Bellringer: 4/8/2019

Number you paper 1-5 and see if you can determine what these magnified photos are!

1. 

2. 

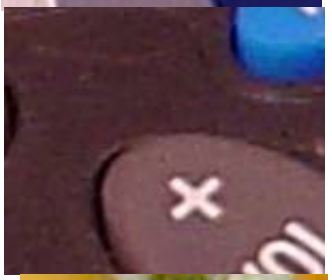
3. 

4. 

5. 

The Answers:



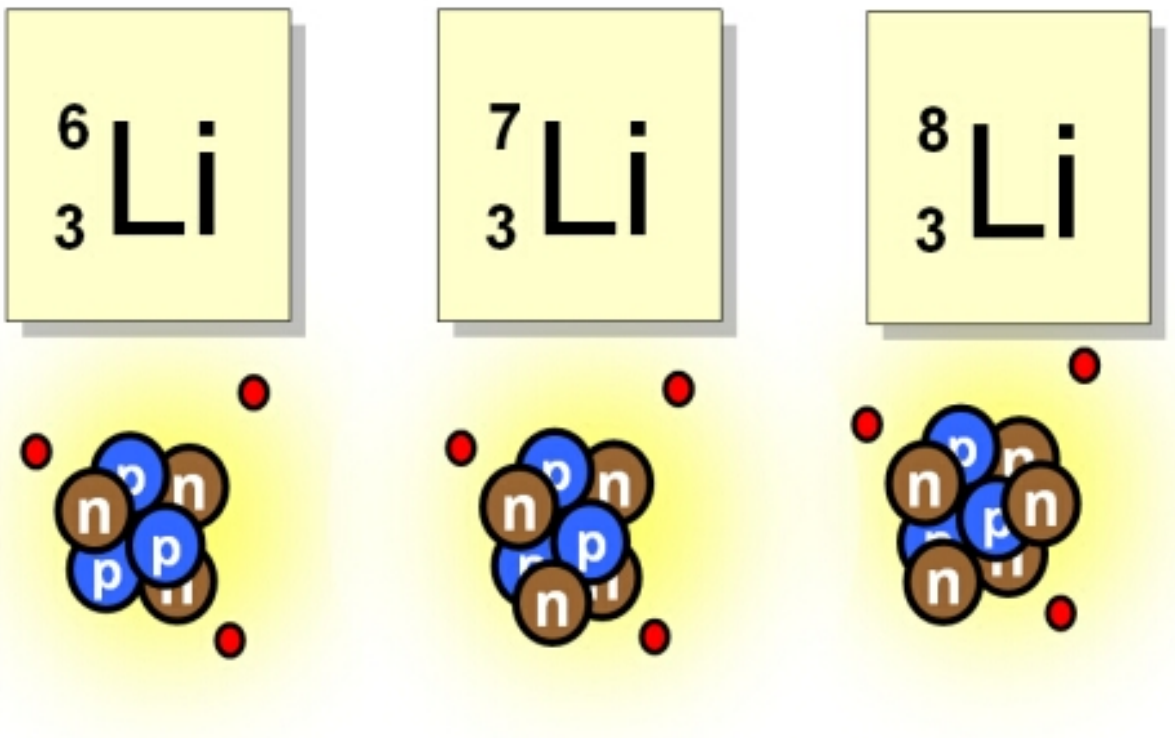








The Structure of the Atom and the Periodic Table

Chapters 4, 5, 10



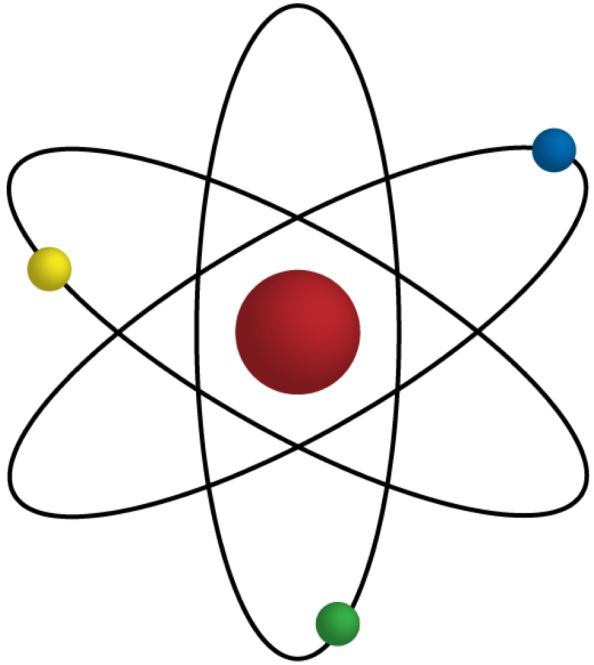
Updates & Reminders

- **Mon**: Start new unit: The Atom
- **Tues**: Notes: Isotopes and Bohr Model
- **Wed**: Notes: Isotopes & Bohr Model
  - **All work is due**
- **Thurs**: Quiz
- **Fri**: notes & Mid Term Review

- **Mon**: Mid Term Review
- **Tues**: **Mid Term: 50 mult choice question**
- **Wed & Thurs**: Lab Activities, Make up Mid Term

Atomic Theories- Modern

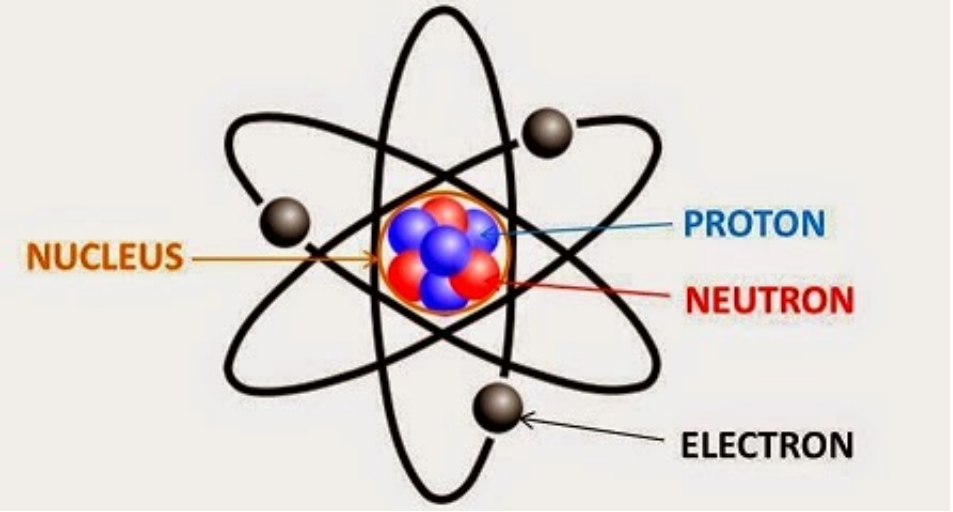
- Atom
  - The **smallest particle of an element that retains the properties** of the element



end

Structure of the Atom

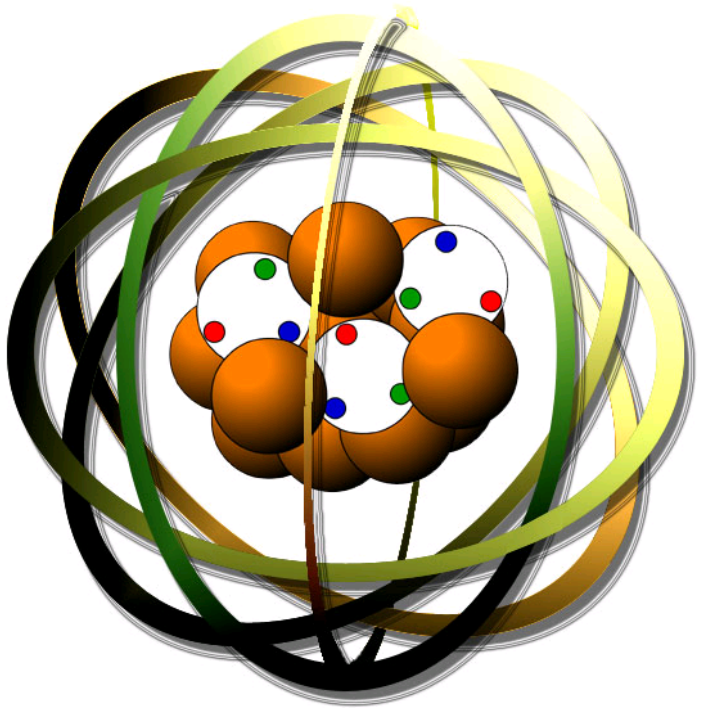
- Atoms are made up of 3 particles
  - Protons, Electrons, and Neutrons
  - Called **subatomic particles**
- You must identify them by mass, charge, and location



end

Structure of the Atom

- The Nucleus
  - Small, dense region in the center of an atom
  - Contains:
    - Protons and Neutrons
    - All of an atom's positive charge
    - Almost all of an atom's mass.



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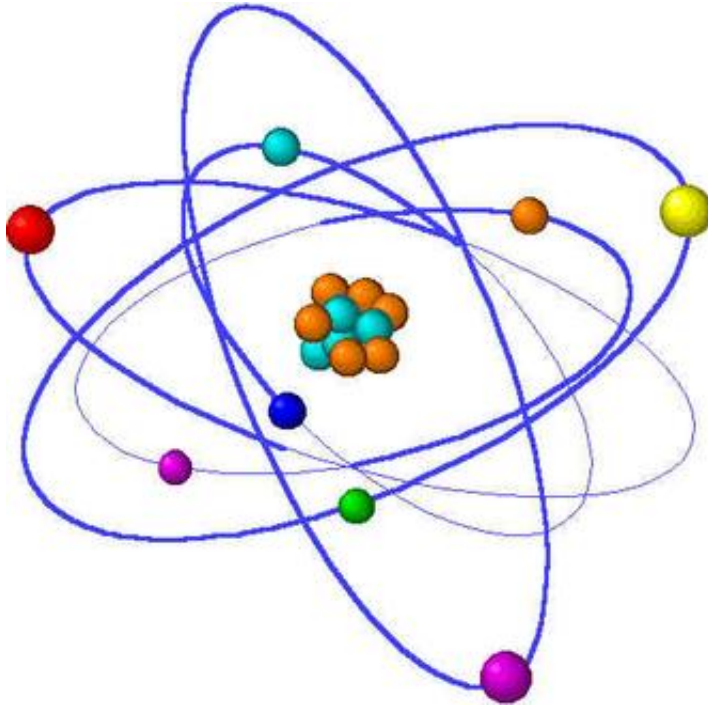
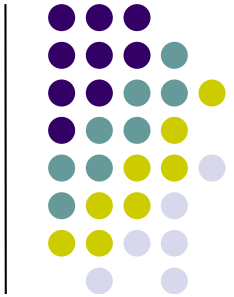
Structure of the Atom



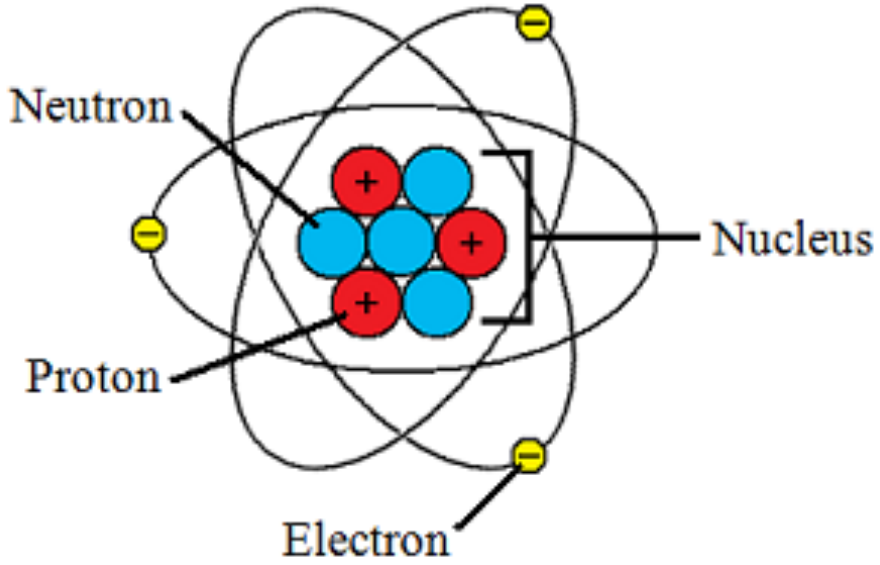
- Proton (p^+)
  - Charge of +1
  - Found inside the nucleus
  - Mass of 1
  - The number of protons defines an element
    - **Change the # of protons and you get a different element**

end

Structure of the Atom



- Neutron (n^0)
  - No charge
  - Found inside the nucleus
  - Mass of 1 (same as a proton)
  - The number of neutrons controls the isotope
    - **Change the # of neutrons and you get different isotopes**



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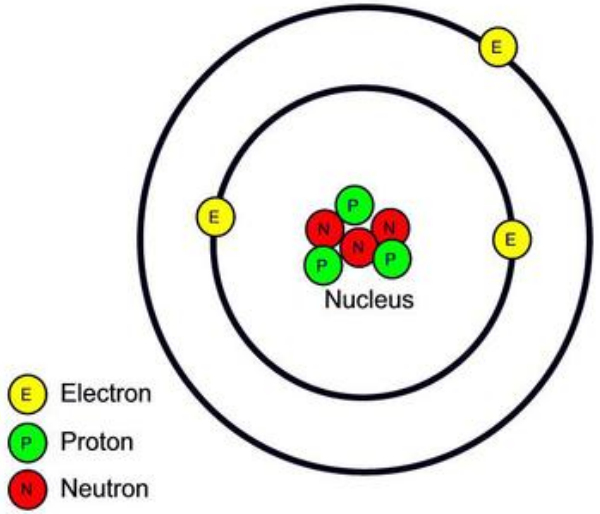
Structure of the Atom



- Electron (e^-)
  - Charge of -1
  - Found outside the nucleus
  - Almost no mass (1/1840 = 0.000543)
  - The number of electrons controls the electrical charge
    - **Change the # of electrons and you get a charge (an ion)**

end

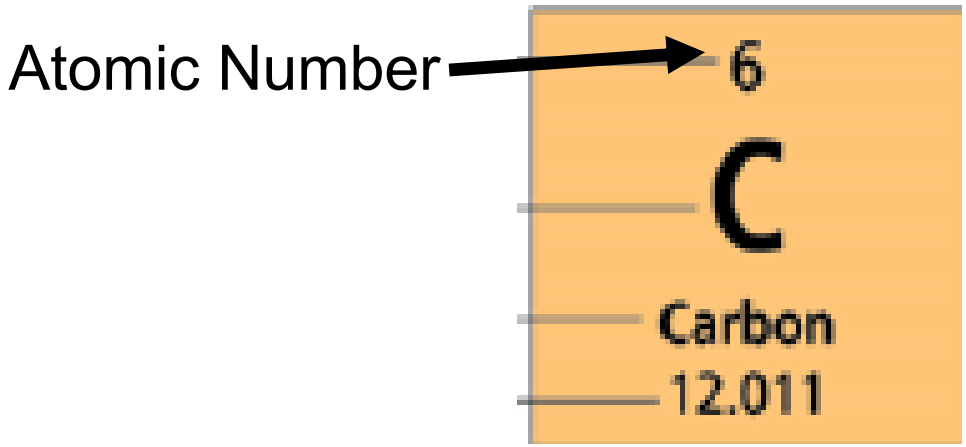
Review

Particle	Symbol	Location	Relative Mass	Relative Electrical Charge	Change in Number
Electron	e^-	Outside the Nucleus	1/1840 Basically = 0	-1	Ions
Proton	p^+	Nucleus	1	+1	Elements
Neutron	n^0	Nucleus	1	0	Isotopes

end

Structure of the Atom

- Atomic Number
  - The **number of protons**
    - This defines each element
  - **Equals the number of electrons** in a neutral atom



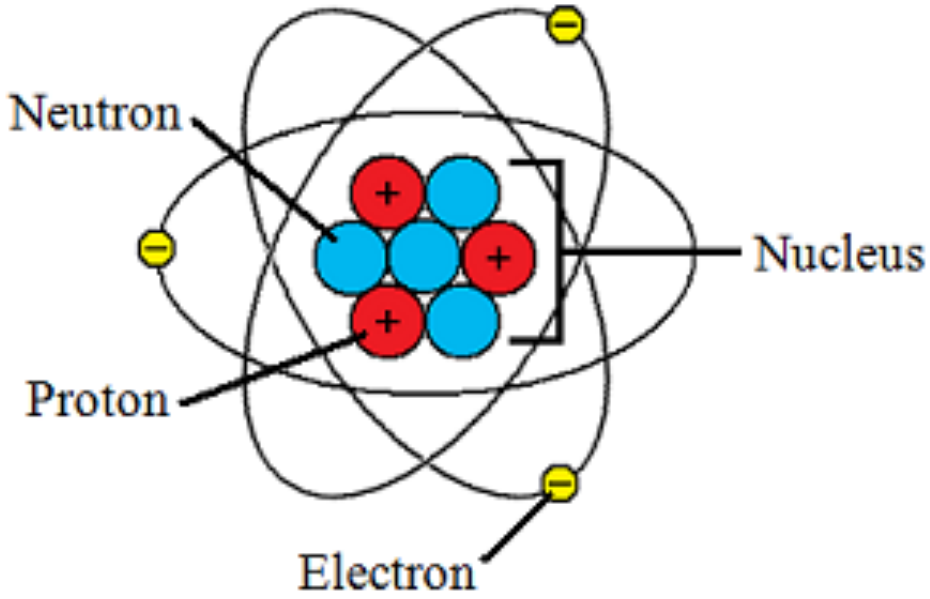
end

Structure of the Atom

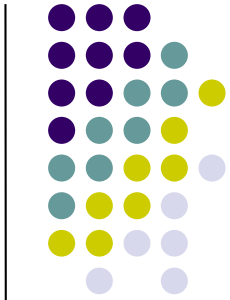
- Mass Number
  - The **relative mass** of each atom

Mass # = (Atomic #) + (# of neutrons)

# of protons



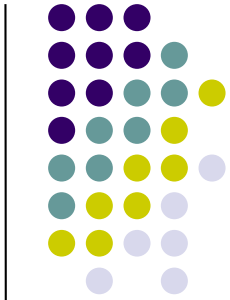
Bellringer: 4/9/2019



Use your Periodic Table & Notes to fill in the table:

Element	Atomic Number	# of protons
	12	
Barium		
		35
Lithium		
	7	
		10

Updates & Reminders



Tues: Notes: Isotopes and Bohr Model

Wed: Notes: Isotopes & Bohr Model

All work & Missing work is due

Thurs: Quiz

Fri: notes & Mid Term Review

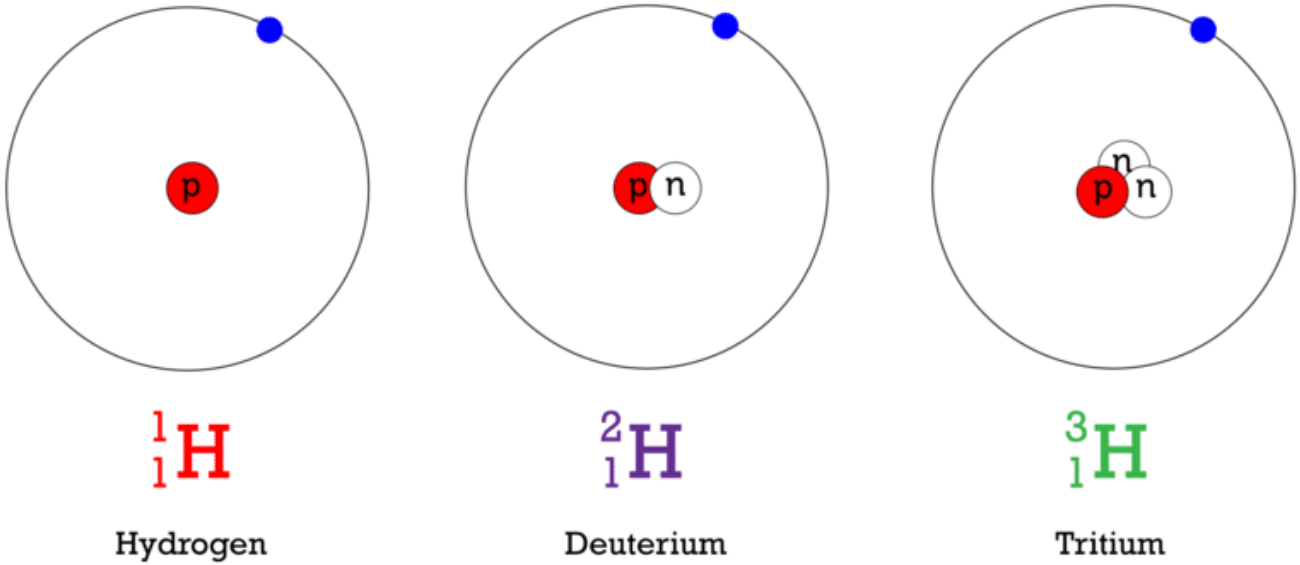
Mon: Mid Term Review

Tues: **Mid Term: 50 mult choice question**

Wed & Thurs: Lab Activities, Make up Mid Term

Table Talk

Use the image below to answer the following questions:



1. Identify 3 ways the images are similar
2. Identify 3 ways the images are different
3. If I were to tell you that these atoms are isotopes, use the image to come up with a definition for the word **isotope**.

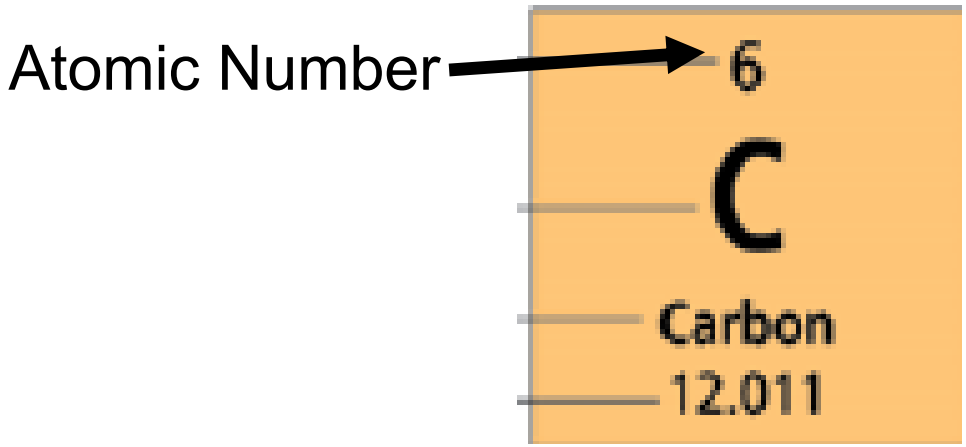
Review: Subatomic Particles

Particle	Symbol	Location	Relative Mass	Relative Electrical Charge	Change in Number
Electron	e^-	Outside the Nucleus	1/1840 Basically = 0	-1	Ions
Proton	p^+	Nucleus	1	+1	Elements
Neutron	n^0	Nucleus	1	0	Isotopes

end

Review: Structure of the Atom

- Atomic Number
  - The **number of protons**
    - This defines each element
  - **Equals the number of electrons** in a neutral atom



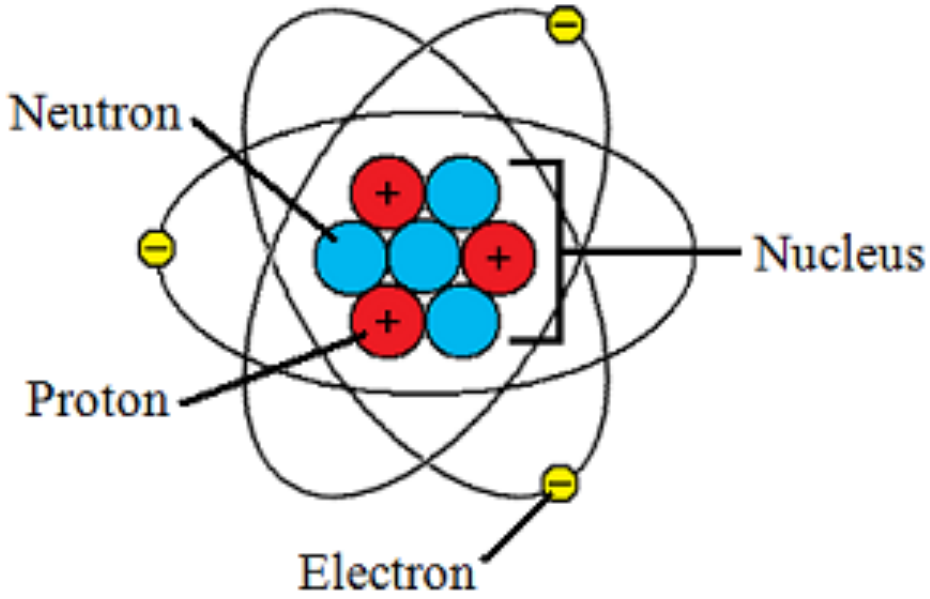
end

Review: Structure of the Atom

- Mass Number
  - The **relative mass** of each atom

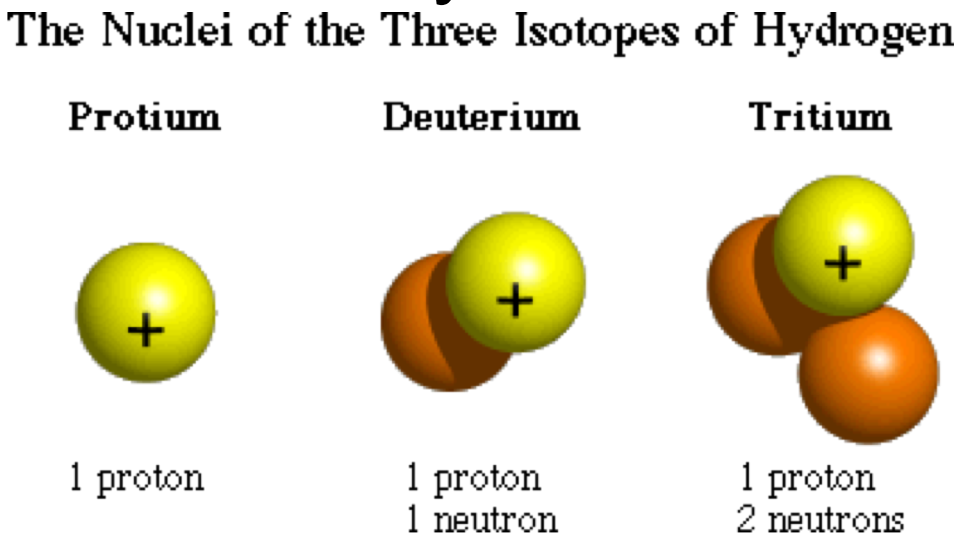
Mass # = (Atomic #) + (# of neutrons)

# of protons



Isotopes

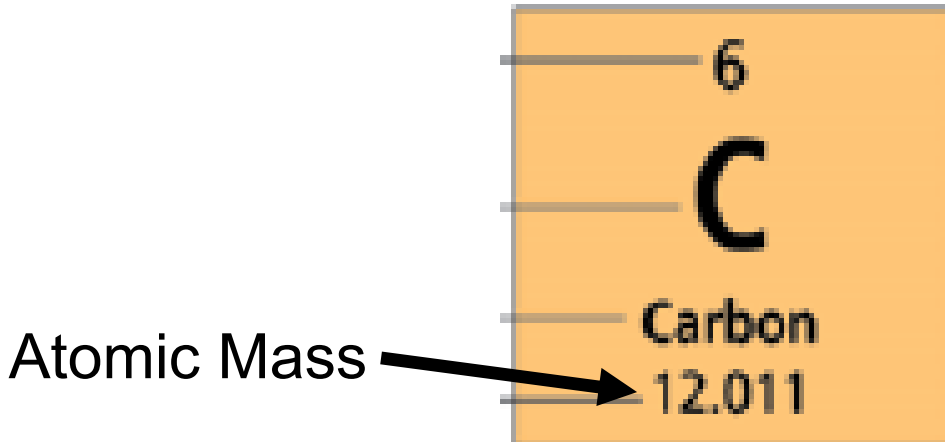
- Isotopes
  - Atoms of **the same element**
  - With **different numbers of neutrons**
    - Which means **different mass numbers**
- All elements have isotopes
- Elements occur naturally as a mixture of isotopes



end

Structure of the Atom

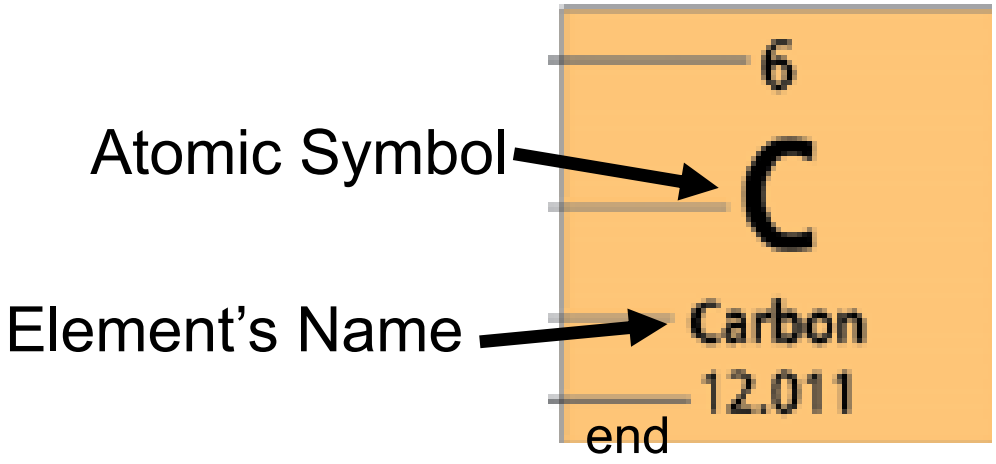
- Atomic Mass
  - **Weighted average mass** for all isotopes of each element
  - **NOT the same as the Mass Number**



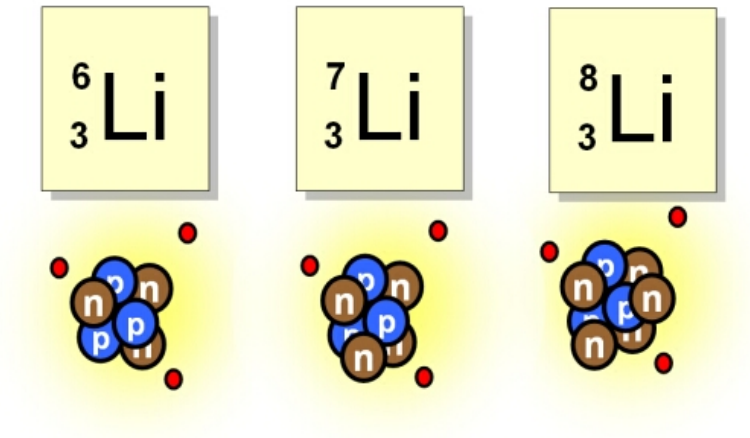
end

Structure of the Atom

- Atomic Symbols
  - 1 or 2 letters
  - The **1st letter is ALWAYS Capitalized, and** the **2nd is ALWAYS Lowercase**
    - Make sure to write your letters correctly!!!!!
  - The element's name is just below the symbol



Structure of the Atom



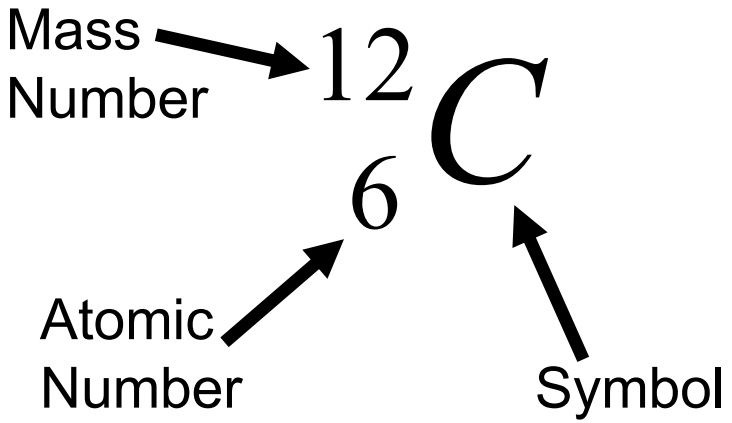
- Writing Atomic Symbols
  - Since all elements have isotopes, scientists must indicate the isotope when they write symbols
  - You need to recognize the isotope from the symbol

Carbon- 12

Name and Mass Number

C- 12

Symbol and Mass Number



end

Bellringer: 4/10/2019

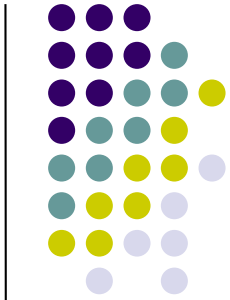
1. This element has 30 protons and 30 neutrons. What element is it?
2. How many protons, neutrons, and electrons does Bromine-80 have?
3. STOTD

** you need a periodic table, calculator, and notes today

**Quiz TOMORROW. **All work due today

**Mid Term April 16, 2019

Updates & Reminders



Wed: Notes: Isotopes & Bohr Model

All work & Missing work is due

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Tues: **Mid Term: 50 mult choice question**

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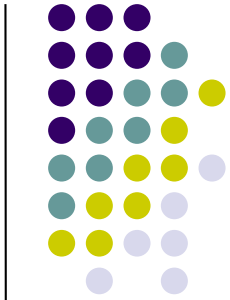
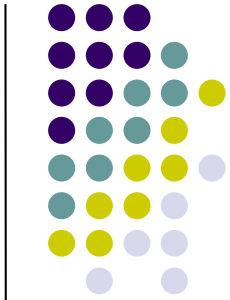
Atomic Theories- Modern



- Bohr Model (Solar System Model)
  - Placed electrons into energy levels
  - Electrons change energy levels by gaining or losing energy
    - Electrons cannot be between levels
  - Electrons can move more than 1 level at a time

end

Atomic Theories- Modern



- In the Bohr Model:
  - Protons and Neutrons form a nucleus
  - Electrons are placed in rings around the nucleus
    - Each energy level can only hold a certain number of electrons

Energy Level	# of electrons
1	2
2	8
3	18
4	32

end

Atomic Theories- Modern

Lets draw H-1

p = 1

n = 0

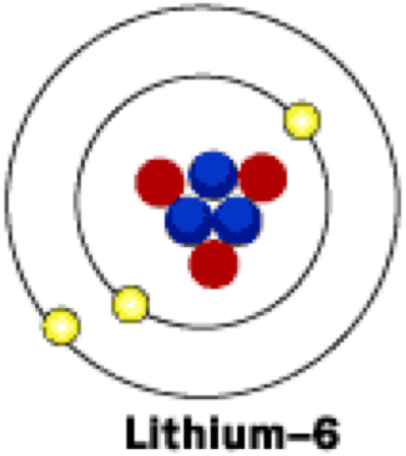
e = 1

Lets draw Li-6

p = 3

n = 3

e = 3

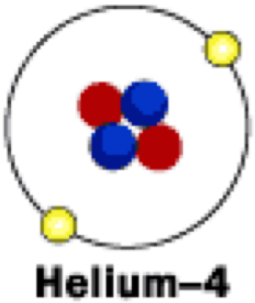


Lets draw He-4

p = 2

n = 2

e = 2

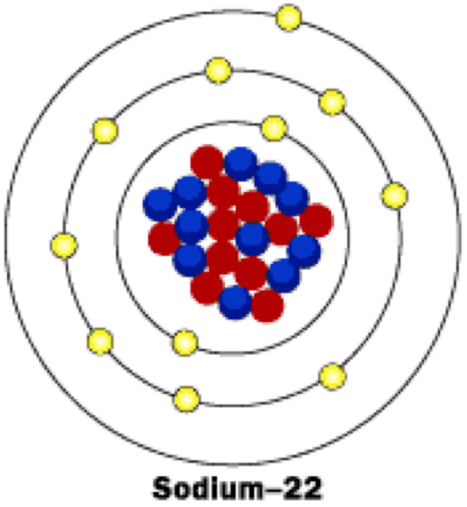


Lets draw Na-22

p = 11

n = 11

e = 11



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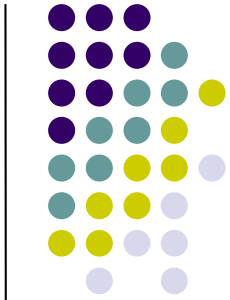
Quiz Tomorrow

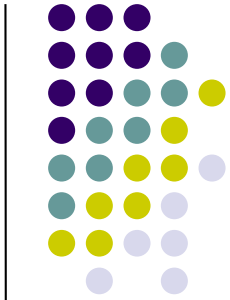


6 questions:

4 multiple choice

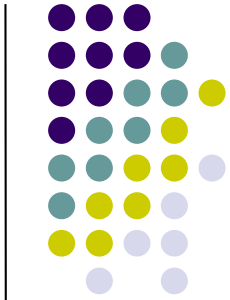
2 Bohr models to draw

Atomic Theories- Modern



- Electrons want to be in the lowest energy level possible
- Ground state
  - All electrons are in the lowest possible energy levels
  - The most stable
- Excited state
  - At least 1 electron is not in the lowest possible energy level

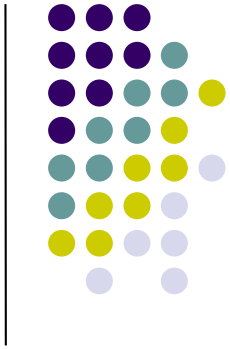
Atomic Theories- Modern



- Bohr's model was good, but it had problems
  - We **cannot know the exact location of electrons**
- Electron Cloud Model
  - Some fancy math allowed us to figure out an area where the electrons will be 95% of the time
    - This area is known as an **Orbital**
    - Each orbital can **only hold 2 electrons**

end

You need:



1. Bellringer Notebook
2. Notes
3. Periodic Table
4. Packet
5. Calculator (optional)

Bellringer: 4/29/2019

1. Complete the following for Boron- 11:
    a) Mass Number
    b) Atomic Number
    c) Number of Protons
    d) Number of Neutrons
    e) Number of Electrons
    f) Write it in Nuclear Notation
2. Draw the Bohr model for the atom.
3. STOTD

Updates and Reminders

Monday: Radiation & Nuclear Equations

Tuesday: Nuclear Equations & ½ lives

Wednesday: ½ lives & Fission/Fusion

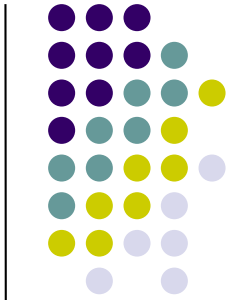
Thursday: **QUIZ** & Periodic Table Info

Friday: Finish Periodic Table

Monday: Review

Tuesday: **TEST**

Project Updates & Reminders



- **Project due MAY 10, 2019 (next Friday)**
- If you need me to buy your materials, let me know no later than **Wednesday**
- You can work on the project on your own time at home, or during Power Hour

Radioactivity

Chapter 10

Nuclear Decay

- Radioisotopes
  - Atoms of an element with an unstable nucleus

When the nucleus breaks down (decays):

- **The atom changes into a different element**
- And, **Radiation is Released**
  - Radiation: Charged Particles and Energy

end

Types of Nuclear Radiation

- Alpha (α) Particle
  - Given off during alpha decay
  - Positively charged
  - Made up of 2 protons and 2 neutrons
    - It's the nucleus of helium (He^{+2})!!!

$$^{238}_{92}U \rightarrow ^{234}_{90}Th + ^{4}_{2}He \qquad ^{238}_{92}U \rightarrow ^{234}_{90}Th + \alpha$$

Alpha Particle

  - Least penetrating type of nuclear radiation
  - Can be stopped by a sheet of paper or clothing

end

Types of Nuclear Radiation

- Beta (β) Particle
  - Given off during Beta decay
  - A Beta Particle is An Electron!!!

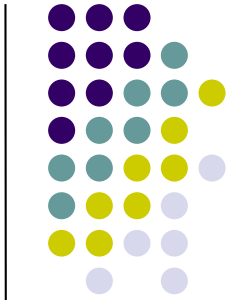
$$^{234}_{90}U \rightarrow ^{234}_{91}Pa + ^{0}_{-1}e \qquad ^{234}_{90}U \rightarrow ^{234}_{91}Pa + \beta$$

Beta Particle

  - More penetrating than alpha particles
  - Can be stopped by a thin sheet of metal
    - aluminum foil

end

Types of Nuclear Radiation



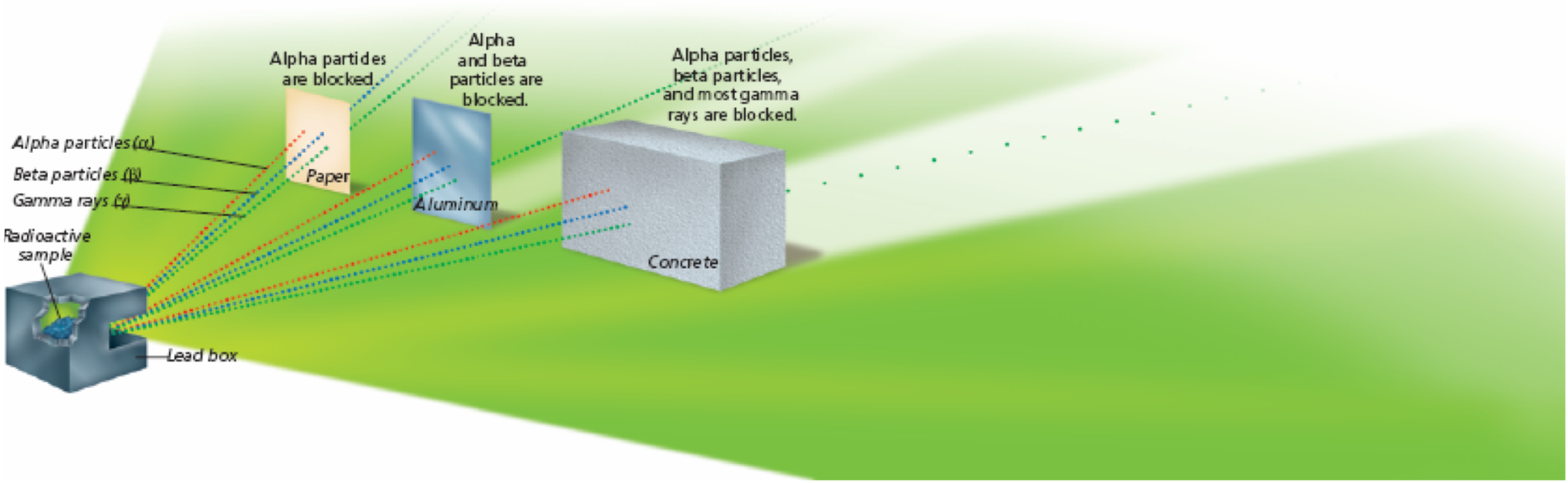
- Gamma (γ) Ray
  - Produced during Gamma decay
  - High Energy Light
    - No particles

$$^{234}_{90}Th \rightarrow ^{234}_{91}Pa + ^{0}_{-1}e + \gamma$$

  - Most penetrating type of radiation
  - Stopped by several meters of lead or concrete

end

Types of Nuclear Radiation



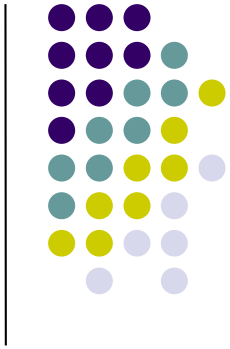
end

Types of Nuclear Radiation

Radiation Type	Symbol	Charge	Mass (amu)
Alpha Particle	α or $^{4}_{2}He$	+2	4
Beta Particle	β or $^{0}_{-1}e$	-1	1/1836
Gamma Ray	γ	0	0

end

Nuclear Equations



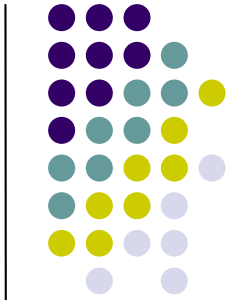
Shows the break down of a radioactive element

Includes the atomic number and the mass number

The total mass number and atomic number must be equal on each side of the equation

Remember Nuclear Notation??

Nuclear Reactions



Nuclear Equations

- Shows the transmutation
- Total Mass Number and Total Atomic Number **must be equal** on each side of the equation

$$^{94}_{41}Nb \rightarrow {}^{0}_{-1}\beta + ?$$

$$^{210}_{82}Pb \rightarrow {}^{4}_{2}He + ?$$

$$^{135}_{53}I \rightarrow ? + {}^{135}_{54}Xe$$

$$^{237}_{93}Np \rightarrow ? + {}^{233}_{91}Pa$$

end

Bellringer: 4/30/2019 Tuesday

1. Write Fluorine-19 in nuclear notation.
2. Describe an alpha particle.
3. Complete the following nuclear equation:

$$^{135}_{53}I \rightarrow ? + ^{135}_{54}Xe$$

4. STOTD

**you will need a periodic table and calculator for today!

Updates and Reminders

Tuesday: Nuclear Equations & ½ lives

Wednesday: ½ lives & Fission/Fusion

Thursday: **QUIZ** & Periodic Table Info

Friday: Finish Periodic Table

Monday: Review

Tuesday: **TEST**

Nuclear Decay

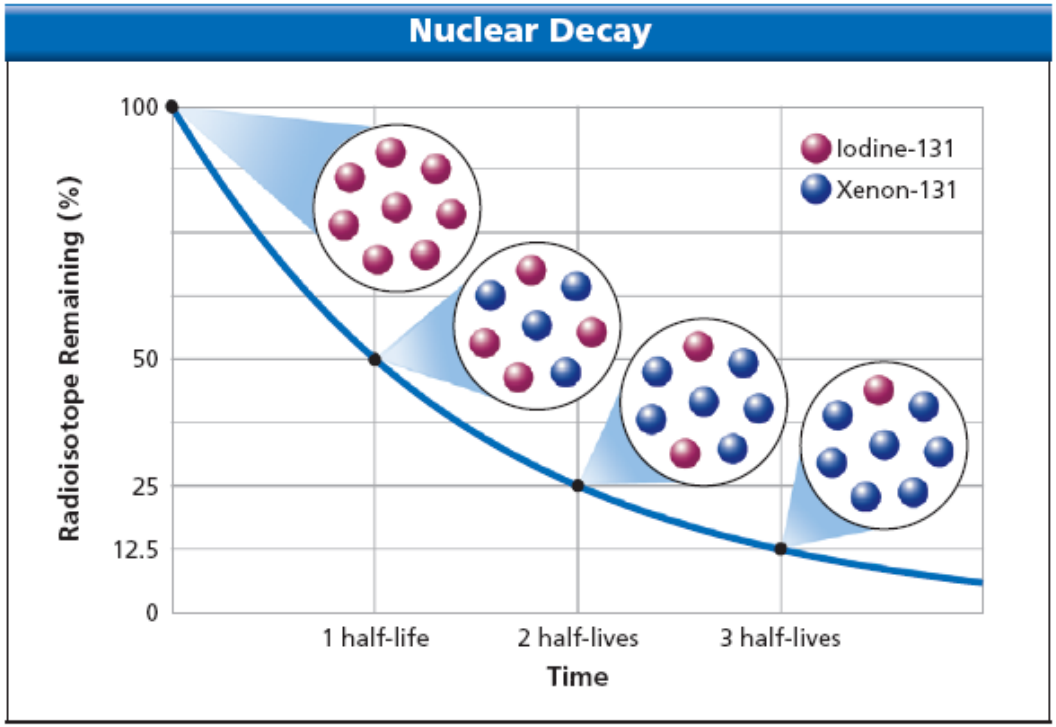
- Radioisotopes decay at a certain rate:
  - A **Half-life**
    - The **time for half of a sample to decay**
- Start with 100 g:

  after 1 half-life = 50 g

  after 2 half-lives = 25 g

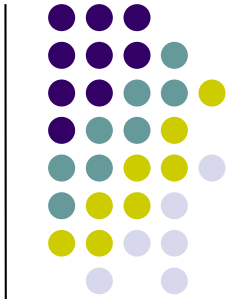
  after 3 half-lives = 12.5 g

  after 4 half-lives = 6.25 g



end

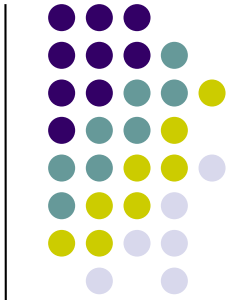
Half-life



Key words and numbers to look for in Half-life problems:

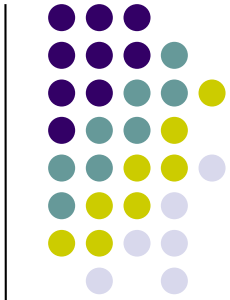
- Initial mass
- Final mass
- Half-life time
- Number of half-lives
- Total amount of time

How to solve



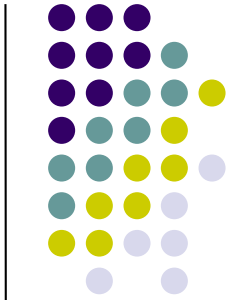
1. Pick out what you know about the problem
2. Underline key words and numbers
3. Figure out what the question is asking you

Guided Practice



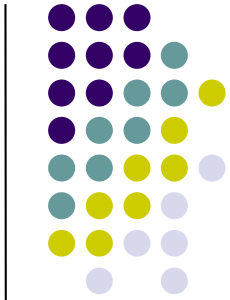
1. What is the half-life of a 100.0 grams sample of nitrogen-16 that decays to 12.5 grams in 21.6 seconds?

Guided Practice



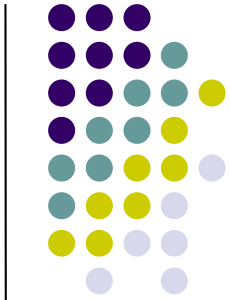
2. All isotopes of technetium are radioactive, but they have widely varying half-lives. If an 800.0 g sample of technetium-99 decay t o100.o g of technetium-99 in 639,000 years, what is its half-life?

Guided Practice



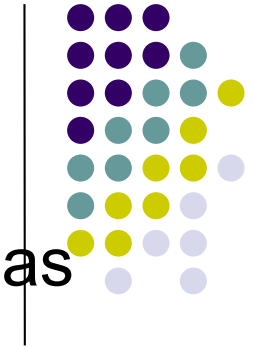
3. A 208 g sample of sodium-24 decays to 15.0 grams of sodium-24 within 60.0 hours. What is the half-life of this radioactive isotope?

Guided Practice



4. If the half-life of iodine-131 is 8.10 days, how long will it take a 50.00 gram sample to decay to 6.25 grams.

Radioactive Decay



1. If you had 25 g of gold-198 how much is left after it has gone through 12 half-lives?

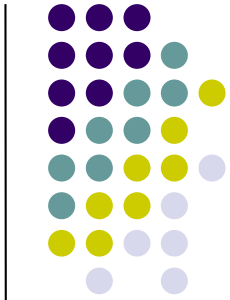
2. You have 10.0 g of francium-210. How many half-lives must pass for 2.5 g to be left?

3. If you start with 200 g of Pu-239 and there are 0.78 g left, how many half-lives have passed?

4. How much of a 100 g sample of gold is left after 8.10 days if its half-life is 2.70 days?

end

Nuclear Decay

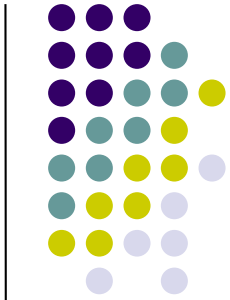


- Each isotope has a specific half-life
  - Anywhere from a few seconds to billions of years
  - Can never be changed

Polonium-215	0.0018 seconds
Sodium-24	15 hours
Iodine-131	8.07 days
Carbon-14	5730 years
Uranium-235	704,000,000 years
Uranium-238	4,470,000,000 years

end

Bellringer:



1. What is the atomic number for iron?
2. How many electrons does an electrically neutral atom of aluminum have?
3. How many protons does Argon-41 have?
4. STOTD

Bellringer:5/1/2019 Wednesday

1. Complete the following nuclear equations:

$$^{234}_{90}U \rightarrow ^{234}_{91}Pa + \_\_\_\_\_$$

$$^{238}_{92}U \rightarrow ^{234}_{90}Th + \_\_\_\_\_$$

2. STOTD

Updates and Reminders

Wednesday: ½ lives & Fission/Fusion

Thursday: **QUIZ** & Periodic Table Info

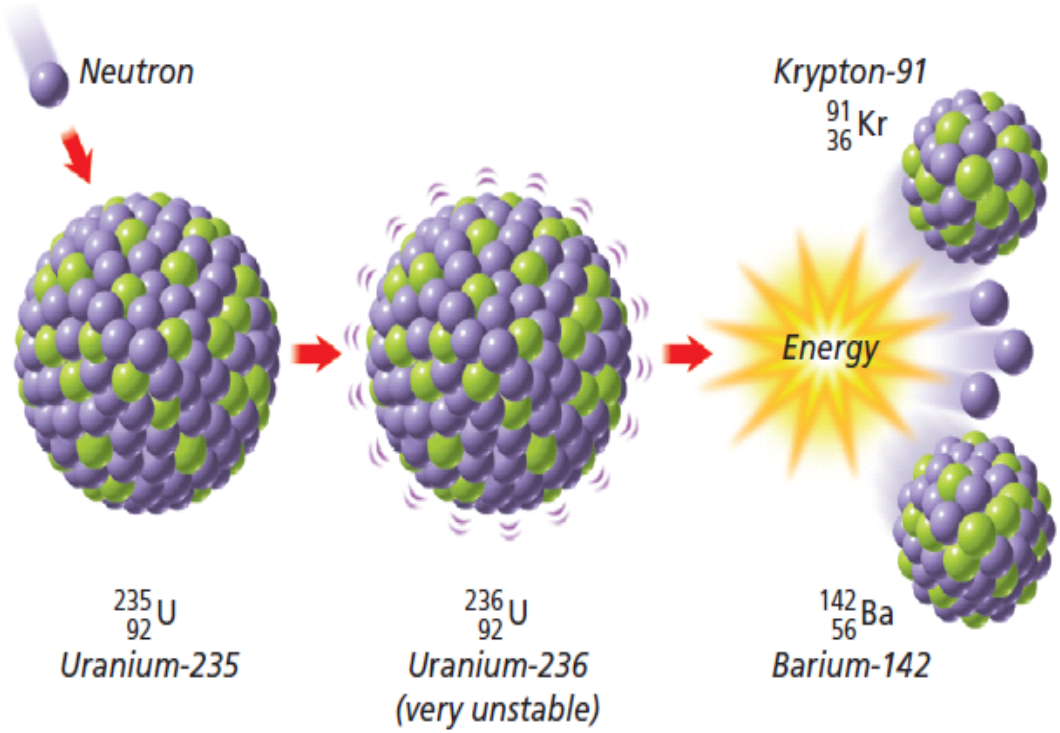
Friday: Finish Periodic Table

Monday: Review

Tuesday: **TEST**

Fission vs. Fusion

- Fission
  - Splitting a nucleus into smaller parts
  - Lots of energy is produced from a very small mass
    - 1 kg of U-235 = 17,000 kg of coal!!!
  - Nuclear Power Stations and Atomic Bombs



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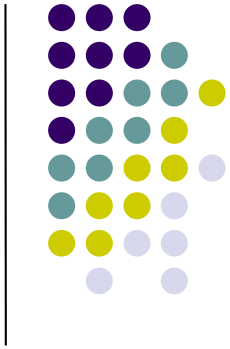
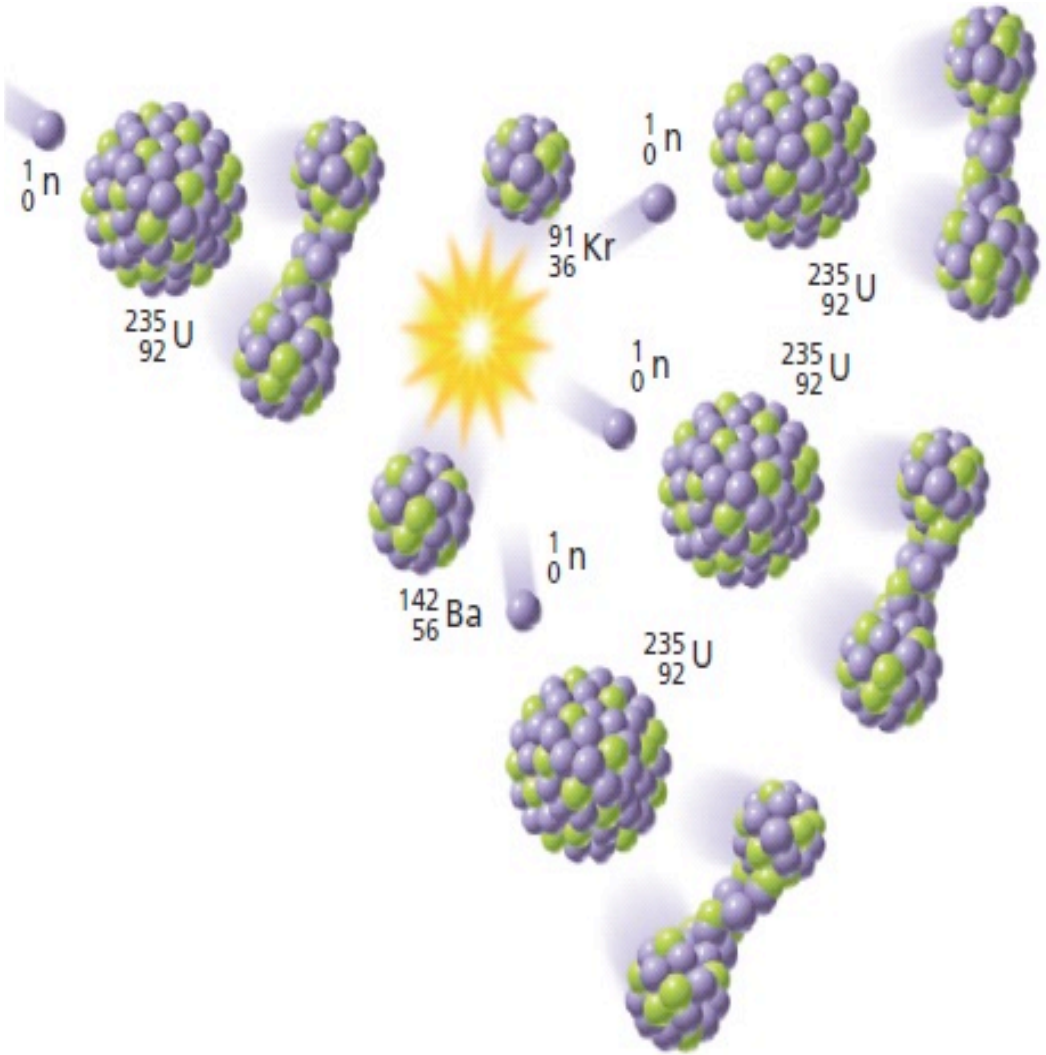
Fission vs. Fusion



- Fusion
  - Nuclei combine to form a larger nucleus
  - The sun/stars
    - ~600 million tons of H is used every second
  - Thermonuclear Bomb (H-Bomb)
  - Scientists are attempting to make fusion power stations
    - Extremely difficult because you need high temperatures and high pressure

end

Fission vs. Fusion

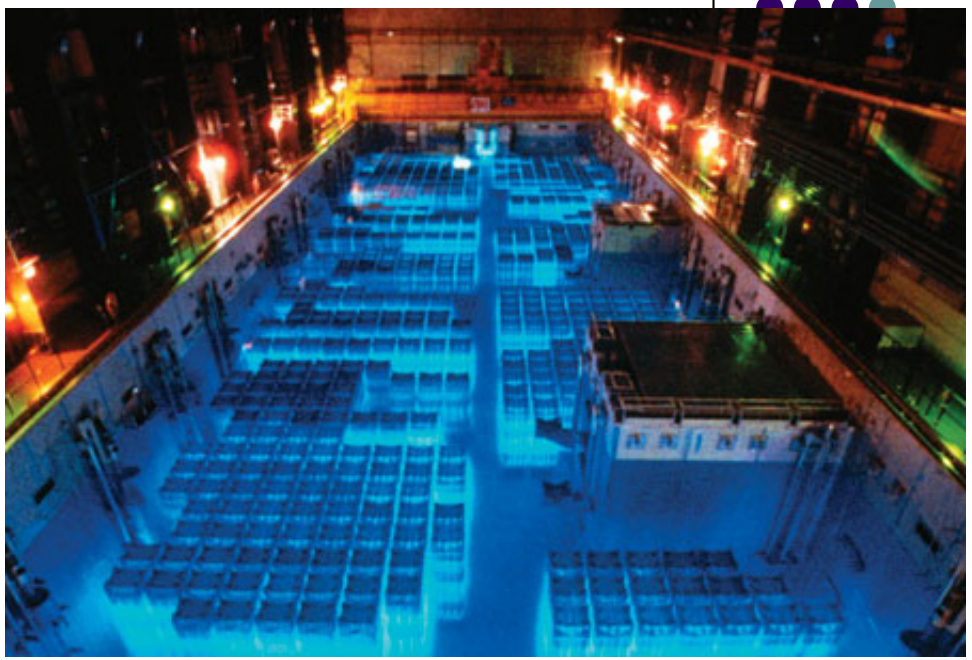


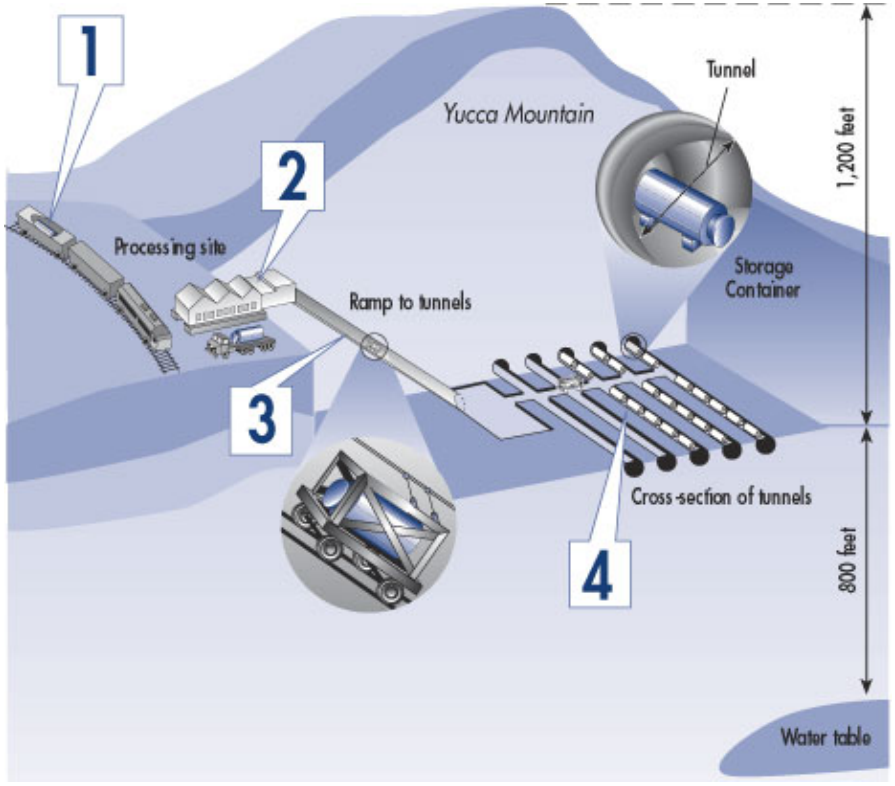
- When a series of nuclear fissions is triggered from the splitting of a single nucleus you get a **chain reaction**

end

Nuclear Waste

- Used nuclear fuel is held in **swimming pools** at the nuclear reactor
  - 40 ft deep
    - Water blocks radiation
  - Kept for 10-20 years
- Planned nuclear waste storage at **Yucca Mountain**
  - Waste will be buried forever





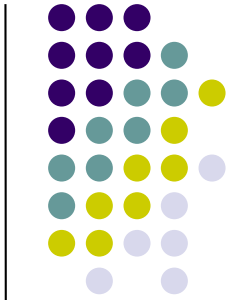
end

Effects of Radiation Levels

Dose (rem)	Effects
5-20	Possible late effects and chromosomal damage
20-100	Temporary reduction in white blood cells
100-200	Mild radiation sickness within a few hours Vomiting, diarrhea, fatigue Reduction in resistance to infection
200-300	Serious radiation sickness effects and hemorrhaging Lethal Dose to 10-35% of the population after 30 days
300-400	Serious radiation sickness along with bone marrow and intestine destruction Lethal Dose to 50-70% of the population after 30 days
400-1000	Acute illness, early death Lethal Dose to 60-95% of the population after 30 days
1000-5000	Acute illness, death in days Lethal Dose to 100% of the population after 10 days

end

Bellringer: 5/2/2019 Thursday



1. What do you know about the periodic table?
2. What information does the periodic table tell you?
3. STOTD

**You will need a periodic table for today

**Notes too

Updates and Reminders

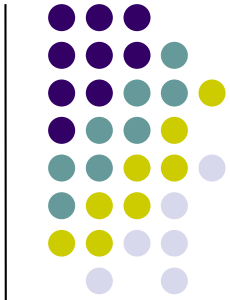
Thursday: **QUIZ** & Periodic Table Info

Friday: Finish Periodic Table

Monday: Review

Tuesday: **TEST**

The Periodic Table



- **By 1860 scientists had discovered 63 elements**
  - But there was no good way to organize them
  - Scientists had to memorized everything
  - **This was changed by Mendeleev**

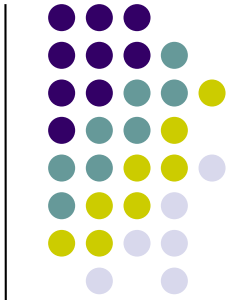
The Periodic Table

- Mendeleev's Periodic Table:
  - Elements with **similar properties** were placed in the **same column**
  - The **mass** of the elements **increased along each row**

Group I	Group II	Group III	Group IV	Group V	Group VI	Group VII	Group VIII
H = 1							
Li = 7	Be = 9.4	B = 11	C = 12	N = 14	O = 16	F = 19	
Na = 23	Mg = 24	Al = 27.3	Si = 28	P = 31	S = 32	Cl = 35.5	Fe = 56, Co = 59,
K = 39	Ca = 40	— = 44	Ti = 48	V = 51	Cr = 52	Mn = 55	Ni = 59, Cu = 63.
(Cu = 63)	Zn = 65	— = 68	— = 72	As = 75	Se = 78	Br = 80	
Rb = 85	Sr = 87	Yt = 88	Zr = 90	Nb = 94	Mo = 96	— = 100	Ru = 104, Rh = 104, Pd = 106, Ag = 108.
(Ag = 108)	Cd = 112	In = 113	Sn = 118	Sb = 122	Te = 125	I = 127	
Cs = 133	Ba = 137	Di = 138	Ce = 140	—	—	—	— — — —
(—)	—	—	—	—	—	—	
—	—	Er = 178	La = 180	Ta = 182	W = 184	—	Os = 195, Ir = 197, Pt = 198, Au = 199.
(Au = 199)	Hg = 200	Tl = 204	Pb = 207	Bi = 208			
—	—	—	Th = 231	—	U = 240		

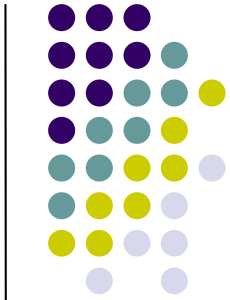
end

The Periodic Table



- **Mendeleev left several blank spaces** in his periodic table
  - **For elements that had not been discovered yet**
  - He correctly predicted the properties of these elements based on the elements around them

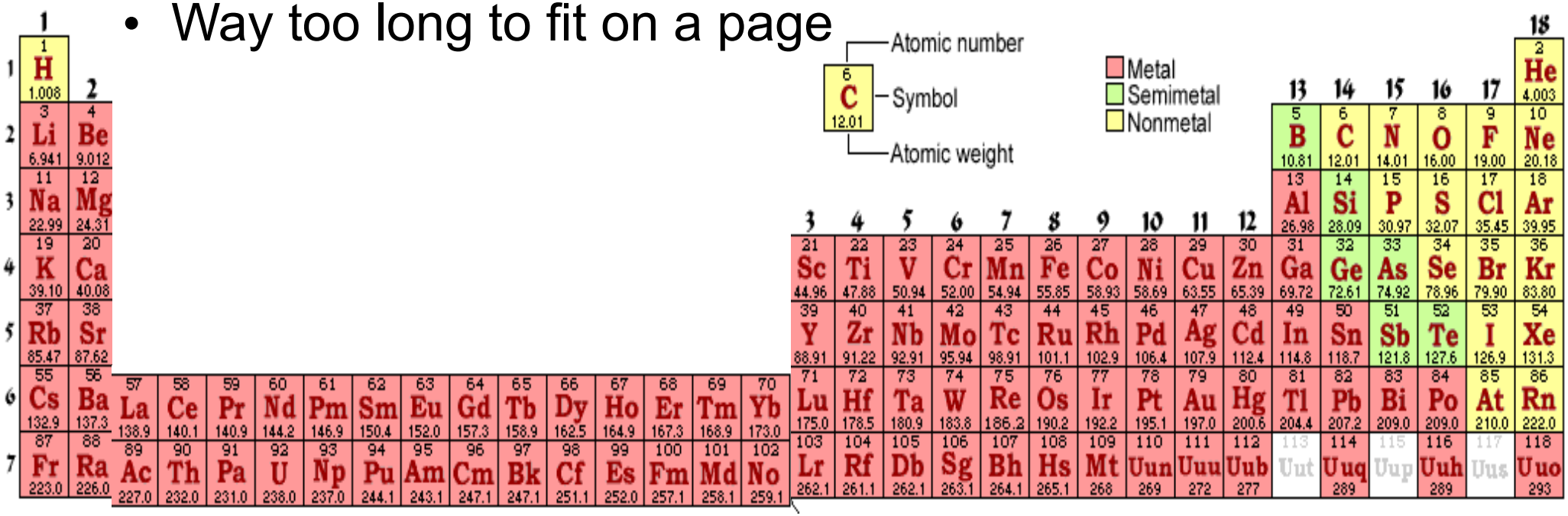
The Periodic Table



- The Modern Periodic Table:
  - Based on Mendeleev's table
  - **Similar Properties** are in the **Same Column**
    - **Columns** are called **Groups**
    - Numbered 1 to 18 (from left to right)
  - **Atomic Numbers increase** going **across the table**
    - **Rows** are called **Periods**
    - Numbered 1 to 7 (from top to bottom)

The Periodic Table

- This is the full Periodic Table
  - As you can see it is REALLY long
  - Way too long to fit on a page



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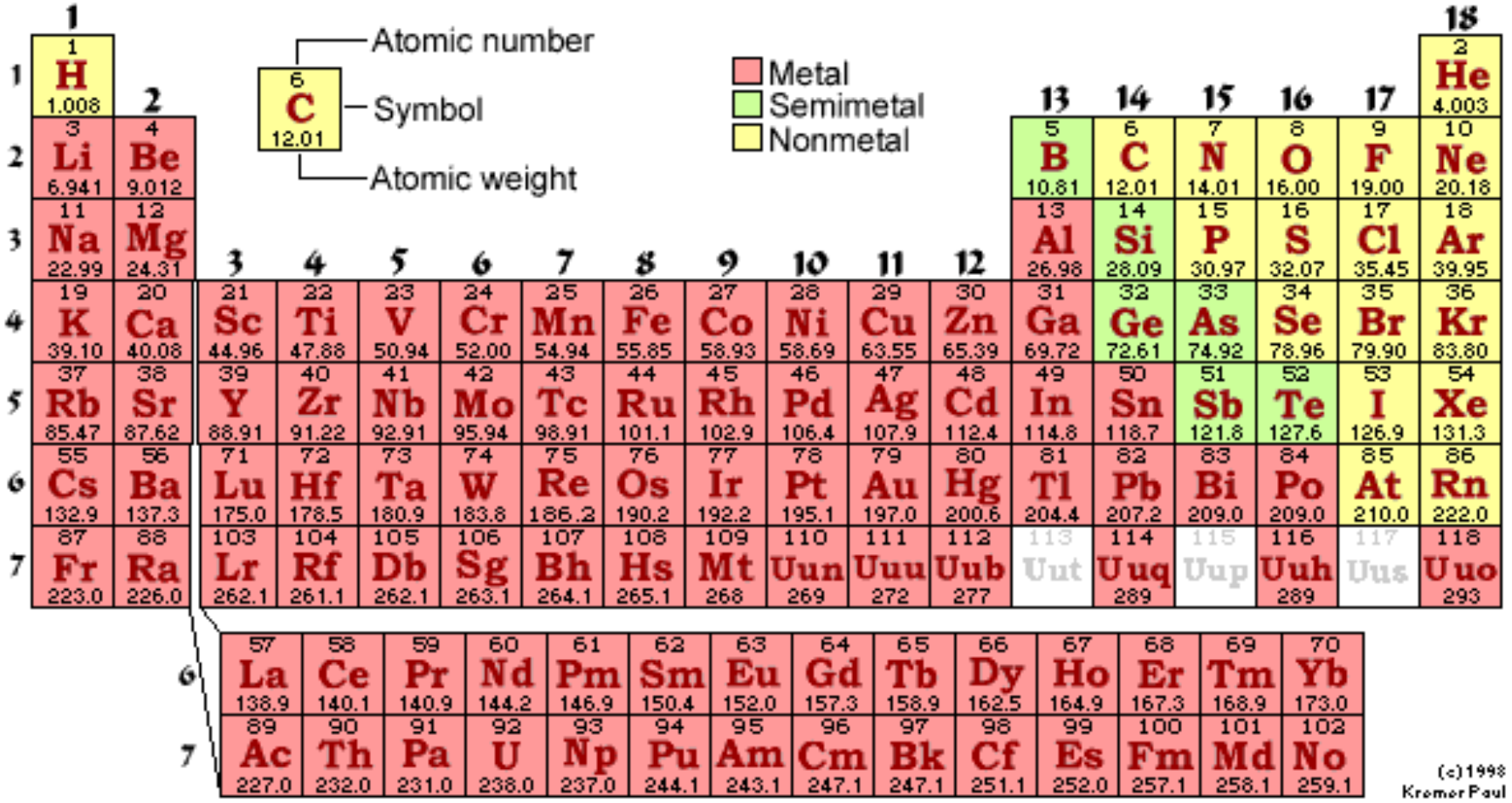
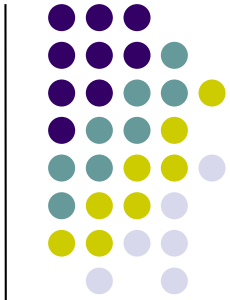
The Periodic Table



- To make everything fit on 1 page, **the Lanthanides and Actinides are moved to the bottom**

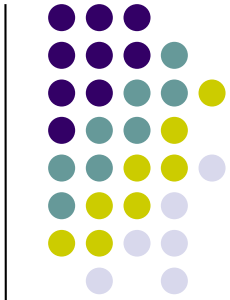
end

The Periodic Table



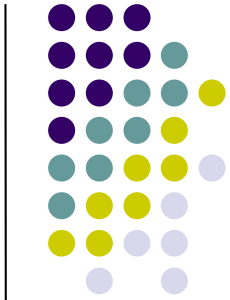
- Metals
  - **Left of the stair-step line**
  - **Francium** (Fr) is the **most reactive**
    - Moving away from Fr, metals become less reactive
  - **Good conductors** of electricity and heat
  - Mostly **solids** at room temperature
    - High melting and boiling points
  - **Malleable** and **ductile**

The Periodic Table



- Nonmetals
  - **Right of the stair-step line**
  - **Fluorine** (F) is the **most reactive nonmetal**
    - Moving away from F, nonmetals become less reactive
  - **Poor conductors** of heat and electricity
  - Mostly **gases** at room temperature
    - Low melting and boiling points
  - **Not malleable** and **not ductile**

The Periodic Table



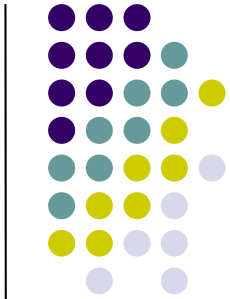
- Metalloids
  - **Touching the stair-step line**
  - Have properties between metals and nonmetals
    - Depends on the temperature

The Periodic Table: Group Names

- **Alkali Metals**
  - Group 1
  - EXTREMELY REACTIVE!
- **Alkaline Earth Metals**
  - Group 2
- **Transition Metals**
  - Groups 3 to 12
  - Have a wide variety of properties
- **Lanthanide and Actinide Series**
  - At the bottom of the table
- All are radioactive
- **Halogens**
  - Group 17
  - Highly Reactive
- **Noble Gases**
  - Group 18
  - **Extremely Unreactive**
    - THEY DO NOTHING!

end

The Periodic Table



- **Atomic Size**
  - **Francium** (Fr) is the **largest** atom
  - **Helium** (He) is the **smallest** atom
  - The closer to Fr, the larger the atom
- **Valence Electrons**
  - Electrons in the highest energy level
  - **Give Elements their Chemical Properties**

Group:	**1**	**2**	**13**	**14**	**15**	**16**	**17**	**18**
# of Valence:	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**

end

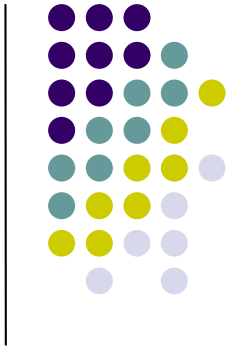
Bellringer:

Write down as many elements that you need to know for you element quiz as you can!!

If you are ready to take the quiz verbally let me know!

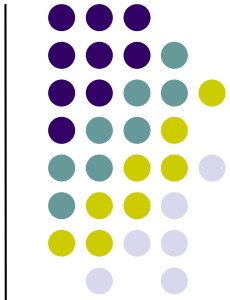
STOTD

Bellringer:



1. Why are elements placed in columns?
2. What do we call a row on the Periodic table?
3. How many protons does the element in group 11, period 5 have?
4. STOTD

Bellringer:



1. What are the family names for each group on the periodic table?
2. How many protons does the element in group 13, period 3 have?
3. Describe a beta particle.
4. STOTD

Bellringer: 3/6/2018

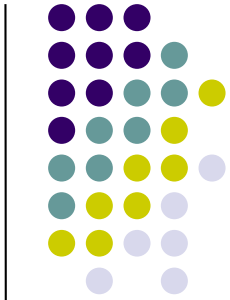
1. Determine the number of protons, neutrons, and electrons in Silicon-28.
2. Draw a Bohr model for Oxygen-16.
3. Complete the following:

$$^{238}_{92}U \rightarrow ^{234}_{90}Th + \square$$

4. STOTD

REVIEW AND TEST TODAY

Bellringer:



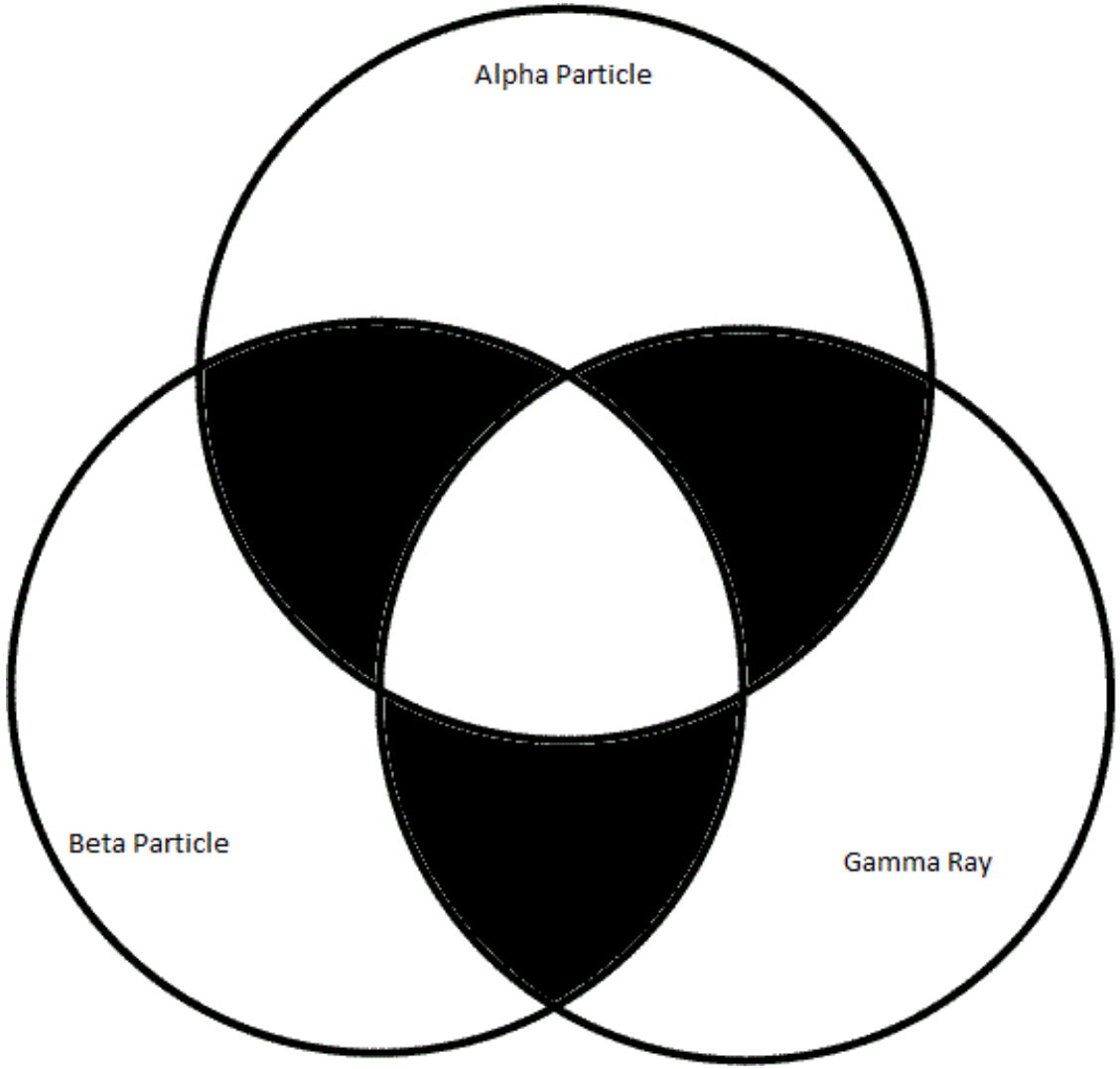
**Get out the periodic table you colored and answer the following:

1. Where can you find the halogens?
2. What is the most reactive nonmetal
3. What 2 elements are liquid at room temperature?
4. STOTD

**Have you turned in your Unit 3 Packet?

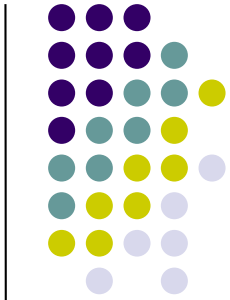
Bellringer:

1. Fill out the Venn Diagram below:



2. STOTD

Bellringer: 11/16/2018



You have an element quiz today!!

Write down as many of your elements as possible without looking at your periodic table or notes!

STOTD

**Start Bohr Model Project today, Due Wednesday

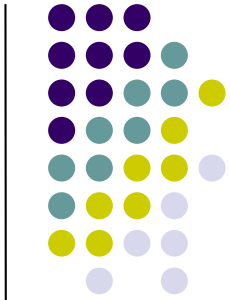
**Quiz Tuesday

**Lab Wednesday

**Mid Term Nov 28

KAHOOT CODE: **8749626**

Bellringer: 4/11/2019



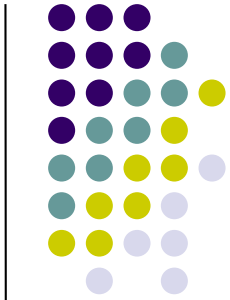
***You need a Periodic Table for today!

1. Describe the nucleus of an atom.
2. How many protons, neutrons, and electrons does Mg-25 have?
3. What is the mass number, atomic number, and average atomic mass for Mg-25?
4. Write Mg-25 in nuclear notation.
5. Safety Tip of the Day

****QUIZ TODAY. ***LAB on Wednesday**

****Mid Term Tuesday, April 16 ,2019**

Structure of the Atom Review



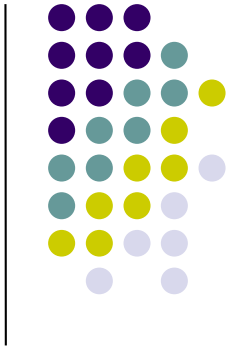
Name	Symbol	Protons	Neutrons	Electrons	Atomic Number	Mass Number
Carbon-12						
	$^{13}_{6}C$					
		15				45
			44		34	
			36		15	

end

Bellringer: Can you unscramble all the words below?
Hint: They all start with the letter B.

C A E R T B I A	1. I can make you sick.
L O B O D	2. I flow through your body.
O B L I O G S I T	3. I study living things.
S E B A	4. I have a pH over 7.
N O B E S	5. We support your body.

Bellringer: 3/1/2018



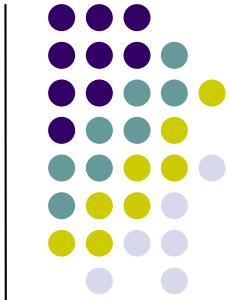
1. What is a radioisotope?
2. What is radiation?
3. How many protons does Cu-64 have?
4. How many neutrons does Chlorine-35 have?
5. STOTD

You need a calculator, periodic table, packet, and notes today.

Turn in any completed sub work

**Element quiz and unit quiz tomorrow

Elements for Friday



Scandium-Sc

Titanium-Ti

Vanadium-V

Chromium-Cr

Manganese-Mn

Iron-Fe

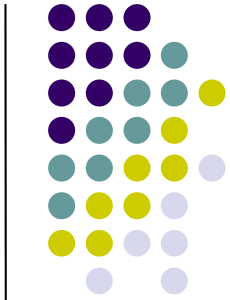
Cobalt-Co

Nickel-Ni

Copper-Cu

Zinc-Zn

Element Quiz #2: Friday December 7



Sodium-Na

Magnesium- Mg

Aluminum- Al

Silicon- Si

Phosphorus- P

Sulfur-S

Chlorine- Cl

Argon- Ar

Potassium: K

Calcium: Ca

Scandium: Sc

Titanium: Ti

Vanadium: V

Chromium: Cr

Manganese: Mn