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| **Science 10 – Chemistry** **Nuclear Reactions** | **Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Block: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |
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**Nuclear reactions are divided into…**

**Fission – splitting of a nucleus**

**Fusion – joining of two nuclei**

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| **Nuclear FISSION** |

Nuclear Fission is when a large nucleus \_\_\_\_\_\_\_\_\_\_\_\_\_\_ into two smaller nuclei, it releases \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

* Heavier nuclei tend to be unstable. ***WHY***? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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During Nuclear Fission, a small amount of \_\_\_\_\_\_\_\_\_\_\_\_\_ is lost and converted to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Matter and energy are ***interchanged*** in a nuclear reaction (the mass of the product is slightly less than the mass of the reactant).

All nuclear power generation is accomplished through ***nuclear fission***.

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| **Chemical Reactions** | **Nuclear Reactions** |
| * Mass is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and energy changes are relatively small.
* There are no changes to the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the nuclei in chemical reactions.
 | * The actual \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the atom changes.
* Protons, neutrons, electrons and/or gamma rays can be \_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_.
* Small changes in mass =
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**Example: Nuclear Fission of U-235**

**Equation:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Practice Problems:**

Find the indicated daughter nucleus for each of the following… (Projected on the board!)

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| **Chain Reactions*** Once the nuclear fission reaction has started, it can keep going
* The neutrons released \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ more reactions on other U-235 atoms.
* This chain reaction can quickly get quickly get out of control
* Materials that absorb neutrons help to control the chain reaction.
* Nuclear bombs are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ reactions.
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| **Nuclear FUSION** |

Nuclear Fusion is when **two small nuclei** join together into **one larger nuclei**, releasing \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

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**Nuclear Fusion** produces **much more energy** for a given mass of fuel than nuclear fission.

Equations: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



Examples of nuclear fusion:

* The sun and other stars (Grade 9)
* A Hydrogen Bomb (needs a fission bomb to ignite it!)

Fusion in stars like the sun **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** the heavier elements in the universe

While heavier elements can be made in the heart of stars, if they are heavier than Iron they will be unstable, and begin to decay.

As an energy source it is clean and plentiful, however, it is very hard to control as it needs very high temperature.

* Scientists cannot yet find a safe, manageable method to harness the energy of nuclear fusion.
* So-called “cold fusion” would occur at temperatures and pressure that could be controlled.