




Unit 1: Periodic Table

Metals	Metalloids	Nonmetals
		
Solid at room temperature	Solid at room temperature	Can be solid, gas or (2) liquids at room temperature
High melting point High boiling point High density	Melting and boiling point varies (but higher than nonmetals)	Low melting and boiling point Low density
Ductile/Malleable	Brittle	Brittle
Lustrous/shiny	Semi-lustrous	Dull
Good conductor of heat and electricity	Semiconductors; used in circuitry	Poor conductors

Metalloids

Nonmetals

Metals

Atomic Number: 6
Symbol: C
Name: Carbon
Average Atomic Mass: 12.011

metals (pink)
nonmetals (blue)
metalloids (green)

1 H Hydrogen 1.008
3 Li Lithium 6.94
11 Na Sodium 22.99
19 K Potassium 39.09
37 Rb Rubidium 85.47
55 Cs Cesium 132.91
87 Fr Francium [223]
2 He Helium 4.003
10 Ne Neon 20.18
18 Ar Argon 39.95
36 Kr Krypton 83.80
54 Xe Xenon 131.29
86 Rn Radon [222]
118 Og Oganesson [294]
5 B Boron 10.81
13 Al Aluminum 26.98
31 Ga Gallium 69.72
49 In Indium 114.82
81 Tl Thallium 204.38
113 Bi Bismuth [208]
15 N Nitrogen 14.01
17 Cl Chlorine 35.45
33 As Arsenic 74.92
51 Sb Antimony 121.76
83 Bi Bismuth [208]
115 Mc Moscovium [288]
7 C Carbon 12.01
9 F Fluorine 18.99
16 O Oxygen 16.00
32 Ge Germanium 72.64
50 Sn Tin 118.71
82 Pb Lead 207.2
114 Fl Flerovium [289]
116 Lv Livermorium [293]
118 Og Oganesson [294]
6 Be Beryllium 9.012
12 Mg Magnesium 24.305
20 Ca Calcium 40.078
38 Sr Strontium 87.62
56 Ba Barium 137.32
88 Ra Radium [226]
74 W Tungsten 183.84
76 Os Osmium 190.23
78 Pt Platinum 195.08
80 Hg Mercury 200.59
112 Cn Copernicium [285]
114 Fl Flerovium [289]
116 Lv Livermorium [293]
118 Og Oganesson [294]
21 Sc Scandium 44.956
23 V Vanadium 50.942
25 Cr Chromium 51.996
27 Co Cobalt 58.933
29 Cu Copper 63.546
31 Ga Gallium 69.723
33 As Arsenic 74.922
35 Br Bromine 79.904
37 Rb Rubidium 85.468
39 Y Yttrium 88.906
41 Nb Niobium 92.906
43 Tc Technetium [98]
45 Rh Rhodium 101.07
47 Ag Silver 107.868
49 In Indium 114.818
51 Sb Antimony 121.757
53 Te Tellurium 127.6
55 Cs Cesium 132.905
57-70 *
59-102 **
71 Lu Lutetium 174.967
73 Ta Tantalum 180.948
75 Re Rhenium 186.207
77 Ir Iridium 192.222
79 Au Gold 196.967
81 Tl Thallium 204.383
83 Bi Bismuth 208.980
85 At Astatine [210]
87 Fr Francium [223]
89-102 **
103 Lr Lawrencium [262]
105 Db Dubnium [268]
107 Bh Bohrium [270]
109 Mt Meitnerium [276]
111 Rg Roentgenium [281]
113 Nh Nihonium [286]
115 Mc Moscovium [288]
117 Ts Tennessine [293]
119 Og Oganesson [294]

*Lanthanide series
**Actinide series

Name: _____ Date: _____

The Periodic Table

Aim: How is the Periodic Table arranged and what patterns emerge among the elements?

Do Now: Please examine how the periodic table is arranged and with the person next to you, find as many patterns as you can.

Periodic Law: Elements arranged by increasing atomic number show repeating patterns to the number of valence electrons.

The image shows a standard periodic table. The elements are arranged in rows (periods) and columns (groups). The first two columns are labeled Group 1 and Group 2. The next ten columns are labeled Group 3 through Group 10. The next six columns are labeled Group 11 through Group 18. The last two columns are labeled Group 17 and Group 18. The elements are arranged in increasing order of atomic number. A callout box shows the lanthanide and actinide series, which are placed below the main table.

Organization of the Table

Groups 1-18: _____

Periods 1-7: _____

2	
9.01218	+2
Be	
4	
2-2	
24.305	+2
Mg	
12	
2-8-2	
40.08	+2
Ca	
20	
2-8-8-2	
87.62	+2
Sr	
38	
2-8-18-8-2	
137.33	+2
Ba	
56	
2-8-18-18-8-2	
226.025	+2
Ra	
88	
-18-32-18-8-2	

Groups

Elements in the same group have the:

- _____
- _____
- _____

Periods

39.0983	+1	40.08	+2	44.9559	+3	47.88	+2	50.9415	+2	51.996	+2	54.9380	+2	55.847	+2	58.9332	+2
K		Ca		Sc		Ti		V		Cr		Mn		Fe		Co	
19		20		21		22		23		24		25		26		27	
2-8-8-1		2-8-8-2		2-8-9-2		2-8-10-2		2-8-11-2		2-8-13-1		2-8-13-2		2-8-14-2		2-8-15-2	

Elements in the same period have the _____

- _____

Name: _____ Date: _____

The Periodic Table

Dmitri Mendeleev: Father of the Periodic Table



- Mendeleev organized the periodic table by listing elements in rows by _____.

- He also put them in groups _____.

Mendeleev's table was close to the table we use today.

<u>Mendeleev's Periodic Table</u>	<u>Modern Periodic Table</u>

The boron staircase is the dividing line for metals and nonmetals.

Metals, Nonmetals and Metalloids

- Metals _____

- _____ . IT IS ONLY IN GROUP 1 BECAUSE IT HAS 1 VALENCE ELECTRON.

1.00794	+1 -1
H	
1 1	

NONMETAL ELEMENT

- Nonmetals _____

- Metalloids _____

Metalloid elements: _____

Name: _____ Date: _____

The Periodic Table

Properties of Metals, Nonmetals and Metalloids

Aim: How do the properties of metals and nonmetals differ?

Atomic Number →																	
Electron Configuration →																	
are mass numbers of the most stable or common isotope.																	
Group																	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Uun	Uuu	Uub		Uuq				

Metal Properties

All metals are solids except for mercury which is a liquid.



- _____
- _____
- _____
- _____
- _____

Name: _____ Date: _____

The Periodic Table

Nonmetal Properties

The nonmetals exist as mostly gases, some solids and 1 liquid (Bromine)

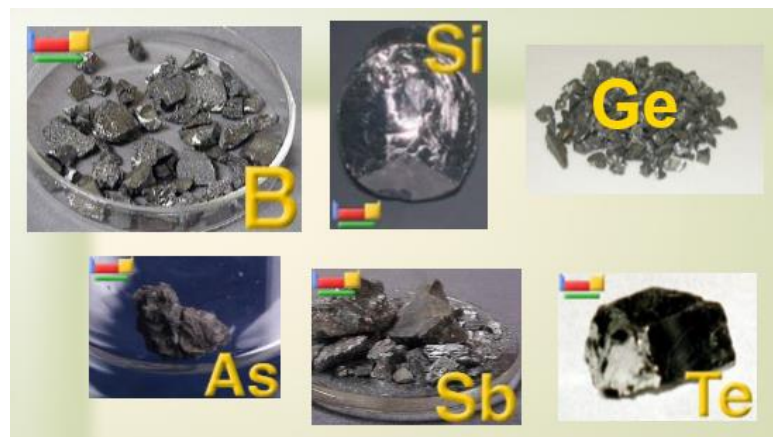


1. _____
2. _____
3. _____
4. _____
5. _____

Metalloid Properties

Metalloids can behave as a metal or a nonmetal, depending upon what type of element they are reacting with.

1. _____
2. _____
3. _____
4. _____
5. _____



Name: _____ Date: _____

The Periodic Table




Periodic Table Coloring Activity

Materials needed:

- Thin tip markers or pen in the following colors: black, red, blue and green.
 - We will use these markers to outline the boxes of the metals, nonmetals and metalloids.
 - We will also draw the dividing line between the metals and nonmetals called the boron staircase.
- Colored pencils or crayons with the following colors: red, orange, yellow, green, blue, purple, brown, black, gray, white and pink.
 - You will be lightly shading in the different groups of the periodic table and labeling the name of each group above its column.

You will follow the directions as provided in the power point presentation and we will complete our periodic tables together.

Metals, Nonmetals and Metalloids- Read the information below.

Metals	Nonmetals	Metalloids
		
<p>Metals are elements that are shiny and are good conductors of heat and electric current. They are <i>malleable</i>. (They can be hammered into thin sheets.) They are also <i>ductile</i>. (They can be drawn into thin wires.)</p>	<p>Nonmetals are elements that are dull (not shiny) and that are poor conductors of heat and electric current. Solids tend to be brittle and unmalleable. Few familiar objects are made of only nonmetals.</p>	<p>Metalloids are also called semi-conductors. They have properties of both metals and nonmetals. Some metalloids are shiny. Some are dull. Metalloids are somewhat malleable and ductile. Some metalloids conduct heat and electric current as well.</p>

You have been given a black and white periodic table that needs some color according to the directions we will follow together as a class. Your table can be found on the next page.

The Periodic Table

Color Key

Element Classes

Metal	Nonmetal	Metalloid
-------	----------	-----------

Metal			Nonmetal			Metalloid											
Phase at Room Temperature																	
<input type="checkbox"/> Solid			<input type="checkbox"/> Liquid			<input type="checkbox"/> Gas											
1 H Hydrogen 1.00794						2 He Helium 4.003											
3 Li Lithium 6.941	4 Be Beryllium 9.012182						9 F Fluorine 18.9984032	10 Ne Neon 20.1797									
11 Na Sodium 22.989770	12 Mg Magnesium 24.3050						16 S Sulfur 32.066	17 Cl Chlorine 35.4527									
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 69.723	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 (277)	114 (277)				

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)

Name: _____ Date: _____

The Periodic Table

Instructions for Coloring your Periodic Table

Metals vs. Nonmetals

- With a black marker add the “stair step” pattern that starts under Boron and extends down to Po and At.
 - *This is the division line between metals and nonmetals.*
- Take the red marker and outline the area where nonmetals are found (don’t forget about Hydrogen!)
 - Outline the color key box labeled “nonmetal” in the same red marker.
 - The nonmetals are to the right of the boron staircase.
 - Please refer to the power point slide to make sure you are outlining the correct elements as nonmetals.
- Take the blue marker and outline the metalloid elements: B, Si, Ge, As, Sb and Te.
 - Outline the color key box labeled “metalloid” in the same blue marker.
 - Refer to the power point slide to make sure you are outlining the correct elements as metalloids.
- Take the green marker and outline the remaining elements as metals.
 - Outline the color key box labeled “metal” in the same green marker
 - Refer to the power point slide to make sure you are outlining the correct elements as metals.

State of Matter at Room Temperature (solid, liquid, or gas)

- There are two elements that are liquid at room temperature: **Hg and Br**.
 - Draw a black water droplet in the upper right corner of the symbol.
 - See the powerpoint slide to be sure you draw the droplet correctly.
- 11 elements exist as gases at room temperature: **H, He, N, O, F, Ne, Cl, Ar, Kr, Xe, Rn**
 - Draw a red balloon in the upper right corner of the symbol.
- The remaining elements are solid at room temperature - leave those alone.

Groups (columns) & Periods (Rows)

Group 1	Period 1	1	Hydrogen
	Period 2	2	Lithium
	Period 3	3	Sodium
	Period 4	4	Potassium
	Period 5	5	Rubidium
	Period 6	6	Cesium
	Period 7	7	Francium

Elements are organized into families (or groups) based on the number of valence electrons they have, which determines their reactivity and other properties.



Source: http://images.slideplayer.com/18/5702901/slides/slide_1.jpg

Each row in the table is called a PERIOD. All the elements in a row have the same number of energy levels.

- You will shade each group of the periodic table according to the instructions in the power point slideshow.
- You will then label the number of each period (row).

Name: _____ Date: _____

The Periodic Table

Aim: How do we find the number of electron shells and valence electrons for an element?

1. In the periodic table, each row is called a _____.
2. The elements in each _____.
3. Each column in the periodic table is called a _____.
4. Each of the elements in the same _____.
5. The electrons in the outer shell _____.
6. The _____.

Symbol	Element Name	Period #	# of electron shells	Group #	Electron configuration	# valence electrons

Name: _____ Date: _____

The Periodic Table

Find that Element!

Symbol	Element	Group #	Period #/ # of electron shells	Electron configuration	# of Valence electrons	Metal, nonmetal or metalloid
Fr			7			
		2	3			
	Bromine				7	
Sb			5			
		3	4			
	Calcium	2				
O					6	
			3		4	
	Polonium					
		1	5			
Xe			5			
		2	6			
		15	4			
	Strontium					
	Iron					
Ne						
Rn						
	Potassium					
F						
S						

Name: _____ Date: _____

The Periodic Table

Lewis Structures (Electron Dot Diagrams)

Aim: What is a Lewis Structure and how do we draw them for different elements?

Objective: You should be able to draw a Lewis structure (Electron Dot Diagram) for an element using the number of valence electrons.

Lewis Structures

- Modeling technique to show how _____

- Dots are placed around an element's symbol to indicate the _____

In a Lewis Structure for an element dots are placed around an element's symbol.

The number of dots depends on the number of _____ the element has.

Ex:

Na

B

Cl

Drawing Lewis Structures: *Use the following steps to draw a dot diagram for Carbon.*

- Step 1:** _____ you are drawing the electron dot diagram for. This symbol represents the nucleus of the atom and each of the four sides represents an orbital.
- Step 2:** Locate the element you are drawing an electron dot diagram for on the periodic table. Find the number of _____. This will be the number of electrons you draw around your symbol.
- Step 3:** Place the first two electrons _____. This is referred to as the first PEL the electrons will fill.
- Step 4:** Place the remaining dots in a _____ around the other sides of the symbol one dot at a time until all the electrons are used up. There should be no more than 2 electrons on each side.

Name: _____ Date: _____

The Periodic Table

VALENCE ELECTRONS

- Valence electrons are the electrons in the outermost principal energy level.
- There can be no more than eight valence electrons.
- Determine the number of valence electrons in the atoms below and draw their electron dot diagram (Lewis structure)

1. Fluorine _____

11. Lithium _____

2. Phosphorus _____

12. Zinc _____

3. Calcium _____

13. Carbon _____

4. Nitrogen _____

14. Iodine _____

5. Iron _____

15. Oxygen _____

6. Argon _____

16. Barium _____

7. Potassium _____

17. Aluminum _____

8. Helium _____

18. Hydrogen _____

9. Magnesium _____

19. Xenon _____

10. Sulfur _____

20. Copper _____

Name: _____ Date: _____

The Periodic Table

Lewis Structure Review: What is a Lewis Structure?

A Lewis Structure is a simplified way to represent an atom and its outer electrons. It has two parts to it: the atomic symbol for the element and dots representing the electrons surrounding it.

Getting Started:

1. Find your _____ on the periodic table.
2. Determine the number of _____ electrons.
3. This is how many electrons you will _____.

Review:

- On the periodic table, each column is called a _____.
- Each element in a _____ has the same number of _____ in their outer orbital, or _____.
- The electrons in the outer shell are known as _____ electrons.

Drawing the Lewis Structure:




C

1. Write the _____ for the element.
2. How many _____ electrons?
3. Start on the _____ a draw the electrons clockwise around the element _____.
4. Check your work - did you drawing the correct number of electrons?

Lewis Structures

Name: _____

- Lewis structures, or dot diagrams, are a simplified way to show how the valence electrons are arranged in the outer shell. This is where the chemical reactions take place. Atoms will either share or give away these electrons to form bonds.
- Using your periodic table, determine the number of valence electrons for each element.
- Draw a dot to represent each valence electron around the element symbol.
- Follow the pattern below starting with position number 1.

H	<div style="display: flex; align-items: center; justify-content: center;"> <div style="border: 2px solid black; padding: 5px; margin-right: 10px;"> <div style="display: flex; justify-content: space-between; margin-bottom: 5px;">6 2</div> <div style="display: flex; align-items: center;"> <div style="text-align: center;">3 7</div> <div style="margin: 0 5px;">Xe</div> <div style="text-align: center;">1 5</div> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;">8 4</div> </div> <div style="margin-right: 10px;">Examples:</div> <div style="display: flex; align-items: center;"> <div style="text-align: center; margin-right: 10px;">  </div> <div style="text-align: center; margin-right: 10px;">  </div> <div style="text-align: center;">  </div> </div> </div>						He
Li	Be	B	C	N	O	F	Ne
Na	Mg	Al	Si	P	S	Cl	Ar
K	Ca						

Name: _____ Date: _____

The Periodic Table

Directions: Use your periodic table to complete the table below.

Element	Symbol	Group #	Valence Electron #	Lewis Structure
Arsenic				
Lead				
	Kr			
Strontium				
Bromine				
	Ge			
Gallium				
	Te			
Radon				
	Fr			

Periodic Table Families PPT Notes

Directions: Choose a color and color in the names of the families. Follow along with the power point and complete the chart. Find the families on you periodic table and color them with the matching color.

Color	Alkali Metals	Alkaline Earth Metals	Transition Metals	Boron Family	Carbon Family	Nitrogen Family	Oxygen Family	Halogen Family	Noble Gases	Rare Earth
Element Symbols	Group 1	Group 2	21 – 30, 39 – 48, 72 – 80, 104 - 112	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8	57 – 71, 89 - 103
Phase(s)	S L G	S L G	S L G	S L G	S L G	S L G	S L G	S L G	S L G	-----
# of Valence Electrons			1 or 2							-----
(M) Metal										57 – 71 Metals
(NM) Non-Metal										89 – 103 Radioactive
(MD) Metalloids										
Reactivity										57 – 71 Metals 89 – 103 Radioactive

Name: _____ Date: _____

The Periodic Table

Aim: What are the properties of the representative element groups in the periodic table?

Do Now: Why do elements in the same group have similar physical and chemical properties?

2	
9.01218	+2
Be	
4	
2-2	
24.305	+2
Mg	
12	
2-8-2	
40.08	+2
Ca	
20	
2-8-8-2	
87.62	+2
Sr	
38	
2-8-18-8-2	
137.33	+2
Ba	
56	
2-8-18-18-8-2	
226.025	+2
Ra	
88	
2-8-32-18-8-2	

Groups of the Periodic Table

- The representative elements are found in groups 1, 2 and 13-18.

- _____

- The transition metals are a shorter block of columns.

- These elements stand out from the other groups because they do not follow the same patterns and trends with their valence electrons and reactivities.

Properties of Transition Metals Groups 3-12

Electrons: _____

Ions: _____

Reactivity: _____

Name: _____ Date: _____

The Periodic Table

Group 1	
2	<div>6.941</div> <div>Li</div> <div>3</div> <div>2-1</div>
3	<div>22.98977</div> <div>Na</div> <div>11</div> <div>2-8-1</div>
4	<div>39.0983</div> <div>K</div> <div>19</div> <div>2-8-8-1</div>
5	<div>85.4678</div> <div>Rb</div> <div>37</div> <div>2-8-18-8-1</div>
6	<div>132.905</div> <div>Cs</div> <div>55</div> <div>2-8-18-18-8-1</div>
7	<div>(223)</div> <div>Fr</div> <div>87</div> <div>18-32-18-8-1</div>

Properties of the Representative Element Groups of the Periodic Table

Group 1: _____

Properties:

Electrons and Ions: _____

Ionization energy and Electronegativity: _____

Reactivity: _____

General Reactivity of Metals

Group 2: _____

Properties:

Electrons and Ions: _____

Ionization energy and Electronegativity: _____

Reactivity: _____

Group 2	
2	<div>9.01218</div> <div>Be</div> <div>4</div> <div>2-2</div>
3	<div>24.305</div> <div>Mg</div> <div>12</div> <div>2-8-2</div>
4	<div>40.08</div> <div>Ca</div> <div>20</div> <div>2-8-8-2</div>
5	<div>87.62</div> <div>Sr</div> <div>38</div> <div>2-8-18-8-2</div>
6	<div>137.33</div> <div>Ba</div> <div>56</div> <div>2-8-18-18-8-2</div>
7	<div>(226)</div> <div>Ra</div> <div>88</div> <div>18-32-18-8-2</div>

Name: _____ Date: _____

The Periodic Table

Group 17: _____

Properties:

Electrons and Ions: _____

Ionization energy and Electronegativity: _____

Reactivity: _____

Phases: _____

• _____

General Reactivity of Nonmetals

• _____

Group 18: _____

Properties:

Electrons and Ions: _____

Ionization energy and Electronegativity: _____

Reactivity: _____

Group

17

2	18.9984 9 2-7 F -1
3	35.453 17 2-8-7 Cl -1 +1 +5 +7
4	79.904 35 2-8-18-7 Br -1 +1 +5 +7
5	126.904 53 2-8-18-18-7 I -1 +1 +5 +7
6	(210) 85 -18-32-18-7 At



Group

18

1	4.00260 2 2 He 0
2	20.180 10 2-8 Ne 0
3	39.948 18 2-8-8 Ar 0
4	83.798 36 2-8-18-8 Kr 0 +2
5	131.29 54 2-8-18-18-8 Xe 0 +2 +4 +6
6	(222) 86 -18-32-18-8 Rn 0