

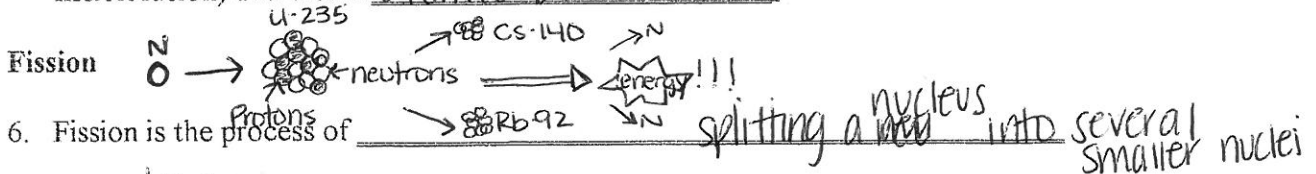
Fission and Fusion Notes

Einstein's Theory of Relativity

- Matter and energy cannot be created or destroyed.
- Matter and Energy are two forms of the same thing, you can convert one to the other!
- Einstein's formula, $E=mc^2$, tells us how matter can be changed into energy.
 $E = \text{energy}$ $m = \text{mass}$ $c = \text{speed of light (300,000,000 m/s)}$
- Einstein's formula tells us that a small amount of mass can be converted into an enormous amount of energy

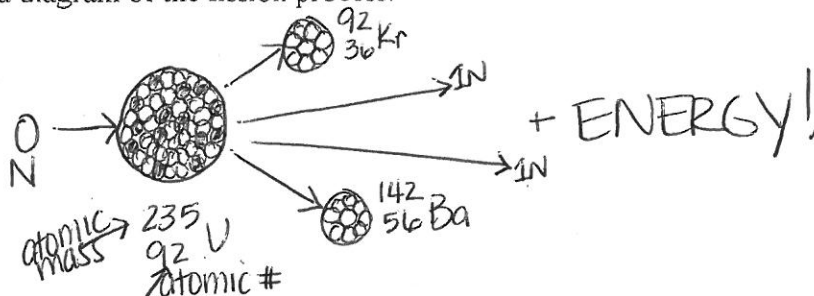
Ex: 1 gram of mass = 100 trillion joules of energy released

- Scientists use this equation to unlock atomic energy (nuclear fission/fusion) and create atomic bombs.



- Only large (heavy) nuclei can undergo the fission process.
- Large amounts of heat and light energy are produced by the fission process.
- The fission process is initiated by a neutron striking an atom's nucleus, then the atom becomes unstable and splits into two smaller nuclei & free neutrons
- When a nuclear fission reaction occurs, the neutrons emitted can strike other nuclei causing them to split. The series of repeated fission reactions is called chain reactions.

- Draw a diagram of the fission process.



12. Example of a fission reaction:



13. Fission produces large amounts of energy that can be captured by nuclear power plants to produce electricity and atomic bombs!

Fusion

14. Fusion is when two smaller nuclei combine to form one nucleus of a larger mass

15. Takes place at very high temperatures.

Ex: Sun = 15 million degrees, Earth = 100 million degrees

16. The fusion process generates tremendous amount of heat (energy)

17. Draw a diagram of the fusion process.



18. For fusion to occur, a large amount of energy is needed to bring two or more protons close enough that nuclear forces overcome their electrostatic repulsion

19. Fusion reactions do not occur naturally on our planet but are the principal type of reaction found in stars (sun)

20. The sun fuses hydrogen atoms to produce helium and vast amounts of energy

21. Fission vs. Fusion. Label the two diagrams found below with the appropriate reaction.



A) Fission B) Fusion