**Nuclear Fission and Fusion**

YOYO: What do you think the difference is between fission and fusion? Write your response below.

Types of Nuclear Reactions

|  |  |
| --- | --- |
| **Natural Transmutation** | **Artificial Transmutation** |
| * Alpha decay * Beta decay * Positron decay * Fusion (energy from the sun) | * Fission (atomic bomb) * Fusion (new technology) |

Fission

* Artificial transmutation = man made
* Fission = splitting of heavy element (large nucleus)
* Heavy element + neutron 🡪 2 middle weight nuclei + 1 or more neutrons + energy
* Example:
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Fusion

* Combines light element to produce a heavier one
* In the sun
* Example:
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Fission vs. Fusion

Fusion

Fission

Radioisotopes

|  |  |
| --- | --- |
| Benefits | Risks |
| * Tracers​ * Medical: radioactive iodine can be used to diagnose and treat thyroid.​ * Food can be stored longer.​ * Nuclear Power​ * Radioactive dating​ * U-238 and Pb-206 are used for geological dating.​ C-14 used for dating living material. | * Biological Damage: damage or destroy cells​ * Long Term Storage​ * Accidents: nuclear explosion​ * Pollution: nuclear waste |

Practice Regents Questions

1. In a fusion reaction, reacting nuclei must collide. Collisions between two nuclei are difficult to achieve because the nuclei are​
   1. both negatively charged and repel each other​
   2. both positively charged and repel each other​
   3. oppositely charged and attract each other​
   4. oppositely charged and repel each other
2. Given the fusion reaction: 21H + 2 1H 🡪 X + energy ​

Which particle is represented by X? ​



1. Which change takes place in a nuclear fusion reaction?​
   1. Matter is converted to energy.​
   2. Energy is converted to matter.​
   3. Ionic bonds are converted to covalent bonds.​
   4. Covalent bonds are converted to ionic bonds.​

​

1. Nuclear fusion differs from nuclear fission because nuclear​ fusion reactions​
   1. form heavier isotopes from lighter isotopes​
   2. form lighter isotopes from heavier isotopes​
   3. convert mass to energy​
   4. convert energy to mass
2. A nuclear fission reaction and a nuclear fusion reaction are​ similar because both reactions​
   1. form heavy nuclides from light nuclides​
   2. form light nuclides from heavy nuclides​
   3. release a large amount of energy​
   4. absorb a large amount of energy
3. In which reaction is mass converted to energy by the process of fission? ​
   1. + 🡪 +
   2. + 🡪 + + 3
   3. 🡪 +
   4. + 🡪
4. Which statement explains why nuclear waste materials may pose​ a problem?​
   1. They frequently have short half-lives and remain radioactive​ for brief periods of time.​
   2. They frequently have short half-lives and remain radioactive ​for extended periods of time.​
   3. They frequently have long half-lives and remain radioactive ​ for brief periods of time.​
   4. They frequently have long half-lives and remain radioactive ​for an extended period of time