Nuclear Chemistry and Physics Overview

- Isotopes
  - > Relative abundance
  - > Radioactive vs Stable
- Nuclear Radiation
  - > Alpha
  - > Beta
  - > Gamma
- Nuclear Decay
  - > Half-life
- Nuclear Energy
  - > Fission
  - > Fusion

Questions

Write down one question you have for each of the four topics.

- Isotopes
  - > Relative abundance
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In groups of 3 or 4, share your questions on each topic. Do any of you have the same questions? In your group, pick one main question from each topic.

- Isotopes
  - > Relative abundance
  - > Radioactive vs Stable

What is an isotope?
Can they form compounds (like molecular and ionic)?

- Nuclear Radiation
  - > Alpha
  - > Beta
  - > Gamma

How much of each kind do we consume?
Why is it Greek alphabet letters?
Does it have an effect on humans?
What would happen if there were no nuclear radiation?

Can the use of radioactive medical devices negatively affect your health.

- Nuclear Decay
  - > Half-life

How do we find half-life of certain elements?

What is half-life?

Do all elements have different half-lives?

- Nuclear Energy
  - > Fission
  - > Fusion

What makes this energy?

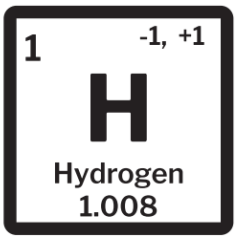
Is the water from the Fukishima plant safe to release to the environment?

What's the difference between fission and fusion?

Does it have a higher efficiency compared to other energy sources?

Isotopes

Question: If a proton has a mass of 1 and a neutron has a mass of 1, why aren't atomic masses round numbers (for example, why isn't Hydrogen's mass 1.000)?



There are 3 reasons:

1. Hydrogen occurs naturally in 3 different forms:

	Natural abundance
Isotopes of hydrogen: $^{1}_{1}H$ – hydrogen-1 $1p^+$, $0n^\circ$	99.98%
$^{2}_{1}H$ – hydrogen-2 (deuterium) $1p^+$, $1n^\circ$	0.018%
$^{3}_{1}H$ – hydrogen-3 (tritium) $1p^+$, $2n^\circ$	0.002%

Isotopes are elements with the same number of protons but different numbers of neutrons.

same

2. The electrons actually have a little bit of mass!

$m_p = 1.67 \times 10^{-27}$ kg

$m_e = 9.11 \times 10^{-31}$ kg or about $\frac{1}{2000}$ the mass of a p+

(NOT zero, just small).

3. Stable nuclei actually have less mass than if we tore them apart!

$E = mc^2$