Isotope Notes

What is an Isotope?

• Atoms with the same number of __________________ and __________________ but __________________ numbers of __________________
• Many elements have two or more isotopes
  – Stable isotopes
  – Unstable isotopes
• Can distinguish one form another by looking at the ________ number:
  – Each __________________ represents the ________ number
  • Oxygen has 3 isotopes: Oxygen-16, Oxygen-17, and Oxygen-18
  • Carbon has 3 isotopes: Carbon-12, Carbon-13, and Carbon-14

Stable Isotopes

• An element whose nucleus does ______ spontaneously give off particles or ________________
• Of the known chemical elements, _____ elements have at least one stable nuclei.
  – These comprise the first 82 elements from hydrogen to lead, with the two exceptions, technetium (element 43) and promethium (element 61), that do not have any stable nuclei.
• Tin has ten stable isotopes

Unstable Isotope

• An element whose ______________ decomposes, or ____________, by ______________ particles and ________________.
  • __________________________
    • The energy or particles that are emitted from the nucleus is called __________________________
      • 3 Types of radiation: Alpha, Beta, Gamma
      • Used to determine the __________ of __________________________

Example of Isotopes

• Carbon has three isotopes and they are carbon 12, carbon 13 and carbon 14.
  – Carbon 12 & 13 are stable isotopes
  – Carbon 14 is an unstable isotope

Isotope Notation...How to write isotopes

• 1st Way of Writing Isotopes-_________________________ ____________-_______________ number
  – Examples
    • Oxygen-16, Oxygen-17, and Oxygen-18
    • Carbon-12, Carbon-13, and Carbon-14
• 2nd Way of Writing Isotopes - 

M = Atomic Mass 
(Neutrons + Protons) 
A = Atomic Number 
(Protons) 
E = Element 

Label the Mass Number and the Atomic Number in each example below.

\[ \begin{align*} 
\text{__________} & \ 78 \text{ Kr} \\
\text{__________} & \ 36 \text{ Kr} \\
\text{__________} & \ 59 \text{ Ni} \\
\text{__________} & \ 28 \text{ Ni} \\
\text{__________} & \ 4 \text{ He} \\
\text{__________} & \ 2 \text{ He} \\
\text{__________} & \ 63 \text{ Cu} \\
\text{__________} & \ 29 \text{ Cu} \\
\end{align*} \]

Calculating Isotopes

• You will use the \underline{\text{__________}} number and the \underline{\text{__________}} number of the isotope to determine the number of \underline{\text{__________}} in the nucleus.
  • Neutrons = Mass number - Atomic number

• Example:
  • Oxygen has 3 isotopes:
    • Oxygen-16
    • Oxygen-17
    • Oxygen-18
    Each of these numbers represents the mass number
  • Oxygen’s atomic number = 8
  • How many neutrons does each isotope of oxygen have?
    • Oxygen-16 \underline{\text{__________}}
    • Oxygen-17 \underline{\text{__________}}
    • Oxygen-18 \underline{\text{__________}}

• Example:
  • How many neutrons does each isotope below have?

\[ \begin{align*} 
\text{__________} & \ 78 \text{ Kr} \\
\text{__________} & \ 36 \text{ Kr} \\
\text{__________} & \ 59 \text{ Ni} \\
\text{__________} & \ 28 \text{ Ni} \\
\text{__________} & \ 4 \text{ He} \\
\text{__________} & \ 2 \text{ He} \\
\text{__________} & \ 63 \text{ Cu} \\
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