Name:_____ Period:_____ Page #_____

Fission and Fusion

Nuclear Weapons

There are two main types of nuclear weapons: atomic bombs, which are powered by **fission reactions** similar to those in nuclear reactors [power plants], and hydrogen bombs, which derive their explosive power from **fusion reactions**.

An **atomic bomb** slams together two pieces of fissionable material, usually uranium-235 or plutonium-239. This releases its energy instantaneously as atoms inside it split in an uncontrolled **chain reaction**. On August 6, 1945, an atomic bomb called Little Boy was dropped on the Japanese city of Hiroshima, followed three days later by another, called Fat Man, on Nagasaki.

Hydrogen bombs fuse together hydrogen atoms to form heavier helium atoms, releasing far more energy than a fission bomb. Two **isotopes** of hydrogen are used – deuterium ($^{2}_{1}H$) and tritium ($^{3}_{1}H$). Hydrogen bombs have never been used in war and are thousands of times more powerful than atomic bombs.

For questions 1-7 identify each as a **fusion** or **fission**

1. Used in nuclear power plants: Fission
2. Occurs on the sun: Fusion
3. More power per gram: _____
4. A larger nucleus divides to make a smaller nucleus: _____
5. Two hydrogen atoms fuse to make a helium atom: _____
6. An atomic bomb: _____
7. A hydrogen bomb: _____

For questions 8- 12 balance the nuclear equation, then indicate if the equation represents fission or fusion **(circle one).**

8. $^{231}_{91}Pa \rightarrow {}^{192}_{77}Ir +$ _____ Fission or fusion
9. $^{4}_{2}He + {}^{2}_{1}H \rightarrow$ _____ Fission or fusion
10. $^{9}_{4}Be + {}^{12}_{6}C \rightarrow$ _____ Fission or fusion
11. $^{238}_{92}U + {}^{1}_{0}n \rightarrow {}^{128}_{52}Te +$ _____ Fission or fusion
12. $^{262}_{105}Db \rightarrow {}^{96}_{42}Mo + {}^{28}_{14}Si +$ _____ Fission or fusion

Fission and Fusion (continued)

13. Why can't we use fusion reaction in a nuclear power plant?

14. Why is it so hard to dispose of nuclear waste?

15. What are the benefits to having a nuclear power plant nearby?

16. What are the hazards to having a nuclear power plant nearby?
4 dangerous
Nuclear power plants can have problems and release radiation.

17. **Fill in the blanks.** There are two types of nuclear reactions, fusion and fission. _____ involves fusing particles together. This is the nuclear reaction that occurs in the sun. Fission involves _____ a heavy nucleus into smaller particles. This is the reaction that produces nuclear energy.

18. Compare and contrast FISSION and FUSION in terms of energy production, particles involved and examples.