

## A Calculation of Relative Isotopic Mass

### Problem 2-32

The following ratios of masses were obtained with a mass spectrometer:  ${}^{19}\text{F}/{}^{12}\text{C} = 1.5832$  ;

${}^{35}\text{Cl}/{}^{19}\text{F} = 1.8406$  ;  ${}^{81}\text{Br}/{}^{35}\text{Cl} = 2.3140$ . Determine the mass of a  ${}^{81}\text{Br}$  atom in atomic mass units.  
(*Hint*: What is the mass of a  ${}^{12}\text{C}$  atom?)

Solution:

Solve the hint first: a  ${}^{12}\text{C}$  atom has a mass of 12.0000 u exactly (definition of atomic mass scale)

Now it's just solving the ratios.

$${}^{19}\text{F} = 1.5832 \frac{\text{u } {}^{19}\text{F}}{\text{u } {}^{12}\text{C}} \times 12.0000 \text{ u} = 18.9984 \text{ u } {}^{19}\text{F}$$

$${}^{35}\text{Cl} = 1.8406 \frac{\text{u } {}^{35}\text{Cl}}{\text{u } {}^{19}\text{F}} \times 18.9984 \text{ u } {}^{19}\text{F} = 34.96845504 \text{ u } {}^{35}\text{Cl}$$

$${}^{81}\text{Br} = 2.3140 \frac{\text{u } {}^{81}\text{Br}}{\text{u } {}^{35}\text{Cl}} \times 34.96845504 \text{ u } {}^{35}\text{Cl} = 80.91700496256 \text{ u } {}^{81}\text{Br} = 80.917 \text{ u } {}^{81}\text{Br}$$