

## IMPORTANCE OF SIG FIGS

-We are always limited by the instrument/technique/conditions that we use to make measurements.

## WEIGHING COMPOUNDS

EX: If a pharmacist wanted to weigh out 1 mg of an expensive medicine product, what balance should she or he use?

## RULES FOR SIG FIGS

- All nonzero integers are significant

EX: 5.469 = 4 sig figs

- All zeros to the left of the first nonzero digit are NOT significant; these are called place holders

EX: 0.0045 = 2 sig figs

- All zeros between nonzero digits ARE significant

EX: 0.09005 = 4 sig figs

- All zeros at the end of a number that has a decimal point are significant

EX: 56.7800 = 6 sig figs

- Zeros at the end of a whole number may or may not be significant

EX: 500, 500.0,  $5.0 \times 10^2$ ,  $5.00 \times 10^2$  = 1, 2, or 3 >>> depending how its written

- For exact numbers, there is no uncertainty as to its value

EX: 210 students = all digits significant

## MATHEMATICAL OPERATIONS

- Addition and subtraction

- Units must match

- Exponent in scientific notation must match

EX:  $5.628 \times 10^2$

+  $3.2 \times 10^2$

ANS:  $8.8 \times 10^2$

- Multiplication and Division

- Goes by LIMITER

EX:  $4809 \times 45.5 \times 300.0 = 6.56 \times 10^7$

SF:     4            3            4

IN MIXED CASES, ONLY ROUND AT THE END

## PERIODIC TABLE

- 92 naturally occurring elements
- In order of increasing atomic number (protons)
- Grouped by properties

DIATOMIC: hydrogen, nitrogen, oxygen, fluorine, chlorine, bromine, iodine

- Atomic Mass: weighted average mass of one atom.

## SEC 2.6

- Atoms have mass, and we need to know their mass to weigh out a specific number of atoms

- very small number: 1 atom of carbon weighs  $1.993 \times 10^{-26}$  kg
- kg is not convenient when talking about an atom's mass
- And we could never weigh out a single atom anyway

- For convenience, Chemists use the expression ATOMIC MASS UNITS (amu)

- amu is the approx. weight of a proton or a neutron
- EX; 1 carbon = 12 amu (exact)

- ISOTOPIC MASS

- the mass of a specific atom (isotope) in amu
- remember that elements can have several isotopes

- ATOMIC MASS

- the weighted average of isotopic masses

EX: LITHIUM OCCURS NATURALLY AS A MIXTURE OF  ${}^6_3\text{Li}$  (7.5%) AND  ${}^7_3\text{Li}$  (92.5%). WHAT IS ITS ATOMIC MASS?

$$\text{ANS: } {}^6_3\text{Li} = 0.075 \times 6.0151 \text{ amu} = 0.451 \text{ amu}$$

$${}^7_3\text{Li} = 0.925 \times 7.0160 \text{ amu} = 6.490 \text{ amu}$$

CALCULATE AVERAGE OF ISOTOPES FOR ATOMIC MASS

## AVOGADRO'S NUMBER

- We cannot count atoms or molecules
- We often use larger quantity expression to describe what we need
- In chemistry, a mole is used a unit of measurement
  - Fundamental SI unit; abbrev. is mol
  - One mole of any element contains  $6.022 \times 10^{23}$  molecules or atoms
- Number moles (n)
- Molar Mass (M)
- Mass (m)
- $n = M/A$

