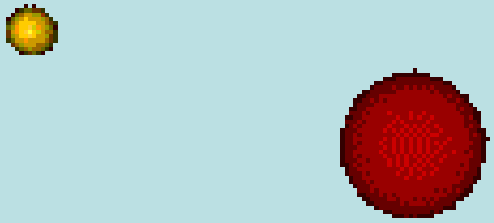
Review Notes 4.3 pt.1

How Atoms Differ



Atomic Number (Z)

- Elements are identified by PROTONS
- The "**atomic number**" = number of protons

Because atoms are neutral….

p+ = e-

Atomic Number

Element	# of protons	Atomic # (Z)
Carbon		
		15
Gold		

Mass Number

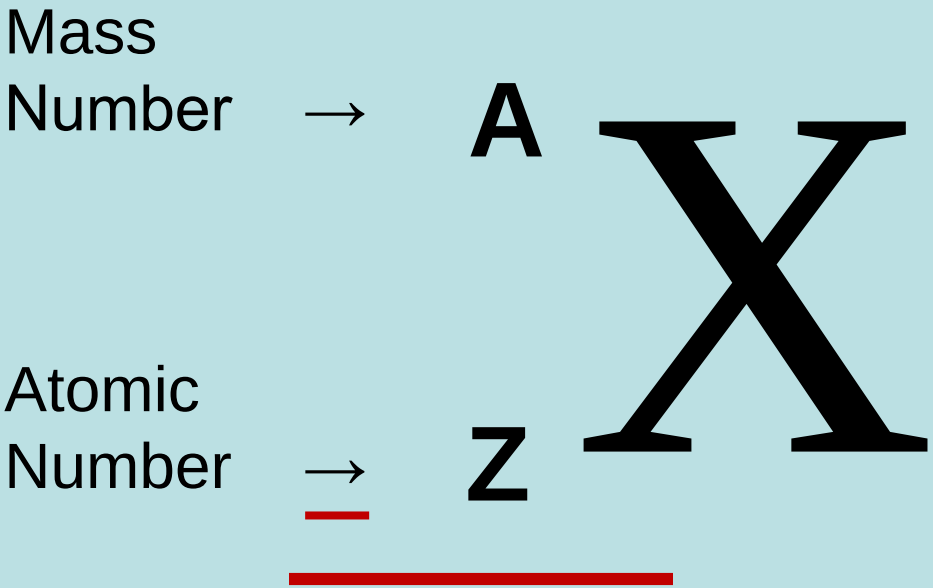
Mass number is the number of protons and neutrons in the nucleus of an isotope: Mass # = p^+ + n^0

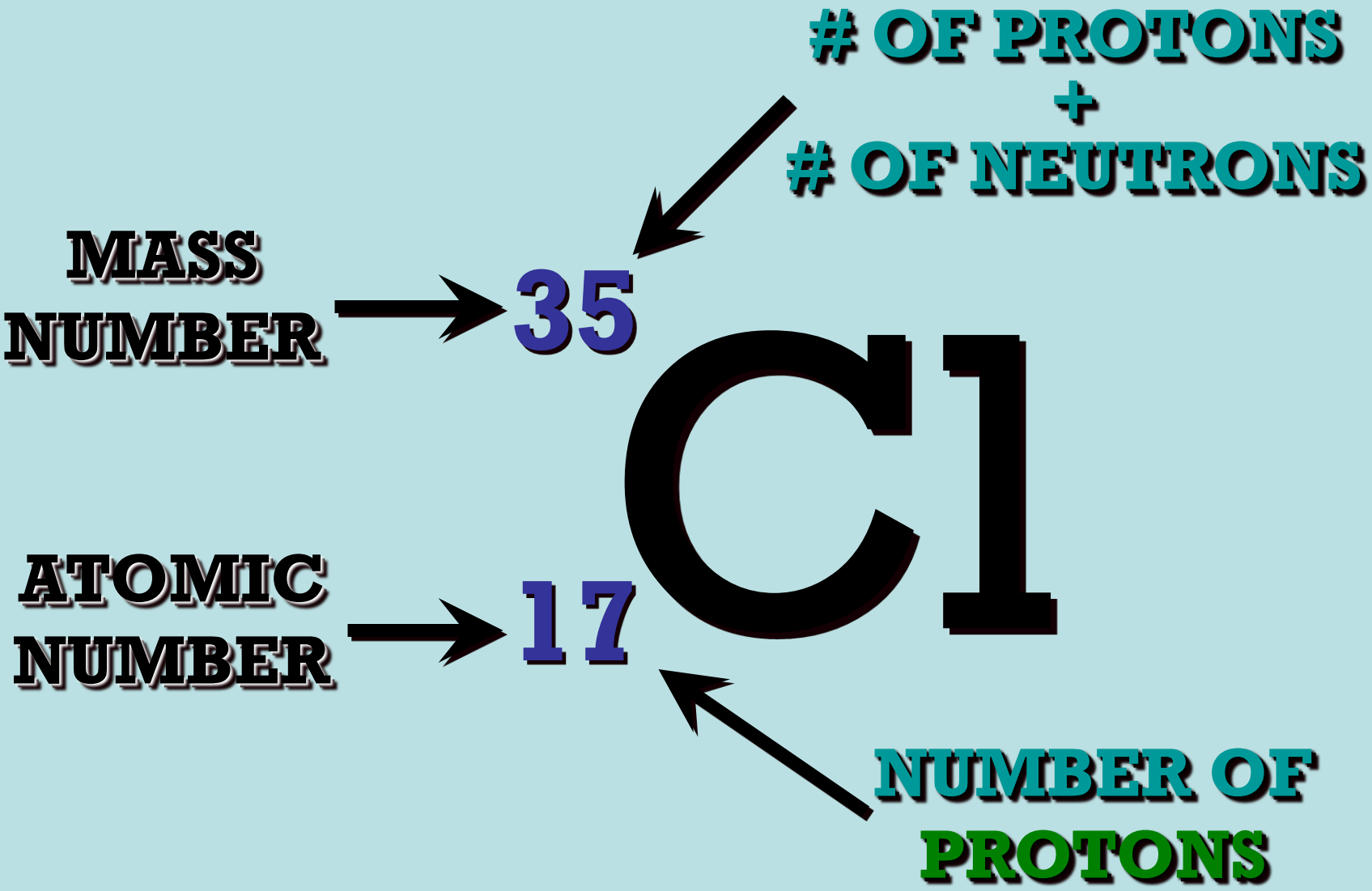
Element	p^+	n^0	e^-	Mass #
Oxygen - 18	8	10	8	18
Arsenic - 75	33	42	33	75
Phosphorus - 31	15	16	15	31

Check for understanding:

- If an element has 91 protons and 140 neutrons find the:
  - a) Atomic number **91**
  - b) Mass number **231**
  - c) number of electrons **91**
  - d) element name **protactinium**

Complete Symbol




OF PROTONS
+
OF NEUTRONS
MASS NUMBER
35
Cl
ATOMIC NUMBER
17
NUMBER OF PROTONS

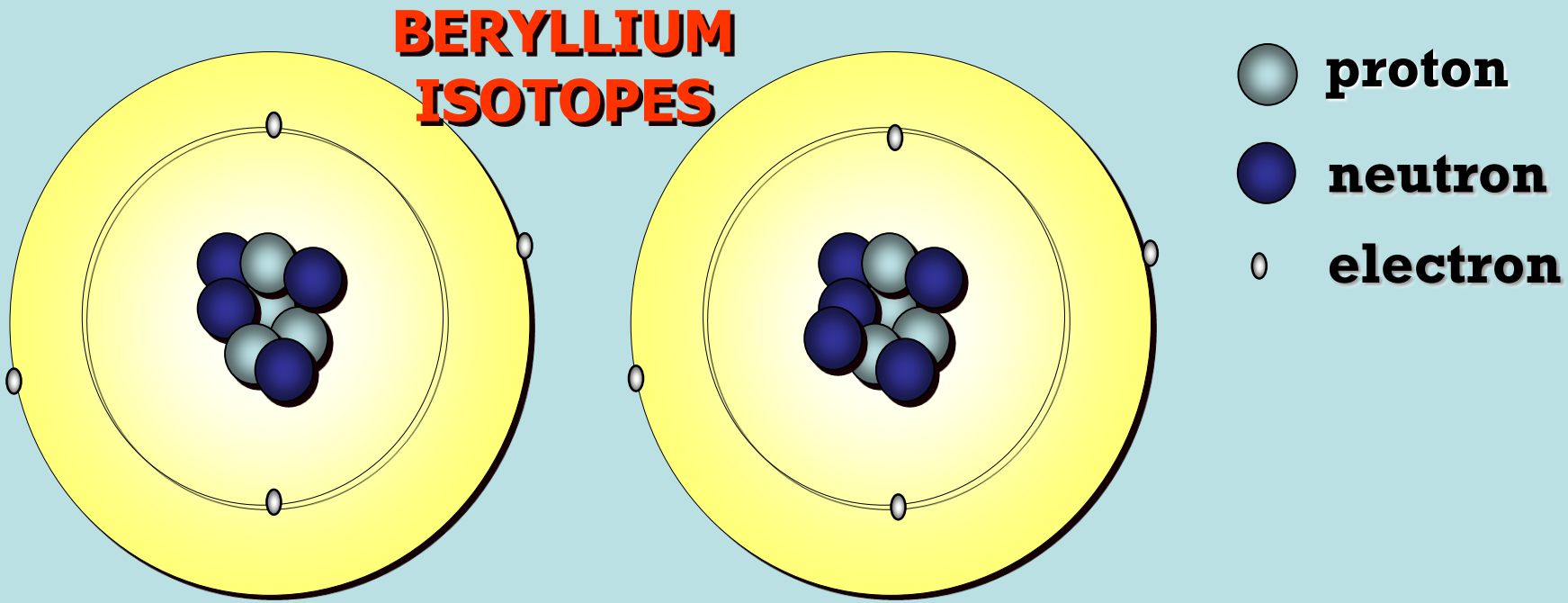
Question #1

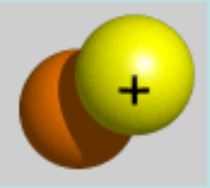
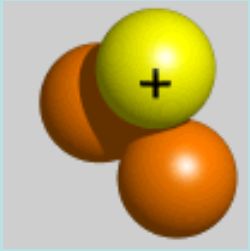
$^{80}_{35}Br$

- Find each of these:
  a) Atomic number **35**
  b) Mass Number **80**
  c) number of protons **35**
  d) number of neutrons **45**
  e) number of electrons **35**
  f) name the isotope **Bromine - 80**

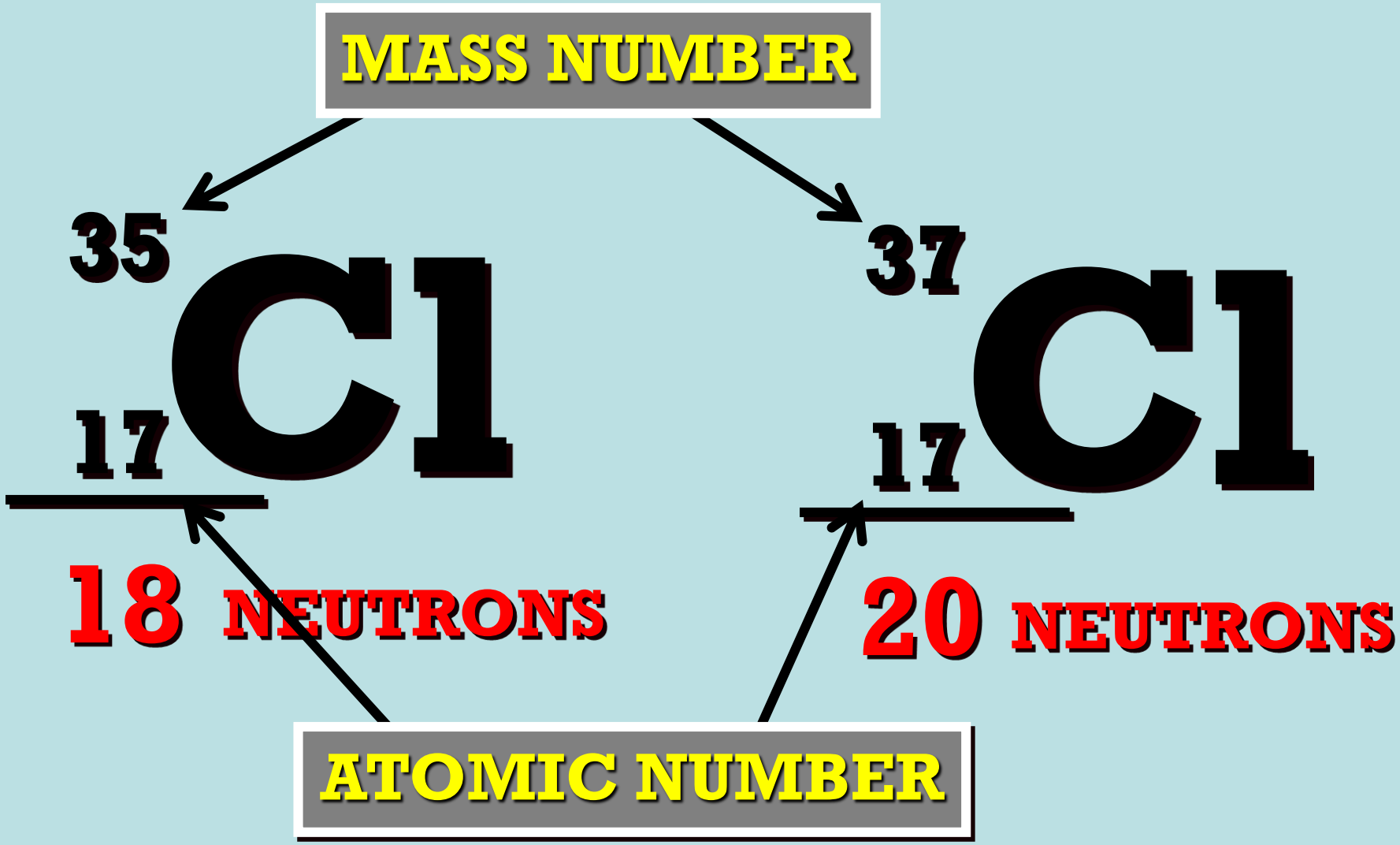
Isotopes

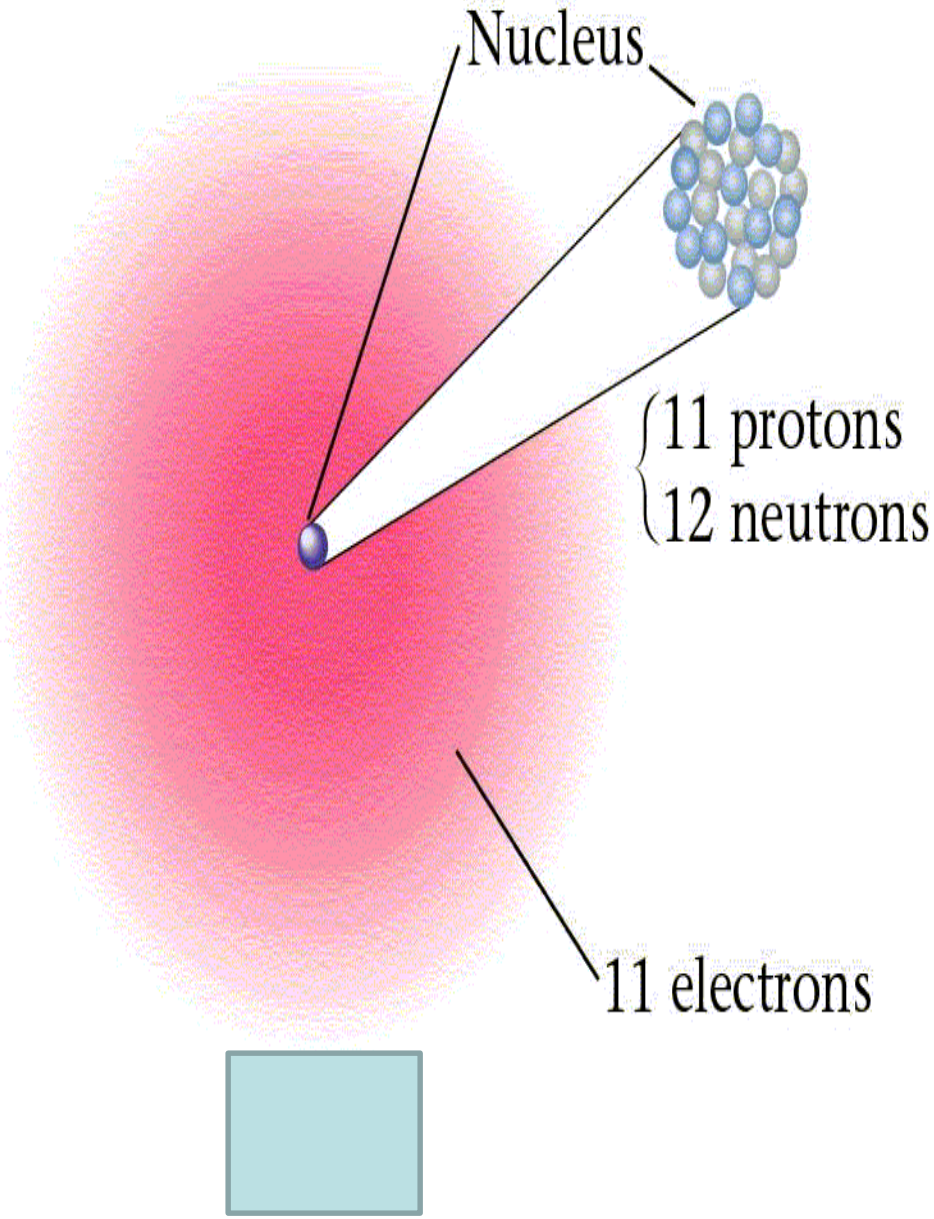
- Atoms of the same element with different numbers of neutrons.
- Thus, different mass numbers.



Isotope	Protons	Electrons	Neutrons	Nucleus
Hydrogen–1 (protium)				
Hydrogen-2 (deuterium)				
Hydrogen-3 (tritium)				

EXAMPLE OF AN ISOTOPE




Nucleus
11 protons
12 neutrons
11 electrons

Question #1

- An element has an atomic number of 34 and a mass number of 78, what is the:
  a) number of protons **34**
  b) number of neutrons **44**
  c) number of electrons **34**
  d) complete symbol $^{78}_{34}Se$
  e) name the isotope **Selenium-78**

Question #2

$^{238}_{92}U$

- Find each of these:
  a) Atomic number **92**
  b) Mass Number **238**
  c) number of protons **92**
  d) number of neutrons **146**
  e) number of electrons **92**
  f) name the isotope **Uranium - 238**

Atomic Mass Unit (amu) & Atomic Mass

- New unit of measurement just for atoms (*very small!!!*).
  - **relative mass of** ***Carbon-12*** is exactly **12.00 *amu***. (6 p^+ + 6 n^0 = 12)
  - ***So…*** **1 *amu* = 1/12 of one *Carbon-12* atom**
- 1 p^+ ≈ **1** *amu* 1 n^0 ≈ **1** *amu* 1e^- ≈ **0** *amu*

Atomic mass:

- Found on periodic table
- "Weighted **average**" of isotopes of an element.

How to Calculate Atomic Mass

Gather Info:

1. Isotopes.
2. Relative Abundance of each isotope
   - Percent abundance / 100 = relative abundance
3. Mass of each isotope
   - *If not given, estimate with mass number*
   - Mass is in *amu* (atomic mass units), not grams.

Calculate:

- Isotope #1 - **Mass x Relative Abundance** = relative mass
- Isotope #2 - **Mass x Relative Abundance** = **+** relative mass

= Atomic Mass

Atomic Mass Problems

(1) Chlorine has 2 isotopes:

Cl-35 is 75.8% abundant and Cl-37 is 24.23% abundant.

What is the average atomic mass of chlorine?

75.8 % / 100 = 0.758 35amu x 0.758 = 26.5 amu

24.23% / 100 = 0.2423 37amu x 0.2423= + 8.965 amu

35.465 = 35.5 amu

(2) Oxygen has 3 isotopes:

O-16 (99.76%) O-17 (0.037%) O-18 (0.2%)

Estimate oxygen's average atomic mass: Very close to 16.0 amu.

(3) Hydrogen has three isotopes: H-1, H-2, H-3. Hydrogen's atomic mass is 1.008amu.

Which is isotope is most abundant in nature? H-1. *(1.008 is close to 1)*