

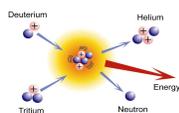
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## Chapter 7: The discovery of radiation and nuclear chemistry

1. Nuclear chemistry is different than normal chemistry because the changes take place in the \_\_\_\_\_ of the atom.
2. What particles make up the nucleus of the atom? \_\_\_\_\_ and \_\_\_\_\_
3. An isotope of an element has the same \_\_\_\_\_ but different number of \_\_\_\_\_. This makes this variety \_\_\_\_\_ or \_\_\_\_\_ than the more common variety of this element.
4. JJ Thomson discovered the \_\_\_\_\_ using a vacuum tube connected to a battery.
5. These cathode tubes also produce \_\_\_\_\_. \_\_\_\_\_ are not particles, but are like radio waves or light waves but have much shorter wavelengths and so much higher energy. They can \_\_\_\_\_ through matter.
6. Within a short time of their discovery, \_\_\_\_\_ were used for \_\_\_\_\_.
7. Radioactivity is a \_\_\_\_\_ process.
8. A French chemist and photographer Henri Becquerel discovered \_\_\_\_\_ when he was trying to \_\_\_\_\_ minerals of \_\_\_\_\_.
9. Ernest Rutherford named the first 3 types of \_\_\_\_\_. The least penetrating type is called \_\_\_\_\_. It has a \_\_\_\_\_ charge and a mass of \_\_\_\_\_. This is the same thing as a \_\_\_\_\_ only without \_\_\_\_\_. The next most penetrating type of radioactivity is the \_\_\_\_\_ particle (named after the second letter of Greek alphabet). It is an \_\_\_\_\_ being shot out of a nucleus at high speed. Gamma radiation is \_\_\_\_\_ it is super short wave length and highly energetic.
10. The release of energy and particles from the nucleus is called \_\_\_\_\_.
11. Many isotopes are not radioactive. They can be perfectly \_\_\_\_\_.



12. When nuclei give off either alpha or beta \_\_\_\_\_ . They change into a different \_\_\_\_\_ because the number of \_\_\_\_\_ changes. This can be called radioactive \_\_\_\_\_ .
13. \_\_\_\_\_ Radiation is strong enough to knock electrons off of other atoms. This forms \_\_\_\_\_ (atoms with a + or a - charge)
14. When writing nuclear decay reactions we must obey the Law of \_\_\_\_\_ of \_\_\_\_\_ and the Law of \_\_\_\_\_ of \_\_\_\_\_ .
15. In an atomic symbol, the subscript is the number of \_\_\_\_\_ or the \_\_\_\_\_ on the periodic table. It always must match the chemical \_\_\_\_\_ .
16. 
$${}_{84}^{210}\text{Po} \rightarrow {}_{82}^{206}\text{Pb} + \underline{\hspace{2cm}}$$
17. By nuclear process it is possible for a radioactive element to \_\_\_\_\_ into another element. This the ancient alchemist's dream. It is now possible to turn a few atoms of lead into gold. It would take a nuclear accelerator and millions of \$, but it can be done.
18. In one \_\_\_\_\_ , one half the amount of radioactive material will decay or turn into another element called a \_\_\_\_\_ product.
19. If an archaeological sample was found to have 1/16 of the original carbon in it, it would take \_\_\_\_\_ half-lives
20. When nuclear fission or nuclear fusion takes place, some of the \_\_\_\_\_ holding the atom together goes missing. This is known as the \_\_\_\_\_ defect.
21. This mass is converted into pure energy . The amount of energy can be calculated by Einstein's famous equation \_\_\_\_\_ = \_\_\_\_\_ .
22. Fusion takes light isotopes and makes them into \_\_\_\_\_ atoms. This releases more energy per atom than \_\_\_\_\_ .
23. Stars get their energy from \_\_\_\_\_ and make new \_\_\_\_\_ .
24. Stars die out when they produce \_\_\_\_\_ . It can't be \_\_\_\_\_ or \_\_\_\_\_ to get energy out.
25. \_\_\_\_\_ is the name of splitting heavy isotopes to form lighter ones. This is the power behind the \_\_\_\_\_ bomb and \_\_\_\_\_ power plants.