Nucleons:
- are particles occupying the ______________
- consist of __ charged __________ and ___________ _____________
- have almost 2000 times the ________ of _______________
- are made up of ___________ and __________

Nuclear Notation:
- atomic _________ ( )
  = _________ + _________

\[ ^{27}_{13} Al \]

atomic _________ ( )
  = no. of _________ (= _________)

\[ ^{27}_{13} Al \] has _____ protons and _____ neutrons, for a total of _______ nucleons.

\[ ^{28}_{13} Al \] has _____ protons and _____ neutrons, for a total of _______ nucleons.

Isotopes:
- atoms of _________ element with different numbers of _________ (different ___________)

Forces Acting on Nucleons:
- strong forces -
  - forces of _____________ between nucleons
  - are independent of the _________ of the nucleon
  - are short range (exist only between ____________ neighbors)

- electrical force -
  - force of _____________ between _____ charged protons
  - are long range

When are nuclei unstable?
- a. large nuclei (Z > 82) - electrical forces of _____________ are greater
  than strong forces of ____________
- b. wrong neutron: proton ____________

A radioactive isotope:
- has an _____________ nucleus
- spontaneously emits a _________ and _________ into another _________
transmutation – changing into another __________ through radioactive ________________

Types of Radioactive Emission:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Composition</th>
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<tbody>
<tr>
<td>alpha</td>
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<tr>
<td>beta</td>
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<tr>
<td>gamma</td>
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</tbody>
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Nuclear Equations:

alpha decay:

\[
^{214}_{84}Po \rightarrow ^{He}_{He} +
\]

beta decay:

\[
^{209}_{82}Pb \rightarrow e^- +
\]

During beta decay, a neutron changes into a proton and an __________.

\[
^{1}_{0}n \rightarrow ^{1}_{1}p +
\]

half-life:

- the __________ it takes for _________ the _________ of a radioactive sample to ______________
- ranges from a fraction of a __________ to billions of __________
- is _______ affected by ______________ conditions

On back, list some dangers and uses for radioactivity, and Show What You Know.