


UNIT 1: NATURE OF SCIENCE AND LAB SAFETY

Topics Covered:

- Observations and Inferences
- Chemistry
- Scientific Method

UNIT OBJECTIVES

- ❑ Know the definition of chemistry and be knowledgeable about specific disciplines of chemistry
- ❑ Understand the nature of the scientific method and distinguish among hypothesis, theory, and law



CHEMISTRY

CHEMISTRY

Chemistry: The study of matter (what matter is made of & how matter changes)



CHEMISTRY

Analytical Chemistry: The study of the composition of substances

Examples:
Pharmaceuticals
Water testing
Quality Control



CHEMISTRY

Biochemistry: The study of living organisms
matter

Examples:
Medical Research



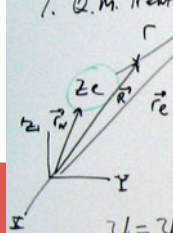
CHEMISTRY

Physical Chemistry: The study of theories & experiments to describe chemical behaviors

Examples:

The physics of chemistry

✓ A...H ATOM
1. Q.m. Treatment ...



$$\psi = \psi(\underline{\vec{R}}) \psi(\underline{\vec{r}}) \Rightarrow \begin{cases} \textcircled{1} \frac{-\hbar^2}{2m} \nabla_{\text{com}}^2 \psi(\underline{\vec{R}}) = E_{\text{com}} \psi(\underline{\vec{R}}) \Rightarrow \text{Free Particle!} \\ \textcircled{2} \frac{-\hbar^2}{2\mu} \nabla^2 \psi(\underline{\vec{r}}) - \left(\frac{Ze^2}{4\pi\epsilon_0}\right) \frac{1}{r} \psi(\underline{\vec{r}}) = E \psi(\underline{\vec{r}}) \end{cases}$$

$$\psi(\underline{\vec{r}}) = \psi(r, \theta, \phi) = R(r) Y(\theta, \phi) \Rightarrow$$

↗ Headache!

$$\Rightarrow H\psi = E\psi$$

$$\left(\frac{-\hbar^2}{2mN} \nabla_N^2 - \frac{\hbar^2}{2me} \nabla^2 - \frac{Ze^2}{4\pi\epsilon_0 r}\right) \psi(\underline{\vec{R}}, \underline{\vec{r}}) = E \psi(\underline{\vec{R}}, \underline{\vec{r}})$$

$$\Rightarrow \left(\frac{-\hbar^2}{2m} \nabla_{\text{com}}^2 - \frac{\hbar^2}{2\mu} \nabla^2 - \frac{Ze^2}{4\pi\epsilon_0 r}\right) \psi(\underline{\vec{R}}, \underline{\vec{r}}) = E \psi(\underline{\vec{R}}, \underline{\vec{r}})$$

$$\textcircled{1} \Delta^2 Y(\theta, \phi) = -l(l+1) Y(\theta, \phi) \Rightarrow Y_{ml}^{(l)}(\theta, \phi) \quad \begin{matrix} l=0,1,2,\dots \\ m_l=0,\pm 1,\dots,\pm l \end{matrix}$$

$$\textcircled{2} \left[\frac{d^2}{dr^2} r R(r) + \left\{ \left(\frac{\Gamma}{r}\right) - \frac{l(l+1)}{r^2} \right\} r R(r) = E r R(r) \right]$$

CHEMISTRY

Organic Chemistry: The study of anything with carbon

Examples:

Pharmaceuticals
Cosmetics
Oil Industry
Plastics



CHEMISTRY

Inorganic Chemistry: The study of anything that does not have CARBON

Examples:

Steel

FIREWORKS

