

5.3 - The Periodic Table

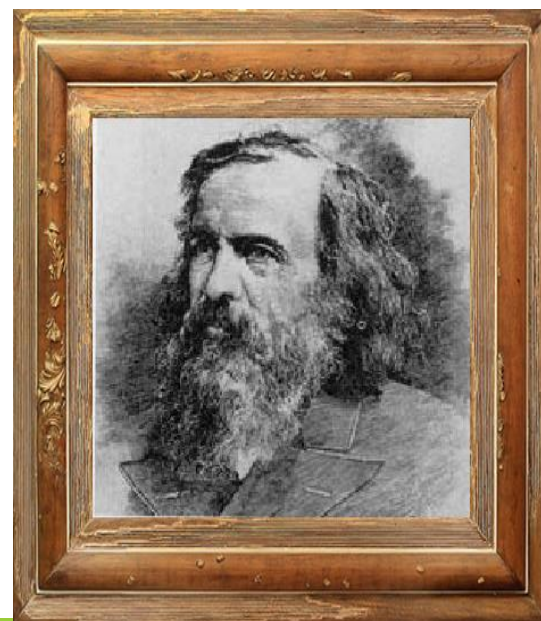
SNC1D

The First Periodic Table

- Dimitri Mendeleev, late 1860s
- organized elements based on increasing **atomic mass**
- grouped elements according to shared physical and chemical properties (especially **reactivity**).

Video:

<http://www.youtube.com/watch?v=nsbXp64YPRQ>



A modern reprinting of Mendeleev's original periodic table

Reihen	Gruppe I. — R'O	Gruppe II. — RO	Gruppe III. — R'O ³	Gruppe IV. RH ⁴ RO ²	Gruppe V. RH ⁵ R'O ⁵	Gruppe VI. RH ⁶ RO ³	Gruppe VII. RH R'O ⁷	Gruppe VIII. — RO ⁴
1	II=1							
2	Li=7	Be=9,4	B=11	C=12	N=14	O=16	F=19	
3	Na=23	Mg=24	Al=27,3	Si=28	P=31	S=32	Cl=35,5	
4	K=39	Ca=40	—=44	Ti=48	V=51	Cr=52	Mn=55	Fe=56, Co=59, Ni=59, Cu=63.
5	(Cu=63)	Zn=65	—=68	—=72	As=75	Se=78	Br=80	
6	Rb=85	Sr=87	?Yt=88	Zr=90	Nb=94	Mo=96	—=100	Ru=104, Rh=104, Pd=106, Ag=108.
7	(Ag=108)	Cd=112	In=113	Sn=118	Sb=122	Te=125	J=127	
8	Cs=133	Ba=137	?Di=138	?Ce=140	—	—	—	— — — —
9	(—)	—	—	—	—	—	—	
10	—	—	?Er=178	?La=180	Ta=182	W=184	—	Os=195, Ir=197, Pt=198, Au=199.
11	{Au=199}	Hg=200	Tl=204	Pb=207	Bi=208	—	—	
12	—	—	—	Th=231	—	U=240	—	— — — —

Mendeleev found that by arranging the elements in this way, they showed * (regular and repeating) patterns in their properties.

- His arrangement of elements became known as the **periodic table**.

The Modern Periodic Table

Elements are arranged by _____* , not atomic mass

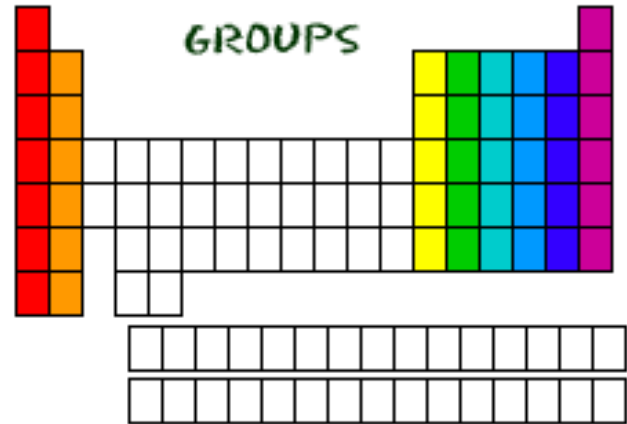
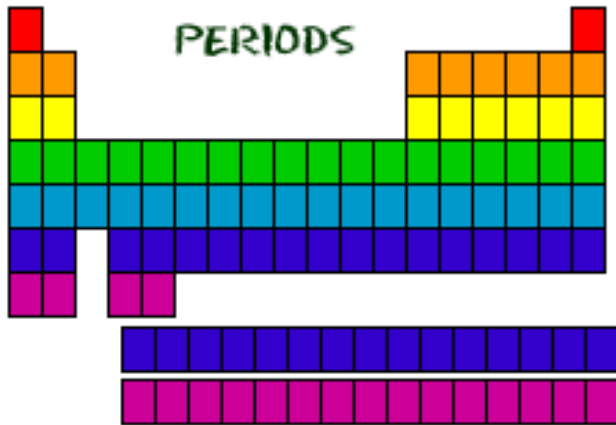
Group→	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
↓Period																		
1	1 H																	2 He
2	3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
3	11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
4	19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
5	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
6	55 Cs	56 Ba	*	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
7	87 Fr	88 Ra	**	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	113 Uut	114 Fl	115 Uup	116 Lv	117 Uus	118 Uuo

Modern Periodic Law

The elements, when arranged in order of **atomic number**, show periodic patterns in their properties.

Features of the Periodic Table

1. The elements are arranged into periods and groups.
 - a) **Period** – Rows in the periodic table (1-7)
 - b) **Group** – Columns in the periodic table (1-18)



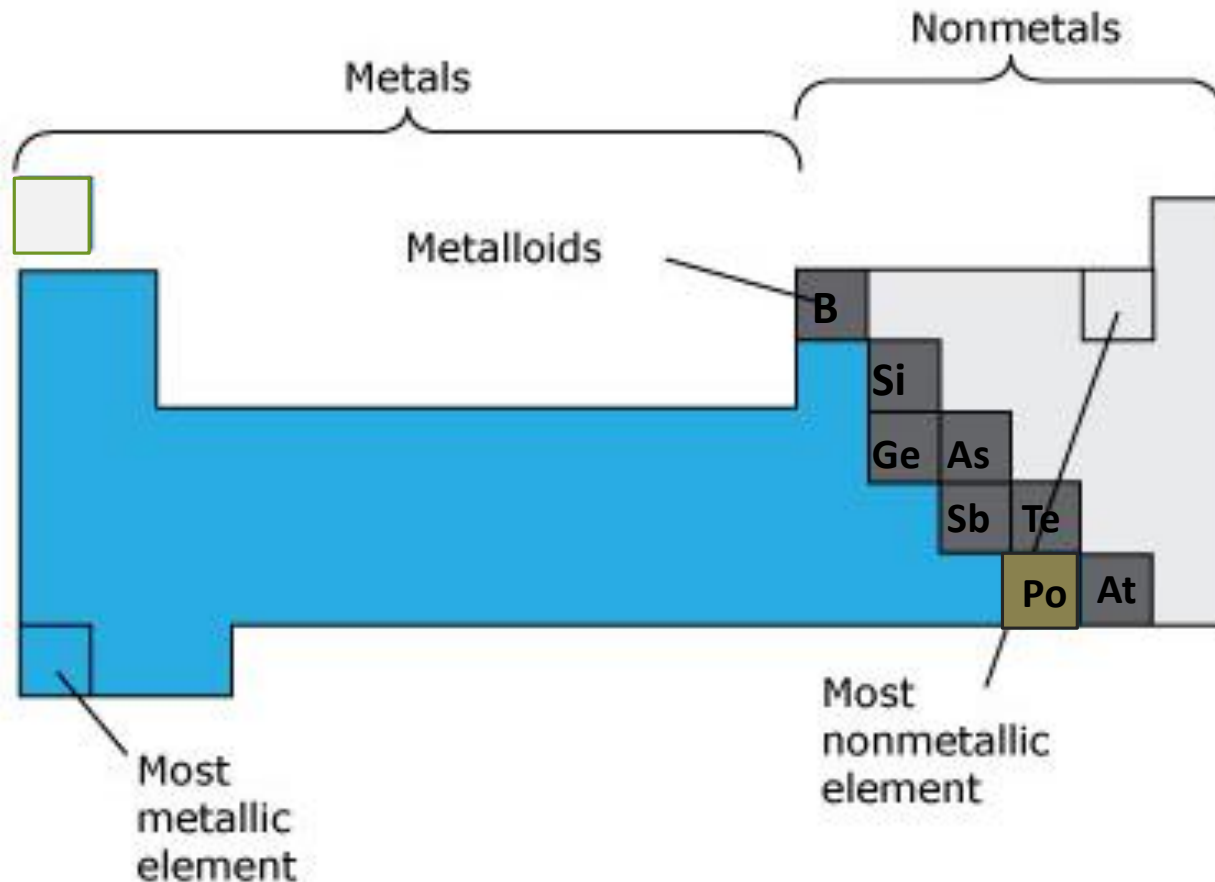
2. The first 92 elements are naturally-occurring. Elements with atomic number 93+ are **synthetic**.

Man-made

50 Sn Tin 118.710	51 Sb Antimony 121.780	52 Te Tellurium 127.60	53 I Iodine 126.90447	54 Xe Xenon 131.293	
81 Tl Thallium 204.3833	82 Pb Lead 207.2	83 Bi Bismuth 208.98040	84 Po Polonium (208.9824)	85 At Astatine (209.9871)	86 Rn Radon (222.0176)
113 Uut Ununtrium (284)	114 Uuq Ununquadium (289)	115 Uup Ununpentium (288)	116 Uuh Ununhexium (292)	117 Uus Ununseptium	118 Uuo Ununoctium (294)

3. Elements in the table are arranged according to their type:

- a) Metal elements are on the left
- b) Non-metals are on the right
- c) Metalloids are in between (the “staircase”)



Hydrogen is the exception:

- Non-metal element
- Located on left side
- Sometimes shown in Group 1, sometimes in Group 17

Why?

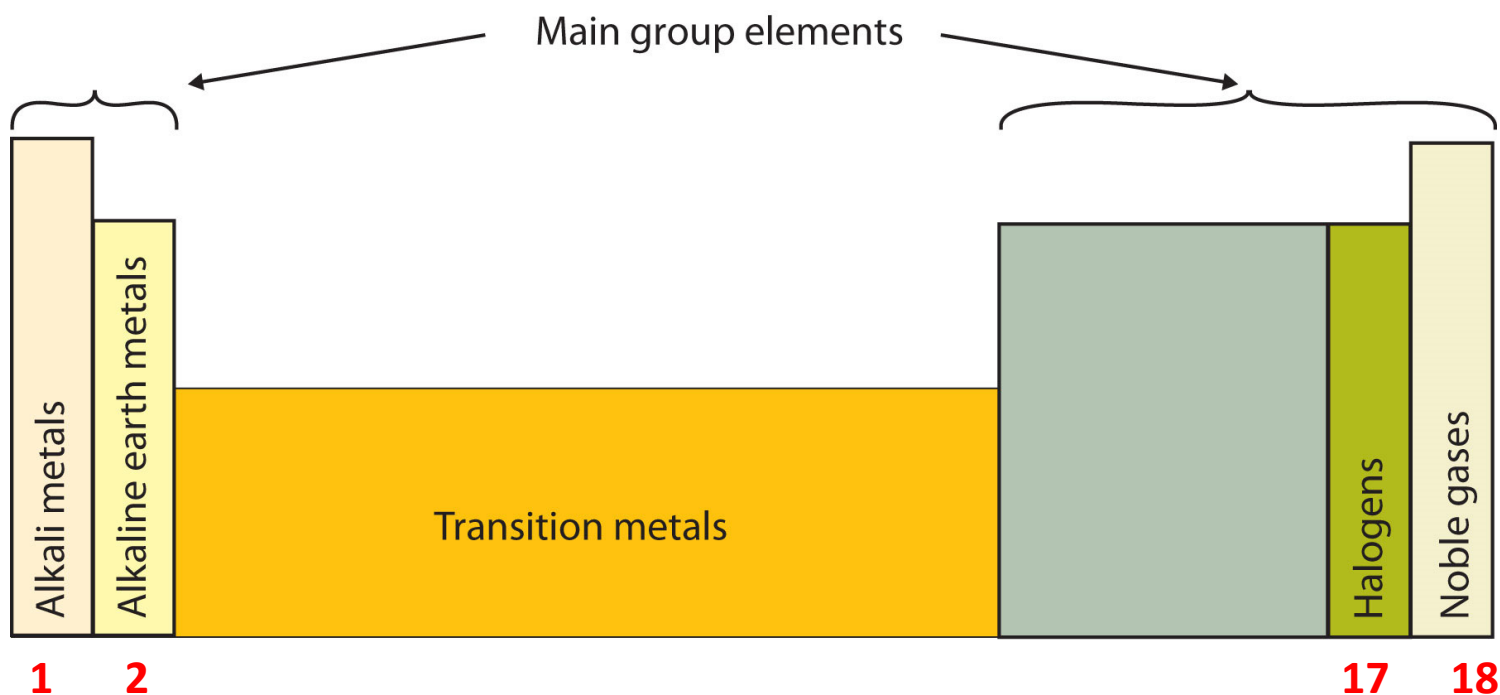
Hydrogen sometimes behaves like a metal element

The image shows a standard periodic table of elements. Two instances of Hydrogen (H) are circled in red. One is in the first column (Group 1) and the other is in the seventh column (Group 17). Red arrows point from the text above to these two positions. The periodic table includes elements from Hydrogen (H) to Oganesson (Og), with the lanthanide and actinide series shown below the main body.

H	He											H	He																
Li	Be											B	C	N	O	F	Ne												
Na	Mg											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												
Sc	Ba	Lu	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn												
Fr	Ra	Lr	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Uut	Uuq	Uup	Uuh	Uus	Uuo												
		La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb														
		Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No														

4. Elements are arranged in columns (called groups or **families**) based on shared physical and chemical properties.

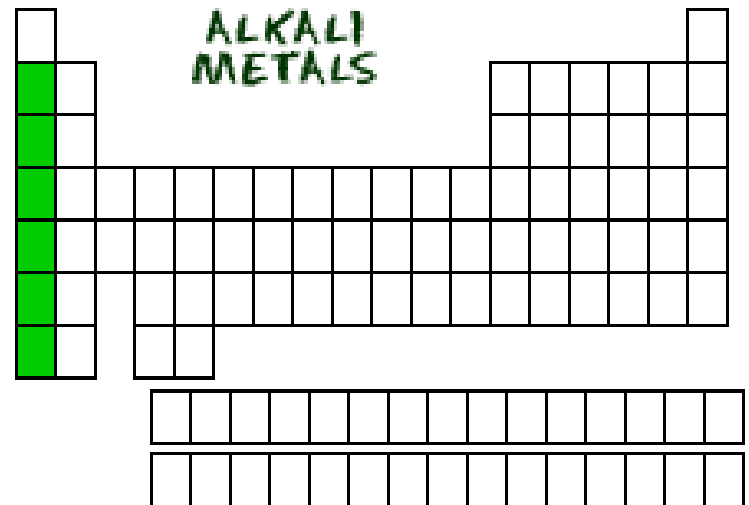
Four of these groups have names.



Use pg. 205 of your text to fill in the table of chemical families on your sheet

Group 1: Alkali Metals

- Li, Na, K, Rb, Cs, Fr
- Metals
- Extremely reactive (the most reactive metals)
 - Usually stored in kerosene or oil to prevent reaction with water or oxygen



<http://www.youtube.com/watch?v=QSZ-3wScePM>

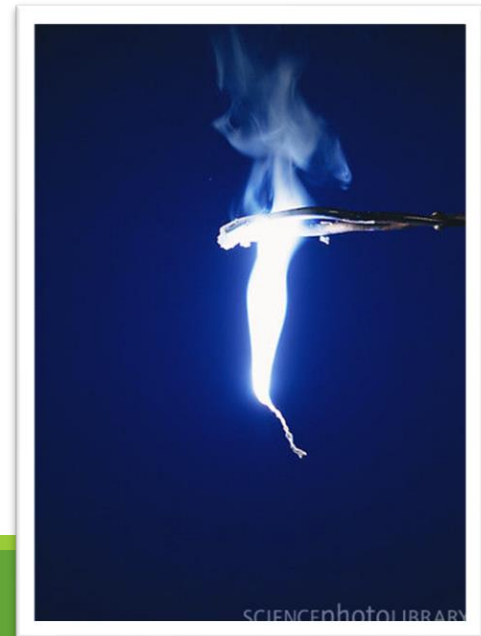
Group 2: Alkaline Earth Metals

ALKALINE
EARTH
METALS

A simplified periodic table diagram where the second column of elements is highlighted in green. The text "ALKALINE EARTH METALS" is written in green above the first three rows of the periodic table.

- Be, Mg, Ca, Sr, Ba, Ra
- Metals
- Reactive (but not as reactive as Group 1)

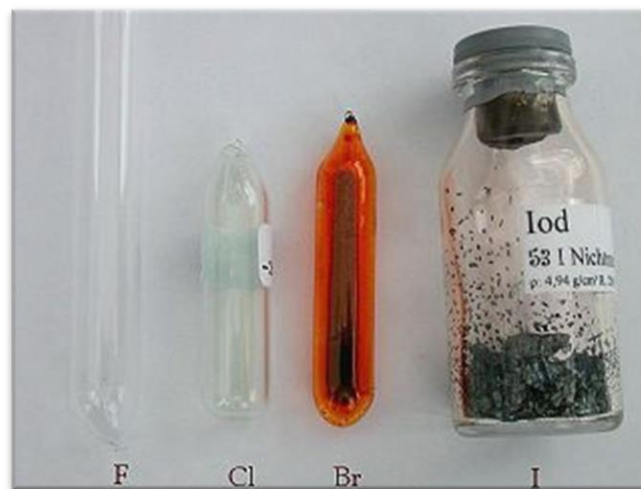
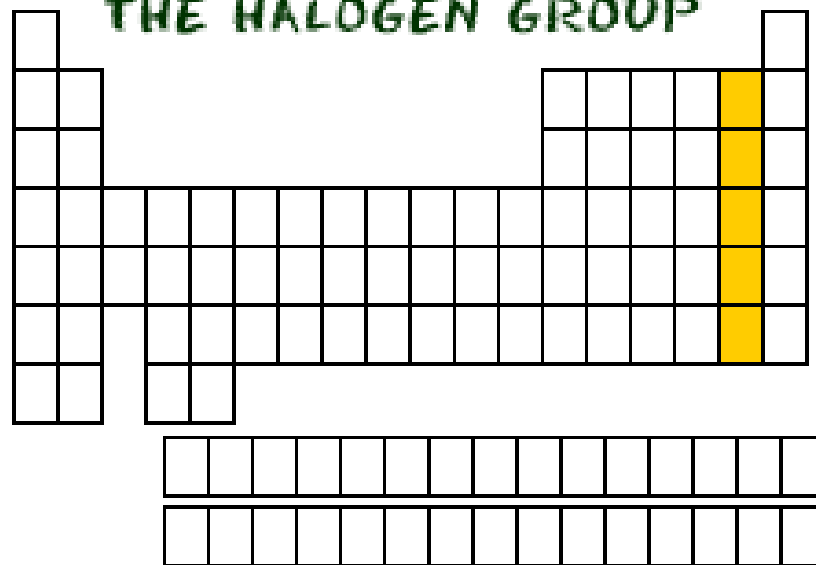
*Magnesium reacts with oxygen
when heated*



Group 17: Halogens

- F, Cl, Br, I, At
- Non-metals
- Extremely reactive (the most reactive non-metals)
- Extremely corrosive

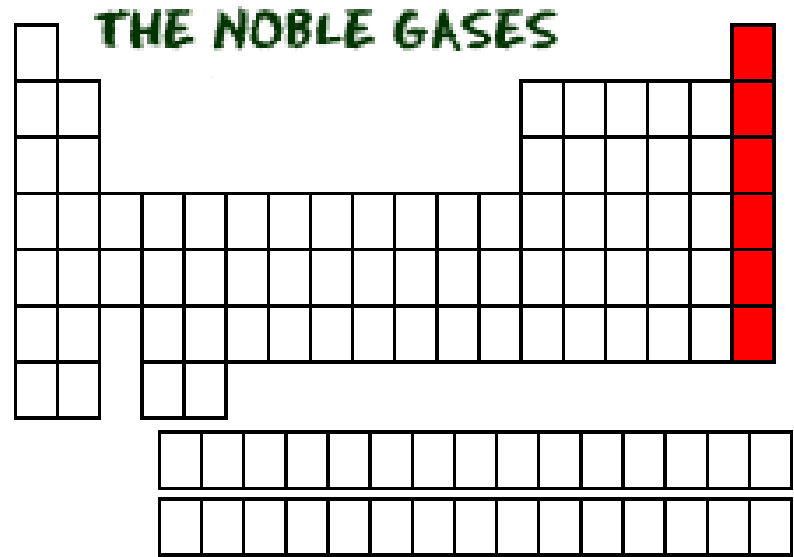
THE HALOGEN GROUP



http://www.youtube.com/watch?v=mY7o28-I_WU

Group 18: Noble Gases

- He, Ne, Ar, Kr, Xe, Rn
- Non-metals
- Odourless, colourless gases
- Extremely non-reactive



Summary

Mendeleev's first periodic table correctly grouped elements with similar properties, *but* he arranged the elements by atomic mass.

- Today's modern periodic table is listed in order of _____*.

Four of the groups of the periodic table have special names:

Group 1: Alkali metals

Group 17: Halogens

Group 2: Alkaline earth metals

Group 18: Noble gases

Homework

- Colour and label Periodic Table as instructed + complete back side of sheet (to be submitted)
- Read Ch 5.3 p. 194- 206
- Q # 3, 4, 5 -6 p. 206

