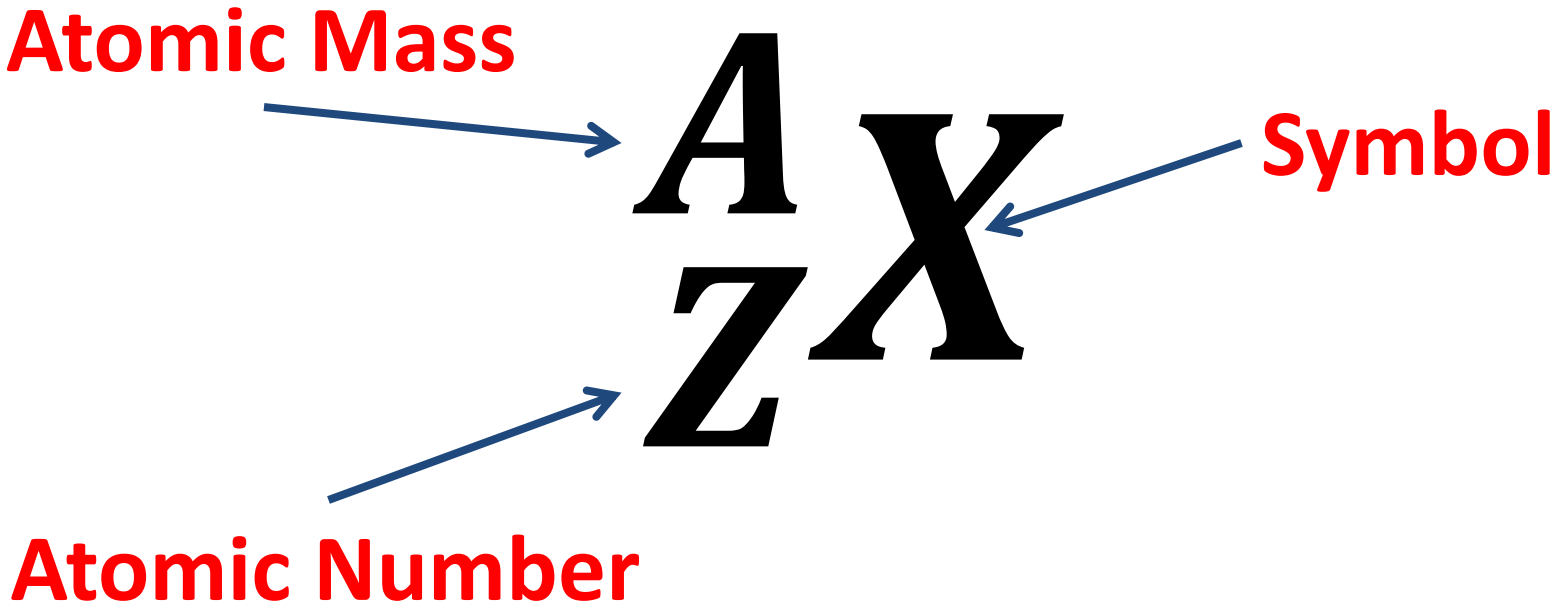
Atomic Number and the Synthesis of New Elements


Atomic Mass
Symbol
Atomic Number

Example

$$^{12}_{6}C$$

Atomic Number:____ Atomic Mass:____ Element:____

Seatwork

Write the Atomic Number, Atomic Mass and Elements of the following nuclei.

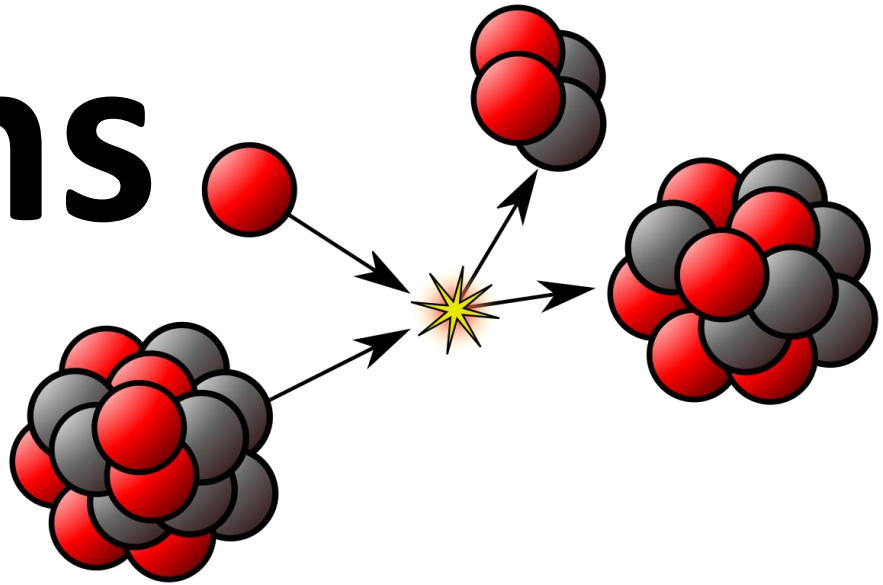
1. $^{14}_{7}N$
2. $^{137}_{56}Ba$
3. $^{40}_{18}Ar$
4. $^{55}_{25}Mn$
5. $^{70}_{31}Ga$
6. $^{178}_{72}Hf$

Seatwork

Identify the number of protons and neutrons present in the following nuclei.

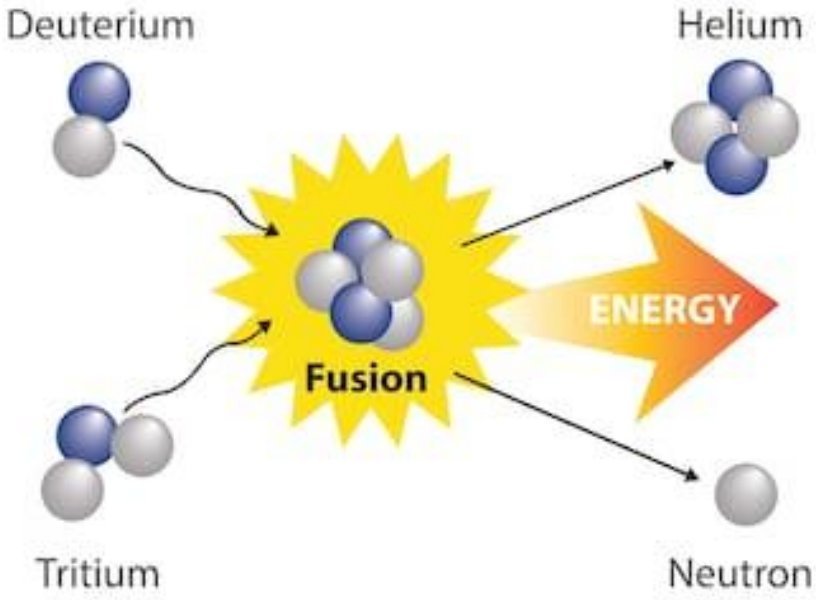
1. $^{89}_{39}Y$
2. $^{52}_{24}Cr$
3. $^{133}_{55}Cs$
4. $^{184}_{74}W$
5. $^{115}_{49}In$
6. $^{294}_{117}Ts$
7. $^{195}_{78}Pt$
8. $^{79}_{34}Se$
9. $^{244}_{94}Pu$

Nuclear Reactions



Nuclear Reaction

Process where two nuclei collide to produce new nuclei



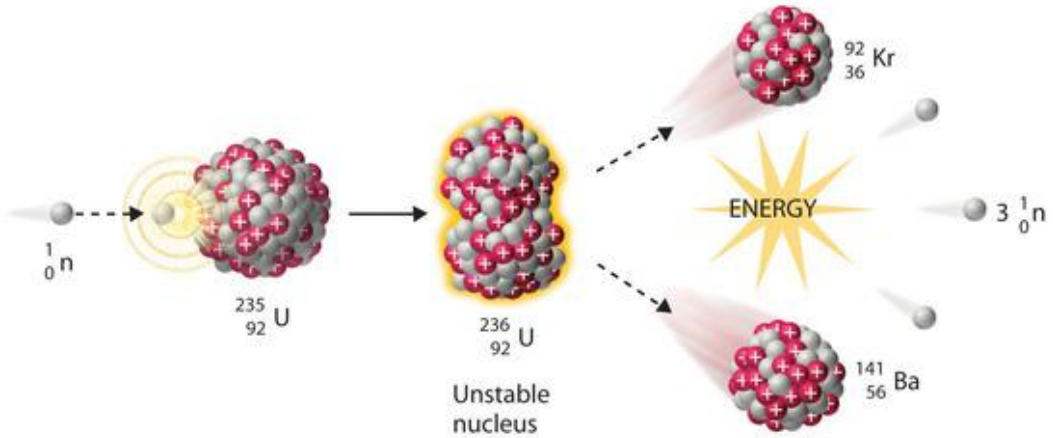
Types of Nuclear Reaction:

Nuclear Transmutation Reaction

Nuclear Decay Reaction

Nuclear Transmutation

Transformation of one element into another element by colliding with high energy particles.

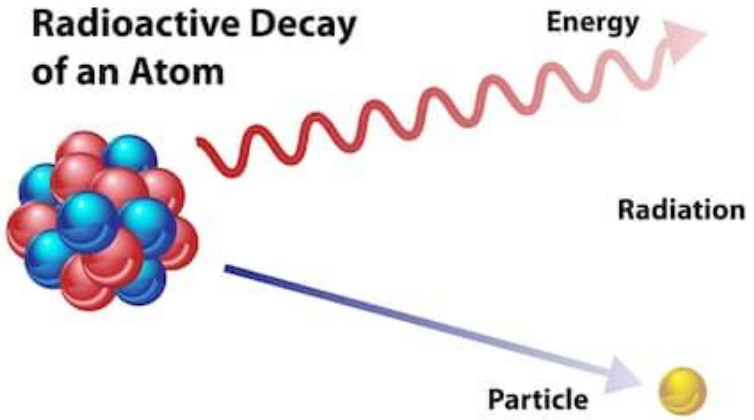


Nuclear Decay

Also known as

radioactive decay

A reaction in which the nucleus emits radiation and transforms into a new nucleus.



3 types of Nuclear Decay:

ALPHA DECAY

A reaction that emits helium-4 nucleus (alpha particles).

Formula: $${}^{A}_{Z}X \rightarrow {}^{A-4}_{Z-2}Y + {}^{4}_{2}\propto$$

Example: $${}^{237}_{93}Np \rightarrow {}^{233}_{91}Pa + {}^{4}_{2}\propto$$

Try this on your notebook

1. $^{204}_{81}Tl \rightarrow \square + ^{4}_{2}\propto$
2. $\square \rightarrow {}^{247}_{96}Cm + ^{4}_{2}\propto$
3. $^{116}_{50}Sn \rightarrow {}^{112}_{48}Cd + \square$
4. $^{280}_{111}Rg \rightarrow \square + ^{4}_{2}\propto$
5. $\square \rightarrow {}^{289}_{114}Fl + ^{4}_{2}\propto$

3 types of Nuclear Decay:

BETA DECAY

A neutron is converted into a proton and emits an electron in a form of a beta particle.

Formula: $${}^{A}_{Z}X \rightarrow {}^{A}_{Z+1}Y + {}^{0}_{-1}\beta$$

Example: $${}^{249}_{96}Cm \rightarrow {}^{249}_{97}Bk + {}^{0}_{-1}\beta$$

Try this on your notebook

1. $^{204}_{81}Tl \rightarrow \square + {}^{0}_{-1}\beta$
2. $\square \rightarrow {}^{247}_{96}Cm + {}^{0}_{-1}\beta$
3. $^{116}_{50}Sn \rightarrow {}^{116}_{51}Sb + \square$
4. $^{280}_{111}Rg \rightarrow \square + {}^{0}_{-1}\beta$
5. $\square \rightarrow {}^{289}_{114}Fl + {}^{0}_{-1}\beta$

3 types of Nuclear Decay:

GAMMA DECAY

A reaction that emits gamma radiation to lower the energy of an unstable nuclei.

Formula: $\mathbf{{}^{A}_{Z}X \rightarrow {}^{A}_{Z}Y + {}^{0}_{0}\gamma}$

Example: ${}^{237}_{93}Np \rightarrow {}^{237}_{93}Np + {}^{0}_{0}\gamma$

Try this on your notebook

$$^{163}_{66}Dy \rightarrow \square + {}^{0}_{0}\gamma$$

$$^{243}_{95}Am \rightarrow {}^{243}_{95}Am + \square$$

$$\square \rightarrow {}^{131}_{54}Xe + {}^{0}_{0}\gamma$$

On a ½ sheet of paper

Nuclear Decay	Reaction
1.	6. $\square \rightarrow {}^{192}_{77}Ir + {}^{0}_{0}\gamma$
2.	7. ${}^{201}_{80}Hg \rightarrow {}^{201}_{81}Tl + \square$
3.	8. ${}^{266}_{106}Sg \rightarrow \square + {}^{4}_{2}\propto$
4.	9. $\square \rightarrow {}^{226}_{88}Ra + {}^{4}_{2}\propto$
5.	10. ${}^{209}_{83}Bi \rightarrow \square + {}^{0}_{-1}\beta$

On a ½ sheet of paper

Nuclear Decay	Reaction
11.	16. $^{127}_{53}I \rightarrow$ ☐ $+ \, ^{0}_{0}\gamma$
12.	17. ☐ $\rightarrow \, ^{201}_{85}At + \, ^{0}_{-1}\beta$
13.	18. $^{209}_{84}Po \rightarrow \, ^{209}_{84}Po +$ ☐
14.	19. ☐ $\rightarrow \, ^{222}_{86}Rn + ^{4}_{2}\propto$
15.	20. $^{262}_{105}Db \rightarrow$ ☐ $+ \, ^{0}_{-1}\beta$