

Isotopes and Atomic Mass:

What does the mass on the periodic table mean?

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Learning Goals:

1. Define "isotope" using mass number, atomic number, number of protons, neutrons and electrons
2. Compare and contrast: element, atom, isotope
3. Given the number of protons, neutrons and electrons, find the mass and name of an isotope
4. Given the name of an element and the number of neutrons, find the mass of an isotope
5. Give evidence to support or dispute: "In nature, the chance of finding one isotope of an element is the same for all elements."
6. Find the average atomic mass of an element given the abundance and mass of its isotopes

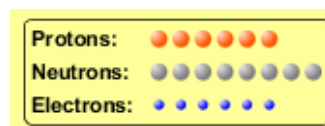
Pre-Lesson Discussion

- Calculate the average mass of the eggs in the container.
- Record the mass of each type of egg and the number of each.
- What is difference between the "Average Mass" and "Individual Mass"?
- Design a situation to make the mixture ____g

Post-Lesson Questions

What would this be?

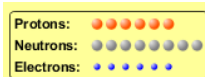
- A. Carbon-12
- B. Carbon-14
- C. Oxygen-14
- D. More than one of these



Reason: The number of protons tells the name of the atom; the mass is given by the sum of protons and neutrons



$$6 \text{ protons} + 8 \text{ neutrons} = 14 \text{ amu}$$



My Isotope

Carbon-14

Unstable

H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	Ac	Rf	Sg	Bh	Hs	Mt	Ds	Rg	Cn							

Which would be isotopes?

1. Protons: 6 (red dots)
Neutrons: 8 (grey dots)
Electrons: 6 (blue dots)
2. Protons: 6 (red dots)
Neutrons: 7 (grey dots)
Electrons: 6 (blue dots)
3. Protons: 6 (red dots)
Neutrons: 8 (grey dots)
Electrons: 7 (blue dots)

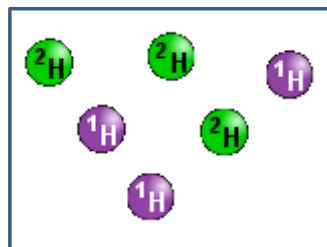
- A. 1 & 2
- B. 1 & 3
- C. 2 & 3
- D. none
- E. more than one combination

Reason: Isotopes have same number of protons (so the same name), but different number of neutrons

1 and 2 are isotopes

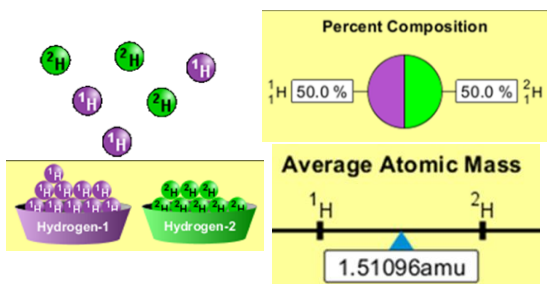
1	$^{16}_8\text{O}$	Protons: 8 Neutrons: 8 Electrons: 8
2	$^{15}_8\text{O}$	Protons: 8 Neutrons: 7 Electrons: 8
3	$^{14}_7\text{N}$	Protons: 7 Neutrons: 7 Electrons: 7

What would the approximate average mass of Hydrogen be?



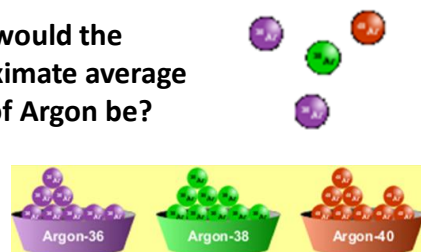
- A. 6 amu
- B. 2 amu
- C. 1.5 amu
- D. 1 amu

Reason: $3/6$ gives 50% of each, so $.5 * 2 + .5 * 1 = 1.5$ amu



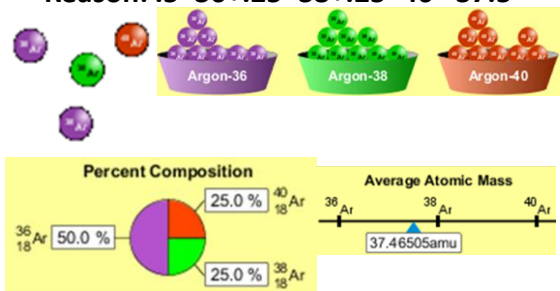
Why are there more digits in the answer in the sim?

What would the approximate average mass of Argon be?

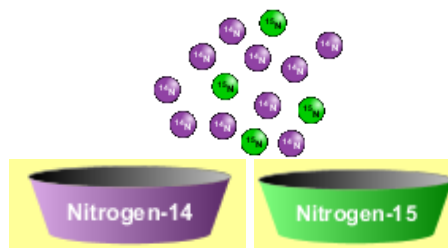


- A. 40 amu
- B. 38 amu
- C. 37.5 amu

Reason: $.5 * 36 + .25 * 38 + .25 * 40 = 37.5$

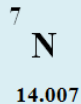


Discussion Questions: How would you know if this combination is likely to be found in some dirt?

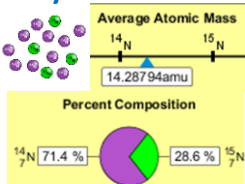


Reason: $10/14 * 14 + 4/14 * 15 = 14.285$

On the periodic table, the mass of Nitrogen is given as 14.007, so this is not the most common mixture found in nature.



"My Mixture"



"Nature's Mix"

