

Nuclear Chemistry and Physics Overview

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

Questions

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

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

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?

How does radiation affect the body?

What is the difference between radioactive and stable?

- Nuclear Radiation

- > Alpha
- > Beta
- > Gamma - high energy light

α, β, γ

A, B, Γ

What is radiation? What are the differences in the 3 types?
What is gamma radiation?

- Nuclear Decay
 - > Half-life

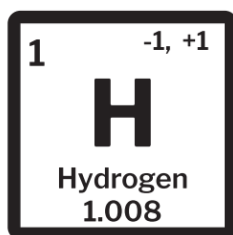
What's a half-life?

- Nuclear Energy
 - > Fission
 - > Fusion

What is the difference between fission and fusion?

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)?



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

There are 3 reasons:

1. Hydrogen occurs naturally in 3 different forms:

${}^1_1\text{H}$ - hydrogen - 1 $1\text{p}^+, 0\text{n}^0$ 99.98%

${}^2_1\text{H}$ - hydrogen - 2 (deuterium) $1\text{p}^+, 1\text{n}^0$ 0.018%

${}^3_1\text{H}$ - hydrogen - 3 (tritium) $1\text{p}^+, 2\text{n}^0$ 0.002%

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

$$m_{p^+} = 1.67 \times 10^{-27} \text{ kg}$$

$$m_{e^-} = 9.11 \times 10^{-31} \text{ kg}$$

) about $\frac{1}{2000}$ the mass of the proton.
Small, but not zero

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

$$E = mc^2$$

energy → ← speed of light.
 ↑ mass

