C Q M W U I H I W P
 Y I Y B D F H C J L P N P O R T U Y R V S
 D U X Z A E H C G H I K M X O Q M D O S O
 R M U W Y L B D O F H J L I N P H R L R H
 O O T U O W Y S A E C G I D K M Y O H O P
 X X Q R S U P W Y B D F H E T L D X C N M
 I I I P R H T V X Z A E C G I K R I N M U
 D D P R A L U M I N U M B R O M I D E T I
 E E V T X E T A R T I N C N I Z D E G Z R
 B D E F H J Z I N C N I T R I T E L O N A
 P R T V Z B D F E T A R T I N M U I R A B
 H J L N P C A L C I U M F L U O R I D E A
 E T A N O B R A C M U I S S A T O P Y Z F
 R T V X E D I M O R B N E G O R D Y H N U



Write the formulas for the following covalent molecules

- 1) antimony tribromide _____
- 2) hexaboron monosilicide _____
- 3) chlorine dioxide _____
- 4) sulfur monoiodide _____
- 5) iodine pentafluoride _____
- 6) dinitrogen trioxide _____
- 7) ammonia _____
- 8) phosphorus triiodide _____

Write the names for the following covalent molecules

- 9) P_4S_5 _____
- 10) O_2 _____
- 11) SeF_6 _____
- 12) Si_2Br_6 _____
- 13) SCl_4 _____
- 14) CH_4 _____
- 15) B_2Si _____
- 16) NF_3 _____

Mixed Naming Practice – both ionic and covalent

DON'T FORGET TO CHECK IF IT IS IONIC OR COVALENT FIRST!!!! It changes how you name them! Also, don't forget to include Roman Numerals if it is a transition metal!

Name the following chemical compounds:

1) NaBr _____

2) $\text{Ca}(\text{C}_2\text{H}_3\text{O}_2)_2$ _____

3) P_2O_5 _____

4) $\text{Ti}(\text{SO}_4)_2$ _____

5) FePO_4 _____

6) K_3N _____

7) SO_2 _____

8) CuOH _____

9) $\text{Zn}(\text{NO}_2)_2$ _____

10) V_2S_3 _____

Write the formulas for the following chemical compounds:

WAIT! 11) silicon dioxide _____

- Don't do these yet, 12) nickel (III) sulfide _____

I will tell 13) manganese (II) phosphate _____

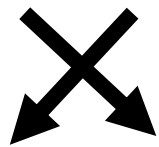
you when 14) silver acetate _____

to come 15) diboron tetrabromide _____

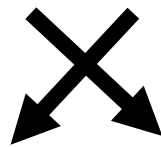
back and 16) potassium carbonate _____

do this 17) ammonium oxide _____

last part! 18) carbon tetrachloride _____



Writing Neutral Compounds with Crossing Over



Directions:

- Using your common ions, write neutral compounds for each problem.
- Use subscripts to indicate more than one atom within a compound.
- SHOW YOUR WORK!!!!
 - o This includes: Symbols for each ion including charges, CROSSING OVER ARROWS, REDUCING TO LOWEST TERMS, and a rewritten final answer with a **BOX** around it!

1	Potassium Bromide	6	Aluminum Carbonate
2	Calcium Fluoride	7	Manganese (IV) Oxide
3	Copper (II) Bromide	8	Calcium Carbonate
4	Ammonium Carbonate	9	Antimony (III) Phosphate
5	Aluminum Cyanide	10	Make up your own!!! Write the name out and then show how you would go from the name to the neutral formula.

Writing Neutral Compounds**“Crossing Over”**

Potassium Oxide

Magnesium Borate

Potassium Chloride

Manganese (IV) Carbonate

Copper (II) Fluoride

FeBr₂

Barium Oxide

Cu₃N₂

Neutral Compound Practice

To write a neutral compound, all charges must _____

Ionic compounds are written with the _____ first, and the _____ second.

	Iodide	Fluoride	Oxide	Phosphide	Nitrate	Sulfate
Calcium						
Silver						
Barium						
Lead (II)						
Chromium(III)						
Tin (IV)						
Ammonium						
Copper (II)						
Iron (II)						
Aluminum						
Magnesium						
Lithium						
Iron (III)						
Vanadium(V)						

Ionic Bonding Puzzle Instructions

Step one: Color all of the “ion puzzle pieces” according to the following rules:

- Color all puzzle pieces with a +1 charge red.
- Color all puzzle pieces with a +2 charge orange.
- Color all puzzle pieces with a +3 charge yellow.
- Color all puzzle pieces with a -1 charge green.
- Color all puzzle pieces with a -2 charge blue.
- Color all puzzle pieces with a -3 charge purple.

Step two: Cut out each of the puzzle pieces.

Step Three: Complete the Ionic Bonding Puzzle Activity using the “ion puzzle pieces” to show the compounds.

Step Four: Once you have finished putting together all of your pieces for the Puzzle Activity, reuse the puzzle pieces to make and glue the following compounds onto page _____ in your notebook.

Write their name and formulas under each set of glued puzzle pieces on your notebook page.

- Lithium bromide
- Magnesium oxide
- Calcium chloride
- Potassium nitride
- Aluminum phosphide
- Aluminum sulfide

Step Five: Complete the worksheet.

Ionic Bonding Puzzle Activity

Use your puzzle pieces to combine the following ions to show how they make a compound.

Write down the chemical formula for the final compound. Remember: Positive ion is written first, negative ion is second! Include subscripts to show the number of atoms!

H + F _____ Be + O _____ Be + I _____

Al + N _____ Al + P _____ Li + P _____

Li + F _____ Li + Br _____ Ca + O _____

Ca + S _____ H + O _____ Al + N _____

Al + Br _____ K + Cl _____ K + I _____

Mg + S _____ K + S _____ Rb + I _____

Rb + Br _____ H + Cl _____

Ionic Bonding Puzzle Worksheet

1) What happens to the total charge of the compound after the ions bond together?
(Hint: add together the charges of the ions in the compound).

2) How many lithium ions are required to bond with one nitrogen ion? Why?

3) How many chlorine ions are required to bond with one aluminum ion? Why?

4) Describe how you can use the periodic table to predict the charge of an ion?

5) Predict the charges for the following: (include the “+” or “-” sign)

Cs _____ Sr _____ In _____

Ra _____ As _____ Se _____

At _____ Fr _____ Ba _____

Lewis Structures of Atoms, Ions and Ionic Compounds WS

#	Question	Answer	
1	What is the octet rule? Explain its role in bonding between atoms		
2	Indicate how many electrons must be gained or lost by each of the following atoms to achieve a stable electron configuration (3 lost, 2 gained, etc)	a) Sr b) Sb c) Si	d) S e) Se f) Xe
3	Which of the following pairs of elements will not form ionic compounds? Explain why or why not for each pair.	Sulfur and Xenon	Sodium and Calcium
		Strontium and Sulfur	Selenium and Chlorine
4	Draw the Lewis Structure for the following Ions or Compounds		
	a) K	f) K^+	
	b) Ba^{2+}	g) BaF_2	
	c) C	h) C^{4-}	
	d) MgO	i) S^{2-}	
	e) Br	j) Na_2S	

Lewis Structures with Single Bonds WS

Molecule	# of valence e ⁻	Lewis Structure	# of Lone Pairs	Molecule	# of valence e ⁻	Lewis Structure	# of Lone Pairs
BF ₃				CH ₂ Cl ₂			
Br ₂				HOOH			
HCl				NH ₃			
ICl				N ₂ H ₄			
CH ₄				PCl ₅			

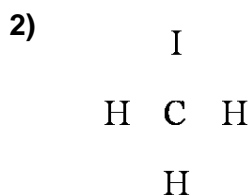
Lewis Structures with Single, Double and Triple Bonds WS

Molecule	Lewis Structure	Description		Molecule	Lewis Structure	Description	
HCN		# of Single Bonds	# of Double Bonds	Carbonate Ion		# of Single Bonds	# of Double Bonds
Valence electrons		# of Triple Bonds	# of Lone Pairs	Valence electrons		# of Triple Bonds	# of Lone Pairs
C ₂ N ₂		# of Single Bonds	# of Double Bonds	OCN ⁻		# of Single Bonds	# of Double Bonds
Valence electrons		# of Triple Bonds	# of Lone Pairs	Valence electrons		# of Triple Bonds	# of Lone Pairs
NO ₂ ⁻		# of Single Bonds	# of Double Bonds	N ₂ H ₂		# of Single Bonds	# of Double Bonds
Valence electrons		# of Triple Bonds	# of Lone Pairs	Valence electrons		# of Triple Bonds	# of Lone Pairs
C ₂ H ₄		# of Single Bonds	# of Double Bonds	F ₃ NO		# of Single Bonds	# of Double Bonds
Valence electrons		# of Triple Bonds	# of Lone Pairs	Valence electrons		# of Triple Bonds	# of Lone Pairs
H ₂ CO		# of Single Bonds	# of Double Bonds	Phosphate Ion		# of Single Bonds	# of Double Bonds
Valence electrons		# of Triple Bonds	# of Lone Pairs	Valence electrons		# of Triple Bonds	# of Lone Pairs

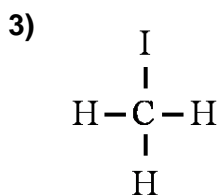
Lewis Structure How-To Sheet

- 1) **COUNT** the valence electrons
- 2) **PLACE** the atoms
 - Least electronegative element at the center (*except H, always on the outside*)
 - Put the remaining atoms around the central atom (*symmetrically if possible*)
 - Look for hints in how the formula is written (*HOOH or CH₃OH for examples*)
- 3) **SINGLE BOND** all atoms together (*nothing floats around by itself!*)
- 4) **FULL SHELL** to all atoms
 - Most things want 8 valence electrons (*octet rule*)
 - Careful with exceptions to the octet rule!
 - Add lone pairs to the outer atoms
 - Add lone pairs to the center atom
- 5) **COUNT AND FIX** if needed – may not need fixing!
 - Make sure you used the correct number of valence electrons (*from step #1*)
 - Used too few electrons? Add extra lone pairs to the central atom.
 - Used too many electrons? Fix it with double and triple bonds!
 - i. Find two atoms next to each other that can make multiple bonds
 - ii. Take a pair away from each of these atoms
 - iii. Put a new pair in-between them to make the new bond
 - iv. Repeat if needed until fixed (*try to keep symmetry in mind!*)

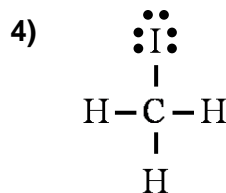
1) CH₃I 4 + 1 + 1 + 1 + 7 = 14 v.e



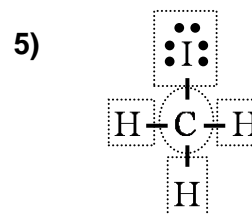
0 e⁻ used



8 e⁻ used, 6 e⁻ left



14 e⁻ used, 0 e⁻ left



each atom has full shell

# of Bonds Certain Atoms Like to Make		Common Exceptions to the Octet Rule*		BOND	SYMBOL	# OF SHARED e ⁻	Remember...
		ATOM	# e ⁻				
H (always)	1			single	X — X	2	<ul style="list-style-type: none"> • Anything can be an exception to the octet rule if it needs to be! • <i>Usually</i> the atoms making multiple bonds will be C, N, O, S • Keep it simple! Things get weird in real life – focus on the patterns!
F, Cl, Br (if not the central atom)	1	H	2	double	X = X	4	
C, Si	4	B	6	triple	X ≡ X	6	
O (if not the central atom)	1 or 2	P	10				
		S	12				

CH₃I	AlF₃	SeF₄
CN⁻	PO₄³⁻	SF₄
I₂	CO	C₂H₂
NH₂⁻	NH₄⁺	CH₃OH

LEWIS STRUCTURE WORKSHEET #1**Directions:** Draw the Lewis structures for all of the following.

CH₃F	Cl₂	IF₃
F₂	H₂	PCl₅
SO₄²⁻	O₂	NO₂
N₂	BeF₂	H₂S

CO₂	BCl₃	SF₆
BrF₅	XeF₄ <i>this one is weird! Ha!</i>	ClF₃
C₂H₆	C₃H₈	C₂H₄
C₂H₅OH	C₂F₂	N₂

LEWIS STRUCTURE WORKSHEET #2**Directions:** Draw the Lewis structures for all of the following.

CH₄	NH₃	SO₂
SiF₄	NCl₃	HNC
ClO₄⁻	SO₃²⁻	CO₃²⁻
H₂CO	HCN	H₂S

Visual Representation

Key Items

Cross Cutting Concepts Summary Page

Patterns	Cause and effect	Scale, proportions and quantity
Systems and models	Energy and matter	Structure and function
Stability and change		

Fall 2016 Final Exam Giant Practice Test – This does not cover every single type of question on the test – it just gives you an idea

6. How many atoms of hydrogen are in one molecule of CH_3Cl ?
A) 6
B) 2
C) 3
D) 5
E) 4
7. How many neutrons are there in one atom of ${}^{46}_{22}\text{Ti}$?
A) 22
B) 24
C) 46
D) 68
E) none of these
8. Which of the following elements is an alkaline earth metal?
A) Ca
B) Cu
C) Fe
D) Na
E) Sc
11. Which of the following is an element?
A) brass
B) salt
C) water
D) earth
E) oxygen
12. The symbol for the element strontium is
A) S
B) St
C) Sm
D) Str
E) Sr
13. How many atoms are represented by one formula unit of aluminum dichromate, $\text{Al}_2(\text{Cr}_2\text{O}_7)_3$?
A) 14
B) 25
C) 27
D) 29
E) none of these
14. How many nitrogen atoms are indicated by the formula $\text{Al}(\text{NO}_3)_3$?
A) 1
B) 3
C) 9
D) 4
E) 0
15. List the three main subatomic particles.
16. How many protons, electrons, and neutrons, respectively, does ${}^{16}\text{O}$ have?
A) 8, 18, 8
B) 8, 8, 8
C) 8, 10, 8
D) 8, 14, 8
E) 8, 18, 16
17. The number of neutrons in one atom of ${}^{206}_{82}\text{Hg}$ is
A) 82
B) 206
C) 124
D) 288
E) none of these
18. An atom with 15 protons and 16 neutrons is an atom of
A) P
B) Ga
C) S
D) Pd
E) Rh
19. How many neutrons are contained in an iodine nucleus with a mass number of 131?
A) 53
B) 74
C) 78
D) 127
E) 131
20. An atom with 45 protons has a mass number of 99. It must contain how many neutrons?
A) 144
B) 45
C) 99
D) 54
E) none of these
21. Which of the following elements is most similar to lithium?
A) Au
B) He
C) Na
D) Hg
E) Mg
22. When ${}^{230}_{90}\text{Th}$ decays by producing an alpha particle, the product nuclide is _____.
23. Alpha particles are
A) electrons
B) protons
C) neutrons
D) helium nuclei
E) X rays

24. The cesium-131 nuclide has a half-life of 30 years. After 90 years, about 6 g remains. The original mass of the cesium-131 sample is closest to
- 30 g
 - 40 g
 - 50 g
 - 60 g
 - 70 g
26. How many atoms of oxygen are in one formula unit(compound) of calcium hydrogen sulfate?
- 3
 - 4
 - 5
 - 6
 - 8
27. How many protons, electrons, and neutrons, respectively, does $^{27}\text{Al}^{3+}$ have?
- 13, 13, 14
 - 13, 10, 14
 - 13, 13, 27
 - 13, 10, 27
 - 13, 13, 13
28. Which of the following exhibits the correct orders (decreasing) for both atomic radius and ionization energy?
- S, O, F, and F, O, S
 - F, S, O, and O, S, F
 - S, F, O, and S, F, O
 - F, O, S, and S, O, F
 - none of these
29. The electron configuration for Cr^{2+} is
- $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^4$
 - $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 3d^5$
 - $1s^2 2s^2 2p^6 3s^2 3p^6 3d^4$
 - $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^2$
 - none of these
30. An element has the electron configuration $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^2$. The element is a(n)
- nonmetal.
 - transition element.
 - metal.
 - lanthanide.
 - actinide.
31. Antimony can be represented by which of the following noble gas configurations?
- $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^5$
 - $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6$
 - $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 5d^{10} 5p^5$
 - $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 5d^{10} 5p^6$
 - $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^3$
32. Which of the following best describes the "trend" for electronegativity across periods (L->R) and down groups, respectively (periods/groups)?
- Decrease / Decrease
 - Increase / Decrease
 - Decrease / Increase
 - Increase / Increase
 - neither
33. When an electron in the ground state absorbs energy, it goes to a(n) _____ state.
- excited
 - lower
 - frenetic
 - ionic
 - stable
34. Which of the following has the electron configuration $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^5$?
- Cr
 - Ca
 - Mn
 - Br
 - none of these
35. Which of the following is the atomic number of a halogen?
- 10
 - 13
 - 17
 - 136
 - 27
36. Which of the following statements *BEST* describes the alkali metal?
- They have two valence electrons, and they form ions with a 2- charge.
 - They have two valence electrons, and they form ions with a 2+ charge.
 - They have one valence electron, and they form ions with a 1+ charge.
 - They have one valence electron, and they form ions with a 1- charge.
 - They have one valence electron, and they form ions with a 2- charge
37. An atom that has an electron configuration of $1s^2 2s^2 2p^6 3s^2 3p^6$ is classified as
- a noble gas element
 - a transition metal
 - an alkaline earth element
 - an alkali metal
 - a halogen
38. When magnesium and oxygen form a bond 2 electrons will be
- Shared equally
 - shared unequally
 - Lost by magnesium gained by oxygen
 - Lost by oxygen gained by magnesium
 - evenly distributed

39. A stable element will have how many valence electrons?
- 8
 - 32
 - 6
 - 18
 - Zero
40. What is the name of the compound whose formula is NO_2
- Nitrogen pentoxide
 - Dinitrogen oxide
 - Nitrogen oxide
 - nitrogen dioxide
 - Nitrogen (V) oxide
41. What is the correct chemical formula for copper(II) oxide?
- Cu_2O_3
 - Cu_3O
 - CuO_3
 - Cu_3O_2
 - CuO
42. What is the chemical formula for Mercury (I) oxide
- Hg_2O_2
 - Hg_2O
 - Hg_2O_4
 - HgO_2
 - HgO
43. Calculate the molar mass of Na_2SO_4 .
- 142 g
 - 100 g
 - 132 g/mol
 - 142 g/mol
 - 124 g/mol
44. The prefix "di" means
- 1
 - 2
 - 3
 - 4
 - 5
45. The chemical formula for dicarbon hexahydride is
- CH_4
 - C_2H_6
 - CH
 - CH_2
 - C_3H_8
46. With which of the following would fluorine atoms MOST easily combine to form an ionic compound?
- oxygen
 - chlorine
 - carbon
 - Sodium
 - sulfur

47. The electron configuration of carbon is $1s^2 2s^2 2p^2$. How many more electrons does carbon need to satisfy the octet rule?
- 1
 - 4
 - 8
 - 5
 - 2

Use the following to answer question 65:

Consider the following molecules.

I. BF_3

II. CHBr_3 (C is the central atom)

III. Br_2

IV. XeCl_2

V. CO

VI. SF_4

Select the molecule(s) that fit the given statement.

48. These molecules follow the octet rule.

- I, II, IV
- I, III, IV, VI
- III, V, VI
- I, IV, VI
- II, III, V

Use the following to answer questions 52-56:

- Halogens
- Alkaline Earth Metals
- Noble Gases
- Alkali Metals
- Metal/Non-metal

49. $1s^2 2s^2 2p^6 3s^2 3p^6$ Represents this type of element

50. These elements become more reactive as you decrease their atomic number.

51. Barium is this type of element

52. The cation of table salt is made from one of these types of elements

53. Nitrogen, Phosphorus, Sulfur, Oxygen represent these elements

54. The name for NaHCO_3 is

- sodium hydrogen carbonate (sodium bicarbonate)
- sodium carbonate
- sodium(I) hydrogen carbonate
- sodium(I) bicarbonate
- none of these

55. Titanium(IV) oxide has the formula

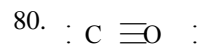
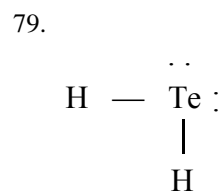
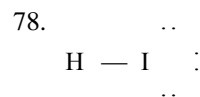
- Ti_4O
- TiO_4
- Ti(IV)O
- TiO_2
- Ti_4O_2

56. According to the following Nuclear Equation, $^{238}_{92}\text{U} \rightarrow ^{234}_{90}\text{Th} + \text{_____}$, which particle is produced?
- A) $^0_0\gamma$
 B) ^4_2He
 C) $^0_{-1}\beta$
 D) $^0_{+1}\beta$
57. What is the electron configuration of Al^{+3}
- A) $1s^2 2s^2 2p^1$
 B) $1s^2 2s^2 2p^6$
 C) $1s^2 2s^2 2p^6 3s^2 3p^1$
 D) $1s^2 2s^2 2p^6 3s^2 3p^6$
 E) $1s^2 2s^2 2p^6 3s^2$
58. An atom with 75 neutrons, 52 protons, and 52 electrons
- A) $^{127}_{51}\text{Sb}$
 B) $^{120}_{52}\text{Te}$
 C) $^{127}_{50}\text{Te}$
 D) $^{75}_{52}\text{Te}$
 E) $^{127}_{52}\text{Te}$
59. Which describes the alkali metals?
- A) They have two valence electron and for ions with a +1 charge
 B) They have one valence electron and for ions with a +1 charge
 C) They have one valence electron and for ions with a +2 charge
 D) They have two valence electron and for ions with a +2 charge
 E) They have one valence electron and for ions with a +3 charge
60. What best describes the reasons for the atomic radius trends
- A) As you go down a group the energy level increases and as you go $L \rightarrow R$ across a period the proton charge decreases
 B) As you go down a group the energy level decreases and as you go $L \rightarrow R$ across a period the proton charge increases
 C) As you go down a group the energy level increases and as you go $L \rightarrow R$ across a period the proton charge increases
 D) As you go down a group the energy level decreases and as you go $L \rightarrow R$ across a period the proton charge decreases
 E) As you go up a group the energy level increases and as you go $R \rightarrow L$ across a period the proton charge increases
61. The electron configuration below represents which periodic table group $1s^2 2s^2 2p^6 3s^2 3p^6$
- A) Transition metal
 B) Alkali metal
 C) Halogen
 D) Noble Gas
 E) Alkaline earth metal
62. What is the electron configuration for Cr^{+3}
- A) $1s^2 2s^2 2p^6 3s^2 3p^6$
 B) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^2$
 C) $1s^2 2s^2 2p^6 3s^1$
 D) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^1$
 E) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^3$
63. The number 0.00003044 expressed in scientific notation is
- A) 3.044×10^{-5}
 B) 3.0×10^{-5}
 C) 3.044×10^5
 D) 3.044×10^{-4}
 E) 3.044
64. Express the number 0.00374 in scientific notation.
- A) 3.74×10^{-3}
 B) 3.74×10^3
 C) 0.374×10^{-3}
 D) 374×10^{-5}
 E) none of these
65. Convert: 42.2 cm = _____ m.
- A) 4.22×10^3 m
 B) 4.22×10^4 m
 C) 0.0422 m
 D) 0.422 m
 E) 4.22 m
66. Convert: 7.7 mm = _____ km.
- A) 7.7×10^{-6} km
 B) 7.7×10^{-3} km
 C) 7.7×10^3 km
 D) 7.7×10^6 km
 E) 7.7×10^2 km
67. Convert 9.16 kg to pounds (1 lb = 453.6 g).
- A) 20.2 lb
 B) 2.02×10^{-2} lb
 C) 4.15×10^3 lb
 D) 4.15 lb
 E) 4.15×10^6 lb
68. Convert 418.2 mi to kilometers (1 m = 1.094 yd; 1 mi = 1760. yd).
- A) 2.599×10^{-4} km
 B) 6.728×10^5 km
 C) 457.5 km
 D) 2.376×10^{-1} km
 E) 6.728×10^2 km
69. Perform the following conversion:
 $5.77 \text{ m/s} = \text{_____ km/h}$
- A) 20.8 km/h
 B) 0.346 km/h
 C) 1.60 km/h
 D) 624. km/h
 E) 173. km/h

70. Perform the following conversion: 5.67 m/s
 $=$ _____ mi/h
 A) 0.395 mi/h
 B) 12.7 mi/h
 C) 284. mi/h
 D) 211. mi/h
 E) 11.3 mi/h
72. Which of the following compounds contains one or more covalent bonds?
 A) NaCl
 B) CaO
 C) CO₂
 D) Cs₂O
 E) BaBr₂
73. Which of the following compounds contains an ionic bond?
 A) HCl(g)
 B) NaCl
 C) CCl₄
 D) SO₂
 E) O₂
74. Which of the following elements has the lowest electronegativity?
 A) Na
 B) Rb
 C) Ca
 D) S
 E) Cl
77. How many lone pairs of electrons are in the Lewis structure for ammonia, NH₃?
 A) 0
 B) 1
 C) 2
 D) 3
 E) 4
78. Draw the Lewis electron structure for the HI molecule.
79. Draw the Lewis electron structure for the H₂Te molecule.
80. Draw the Lewis structure for CO.
82. Which of the following has a double bond?
 A) H₂O
 B) NH₃
 C) O₂
 D) CO
 E) H₂S

Answer Key

- | | | |
|----------------------------------|-------|-------|
| | 29. D | 53. E |
| 6. C | 30. C | 54. A |
| 7. B | 31. E | 55. D |
| 8. A | 32. B | 56. B |
| 11. E | 33. A | 57. B |
| 12. E | 34. C | 58. E |
| 13. D | 35. C | 59. B |
| 14. B | 36. C | 60. C |
| 15. electron, proton,
neutron | 37. A | 61. D |
| 16. B | 38. C | 62. D |
| 17. C | 39. A | 63. A |
| 18. A | 40. D | 64. A |
| 19. C | 41. E | 65. D |
| 20. D | 42. B | 66. A |
| 21. C | 43. D | 67. A |
| 22. ${}^{226}_{88}\text{Ra}$ | 44. B | 68. E |
| 23. D | 45. B | 69. A |
| 24. C | 46. D | 70. B |
| 26. E | 47. B | 72. C |
| 27. B | 48. E | 73. B |
| 28. A | 49. C | 74. B |
| | 50. A | 77. B |
| | 51. B | |
| | 52. D | |



82. C

Check your answers. Highlight the ones you got wrong. On page 130 list the question numbers you missed, next to them list the TOPIC that the question was about, and then show your correction next to it. The topics you missed are the topics you should study the most before the final!

Pick the TOP five questions you would like Mrs. Farmer to try and do in class under the document camera.

1) _____ 2) _____ 3) _____ 4) _____ 5) _____

Go to the following link and submit these questions to the online form so Mrs. Farmer knows which ones you would like her to do!

<http://tinyurl.com/jxy7rwh>

FALL 2016 FINAL EXAM TOPIC LIST

This is not a definitive list. This is just a suggestion to provide general guidance in studying.

1)	9)	17)
2)	10)	18)
3)	11)	19)
4)	12)	20)
5)	13)	21)
6)	14)	22)
7)	15)	23)
8)	16)	24)

TOPIC RANKING

DIRECTIONS: TOPICS IN NO SPECIAL ORDER. Rate each topic on a scale of 1-5 how well you think you understand it.
1 = "We learned this???" 5 = "I know this so well I could teach it to someone else!"

Topic #	Pre-Study	Post-Study	Topic #	Pre-Study	Post-Study	Topic #	Pre-Study	Post-Study
1			9			17		
2			10			18		
3			11			19		
4			12			20		
5			13			21		
6			14			22		
7			15			23		
8			16			24		

Fall Final Exam Practice Problems - CHUNK #1 - Topics 1-7

Topic #	Q #	Question
1	1	Who were the 8 scientists that were covered in class that contributed to the development of different atomic models? What did they each contribute?
	2	Sketch and name the seven atomic models that were covered in class.
	3	Describe Rutherford's Gold Foil experiment and what it proved.
	4	What does the Quantum model say about the nature of electrons in an atom?
2	5	Put 0.00345 in scientific notation
	6	Put 29800000 in scientific notation
	7	What is wrong with the following number that was supposed to be put in sci. notation? 24.6×10^3
	8	What is wrong with the following number that was supposed to be put in sci. notation? 0.54×10^2
3	9	Which prefix represents 1000?
	10	Which prefix represents 1/10?
	11	What is the "base unit" for length? For volume? For mass?
	12	What is the mnemonic we use for metric system?
4	13	How many centimeters are in 340.2 kilometers? (remember KHDBDCM)
	14	How many millimeters are in 29.4 meters?
	15	Convert 2.7 kg into grams.
	16	Convert 0.85 mg into decagrams.
5	17	What is the definition of atomic mass?
	18	What does the atomic number tell you?
	19	How many neutrons does an atom of silver have?
	20	How many protons, neutrons, and electrons does each atom have? Cl Ba C Ne
6	21	What is an isotope?
	22	What is the difference between Carbon-12, Carbon-13, and Carbon-14?
	23	How many protons, neutrons, electrons does Bromine-80 have compared to Bromine-83?
	24	Which version of Bromine above is the more common isotope? How do you know?
7	25	What is a mole?
	26	Why do we use "the mole" in chemistry class?
	27	Describe how to calculate molar mass for a molecule. Do you round your atomic masses or not? Why?
	28	What is the molar mass of Ag?
	29	What is the molar mass of $\text{Ca}(\text{OH})_2$
	30	What is the molar mass of K_2SO_4
	31	What is the molar mass of $(\text{NH}_4)_2\text{S}$,

Fall Final Exam Practice Problems - CHUNK #2 - Topics 8-15		
Topic #	Q #	Question
8	1	Convert 3.5 mi into cm
	2	Convert 4 mi/hr into m/s
	3	Convert 19.2 mi/min into m/hr
	4	Convert 52 m/s into mi/hr
9	5	Convert 20g of Ca(OH) ₂ into moles.
	6	Convert 15g of K ₂ SO ₄ into moles.
	7	Convert 54 moles of (NH ₄) ₂ S into grams.
	8	Convert 0.056 moles of Ag into grams.
	9	Convert 16 moles of H ₂ SO ₄ into molecules.
	10	Convert 2.5x10 ³¹ molecules of H ₂ SO ₄ into moles
10	11	What is an electron orbital?
	12	Sketch pictures of an “s” orbital and a “p” orbital.
	13	How many electrons can an orbital hold?
	14	How many electrons can a set of s orbitals hold? A set of p orbitals? A set of d orbitals? A set of f orbitals?
11	15	Sketch what the orbital diagram should look like for sulfur. (Mrs Farmer will show you how to sketch one out easily)
	16	Sketch what the orbital diagram should look like for Mn
	17	Write a short paragraph explaining how to fill an orbital diagram.
12	18	What element is represented by the e- configuration of: 1s ² 2s ² 2p ⁶ 3s ² 3p ⁶ 4s ² 3d ¹⁰ 4p ² ?
	19	What element is represented by the electron configuration of: 1s ² 2s ² 2p ⁶ 3s ² 3p ⁴ s ¹
	20	Write the electron configuration for phosphorus
	21	Write the electron configuration for silver
13	22	Draw a picture of what happens during atomic absorption. Write 3 sentences describing what happens.
	23	Draw a picture of what happens during atomic emission. Write 3 sentences describing what happens.
	24	What does ground state mean? Excited state?
14	25	List the three main types of radiation, what their symbols are (including the little numbers on top and bottom of the symbol), and what stops them.
	26	Which type of radiation is pure energy? Which type is a high energy electron? Which type is a helium nucleus?
	27	What is the charge on the three main types of radiation & what type of charge would they be attracted to?
15	28	Finish the following nuclear equation: ${}^{99}_{43}\text{Tc} \rightarrow \underline{\hspace{1cm}} + {}^0_{-1}\text{e}$
	29	Finish the following nuclear equation: ${}^{238}_{92}\text{U} \rightarrow {}^{234}_{90}\text{Th} + \underline{\hspace{1cm}}$
	30	Write the nuclear equation for Samarium undergoing beta emission

Fall Final Exam Practice Problems-CHUNK#3 – Topics 16-24		
Topic	Q	Question
16	1	The half-life of Iron-59 is 44.5 days. How much of a 1.750 mg sample will remain after 243.5 days?
	2	If the half life of a substance is 5 weeks, what % is left after 20 weeks?
	3	The half life of a substance is 12 days. How much did you start with if you have 9.3 grams left after 4 weeks?
	4	The half-life of a sample is 13 days. How much of a 50 g sample will remain after 567.5 days?
18	5	What charge do alkali metals, alkaline earth metals, halogens, noble gases like to have? (example, alkali metals like to have +1 charge)
	6	How many valence e- does each of these have: Na, Cs, Be, F, O, S, C, B
	7	Label a sketch of a periodic table with the names of each group.
	8	List two of each type of atom: metals, nonmetals, metalloid, and transition metals
19	9	Draw a sketch of a periodic table and draw an arrow pointing from lowest ionization energy towards the highest.
	10	Rank the atoms from lowest to highest ionization energy: Na, F, Fr, Ca, Fe, S
	11	Draw a sketch of a periodic table and draw an arrow pointing from lowest electronegativity towards the highest.
	12	Rank the following atoms from lowest to highest electronegativity: Na, F, Fr, Ca, Fe, S
	13	Draw a sketch of a periodic table and draw an arrow pointing from smallest to largest atomic radius.
	14	Rank the following atoms from smallest to largest atomic radius: Na, F, Fr, Ca, Fe, S
20	15	Write out the formulas for: Carbonate, Phosphate, Iron (III), Nitrate
21	16	Describe how to name ionic compounds vs covalent molecules
	17	Name the following: N_4O_{10} P_4S_{10} $CuCl_2$ CCl_4 C_5I Al_2O_3 $ZnSO_4$ NH_4NO_2 $Ca(ClO_2)_2$
22	18	Write the formula for the following: Gallium Oxide, Calcium Chloride, Ammonium Phosphite, Calcium Peroxide
	19	Write the formulas: diphosphorus monoxide, tetrasulfur trifluoride, nitrogen tetrahydride
23	20	What class of elements make up ionic bonds? Covalent bonds? Metallic bonds?
	21	What is happening during an ionic bond? A covalent bond? Why do things bond in the first place???
	22	Identify the following as ionic, covalent, or metallic bonds: NaF KOH CS_2 Ni H_2 F_2
24	23	What is the definition of the octet rule?
	24	What are the main exceptions to the octet rule?
	25	Draw Lewis Structures for CO_2 , N_2 , O_2 , H_2 , H_2O , NH_3
	29	For the Lewis Structures you drew above identify which have single bonds, double bonds, triple bonds. Which have lone pairs? How many lone pairs does each one of those have?
	30	Draw a Lewis structure to figure out if each compound is held together with a single bond, a double bond, or a triple bond: HCl and N_2 and CO
17	31	Write the decay series of U-241 undergoing alpha, beta, beta, alpha decays.