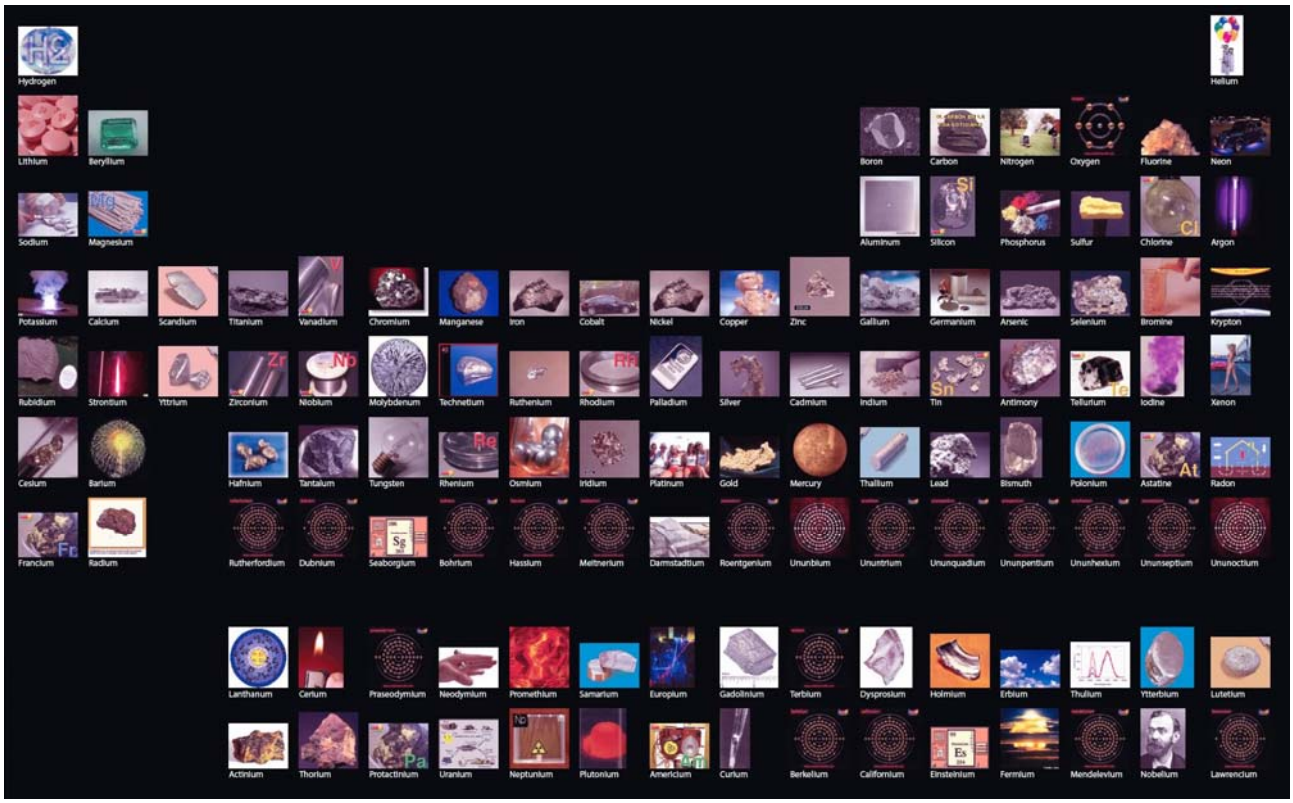
Periodic Trends



C. Souders - Battlefield

Standard of Learning

(SOL CH.2 d, e, f, h): The student will demonstrate an understanding of the periodic table and the relationship between properties of elements and their electron structure.

Essential Question(s)

- How are elements in a family or group related and what the general trends regarding properties?
- How are elements in a period related and what are the general trends regarding properties?
- How is ionization energy impacted by the shielding effect?

Unit: The Periodic Table
Lesson: Periodic Trends
Time Frame: 90 minutes (1 block)

PWCS Standards Based Planning Process

Standards: ***What will students know and be able to do?***

Essential Understandings -

- When elements are listed in order by atomic number, repeating patterns of physical and chemical properties identify families of elements with similar properties.
- The periodic table shows these families or groups in columns.
- The horizontal rows are called periods.
- The valence electrons govern the chemical properties of the elements. Many of the properties of the elements change predictably across a period or down a group of the periodic table. Some examples of these are
  - atomic radius
  - electronegativity
  - ionization energy (the shielding effect tends to reduce ionization energy)
- Basic trends in periods and families help to predict the outcomes of atomic interactions.
- Elements may occur in three physical states (solid, liquid, gas). These states are characterized by:
  - density
  - conductivity
  - melting point
  - boiling point
  - malleability
  - ductility

Essential Skills –

- Given a randomly arranged set of elements with atomic number(s) and properties, arrange them in order, showing appropriate breaks from one period to another.
- Relate the first ionization energy to the position of the element with respect to other members of its period by its period location and to other members of its family by its family location.

Essential Skill ***(Continued)*** **–**

- Match the names of selected specific groups on the periodic chart with the elements they represent (alkali metals, alkaline earth metals, halogens, noble gases, transition elements, etc.)
- Compare the 1 through 18 numbering system with the A/B system(s) and relate to the chemical and physical characteristics of the elements contained therein.
- Relate the electronegativity of an element to its position on the periodic chart.
- Relate the shielding effect to the first ionization energy.
- Using the "BrINClHOF" mnemonic, "HONClBrIF" mnemonic or saying "go to number 7 and make the shape of a 7", list the elements that occur in the diatomic state when in the free state.
- Given an appropriate periodic chart, the student will be able to ascertain each of the characteristics of an element and will use that information to completely describe the element.

Assessment: ***How will the student and I know when he/she is successful?***

- **Before Lesson (Pre-Assessment) –** This lesson will follow a previous lesson on reading the periodic table, subatomic particles, electron configurations, etc. Assessment results should provide information to the teacher on whether or not the students are ready to move on. Students should be able to interpret short hand notation of an element, identify the number of protons, neutrons and electrons and write the electron configuration for an element. There is an introduction activity provided that identifies if a student can interpret data given to them.
- **During Lesson (Formative) –** Concepts will start off simple and build throughout the lesson. Student assignments are important for the teacher to tell if there is a good level of understanding. Students can generally understand *what* the pattern of the specific periodic trend is but they have a difficult time applying that trend in a question. It is important for the teacher to not only question what the trend is but to ask questions that require application.
- **After Lesson (Summative) –** There is a quiz that assesses student progress in this lesson. This information would most likely be included in a unit test as well. The assessment directly assesses skills practiced during the lesson.

PWCS Standards Based Planning Process (continued)

Task Analysis: ***What knowledge, skills and level of understanding do students need to be successful with this lesson?***

- **Pre-Assessment Data:** Students should be able to pull some information from previous knowledge –
  - Identify what the difference between an ion and isotope is.
  - Read a periodic table and interpret the data it presents
- **Important Vocabulary (Literacy) –**

Group (previous) Period (previous) Atomic radius Ion (previous) Isotope (previous)	Alkali metals Alkaline earth metals Cation Anion Electronegativity	Halogens Transition metal Representative elements Periodic law Ionization energy	Metalloids Nonmetals Noble gases Metals Inner transition metals

- **Skill Development and Differentiation–** There are many points in this lesson where students can be evaluated and teaching methods edited to support all students.
  - Students who are moving ahead of pace could participate in experiments to chemically test whether a substance is a metal, non-metal or metalloid.
  - Students who need more assistance could create a periodic table that can be broken down (using note cards) that will allow them to divide the elements into their groups, trends, classifications, etc. This could provide students with hands-on practice.
  - The labeling of the periodic table during lecture should help students visualize where specific sections are on the periodic table. Colors and keys should make it easy to identify. The teacher also creating a master copy should help those students with a photographic memory.
  - The PowerPoint is to be used as a tool to assist in delivering information to students. The teacher should break where necessary to allow students to participate in activities and/or handouts to ensure the information is being absorbed.

Instruction Using Inquiry Model: ***What learning experiences will facilitate student success?***

Framing the Learning:

1. **Engage –** This lesson is embedded in a unit regarding the periodic table. The opening activity taps into skills taught at the very beginning of the year and at the same time introduces the concept of trends within elements. Students will work in groups to build their tables based off information given in the appendix of the text.

Learning Experiences:

2. **Explore –** One main activity is included in this lesson, the Martian Activity. This activity allows students to apply the concepts learned in the lesson yet keeps it interesting by using a make-believe scenario and treating the assignment as a riddle. It is important to make sure students use the fake element presented to them in the assignment and they do not copy sections of the periodic table thinking this is the answer.
3. **Explain –** There is a PowerPoint provided with the basic knowledge needed in this lesson. There is also a blank periodic table included for students to label as they work through the lecture. It is helpful for the teacher to label a periodic table along with the students so they understand what they are labeling and why. Students are encouraged to use colors with a key as well as word labels to help them to visualize the parts of the periodic table.
4. **Elaborate –** There is one practice handout included that requires students to apply the trend concepts to the periodic table. It is up to the teacher to decide if more practice is needed for students and to guide them in the right direction for assistance. Teachers will need to correct this assignment for accuracy to provide students with accurate feedback and guidance. It is important for the teacher to make sure students not only know the trends but they also know how to apply the trends.
5. **Evaluate –** There is a Periodic Trends Quiz included in this packet, the information will also be included in a cumulative unit test. The teacher may choose to include smaller formal assessments throughout the lesson as they feel necessary.

Resources:

- Introduction Activity Handout, copies of Appendix B.2 or copies of the textbook for each group of students. Or a supplemental chart with properties of elements such as melting point, boiling point and density.
- Periodic Trends PowerPoint
- Blank Periodic Table, colored pencils/crayons for labeling.
- Martian Activity – directions, answer sheet and a periodic table for reference.
- Periodic Trends Handout
- Periodic Trends Quiz

Reflection: ***Based on data, how do I refine the learning experiences and/or the assessment?***

- **Analysis of Data –** This lesson is the closing lesson of this unit, however the concepts will continue in future lessons for things such as covalent bonding. Evidence of mastery will come from the quizzes, assignments and verbal assessments completed by the teacher. Assessment during the lesson will allow the teacher to edit pacing and scaffold as necessary.

- **Immediate Implications –** The teacher can create more practice problems and activities to allow students to practice more. With guidance the student could create a set of flashcards with elements to physically make a periodic table and divide up the sections as well as use them with the teacher to practice the trend patterns. If a student has a strong grasp on the topics they could participate in a lab that chemically tests whether the substances are metals, non-metals or metalloids.

- **Future Planning –** This lesson was developed to scaffold students into a strong understanding of the divisions of the periodic table and the trends of the periodic table. At each stage of the lesson the teacher will evaluate students progress and adjust accordingly. If the final assessment of the lesson requires re-teaching the teacher will edit the pace to accommodate.

(SOL CH.2 d, e, f, h): The student will demonstrate an understanding of the periodic table and the relationship between properties of elements and their electron structure.

Name: _____

Class Period: _____ Date: _____

ENGAGE PHASE

Introduction Activity: Trends in Physical Properties

Procedure:

1. In your group obtain a large whiteboard and marker.
2. Make a table with five columns. In the first column list the metals lithium, sodium, potassium, rubidium and cesium, in that order. Title the other four columns atomic number, melting point, boiling point and density.
3. Make a second table for the nonmetal elements fluorine, chlorine, bromine and iodine. Title the other four columns atomic number, melting point, boiling point and density.
4. Use table B.2 (in Appendix B of the textbook) to complete each table. Include the appropriate units for each property.

Think About It:

1. For the metals, what are the trends for the melting points and boiling points as the atomic number increases.
2. Are the trends for melting and boiling points the same for the nonmetals? Explain.
3. What is the general trend in densities of the metals with increasing atomic number?
4. Why is the range of densities much greater among the nonmetals than among the metals?

Use appendix B.2 from Prentice Hall: Chemsitry © 2005

Table B.2

Some Properties of the Elements (cont.)

Element	Symbol	Atomic number	Atomic mass	Melting point (°C)	Boiling point (°C)	Density (g/cm^3) (gases at STP)	Oxidation numbers
Iron	Fe	26	55.847	1535	2750	7.874	+2, +3
Krypton	Kr	36	83.80	−156.6	−152.30	0.003733	
Lanthanum	La	57	138.9055	921	3457	6.145	+3
Lawrencium	Lr	103	(262)	—	—	—	+3
Lead	Pb	82	207.2	327.502	1740	11.35	+2, +4
Lithium	Li	3	6.941	180.54	1342	0.534	+1
Lutetium	Lu	71	174.967	1663	3395	9.840	+3
Magnesium	Mg	12	24.305	648.8	1107	1.738	+2
Manganese	Mn	25	54.9380	1244	1962	7.32	+2, +3, +4, +7
Meitnerium	Mt	109	(268)	—	—	—	
Mendelevium	Md	101	257	—	—	—	+2, +3
Mercury	Hg	80	200.59	−38.842	356.58	13.55	+1, +2
Molybdenum	Mo	42	95.94	2617	4612	10.22	+6
Neodymium	Nd	60	144.24	1021	3068	6.90	+3
Neon	Ne	10	20.179	−248.67	−246.048	0.0008999	
Neptunium	Np	93	(237)	640	3902	20.25	+3, +4, +5, +6
Nickel	Ni	28	58.69	1453	2732	8.902	+2, +3
Niobium	Nb	41	92.9064	2468	4742	8.57	+3, +5
Nitrogen	N	7	14.0067	−209.86	−195.8	0.0012506	−3, +3, +5
Nobelium	No	102	(259)	—	—	—	+2, +3
Osmium	Os	76	190.2	3045	5027	22.57	+3, +4
Oxygen	O	8	15.9994	−218.4	−182.962	0.001429	−2
Palladium	Pd	46	106.42	1554	2970	12.02	+2, +4
Phosphorus	P	15	30.97376	44.1	280	1.82	−3, +3, +5
Platinum	Pt	78	195.08	1772	3627	21.45	+2, +4
Plutonium	Pu	94	(244)	641	3232	19.84	+3, +4, +5, +6
Polonium	Po	84	(209)	254	962	9.32	+2, +4
Potassium	K	19	39.0982	63.25	760	0.862	+1
Praseodymium	Pr	59	140.9077	931	3512	6.64	+3
Promethium	Pm	61	(145)	1168	2460	7.22	+3
Protactinium	Pa	91	231.0359	1560	4027	15.37	+4, +5
Radium	Ra	88	(226)	700	1140	5.5	+2
Radon	Rn	86	(222)	−71	−61.8	0.00973	
Rhenium	Re	75	186.207	3180	5627	21.02	+4, +6, +7
Rhodium	Rh	45	102.9055	1966	3727	12.41	+3
Roentgenium	Rg	111	(272)	—	—	—	
Rubidium	Rb	37	85.4678	38.89	686	1.532	+1
Ruthenium	Ru	44	101.07	2310	3900	12.41	+3
Rutherfordium	Rf	104	(261)	—	—	—	
Samarium	Sm	62	150.36	1077	1791	7.520	+2, +3
Scandium	Sc	21	44.9559	1541	2831	2.989	+3
Seaborgium	Sg	106	(263)	—	—	—	
Selenium	Se	34	78.96	217	684.9	4.79	−2, +4, +6
Silicon	Si	14	28.0855	1410	2355	2.33	−4, +2, +4
Silver	Ag	47	107.8682	961.93	2212	10.50	+1

Table B.2

Some Properties of the Elements

Element	Symbol	Atomic number	Atomic mass	Melting point (°C)	Boiling point (°C)	Density (g/cm^3) (gases at STP)	Oxidation numbers
Actinium	Ac	89	(227)	1050	3200	10.07	+3
Aluminum	Al	13	26.98154	660.37	2467	2.6989	+3
Americium	Am	95	243	994	2607	13.67	+3, +4, +5, +6
Antimony	Sb	51	121.75	630.74	1587	6.691	−3, +3, +5
Argon	Ar	18	39.948	−189.2	−185.7	0.0017837	
Arsenic	As	33	74.9216	817	613	5.73	−3, +3, +5
Astatine	At	85	(210)	302	337	—	
Barium	Ba	56	137.33	725	1640	3.5	+2
Berkelium	Bk	97	(247)	986	—	14.78	
Beryllium	Be	4	9.01218	1278	2970	1.848	+2
Bismuth	Bi	83	208.9804	271.3	1560	9.747	+3, +5
Bohrium	Bh	107	(264)	—	—	—	
Boron	B	5	10.81	2075	3675	2.34	+3
Bromine	Br	35	79.904	−7.2	58.78	3.12	−1, +1, +5
Cadmium	Cd	48	112.41	320.9	765	8.65	+2
Calcium	Ca	20	40.08	839	1484	1.55	+2
Californium	Cf	98	(251)	900	—	14	
Carbon	C	6	12.011	3550	4827	2.267	−4, +2, +4
Cerium	Ce	58	140.12	799	3426	6.657	+3, +4
Cesium	Cs	55	132.9054	28.40	669.3	1.873	+1
Chlorine	Cl	17	35.453	−100.98	−34.6	0.003214	−1, +1, +5, +7
Chromium	Cr	24	51.996	1907	2672	7.18	+2, +3, +6
Cobalt	Co	27	58.9332	1495	2870	8.9	+2, +3
Copper	Cu	29	63.546	1083.4	2567	8.96	+1, +2
Curium	Cm	96	(247)	1340	—	13.51	+3
Darmstadtium	Ds	110	(269)	—	—	—	
Dubnium	Db	105	(262)	—	—	—	
Dysprosium	Dy	66	162.50	1412	2562	8.550	+3
Einsteinium	Es	99	(252)	—	—	—	
Erbium	Er	68	167.26	159	2863	9.066	+3
Europium	Eu	63	151.96	822	1597	5.243	+2, +3
Fermium	Fm	100	(257)	—	—	—	
Fluorine	F	9	18.998403	−219.62	−188.54	0.00181	−1
Francium	Fr	87	(223)	27	677	—	+1
Gadolinium	Gd	64	157.25	1313	3266	7.9004	+3
Gallium	Ga	31	69.72	29.78	2204	5.904	+3
Germanium	Ge	32	72.59	937.4	2830	5.323	+2, +4
Gold	Au	79	196.9665	1064.43	2856	19.3	+1, +3
Hafnium	Hf	72	178.49	2227	4602	13.31	+4
Hassium	Hs	108	(265)	—	—	—	
Helium	He	2	4.00260	−272.2	−268.934	0.001785	
Holmium	Ho	67	164.9304	1474	2695	8.795	+3
Hydrogen	H	1	1.00794	−259.14	−252.87	0.00008988	−1, +1
Indium	In	49	114.82	156.61	2080	7.31	+1, +3
Iodine	I	53	126.9045	113.5	184.35	4.93	−1, +1, +5, +7
Iridium	Ir	77	192.22	2410	4130	22.42	+3, +4

Table B.2

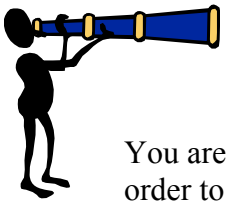
Some Properties of the Elements (cont.)

Element	Symbol	Atomic number	Atomic mass	Melting point (°C)	Boiling point (°C)	Density (g/cm^3) (gases at STP)	Oxidation numbers
Sodium	Na	11	22.98977	97.81	882.9	0.971	+1
Strontium	Sr	38	87.62	769	1381	2.63	+2
Sulfur	S	16	32.06	112.8	444.7	2.07	−2, +4, +6
Tantalum	Ta	73	180.9479	2996	5425	16.654	+5
Technetium	Tc	43	(98)	2172	4877	11.50	+4, +6, +7
Tellurium	Te	52	127.60	449.5	989.8	6.24	−2, +4, +6
Terbium	Tb	65	158.9254	1356	3123	8.229	+3
Thallium	Tl	81	204.383	303.5	1457	11.85	+1, +3
Thorium	Th	90	232.0381	1750	4790	11.72	+4
Thulium	Tm	69	168.9342	1545	1947	9.321	+3
Tin	Sn	50	118.69	231.968	2270	7.31	+2, +4
Titanium	Ti	22	47.88	1660	3287	4.54	+2, +3, +4
Tungsten	W	74	183.85	3410	5660	19.3	+6
Ununbium	Uub	112	(277)	—	—	—	
Ununquadium	Uuq	114	—	—	—	—	
Uranium	U	92	238.0289	1132.3	3818	18.95	+3, +4, +5, +6
Vanadium	V	23	50.9415	1890	3380	6.11	+2, +3, +4, +5
Xenon	Xe	54	131.29	−111.9	−107.1	0.005887	
Ytterbium	Yb	70	173.04	819	1194	6.965	+2, +3
Yttrium	Y	39	88.9059	1522	3338	4.469	+3
Zinc	Zn	30	65.38	419.58	907	7.133	+2
Zirconium	Zr	40	91.22	1852	4377	6.506	+4

(SOL CH.2 d, e, f, h): The student will demonstrate an understanding of the periodic table and the relationship between properties of elements and their electron structure.

Name: _____

Class Period: _____ Date: _____



EXPLORE PHASE

Martian Activity

You are a part of a collection of scientists who have been chosen to assist a group of alien scientists. In order to be able to converse scientifically, you must learn their language, and most importantly, you must arrange their elements according to the trends that exist in the periodic table. Below are clues for the alien's elements. So far, the aliens have only discovered elements in groups 1, 2, and 13-18, and periods 1-5. Although the names of the elements are different, they must correspond to our elements if our belief of universal elements holds true. Read each clue carefully, and then place the symbol for that clue's element in the blank periodic table provided.

1. Livium (Lv): This element is responsible for life. It has 2 electron energy levels and 4 electrons available for bonding in the outermost energy level.
2. Computerchipium (Cc): This element is important for its use as a semiconductor in computers.
3. Lightium (L): This is the lightest of elements; aliens used to use it in their aircraft until their aircraft caught fire in a horrific accident.
4. Breathium(Br): When combined with Lightium (L), it makes the alien's most common liquid whose formula is L2Br.
5. Francium (F): A metal found in period 4 group 13.
6. Moonium (Mo): An element with an atomic number of 34.
7. Explodium (Ex): This element is the most reactive metal on the alien's table.
8. Violetium(V): This element is found as part of a compound in bananas. When burned, it has a violet colored flame.
9. Sparkium (Sp) and Burnium (Bu) are members of the alkali metal group, along with Violetium(V) and Explodium (Ex). Their reactivity, from least to greatest, is Sp, Bu, V,
10. Balloonium (Ba): A noble gas used to fill balloons.
11. Toothium (To): This element is added to juices to help build strong bones and teeth.
12. Metalloidium (M) and Poisonium (Po): Two metalloids found in period 4. Po is the more massive than M.
13. Lowigium (Lo): A period 4 halogen.
14. Darkbluium(Dk): Has an atomic mass of 115.
15. Hugium (Hu): The element on the alien's periodic table that has the most mass.
16. Glucinium (Gl): The element found in period 2, group 2.
17. Reactinium (Re): The most reactive non-metal on the periodic table.
18. Balloonium (Ba), Signium(Si), Stableium(Sb), Supermanium (Sm), and Hugium (Hu) are all noble gases. They are arranged above from least to most massive.
19. Cannium (Cn): This element helps to preserve foods; it is used in can manufacturing.
20. Burnium (Bu), Blue-whitium (Bw), Bauxitium (Xi), Computerchipsium (Cc), Bringer-of-lightium (Bl), Stinkium (Sk), Purium (P), and Stableium (Sb) are all found in period 3. Bu has 1 electron in its outer energy level, Bw has 2, Xi has 3, Cc has 4, Bl has 5, Sk has 6, P has 7 and Sb has 8.
21. Scottishium (Sc): A metal element found in group 2.
22. Infectium (If): This element, mixed with alcohol, is used on cuts.
23. Abundantcium(Ab): One of the most abundant gasses in the universe. It has 7 protons, 7 neutrons,and 7 electrons.
24. Some additional clues: The number after the symbol indicates the number of electrons in the outer energy level: Notalonium(Na): 5 Earthium (E): 6 Boracium (B): 3

	1								18
1		2		13	14	15	16	17	
2									
3									
4			TRANSITION ELEMENTS						
5									

MARTIAN ACTIVITY KEY

	1								18
1	L	2		13	14	15	16	17	Ba
2	Sp	Gl		B	Lv	Ab	Br	re	Si
3	Bu	Bw		Xi	Cc	Bl	Sk	P	Sb
4	V	To	TRANSITION ELEMENTS	F	Po	M	Mo	Lo	Sm
5	Ex	Sc		Dk	Cn	Na	E	If	Hu

(SOL CH.2 d, e, f, h): The student will demonstrate an understanding of the periodic table and the relationship between properties of elements and their electron structure.

EXPLAIN PHASE

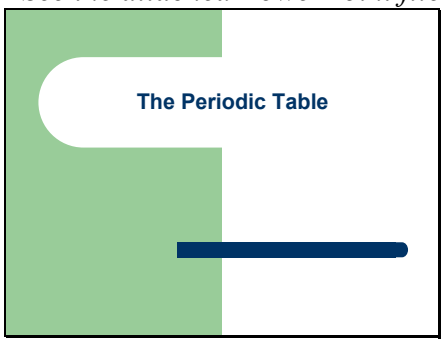
Name: _____

Class Period: _____ Date: _____

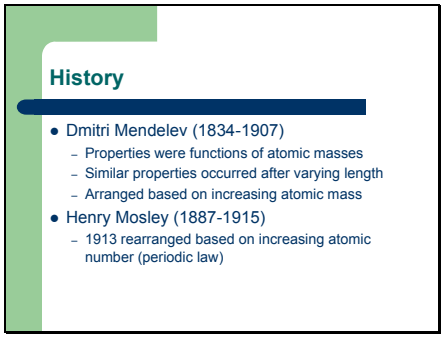
Periodic Trends PowerPoint

See the attached PowerPoint file titled "Periodic Trends" to edit and/or present.

Slide 1



Slide 2



Slide 3

Names & Symbols

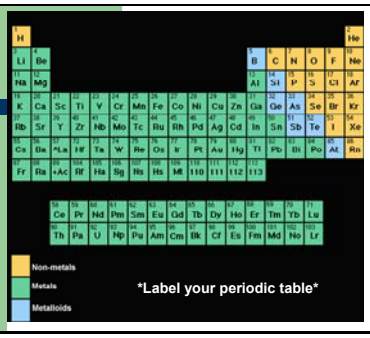
- Most common source for name is some property of the element
- Element's place of discovery
- Mineral in which element was found
- To honor person or place
- Symbols derived from English/Latin name
- Symbols contain capital and lowercase

Slide 4

Positions of Key Elements/Groups

- Columns are groups & rows are periods
- Metals – left side; high luster & good electrical conductivity
- Nonmetals – right side; nonlusterous & poor electrical conductivity
- Metalloids – along the staircase; properties of both

Slide 5

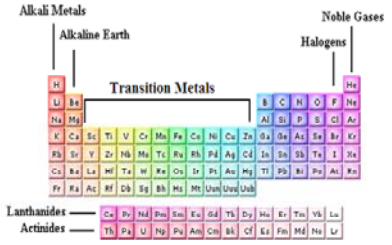


Slide 6

Common Groups

- Representatives – Group A
- Transitions – Group B
- Active Metals
  - Group 1 (1A) – Alkali Earth
  - Group 2 (2A) – Alkaline Earth
- Nonmetals
  - Group 16(6A) - Chalogens
  - Group 17(7A) – Halogens
  - Group 18(8A) – Noble Gases

Slide 7



Label your periodic table

Slide 8

Common Properties

- Elements w/ 3 or fewer electrons in outer level are considered metals
- Elements w/ 5 or more electrons in outer level are considered nonmetals
- Metalloids have properties of both

Slide 9

Periodic Properties

- Element's position is related to its atomic number and its electron configuration

Slide 10

Atomic Radius

- Radius of atom without regards to its surrounding atoms
- Increases down a group (more levels)
- Decreases from left to right across table

Slide 11

Radii of Ions

- Ions generally smaller than their atoms
- Ions that are free to move can conduct an electric current
- Metallic ions formed by a loss
  - Smaller than their atoms
- Nonmetallic ions formed by a gain
  - Larger than their atoms

Slide 12

Electronegativity

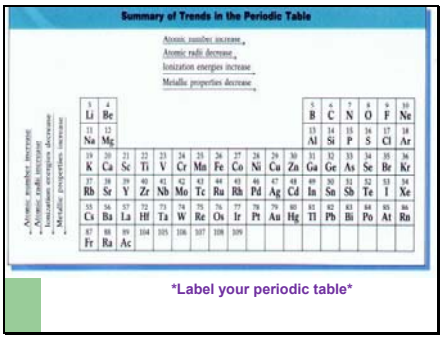
- Tendency for atoms to attract electrons when combined w/ another element
- Decreases down a group
- Increases across a row
- Metals have low electron affinities
- Nonmetals have high electron affinities

Slide 13

Ionization Energy

- Energy required to remove an electron from an atom
- 1st ionization energy – energy to remove the first electron
- Increases across row/period
- Decreases down a column/group
- Metals have low ionization energies
- Nonmetals have high ionization energies

Slide 14



Label your periodic table

The Periodic Table of the Elements

1 **H** Hydrogen 1.00794																	2 **He** Helium 4.003
3 **Li** Lithium 6.941	4 **Be** Beryllium 9.012182											5 **B** Boron 10.811	6 **C** Carbon 12.0107	7 **N** Nitrogen 14.00674	8 **O** Oxygen 15.9994	9 **F** Fluorine 18.9984032	10 **Ne** Neon 20.1797
11 **Na** Sodium 22.989770	12 **Mg** Magnesium 24.3050											13 **Al** Aluminum 26.581538	14 **Si** Silicon 28.0855	15 **P** Phosphorus 30.973761	16 **S** Sulfur 32.066	17 **Cl** Chlorine 35.4527	18 **Ar** Argon 39.948
19 **K** Potassium 39.0983	20 **Ca** Calcium 40.078	21 **Sc** Scandium 44.955910	22 **Ti** Titanium 47.867	23 **V** Vanadium 50.9415	24 **Cr** Chromium 51.9961	25 **Mn** Manganese 54.938049	26 **Fe** Iron 55.845	27 **Co** Cobalt 58.933200	28 **Ni** Nickel 58.6934	29 **Cu** Copper 63.546	30 **Zn** Zinc 65.39	31 **Ga** Gallium 65.723	32 **Ge** Germanium 72.61	33 **As** Arsenic 74.92160	34 **Se** Selenium 78.96	35 **Br** Bromine 79.904	36 **Kr** Krypton 83.80
37 **Rb** Rubidium 85.4678	38 **Sr** Strontium 87.62	39 **Y** Yttrium 88.90585	40 **Zr** Zirconium 91.224	41 **Nb** Niobium 92.90638	42 **Mo** Molybdenum 95.94	43 **Tc** Technetium (98)	44 **Ru** Ruthenium 101.07	45 **Rh** Rhodium 102.90550	46 **Pd** Palladium 106.42	47 **Ag** Silver 107.8682	48 **Cd** Cadmium 112.411	49 **In** Indium 114.818	50 **Sn** Tin 118.710	51 **Sb** Antimony 121.760	52 **Te** Tellurium 127.60	53 **I** Iodine 126.90447	54 **Xe** Xenon 131.29
55 **Cs** Cesium 132.90545	56 **Ba** Barium 137.327	57 **La** Lanthanum 138.9055	72 **Hf** Hafnium 178.49	73 **Ta** Tantalum 180.9479	74 **W** Tungsten 183.84	75 **Re** Rhenium 186.207	76 **Os** Osmium 190.23	77 **Ir** Iridium 192.217	78 **Pt** Platinum 195.078	79 **Au** Gold 196.96655	80 **Hg** Mercury 200.59	81 **Tl** Thallium 204.3833	82 **Pb** Lead 207.2	83 **Bi** Bismuth 208.98038	84 **Po** Polonium (209)	85 **At** Astatine (210)	86 **Rn** Radon (222)
87 **Fr** Francium (223)	88 **Ra** Radium (226)	89 **Ac** Actinium (227)	104 **Rf** Rutherfordium (261)	105 **Db** Dubnium (262)	106 **Sg** Seaborgium (263)	107 **Bh** Bohrium (262)	108 **Hs** Hassium (265)	109 **Mt** Meitnerium (266)	110 (269)	111 (272)	112 (277)	113	114				

58 **Ce** Cerium 140.116	59 **Pr** Praseodymium 140.90765	60 **Nd** Neodymium 144.24	61 **Pm** Promethium (145)	62 **Sm** Samarium 150.36	63 **Eu** Europium 151.964	64 **Gd** Gadolinium 157.25	65 **Tb** Terbium 158.92534	66 **Dy** Dysprosium 162.50	67 **Ho** Holmium 164.93032	68 **Er** Erbium 167.26	69 **Tm** Thulium 168.93421	70 **Yb** Ytterbium 173.04	71 **Lu** Lutetium 174.967
90 **Th** Thorium 232.0381	91 **Pa** Protactinium 231.03588	92 **U** Uranium 238.0289	93 **Np** Neptunium (237)	94 **Pu** Plutonium (244)	95 **Am** Americium (243)	96 **Cm** Curium (247)	97 **Bk** Berkelium (247)	98 **Cf** Californium (251)	99 **Es** Einsteinium (252)	100 **Fm** Fermium (257)	101 **Md** Mendelevium (258)	102 **No** Nobelium (259)	103 **Lr** Lawrencium (262)

(SOL CH.2 d, e, f, h): The student will demonstrate an understanding of the periodic table and the relationship between properties of elements and their electron structure.

Name: _____

Class Period: _____ Date: _____

ELABORATE PHASE

Periodic Trends

Circle the atom in each pair has the larger atomic radius?

1. Li or K
2. Ca or Ni
3. Ga or B
4. O or C
5. Cl or Br
6. Be or Ba
7. Si or S
8. Fe or Au

Circle the atom in each pair has the larger ionization energy?

1. Na or O
2. Be or Ba
3. Ar or F
4. Cu or Ra
5. I or Ne
6. K or V
7. Ca or Fr
8. W or Se

Circle the atom in each pair has the smaller electronegativity?

1. K or O
2. Ba or I
3. Al or I
4. K or Cs
5. Fe or I
6. F or S

Periodic Trends KEY

Circle the atom in each pair has the larger atomic radius?

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Circle the atom in each pair has the smaller electronegativity?

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8. Ba or I
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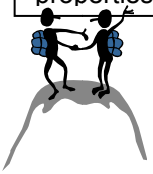

EVALUATE PHASE

Periodic Trends Quiz

1. On the periodic table below label the Alkali Metals, Alkaline Earth Metals, Halogens and Noble Gases.

The Periodic Table of the Elements

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2. Identify the number of protons, neutrons and electrons in the following:
   a. S^{2-}

   b. Magnesium-26

3. Explain the difference between an ion and an isotope.

4. Compare and Contrast the placement *and* properties of metals, non-metals and metalloids.

5. Identify the following for the two elements F and Fr:
   a. Highest electronegativity

   b. Lowest ionization energy

   c. Largest atomic radius