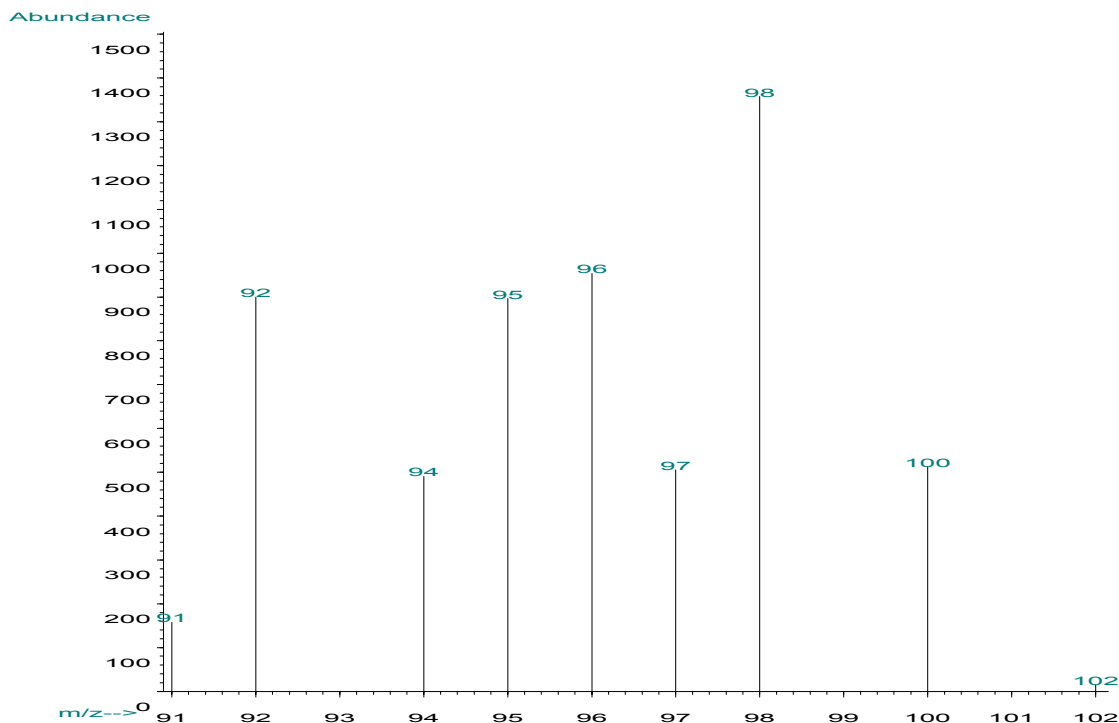# ISOTOPIC ANALYSIS BY MASS SPECTROMETRY



The mass spectrum for molybdenum metal is shown above as acquired on Pepperdine's mass spectrometer. The x-axis of the mass spectrum is actually the mass-to-charge ratio for each isotope; however, in this case $m/z$ is the same as atomic mass units. The y-axis is named *Abundance* but actually refers only to the relative number of each isotope in the mass analyzer. Recall from lecture discussion and reading that the abundance of an isotope is proportional to the intensity of the mass line in the mass spectrum.

Use a ruler and the exact mass information in the table below to determine the percentage abundance of each significant isotope of molybdenum. Based on the masses and abundances, calculate the weighted-average atomic mass of the element Mo. Explain any differences in the calculated atomic mass from the atomic mass listed on the periodic table.

| Isotope | Isotopic Mass (u) | Percentage Abundance |
|---------|-------------------|----------------------|
| 92 | 91.9063 | 16.29 |
| 94 | 93.9047 | 8.85 |
| 95 | 94.90584 | 16.15 |
| 96 | 95.9046 | 17.32 |
| 97 | 96.9058 | 7.41 |
| 98 | 97.9055 | 14.63 |
| 100 | 99.9076 | 9.35 |

$$\text{Percentage abundances} = \frac{\text{abundance of isotope}}{\sum \text{abundances}} \times 100\%$$

Weighted Average Atomic Mass $= 95.86\ u$

Measured Average Atomic Mass $= 95.94\ u$