**FPS – Nuclear reactions notes**

Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period\_\_\_\_\_\_\_\_\_\_

|  |  |  |  |
| --- | --- | --- | --- |
| ***Bellwork*** | | | |
| http://www.sr.bham.ac.uk/xmm/images/atom/radioactivity_240_201.jpg | | 1. Listen to the nuclear decay song, then list 3 things you remember from the song. | |
| 1. **Nuclear Radioactivity:**    1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 🡪composed of protons and neutrons    2. Strong force 🡪 causes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to be attracted.    3. Powerful only when protons and neutrons are closely \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ together.    4. Large nucleus is held \_\_\_\_\_\_\_\_\_\_\_ tightly than a small nucleus 2. **Nuclear decay** happens when the \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_ is not large enough to hold the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_together.  a. The nucleus gives off \_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ until they transform into a different isotope or another element. 3. **Isotopes** 🡪 atoms with the same number of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, but different number of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.   Examples: Carbon-14 6 protons, 8 neutrons  Carbon-12 6 protons, 6 neutrons   1. An atom’s \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ will depend on the ratio of protons to neutrons in the nucleus.    1. A nucleus with either too many or too few neutrons compared to protons is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 2. POP QUIZ: Explain why nuclear decay occurs.   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   1. History:    1. 1896 – Henri Becquerel discovered radioactivity with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_    2. 1898 – Marie & Pierre Curie discovered radioactivity with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | | |
| 1. **Nuclear radiation –** Particles and energy released from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ nucleus. There are 3 types:    1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_ particles    2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_ particles    3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_ rays 2. **Alpha(α) particles 🡪** consist of 2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and 2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ with a charge of +2. They do not travel far due to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Though they are the least penetrating form of radiation, they can cause serious \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. 3. **Beta (β) particles 🡪** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ emitted during the decay of a neutron into a proton in an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ nucleus. They can travel farther and faster than alpha particles because beta particles are so \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. 4. **CH10_02dGamma(γ) Rays 🡪** high energy electromagnetic radiation emitted by a nucleus during radioactive decay. They have no \_\_\_\_\_\_\_\_\_\_\_\_\_ and no \_\_\_\_\_\_\_\_\_\_\_\_\_\_. These rays can penetrate matter deeply, even \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. | | | |
| http://wiki.chemprime.chemeddl.org/images/c/c1/Penetrating_power.jpg | 1. What are the three types of decay we talked about? | |
| 1. When an atom is ***radioactive***, it is… \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 2. ***Half-life of radioactive isotopes*** a. The length of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ it takes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the atoms of a sample of radioactive isotopes to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.   b. Varies from fractions of a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to billions of \_\_\_\_\_\_\_\_\_\_\_\_\_\_  c. Do you remember plutonium’s half-life? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   1. ***How can we use radioactive half-lives?*** Can be used to determine the \_\_\_\_\_\_\_\_\_\_\_ of old objects, such as  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. 2. ***Rate of Nuclear decay***   -There are two ways to determine the rate of decay.  -The first is by the rate at which the \_\_\_\_\_\_\_\_\_\_\_ of the radioactive isotope \_\_\_\_\_\_\_\_\_\_\_\_.  -The second is by the rate at which the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (alpha and beta) is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. (counts per minute on the \_\_\_\_\_\_\_\_\_\_\_\_\_\_ counter)  -The half life is a constant that is dependent on the isotope, time of half life does not change over time.   1. ***Nuclear fission*** 🡪 the process of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ a nucleus into two nuclei with smaller masses 2. ***Chain reaction*** 🡪 an ongoing series of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ reactions 3. ***Nuclear fusion*** 🡪 two nuclei with low masses are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to form ONE larger \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ a. Can only happen when nuclei are moving \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   b. Temperature must be as high as the temperature of a \_\_\_\_\_\_\_\_\_\_\_   1. ***Nuclear Notation***   http://www.mikeblaber.org/oldwine/chm1045/notes/Atoms/AtomStr2/IMG00010.GIF   1. ***Nuclear reactions***   When an atom undergoes nuclear decay it alters the makeup of the nucleus.  It will \_\_\_\_\_\_\_\_\_\_\_\_\_\_ to a new element.  \_\_\_\_\_\_\_\_ particle decrease atomic number by \_\_ and the mass number by \_\_  U  238  92  ⎯⎯→  Th  234  90  He  4  2  +  \_\_\_\_\_\_\_\_ particles increase the atomic number by \_\_\_\_ and cause the mass number to remain unchanged.    I  131  53  Xe  131  54  ⎯⎯→  +  e  0  −1 | | |

Complete the review questions and nuclear reactions alone or with a partner!

1. What is the nucleus of an atom composed of?
2. What is a strong force?
3. How are the strong forces between a large nucleus and a small nucleus different?
4. Why does nuclear decay happen?
5. What two things are released during nuclear decay?
6. What is an isotope?
7. Give an example of isotopes of Carbon.
8. What does it mean when a nucleus is unstable or *radioactive?*
9. In what elements did Marie Curie discover radioactivity?
10. What is an alpha particle?
11. What is a beta particle?
12. What is a gamma ray?
13. How are alpha and beta particles different?
14. How are gamma rays different from alpha and beta particles?
15. Which is the most dangerous radiation AND why?