Class Announcements

2.4 What Are Atoms Made Of? – *The Three Subatomic Particles*

Name	Symbol	Mass (g)	Charge	Mass*1 (amu)*2
Proton	$^{1}_{1}p$	1.673×10^{-24}	+1	1
Neutron	$^{1}_{0}n$	1.675×10^{-24}	0	1
Electron	$^{0}_{-1}e$	9.109×10^{-28}	-1	0.0005

a) Chemists tend to ignore the mass of the electron

b) # protons ... the atom determinator ... #p = Atomic Number (Z)

c) # neutrons ... the other mass contributor ... #n + #p = Mass Number (A)

d) # electrons ... determines the charge on the atom.

$^{A}_{Z}X$

X = symbol

A = Mass Number

Z = atomic number

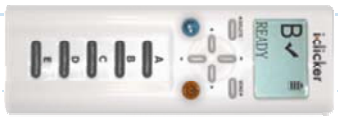
*1: Rounded to 1 significant figure

*2: 1 amu = 1.6605×10^{-24} g

2.4 What Are Atoms Made Of? – *The Three Subatomic Particles*

2.4 Example_1

Which if any of the following species has the same number of Neutrons as it does Electrons?



a) $^{47}_{24}Cr$ b) $^{24}Mg^{2+}$ c) $^{59}_{27}Co^{2+}$
d) $^{35}Cl^{-}$ e) $^{125}_{50}Sn$

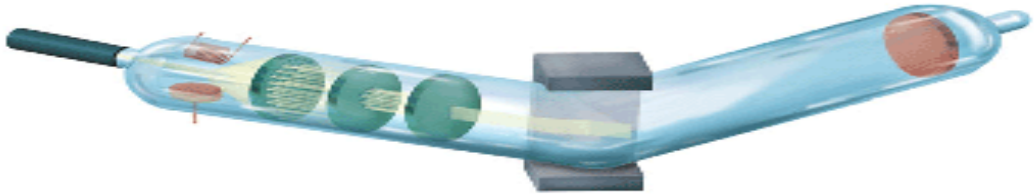
	# Protons	# Neutrons	# Electrons	
$^{47}_{24}Cr$	24	23	24	
$^{24}Mg^{2+}$	12	12	10	
$^{59}_{27}Co^{2+}$	27	32	25	
$^{35}Cl^{-}$	17	18	18	✓
$^{125}_{50}Sn$	50	75	50	

2.4 What Are Atoms Made Of? – *Isotopes*

Isotope : Atoms with the same number of protons but different number of neutrons

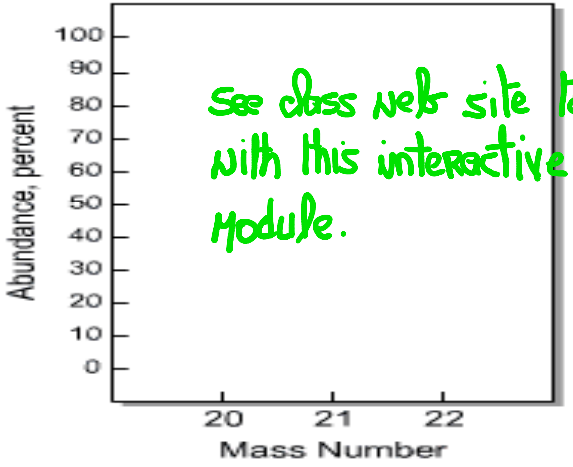
	#p	#n	#e
^{12}C	6	6	6
^{14}C	6	8	6

Active Figure 2.04: Mass Spectrometer



Gas
- F
- Ne
- Na

Magnet Strength



See class web site to play with this interactive module.

2.4 What Are Atoms Made Of? — *Atomic Weight*

2.4 Example_2

Chlorine has two naturally occurring isotopes:

^{35}Cl, 75.77% Abundant, Exact Mass 34.96885 amu

^{37}Cl, 24.23% Abundant, Exact Mass 36.96590 amu

What is the Atomic Weight of Chlorine?

Atomic Weight : simply the weighted average of the naturally occurring isotopes

$$0.7577(34.96885) + 0.2433(36.96590)$$

$$= 35.45271 \text{ amu}$$

2.4 Example_3

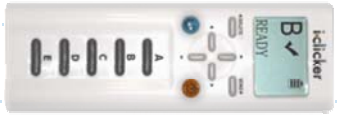
Neon has 3 naturally occurring isotopes:

^{20}Ne, 90.92% Abundant, Exact Mass 19.9989 amu

^{21}Ne, 0.26% Abundant, Exact Mass 20.9975 amu

^{22}Ne, 8.82% Abundant, Exact Mass 21.9979 amu

What is the Atomic Weight of Neon?



The 4th decimal place in the answer is

a) 5 b) 6 c) 7 d) 8 e) 9

2.4 Example_3

Neon has 3 naturally occurring isotopes:

^{20}Ne, 90.92% Abundant, Exact Mass 19.9989 amu
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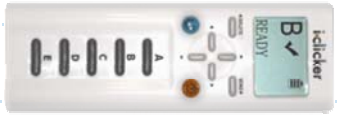
What is the Atomic Weight of Neon?



The 4th decimal place in the answer is
a) 5 b) 6 c) 7 d) 8 e) 9

$0.9092(19.9989) + 0.0026(20.9975) + 0.0882(21.9979) = 20.1778$ amu

Periodic Table Structure

Groups

Main Group Elements

Transition Group Elements

Periods

Lanthanides and Actinides

Metals

Nonmetals

Metalloids

Alkali Metals

Alkaline Earth Metals

Halogens

Noble Gases

Metals – like to lose electrons

Metalloids

Nonmetals – like to gain electrons

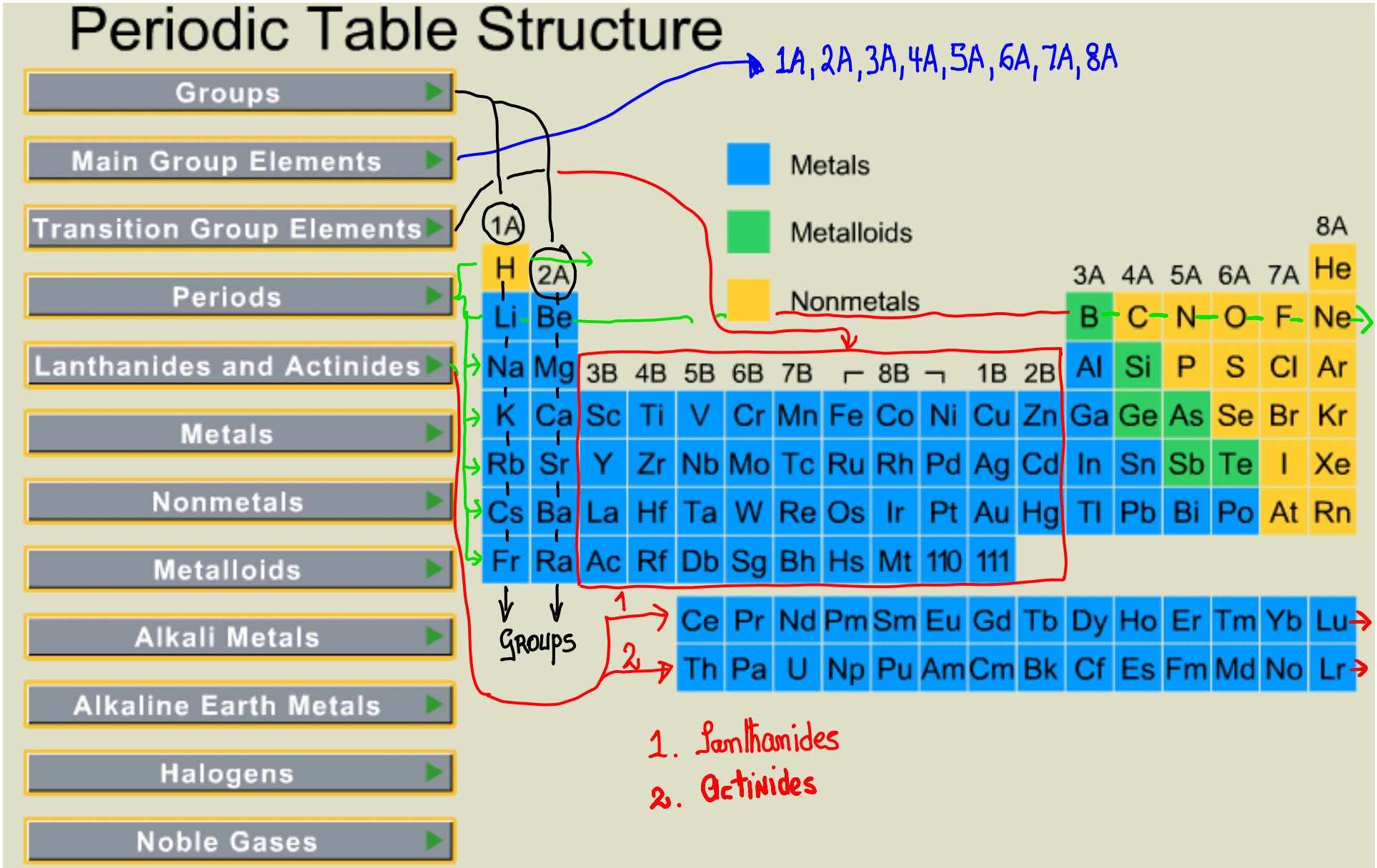
1A	2A	3B	4B	5B	6B	7B		8B		1B	2B	3A	4A	5A	6A	7A	8A
H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	110	111							

Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

Go to class web site to play with this interactive module.

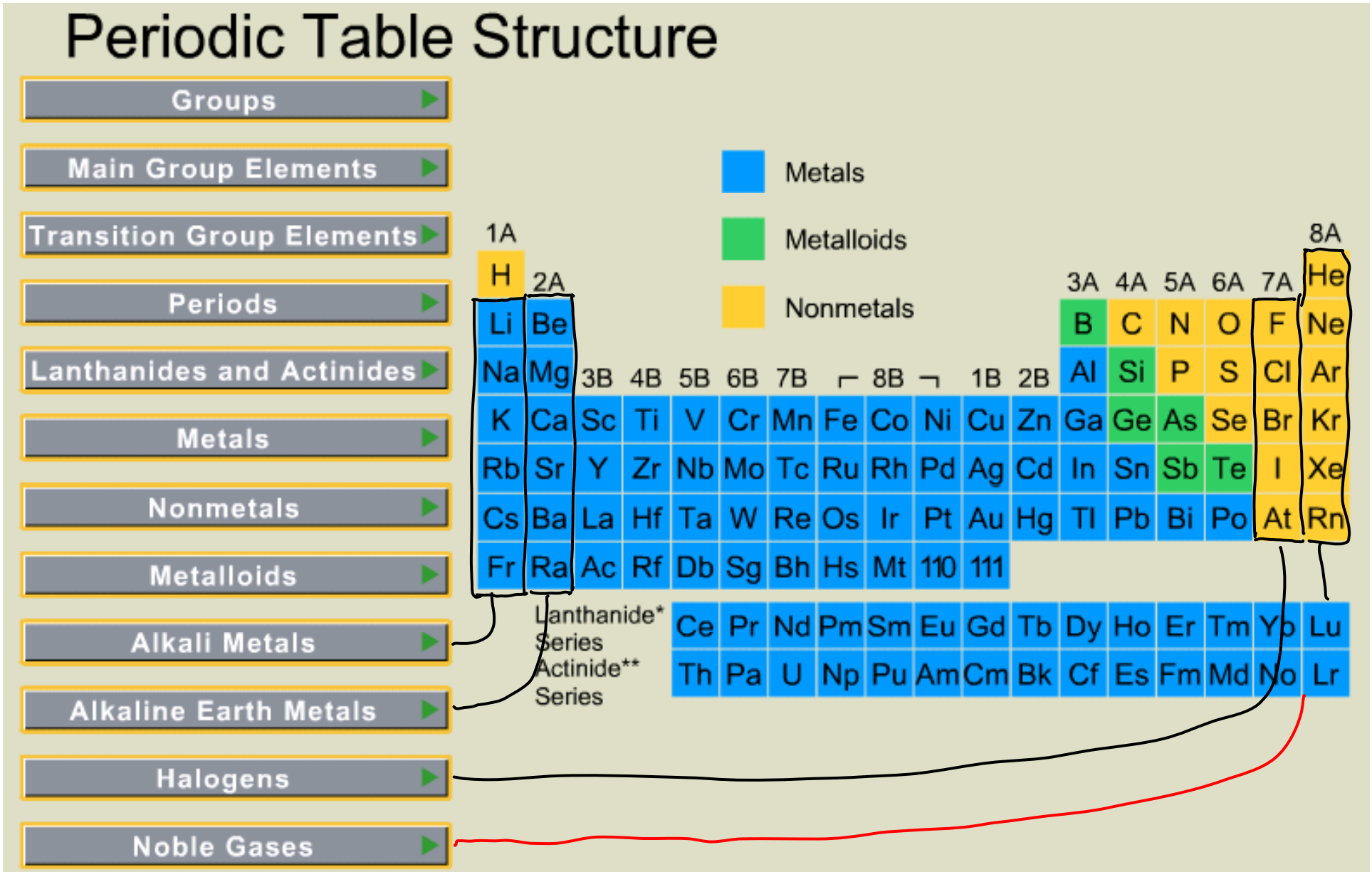
2.5 What Is the Periodic Table

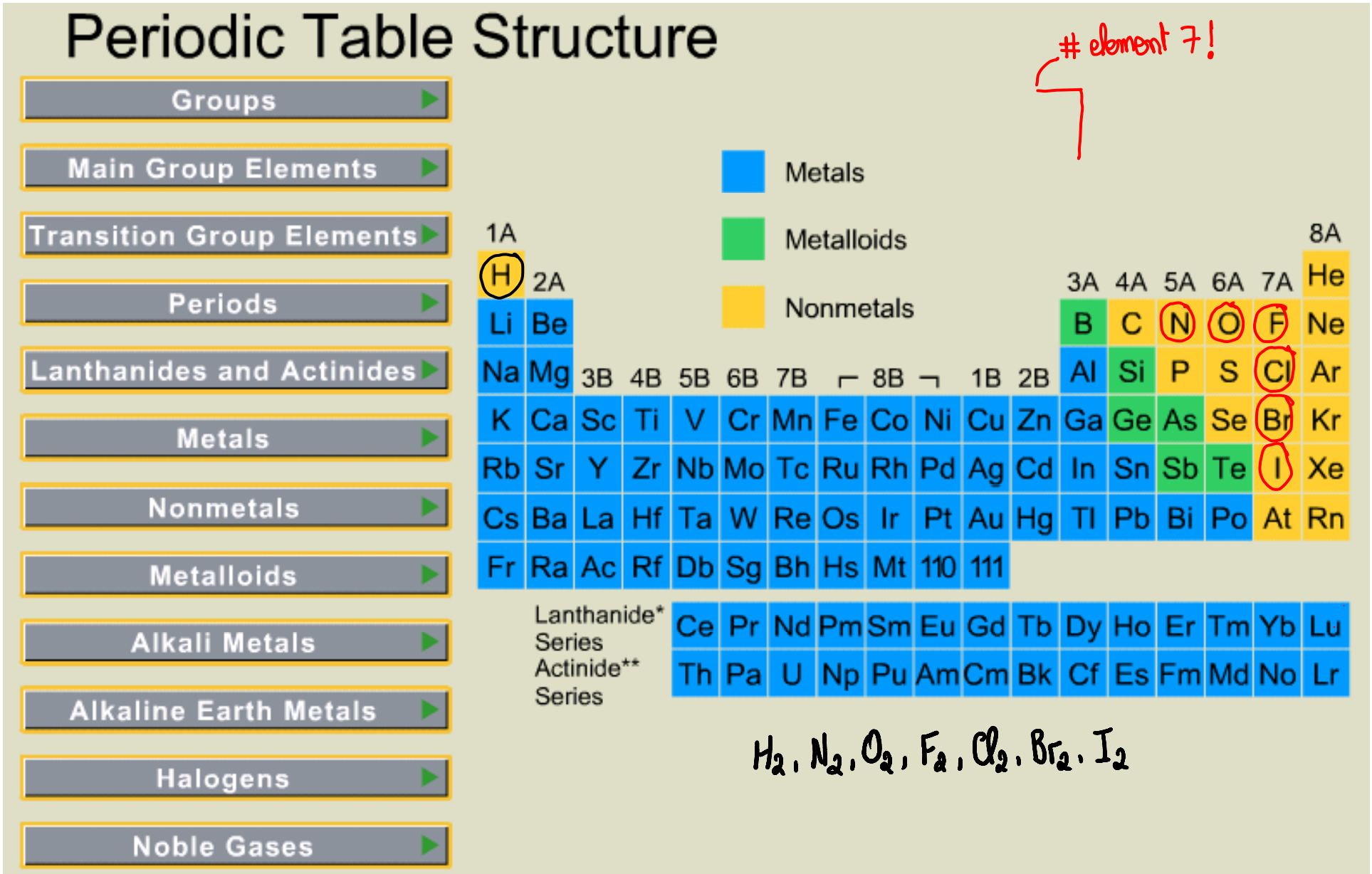
Groups – Periods – Main Group – Transition Metal – Lanthanide – Actinide



2.5 What Is the Periodic Table

Alkali Metals – Alkaline Earth Metals – Halogens – Noble Gases




Periodic Table Structure
Groups
Main Group Elements
Transition Group Elements
Periods
Lanthanides and Actinides
Metals
Nonmetals
Metalloids
Alkali Metals
Alkaline Earth Metals
Halogens
Noble Gases
Metals
Metalloids
Nonmetals
element 7!
1A 2A 3A 4A 5A 6A 7A 8A
H He
Li Be B C N O F Ne
Na Mg 3B 4B 5B 6B 7B 8B 1B 2B 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 110 111
Lanthanide* Series
Actinide** Series
Ce Pr Nd Pm Sm Eu Gd Tb Dy Ho Er Tm Yb Lu
Th Pa U Np Pu Am Cm Bk Cf Es Fm Md No Lr
H2, N2, O2, F2, Cl2, Br2, I2