**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.
	2.
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