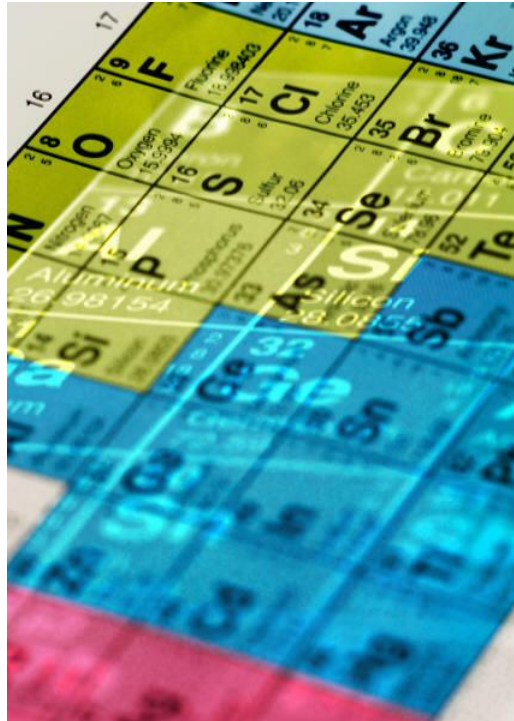


Unit 5: The Periodic Table

Section 1: Organizing the Elements



Early chemists used the properties of elements to sort them into groups, or triads.

1700:
13
elements



Chlorine
35.453 amu



Bromine
79.904 amu



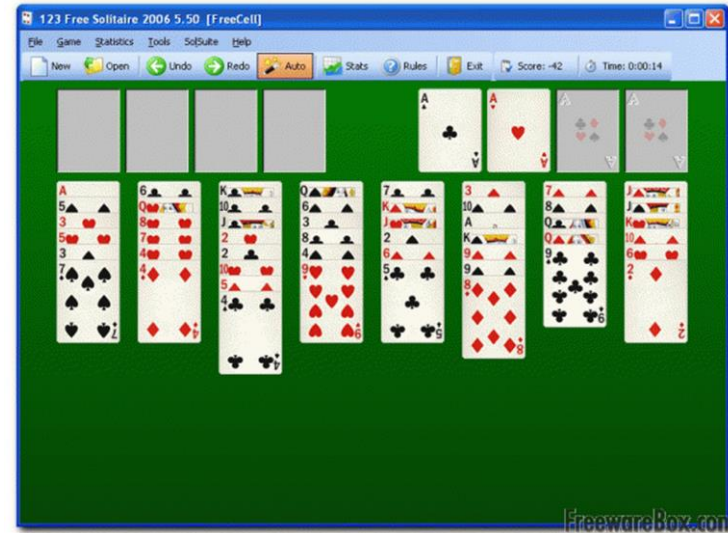
Iodine
126.90 amu

1864:
56
elements

•Newlands and Meyer arrange elements by atomic mass and notice similar properties.

1869:
63
elements

Dmitri Mendeleev got an idea from his favorite card game...



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56

elements

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elements

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Mendeleev arranged the **elements** by **increasing atomic mass** *and* by **similar properties.**

Mendeleev's table predicted the properties of undiscovered elements.

Group	I	II	III	IV	V	VI	VII	VIII
Period 1	H=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
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
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
11	Au=199	Hg=200	Tl=204	Pb=207	Bi=208			
12				Th=231		U=240		

Elements later discovered:

Gallium, Germanium, and Scandium

Properties of Gallium		
	Mendeleev's predictions	Actual Properties
Atomic mass	68	69.7
Density	6.0 g/cm ³	5.9 g/cm ³
Appearance	soft gray metal	soft gray metal
Melting point	Low melting point	29.8°C

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1913:

atomic

numbers

Moseley arranges elements by the newly discovered "atomic number."

- Period: a row across the table.

1A	1	each <u>period</u> is an <u>energy level</u>																8A	
	1	H																	2
	2	3	4											5	6	7	8	9	10
		Li	Be											B	C	N	O	F	Ne
	3	11	12											13	14	15	16	17	18
		Na	Mg											Al	Si	P	S	Cl	Ar
	4	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
		K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
	5	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
		Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
	6	55	56	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86
		Cs	Ba	Lu	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
	7	87	88	103	104	105	106	107	108	109	110	111	112			114			
		Fr	Ra	Lr	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Uub			Uuq			

57	58	59	60	61	62	63	64	65	66	67	68	69	70
La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb
89	90	91	92	93	94	95	96	97	98	99	100	101	102
Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No

- Group : a column down the table.

1A	same group, similar prop's																8A	
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	8B			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	71 Lu	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	103 Lr	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Uub			114 Uuq			

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
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

3 classes of elements are:

Metals

Metalloids

Nonmetals

(most elements)

Metallic



less Metallic

Metals																		Metalloids			Nonmetals		
1 IA 1A H	2 IIA 2A Be																18 VIIB 8A He						
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne						
11 Na	12 Mg	3 IIIA 3B	4 IVA 4B	5 VA 5B	6 VIA 6B	7 VIIA 7B	8 VIII 8B			11 IB 1B	12 IIB 2B	13 Al	14 Si	15 P	16 S	17 Cl	18 Ar						
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr						
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe						
55 Cs	56 Ba	71 Lu	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						
87 Fr	88 Ra	103 Lr	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Uub		114 Uuq										
		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								
		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								



Metals

luster (shiny)
malleable (sheets)
ductile (wires)
good conductors
(heat/electricity)

Nonmetals

most gases
brittle solids

poor
conductors

Metalloids

dull/shiny
brittle

semi-
conductors

