

**Honors Chem I**  
**Nuclear Properties and Change Review Sheet-20 points**

Name: \_\_\_\_\_

*History of the Atomic Model*

1. Describe how the atomic model changed as time progressed and how each discovery led to the next:  
Democritus-Dalton-Thomson-Rutherford-Chadwick-Bohr-Quantum (electron cloud) model
2. Explain the gold foil experiment and how Rutherford used it to justify a dense nucleus surrounded by mostly empty space.
3. Why were neutrons discovered last of the major particles?

*Protons, Neutrons, Electrons and Isotopes*

1. How do isotopes of the same element differ?
2. What is meant when we say that the number of protons defines the element?
3. How many protons, neutrons and electrons are in a neutral atom of Sn-120?
4. What is the mass number and symbol of an element with 35 protons and 42 neutrons?
5. Why are the masses listed on the periodic table not whole numbers typically?
6. Where do you find the protons, neutrons and electrons in an atom?

*Radioactivity and Decay*

1. Why are the larger atoms near the bottom of the table particularly unstable and subject to decay?
2. List the six primary radioactive particles released during decay reactions.
3. Which of the particles is most dangerous? least dangerous?
4. Why are radioactive particles dangerous to humans?

*Half-Life*

1. How much of a 400 g sample of Thorium-238 would be left after 6 half-lives?
2. How many half-lives would it take before 1000 g of Uranium-238 would be less than 50 g?
3. What is the definition of half-life?
4. Why is it important to know how long the half-life is for a sample of radioactive material?

*Fusion*

1. Explain what occurs in the fusion of hydrogen isotopes in our sun.
2. Why is fusion not currently a practical source of power?

*Fission*

1. Explain how fission differs from fusion.
2. What is the difference between subcritical, critical and supercritical fission?
3. Which type of fission would you want in a nuclear warhead? nuclear power plant?
4. Balancing nuclear equations:
  - a.  $\text{Pu-240} \rightarrow \text{Fr-220} + ?$
  - b.  $\text{Ba-137} + \text{alpha} \rightarrow \text{beta} + ?$
  - c.  $\text{Pu-240} + 3 \text{ neutrons} \rightarrow \text{alpha} + \text{beta} + ?$

*Nuclear Power*

1. Describe and identify the components of the:
  - a. Primary loop
  - b. Secondary loop
  - c. Tertiary loop
2. What are the “pros and cons” of using nuclear power?
3. Describe one catastrophic or near catastrophic event as discussed in class.

*Nuclear Weapons*

1. Explain how a traditional nuclear bomb is designed.
2. Describe how a dirty bomb works and what effects it would have.
3. Why is it so difficult for nations to join the “nuclear club?”

*Other Nuclear Applications*

1. Explain how radiation can be used in the diagnosis and treatment of disease.
2. Explain the advantages and disadvantages of nuclear powered submarines.