



# Double Bubble Compare & Contrast

CONTRAST

COMPARE

CONTRAST



What is different about the two?

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What is the same about the two?

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What is different about the two?

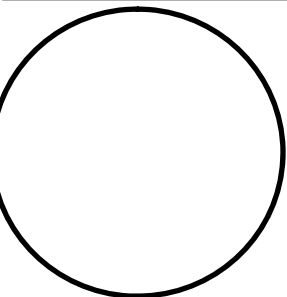
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What is the same about the two?

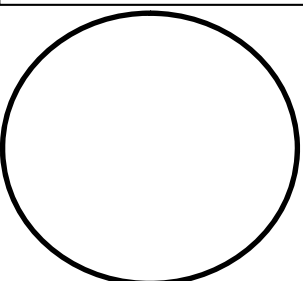
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What is different about the two?

2 \_\_\_\_\_

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What is different about the two?

2 \_\_\_\_\_

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What is different about the two?

3 \_\_\_\_\_

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What is the same about the two?

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What is different about the two?

3 \_\_\_\_\_

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2

2

**25.1**

**NUCLEAR RADIATION**

**Section Review**

**Objectives**

- Explain how an unstable nucleus releases energy
- Describe the three main types of nuclear radiation

**Vocabulary**

- radioisotopes
- radioactivity
- radiation
- alpha particle
- beta particle
- gamma ray

**Part A Completion**

*Use this completion exercise to check your understanding of the concepts and terms that are introduced in this section. Each blank can be completed with a term, short phrase, or number.*

Isotopes with unstable nuclei are   1   and are called   2  . The   3   of radioisotopes decay to   4   nuclei plus emission of large amounts of   5  . The radiation may be alpha,   6  , or gamma.   7   radiation consists of alpha particles (positively charged   8   nuclei) that are easily stopped by a sheet of paper. Beta radiation is composed of fast-moving particles, which are   9  . Beta radiation is more penetrating than alpha radiation; it is stopped by   10  .   11   radiation is electromagnetic radiation. Gamma radiation has no   12   or electrical charge. It is extremely penetrating.   13   bricks and   14   reduce the intensity of gamma radiation but do not completely   15   it.

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

5. \_\_\_\_\_

6. \_\_\_\_\_

7. \_\_\_\_\_

8. \_\_\_\_\_

9. \_\_\_\_\_

10. \_\_\_\_\_

11. \_\_\_\_\_

12. \_\_\_\_\_

13. \_\_\_\_\_

14. \_\_\_\_\_

15. \_\_\_\_\_



## Part B True-False

Classify each of these statements as always true, AT; sometimes true, ST; or never true, NT.

- \_\_\_\_\_ 16. Beta radiation is emitted when a radioisotope decays.
- \_\_\_\_\_ 17. Gamma radiation has a negative charge
- \_\_\_\_\_ 18. Gamma radiation is high-energy electromagnetic radiation.
- \_\_\_\_\_ 19.  ${}_{92}^{238}\text{U} + {}_{-1}^0\text{e} \rightarrow {}_{92}^{239}\text{U}$
- \_\_\_\_\_ 20. When a beta particle is emitted, the atomic number increases by 1, and the mass number stays the same.

## Part C Matching

Match each description in Column B to the correct term in Column A.

### Column A

- \_\_\_\_\_ 21. radioisotopes
- \_\_\_\_\_ 22. radioactive decay
- \_\_\_\_\_ 23. gamma ray
- \_\_\_\_\_ 24. alpha particles
- \_\_\_\_\_ 25. beta particles

### Column B

- a. the process in which an unstable nucleus releases energy by emitting radiation
- b. isotopes that have unstable nuclei and undergo radioactive decay
- c. high-energy photon with no mass or electrical charge
- d. electrons resulting from the breaking apart of a neutron in an atom
- e. helium nuclei emitted from a radioactive source

## Part D Problems

Answer the following in the space provided.

26. Write nuclear equations for these processes.

a. The alpha decay of  ${}_{84}^{218}\text{Po}$

\_\_\_\_\_

b. The beta decay of  ${}_{82}^{210}\text{Pb}$

\_\_\_\_\_



Name \_\_\_\_\_

Date \_\_\_\_\_ Period \_\_\_\_\_

**ATOMS & THEIR ISOTOPES  
REVIEW QUESTIONS**

1. What particles are contained in the nucleus?
2. Which is the smallest particle that makes up an atom?
3. Where are the electrons located?
4. What is the name of the atom model that looks like a sun & planets?
5. What are the charges on the electron, neutron, and proton?
6. What is the mass of a proton? An electron? A neutron?
7. Who was the first scientist to group atoms into a table by their characteristics? (the first periodic table)
8. What are isotopes?
9. How many  $p^+$ ,  $n^0$ , and  $e^-$  are found in Nickel-66?
10. How many  $p^+$ ,  $n^0$ , and  $e^-$  are found in Helium-2?
11. How many  $p^+$ ,  $n^0$ , and  $e^-$  are found in Carbon-14?
12. How many  $p^+$ ,  $n^0$ , and  $e^-$  are found in Uranium-235?



Name \_\_\_\_\_

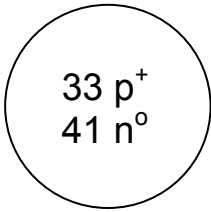
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### Identify the Element

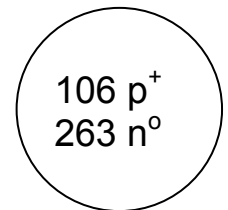
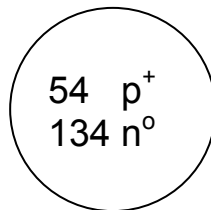
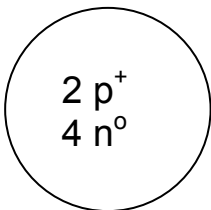
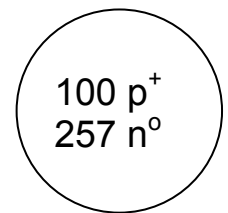
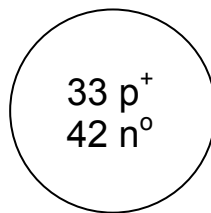
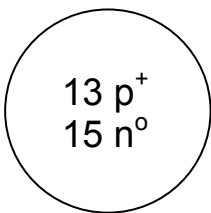
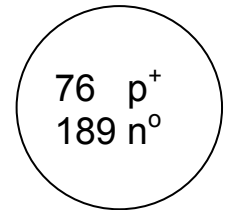
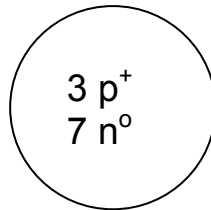
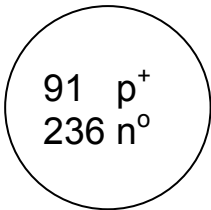
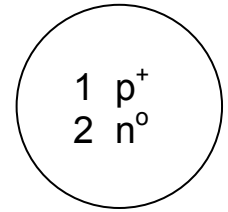
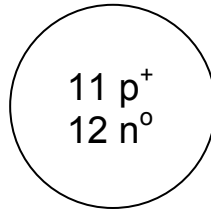
Element	Symbol	Atomic Number	Atomic Mass	p <sup>+</sup>	e <sup>-</sup>	n <sup>o</sup>
Uranium-238	<sup>238</sup> U	92	238	92	92	146
Zirconium-94						
Mercury-204						
Iodine-124						
	<sup>207</sup> Pb					
	<sup>243</sup> Am					
	<sup>64</sup> Cu					
	<sup>187</sup> W	74				
	<sup>11</sup> B	5				
		12	24			
		8	16			
		8	15			
		26	58			
		26				30
		9				11
				20		21
				11		13
					19	23
					1	1



Identify the isotopes whose nuclei are shown below:



**Arsenic-74**



# 8

## Nuclear Activities

### Critical Mass & The Enola Gay

**Directions:** Each student will hold 3, 6 or 9 ping pong balls. Divide the room into two sections. Throw one ping pong ball. The rule is that when a student is hit by one ping pong ball, three must be released randomly.

What happened? Why?

Now put the entire class within a 3 meter radius and try again.  
What happened? Why?

### Half-Life Decay to Safety

**Directions:** Use 100 pennies or other two sided object. Pick one side as radioactive and the other as non-radioactive. Put all the objects into a container and shake. Spread them out without adjusting sides. Pick out all the non-radioactive atoms and put the remaining "radioactive" atoms in the container. How many "non-radioactive atoms" were there after this first round? Shake again & spread them out again. How many non-radioactive atoms? Keep doing it until the radioactivity dies out.

Round Half-Life	Radioactive Atoms Left	Percent Original Radioactive Atoms Which are Left	Percent Non-Radioactive Atoms Which are Left	Non-Radioactive Atoms Left	Years of Decay Radon-222 $T_{\frac{1}{2}} = 38 \text{ sec}$
1	.	.	.	.	
2	.	.	.	.	
3	.	.	.	.	
4	.	.	.	.	
5	.	.	.	.	
6	.	.	.	.	
7	.	.	.	.	
8	.	.	.	.	
9	.	.	.	.	

**Directions:** Combine your groups 100 with another group and do the same activity starting with 200 pennies. Hypothesize about how many rounds will it take to for the radioactive source to be safe. \_\_\_\_\_ Write your results in the empty boxes above.

### Fission & Fusion Demos

**Directions:** Blow up a balloon. Pinch and twist in the center. Nuclear Fission!

**Directions:** Put 2 drops of water on the overhead projector. Nuclear Fusion!

### Questions:

1. Why do Doctors use radioactive isotopes which have short half lives?
2. What happens to the nucleus during Nuclear Fission?
3. How many half-lives does Radon need to live out to get rid of about 87.5% of the radioactivity?





# Ruben's Science

## RADIOACTIVITY

Name \_\_\_\_\_

Date \_\_\_\_\_ Period \_\_\_\_\_

### Warm-up/Homework Review Questions

1. What do we call the process of Radioisotopes "falling apart?"
2. When a radioisotope decays, what do we call the material that remains?
3. What is the best way to find out the half-life of a radioisotope?
4. Which type of radioactivity is most harmful? Why?
5. When a radioisotope, such as U-238 decays in *multiple* steps, what do we call that?
6. Radioactive decay occurs at a constant rate. ( TRUE FALSE )
7. When describing radioactive decay, what is a half-life?
8. What is the difference between an isotope and a radioisotope?
9. What is the symbol for an alpha particle? A beta particle? Gamma radiation?
10. 40 g of a radioisotope has a half-life of 5 days is placed on a shelf. How many grams of this radioisotope will remain after 20 days?
11. The half-life of U-231 is 4.2 days. If we started with 100 grams of  $^{231}\text{U}$ , how many days will it take before only 12.5 g of U-231 remains?
12. The half-life of C-14 is 5,715 years. Archaeologists find the ash remains of an ancient fire pit. The sample is analyzed and found to have only 6.25 % of the normal C-14 content found in the ash from a recent fire. How many half-lives have passed? How many years old is the sample?



## 25

## NUCLEAR CHEMISTRY

## Practice Problems

In your notebook, solve the following problems.

## SECTION 25.1 NUCLEAR RADIATION

- What happens to the mass number and atomic number of an atom that undergoes beta decay?
- A radioisotope of an element undergoes alpha particle decay. How do the atomic number and mass number of the particle change?
- Give the composition of the nucleus of the following isotopes.
  - ${}^{64}_{28}\text{Ni}$
  - ${}^{136}_{53}\text{I}$
  - ${}^{195}_{79}\text{Au}$
- Complete each of the following equations.
  - ${}^{14}_6\text{C} \rightarrow {}^{-0}_{-1}\text{e} + ?$
  - ${}^{241}_{95}\text{Am} \rightarrow {}^4_2\text{He} + ?$
  - ${}^{16}_7\text{N} \rightarrow {}^{16}_8\text{O} + ?$

## SECTION 25.2 NUCLEAR TRANSFORMATIONS

- Write a nuclear equation for the following radioactive processes.
  - alpha decay of francium-208
  - electron capture by beryllium-7
  - beta emission by argon-37
  - positron emission by fluorine-17
- Complete the equations for these transmutation reactions.
  - ${}^6_3\text{Li} + {}^1_0\text{n} \rightarrow {}^4_2\text{He} + ?$
  - ${}^{235}_{92}\text{U} + {}^1_0\text{n} \rightarrow ? + {}^{141}_{56}\text{Ba} + 3{}^1_0\text{n}$
  - ${}^{27}_{13}\text{Al} + {}^4_2\text{He} \rightarrow ? + {}^1_0\text{n}$
  - ${}^{235}_{92}\text{U} \rightarrow {}^{90}_{38}\text{Sr} + ? + {}^1_0\text{n} + 4{}^{-0}_{-1}\text{e}$
  - ${}^1_0\text{n} + ? \rightarrow {}^{144}_{58}\text{Ce} + {}^{90}_{38}\text{Sr} + 6{}^1_0\text{n} + 2{}^{-0}_{-1}\text{e}$
- Polonium-214 has a relatively short half-life of 164 s. How many seconds would it take for 8.0 g of this isotope to decay to 0.25 g?
- How many days does it take for 16 g of palladium-103 to decay to 1.0 g? The half-life of palladium-103 is 17 days.
- By approximately what factor would the mass of a sample of copper-66 decrease in 51 minutes? The half-life of copper-66 is 5.10 min.
- In 5.49 seconds, 1.20 g of argon-35 decay to leave only 0.15 g. What is the half-life of argon-35?

## NUCLEAR CHEMISTRY

## Chapter Quiz

Choose the best answer and write its letter on the line.

- \_\_\_\_\_ 1. Which of these could stop the penetration of an alpha particle? 25.1  
 a. the top layer of your skin                      c. a piece of paper  
 b. aluminum foil                                      d. all of the above
- \_\_\_\_\_ 2. Ionizing radiation that consists of helium nuclei is 25.1  
 a. X-rays.                                              c. beta radiation.  
 b. alpha radiation.                                  d. gamma radiation.
- \_\_\_\_\_ 3. The most penetrating form of radiation is 25.1  
 a. alpha radiation.                                  c. gamma radiation.  
 b. beta radiation                                      d. ultraviolet light.
- \_\_\_\_\_ 4. When a neutron decomposes, which of the following is formed? 25.1  
 a. an alpha particle                                  c. a proton only  
 b. a proton and an electron                      d. a beta particle only
- \_\_\_\_\_ 5. An unstable nucleus 25.2  
 a. may have too many neutrons.  
 b. may have too few electrons.  
 c. gains energy by emitting radiation.  
 d. all of the above
- \_\_\_\_\_ 6. A reaction in which two light nuclei combine to form a heavier nucleus is termed 25.3  
 a. fission.                                              c. alpha decay.  
 b. a chemical reaction.                              d. fusion.
- \_\_\_\_\_ 7. Which of these processes results in a *splitting* of a nucleus? 25.3  
 a. a chemical reaction                              c. a fission reaction  
 b. a fusion reaction                                  d. an ionizing reaction
- \_\_\_\_\_ 8. What particle is needed to complete this nuclear reaction? 25.1  
 ${}^{222}_{86}\text{Rn} \rightarrow {}^{218}_{84}\text{Po} + \text{_____?}$   
 a.  ${}^0_{-1}e$                                                   c.  ${}^0_{+1}e$   
 b.  ${}^4_2\text{He}$                                                 d.  ${}^1_0n$
- \_\_\_\_\_ 9. A transmutation reaction must always involve 25.2  
 a. a change in the number of protons in a nucleus of the atom.  
 b. a decrease in the number of neutrons in the nucleus of the atom.  
 c. an increase in the number of neutrons in the nucleus of the atom.  
 d. a decrease in the number of electrons in the atom.
- \_\_\_\_\_ 10. Controlled nuclear chain reactions 25.3  
 a. take place in nuclear reactors.  
 b. are always fusion reactions.  
 c. never produce radioactive by-products.  
 d. are characteristic of atomic bombs.



12

**C**

6

13

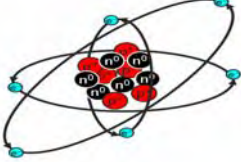
**C**

6

14

**C**

6



First Name, Last \_\_\_\_\_

SCORE: \_\_\_/10 pts

Period \_\_\_\_\_

### 4 Atoms Reteaching & Cumulative Review

Symbol	Isotope Name	Mass Number a.m.u.	Atomic Number =	Neutrons	Electrons	Protons
	Carbon-12	-	6	=		
	Carbon-13	13 -		= 7		
	Chlorine-35	35		=		
			17	= 20		
	Uranium-235			=		
		238	92	=		92

**Directions:** Look at the above tables & highlight all appropriate answers (all, some or none are correct).

**1. Isotopes always share the same:**

atomic #, protons, electrons, neutrons, atomic mass, electrons gain/lost.

**2. Isotopes of the same element have different:**

atomic #, protons, electrons, neutrons, atomic mass, electrons gain/lost.

**3. Elements are always identified by the same:**

atomic #, protons, electrons, neutrons, atomic mass, e- gain/lost.

**4. If the avg. atomic mass is 35.45 a.m.u., which is more abundant?**

Chlorine-35, Chlorine-37, none correct.

**4b Atomic Structure**

	Proton	Electron	Neutron	Alpha	Beta	Gamma	
Mass							
Letter							
Charge	+1						

**5. Which two have the same mass?** (alpha, protons, electrons, beta)

**6. Which two have the same charge?** (protons, electrons, neutrons, beta)

**7. Which two have no charge?** (protons, electrons, neutrons, gamma)

**8. Which two have no mass?** (protons, electrons, neutrons, gamma)

**9. Which has the biggest mass & charge so penetrates the least?**

(alpha, protons, electrons, beta)

**10. Which has no mass & no charge so penetrates most?**

(alpha, beta, gamma, delta)



**FIFTY FREQUENTLY FORGOTTEN FUN FACTS**

This packet contains topics from each of the units we worked on this year with questions. Most of the questions are similar to what you would expect to see on Part B2 and C of the Regents Exam in Chemistry. The multiple choice questions mirror common questions found on Parts A and B1.

**I. ATOMIC STRUCTURE & NUCLEAR CHEMISTRY**

**1) Protons are +1 each with a mass of 1 amu each, the number of protons = atomic number, nuclear charge = + (# protons). [Periodic Table]**

a) How many protons are there in a nucleus of Kr-85 ? \_\_\_\_\_

b) What is the nuclear charge of an atom of Br? \_\_\_\_\_

c) What is the mass of the protons in a nucleus of O-15? \_\_\_\_\_

**2) Neutrons are neutral with a mass of 1 amu each, # neutrons = mass # - atomic number. Isotopes = atoms of the same element (same atomic #) but different # of neutrons (mass #). [Periodic Table]**

a) How many neutrons are there in the nucleus of  $^{56}_{26}\text{Fe}$ ? \_\_\_\_\_

b) Circle the two nuclei that are isotopes of each other:  $^{15}_8\text{O}$      $^{15}_7\text{N}$      $^{16}_8\text{O}$      $^{16}_9\text{F}$

**3) Electrons are each -1 with a mass that is VERY, VERY tiny compared to the mass of a proton or neutron.**

a) Which particle has a mass that is  $1/1836^{\text{th}}$  the mass of a proton?

1)  $^4_2\text{He}$

2)  $^1_1\text{H}$

3)  $^0_{-1}\text{e}$

4)  $^1_0\text{n}$

**4) Natural Decay: Parent Nuclide  $\rightarrow$  Decay particle + daughter nuclide [Tables N and O]**

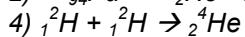
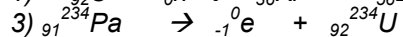
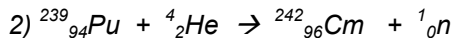
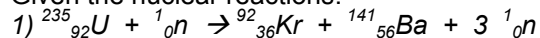
a) Write the decay for U-238: \_\_\_\_\_

b) Write the decay for K-37: \_\_\_\_\_

c) Write the decay for P-32: \_\_\_\_\_

**5) Artificial Transmutation is when a relatively stable nucleus is impacted by a particle bullet at high speeds and becomes an unstable nucleus of a different element. Nuclear fission occurs when nuclei of U-235 or Pu-239 are impacted by a neutron and split into two smaller nuclei and more neutrons. Nuclear fusion occurs when two small nuclei of hydrogen combine at high temperatures and pressures to form larger nuclei of helium. Both fission and fusion convert mass into a huge amount of energy.**

Given the nuclear reactions:



a) Which reaction represents natural decay? \_\_\_\_\_

b) Which reaction represents artificial transmutation? \_\_\_\_\_

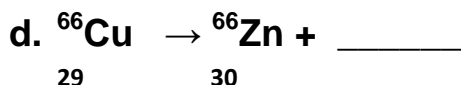
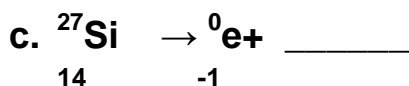
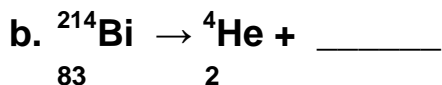
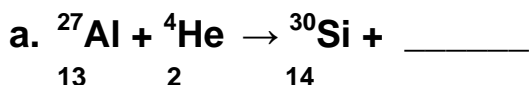
c) Which reaction represents nuclear fission? \_\_\_\_\_

d) Which reaction represents nuclear fusion? \_\_\_\_\_



**25 NUCLEAR RADIATION Reteaching & Review**

1. What are the three main types of nuclear radiation?  
\_\_\_\_\_
2. What part of the atom undergoes change during radioactive decay?  
\_\_\_\_\_
3. How is the atomic number of a nucleus changed by alpha decay?  
\_\_\_\_\_
4. How is the atomic number of a nucleus changed by beta decay?  
\_\_\_\_\_
5. How is the atomic number of a nucleus changed by gamma decay?  
\_\_\_\_\_
6. How is the atomic mass of a nucleus change by alpha decay?  
\_\_\_\_\_
7. How is the atomic mass of a nucleus changed by beta decay?  
\_\_\_\_\_
8. How is the atomic mass of a nucleus changed by gamma decay?  
\_\_\_\_\_
9. Which of the three kinds of radiation is the most penetrating?  
\_\_\_\_\_
10. How much of a sample of radioisotope remains after one half-life?  
\_\_\_\_\_
11. How much of a sample of radioisotope remains after two half-lives?  
\_\_\_\_\_
12. Complete and balance the equations for the following nuclear reactions.



Nuclear Reactions Formal Assessment 2**Circle the correct answer:**

1. Which is the correct order from greatest to least penetration power?
- a. alpha, beta, gamma      b. Gamma, beta, alpha  
c. none correct              d. Both correct

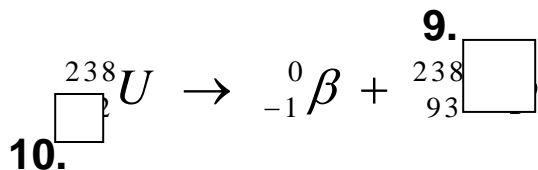
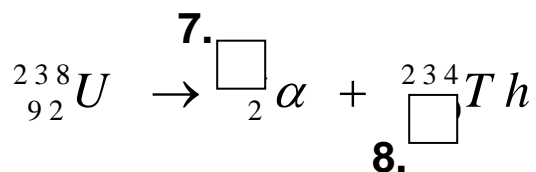
**For 2 - 5 :** For each particle, fill in either 0, 0, 1, or 2 (use each answer once).

	2 alpha	3 beta	4 gamma	5 neutron
Mass in amu (p+n)	4	<input type="text"/>	0	<input type="text"/>
Symbol	$\alpha$	$e$	$\gamma$	n
Charge of nucleus	+ <input type="text"/>	-1	<input type="text"/>	0

Write **True** or **False** in the blank


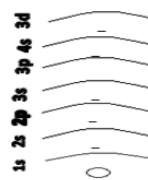
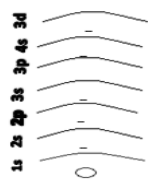

6. \_\_\_ Loss of an **alpha** particle, results in a loss of 2 + charges & loss of 4 a.m.u.'s.

**For 7-10: Fill in blanks** with the appropriate number or symbol.



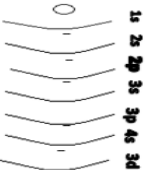
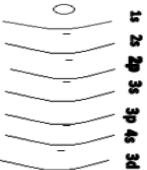
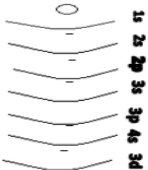
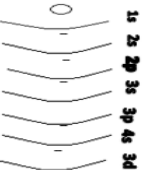
Atomic Structure Worksheet

Fill in the blanks for the elements in this chart.

Element	# of Protons	# of Electrons	# of Neutrons	A.M.U.	Average Atomic Mass	Draw Atom with Orbitals	Electron Configuration	Alpha Decay Reaction	Beta Decay Reaction
C-14	6	6	8	14.0	12.0107		[He]2s <sup>2</sup> 2p <sup>4</sup>	$^{14}\text{C}_6 \rightarrow ^4\text{He}_2 + ^{10}\text{Be}_4$	$^{14}\text{C}_6 \rightarrow ^4\text{e}_{-1} + ^{14}\text{N}_7$
O-15									
P-31									
K-40									





F-21									
Cl-34									
Al-28									
V-52									

HALF LIFE QUESTIONS

1. After 50 days, 5 grams of vanadium-52 has decayed to 0.625 grams. What is the half-life of V-52?
2. If the half-life of Cl-34 is 3 hours, how much remains from a 20.0 grams sample after 15 hours?

## 4 &amp; 25 Jeopardy

- 1-100 DALTONS THEORY OF **INDIVISIBLE ATOMS** STOOD THE TEST OF TIME.
- 1-200 **Who DID THE GOLD FOIL EXPERIMENT AND FOUND THAT ATOMS HAVE POSITIVE CENTERS SURROUNDED BY MOSTLY ELECTRONS!** a. J. J. Thompson b. Robert Millikin  
c. Rutherford d. Heisenberg e. Bohr
- 1-300 Who discovered the **electron**.
- 1-400 Who used the equation  $E = mc^2$  to calculate the amount of energy released in nuclear reactions.
- 2-100 Which is an element? \_\_\_\_\_ Which is an element and molecule? \_\_\_\_\_ Which is a compound. \_\_\_\_\_
- 2-200 Which is the most accurate to describe the **mass and charge** of the proton electron & neutron  
a. 1 +1 0 -1 0 1 b. 1 -1 1 -1 1 0  
c. 1 1 2 -1 0 0 d. 1 +1 0 -1 1 0
- 2-300 What **particles are in the nucleus**? 2-400 What particles are added to make the **mass number**?
- 2-500 How many neutrons does Sodium usually have? Why is the atomic mass not a whole number like 23?
- 3-100 **Fission or Fusion** Which happens on the **sun**?
- 3-200 **Fission or Fusion** **Splitting of the atom**, like Uranium in the 2 bombs on Japan in WWII.
- 3-300 **Fission & Fusion** Hydrogen **changing into Helium**
- 3-400 An element is 50% with a mass of 35 a. m. u. and 50% with a mass of 36 a. m. u. What should it's atomic mass be listed as? \_\_\_\_\_ What element is it? \_\_\_\_\_
- 3-500 The **mass number** is: a) The number of protons + neutron b) Th # of protons + electrons  
c) The number of electrons + neutrons d) The atomic number + protons
- 4-100 The **isotopes of Hydrogen** each have 1 proton but differ in their number of electrons.
- 4-200 When Iodine release an electron (or **beta particle**), **its atomic mass**  
a. increases b. Remains the same c. decreases d. Can't be determined
- 4-300 Elements have **different isotopes**. This is why on P. Table **average** \_\_\_\_\_ has decimals.
- 4-400 Using the 2 Atomic Mass numbers, explain why the particle released **must be an electron**.
- 4-500 Looking at Sulfur on the Periodic Table, if Sulfur-32 is the most abundant form, what other **2 forms are more likely**. a. 28, 29 b. 30, 31 c. 32, 33 d. 63, 64
- 5-100 The # of Protons electrons & neutrons for the smaller Potassium Isotope is  
a. 20, 19, 19 b. 19, 19, 20 c. 19, 19, 19 d. none correct
- 5-200 If the **atomic number is 50 & mass number 125**, what's the # of Protons, Electrons & Neutrons? What element?
- 5-300 The **mass & charge of gamma** is: \_\_\_\_\_
- 5-400 **The change in atomic mass** when beta is released is? +4, -4, +2, or -2
- 5-500 What is the **least and most penetrating form** and radiation? \_\_\_\_\_ Explain Why?
- 6-100 What particle is **released w/ alpha**? A. proton B. neutron C. 2 neutrons & 2 electrons D. helium nucleus
- 6-200 **What unit** is used to measure the **average atomic mass** of an element's isotopes?
- 6-300 What is the **symbol for tritium** or Hydrogen - 3? \_\_\_\_\_ (ex:  ${}_6\text{C}$ )
- 6-400 What is **the difference between mass number and average atomic mass**?
- 6-500 **Alpha Decay changes** the atomic mass & atomic number by  
A. Increase by 2 increase by 2 B. Increase by 4 Decrease by 2  
C. Decrease by 4 Decrease by 2 D. Decrease by 0 Increase by -1
- 7-100 Chlorine -35 & C1-37 are the 2 Isotopes. Which **isotope is more abundant**? How do you know?
- 7-200 All **atoms of the same element** must have the same  
A. mass B. electrons & protons C. mass number D. more than 1 answer above
- 7-300 What is the **smallest particle of an element that retains the properties** of that element?  
a. electron b. Atom c. element d. proton e. electron
- 7-400 Which **2 ideas of Daltons' Atomic Theory had to be revised** and explain why for each reason?
- 7-500 Lithium - 6 is 10.0% of the total Lithium found. Lithium - 7 is 90.0%. What is the avg. atomic mass of Lithium?
- 8-100 How many protons has: Carbon-14? Carbon-13? Carbon-12?
- 8-200 After 2 half-lives how much radioactive material is left (in %) and explain?
- 8-300 How many neutrons does Uranium give off in a nuclear chain reaction?
- 8-400 Why doesn't a Uranium bomb go off early.
- 10-500 Why would Uranium be a bad radio Isotope for medicine?

**How to get the best score on the test?**

1. Take the above info & study it.
2. Highlight it.
3. Write the info on test help sheet. Review packet.
4. Anything you don't understand, read over in Chapters 4 & 25 in the textbook.

