

# Average Atomic Mass

## Aim

- to calculate the average mass of an element

## Notes

### Atomic mass

- ★ The relative mass of an atom is the sum of its protons and neutrons

- ☆ Examples

- ★ Carbon 12 has 6 protons and 6 neutrons ( $6 + 6 = 12$ )

- ★ Carbon 14 has 6 protons and 8 neutrons ( $6 + 8 = 14$ )

- ☆ The relative mass of any isotope is an integer

### Average atomic mass

- ★ The masses of the elements listed on the *Periodic Table* are not integers

- ★ The masses of the elements listed on the *Periodic Table* are the average masses of the isotopes of each element

- ☆ The average mass of an element is a weighted average

- ☆ Both the mass of the isotopes and the percentage of each effect the average mass

- ☆ Procedure

- ★ The percentage, expressed as a decimal, is multiplied by the mass to get the product

- ★ The products are added together to get the total

$$x_{AVG} = \sum_{y=1}^n p_y x_y = p_1 x_1 + p_2 x_2 + \dots + p_n x_n$$

- ☆ Example

### Average Mass of Nitrogen

<u>Isotope</u>	<u>Percentage</u>	<u>Mass</u>	<u>Product</u>
Nitrogen-14	0.9963	14	13.95
Nitrogen-15	0.0037	15	<u>0.06</u>
			14.01

### Answer the questions below by circling the number of the correct response

- The common isotopes of hydrogen have masses of 1 amu, 2amu, and 3 amu. The average atomic mass of hydrogen is 1.00794 amu. This shows that the most common isotope has a mass of (1) 1 amu, (2) 2 amu, (3) 3 amu, (4) 4 amu
- Chlorine occurs naturally as two common isotopes,  $^{35}\text{Cl}$  and  $^{37}\text{Cl}$ . Which of the following percentages results in the average mass of about 35.5 amu? (1) 20 percent  $^{35}\text{Cl}$  and 80 percent  $^{37}\text{Cl}$  (2) 50 percent  $^{35}\text{Cl}$  and 50 percent  $^{37}\text{Cl}$  (3) 75 percent  $^{35}\text{Cl}$  and 25 percent  $^{37}\text{Cl}$  (4) 85 percent  $^{35}\text{Cl}$  and 15 percent  $^{37}\text{Cl}$
- A new element, unbiennium, has been synthesized. A typical sample contains 22.50 percent Ube-323 and 77.50 percent Ube-325. What is the average mass? (1) 324.6 amu (2) 323.4 amu (3) 324.0 amu (4) 325.2 amu