

- Two Types of Isotopes -

1- **NATURAL ISOTOPES**: Are found naturally in our environment. Most are Stable and some are Unstable. Unstable isotopes disintegrate and release radiation. Unstable isotopes are called Radioisotopes.

2- **ARTIFICIAL ISOTOPES**: Are created synthetically inside nuclear reactors by bombarding atoms with other atoms. Most artificial isotopes are Unstable and disintegrate releasing a great deal of radiation. These unstable isotopes are also called Radioisotopes.

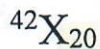
- **Radioisotopes** release radiation in the form of Alpha particles, Beta particles, and Gamma Rays -

Uses of Radioisotopes / Radiation: Refer to Notes 1-G: Atoms & Elements: Describing Radiation

Dangers associated with of Radioisotopes / Radiation: Refer to Notes 1-G: Atoms & Elements: Describing Radiation

Practice:

1) Which of the 5 hypothetical atoms are isotopes of the same element?



a) V and W

b) W and Z

c) X and Z

☒ d) V and X

2) Which element supplies the radioactive isotope that is used to treat or study the thyroid gland.

☒ a) Iodine

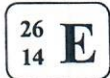
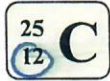
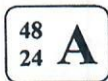
b) Thorium

c) Calcium

d) Strontium

e) Radium

3) Which of the 7 hypothetical atoms are isotopes of the same element? Explain your answer.



Sample Problems:

- 1) The following table shows the relative abundances of all the different isotopes of Neon (Ne).

Ne - 20	90.92 %
Ne - 21	0.26 %
Ne - 22	<u>8.82 %</u>

a) What is the abundance of Ne-22 ? 8.82%

b) The atomic Mass of neon will most likely resemble which one of its isotopes? Why? Ne-20 Most abundant

c) Calculate the Atomic Mass of Neon.

$$\frac{(20 \cdot 90.92) + (21 \cdot 0.26) + (22 \cdot 8.82)}{100} = \underline{\underline{20.18 \text{ amu}}}$$

- 2) Given the following information about the abundances of all known Zinc isotopes, calculate the atomic mass of Zn as seen on the periodic table.

Zinc-64 → 48.60 %

Zinc-66 → 27.90 %

Zinc-67 → 4.10 %

Zinc-68 → 18.80 %

Zinc-70 → 0.60 %

$$\frac{(64 \cdot 48.6) + (66 \cdot 27.9) + (67 \cdot 4.10) + (68 \cdot 18.8) + (70 \cdot 0.60)}{100} = \underline{\underline{65.47 \text{ amu}}}$$

- 3) Element X has three isotopes whose characteristics are given in the following table. Given this information, what is the atomic mass of element X? Show work

Isotope	Relative abundance
$^{190}_{84}\text{X}$	55%
$^{192}_{84}\text{X}$	30%
$^{194}_{84}\text{X}$	15%

$$\frac{(190 \cdot 55) + (192 \cdot 30) + (194 \cdot 15)}{100} = \underline{\underline{191.2 \text{ amu}}}$$

- *4) Richard recorded data on the three stable isotopes of a newly discovered element. Unfortunately, a coffee spill in the late hours of the night resulted in smudged data. Richard was able to recover data on the average atomic mass (24.72 amu.), as well as data on the first two isotopes in the chart below.

Isotope	Natural abundance (%)
^{24}W	78.99
^{26}W	11.01
$^{\text{x}}\text{W}$	? <u>10%</u>

$$\frac{(24 \cdot 78.99) + (26 \cdot 11.01) + (x \cdot 10)}{100} = 24.72$$

$$1895.76 + 286.26 + 10x = 24.72(100)$$

$$2182.02 + 10x = 2472$$

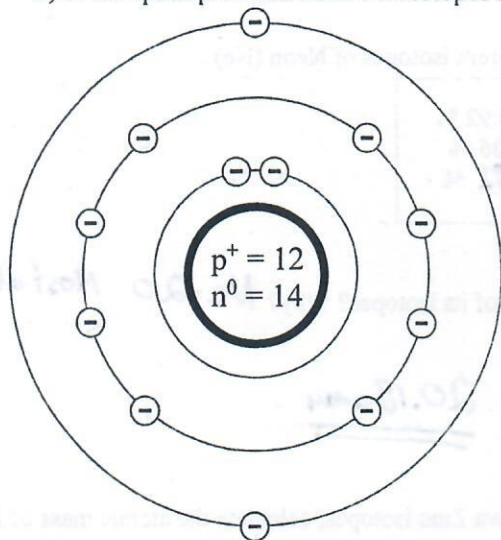
$$10x = 2472 - 2182.02$$

$$\frac{10x}{10} = \frac{289.98}{10}$$

$$x = \underline{\underline{29 \text{ amu}}}$$

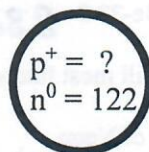
What is the atomic mass of the missing isotope?

5) In the space provided name the isotopes shown.



Name:

Magnesium-26



$$p^+ = e^-$$

2e- 8e- 18e- 32e- 18e- 4e-

Name:

Lead - 204

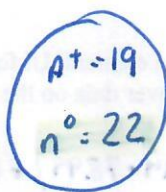
6) In the space provided draw the atomic structures of the following isotopes using the simplified Bohr-Rutherford model.

Chlorine-35



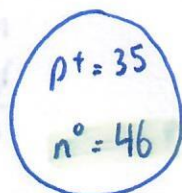
2e- 8e- 7e-

Potassium-41



2e- 8e- 8e- 1e-

Bromine-81



2e- 8e- 18e- 7e-