


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:



CHEMISTRY

Organic Chemistry:

Examples:



CHEMISTRY

Inorganic Chemistry:

Examples:



CHEMISTRY

Analytical Chemistry:

Examples:



CHEMISTRY

Biochemistry:

Examples:

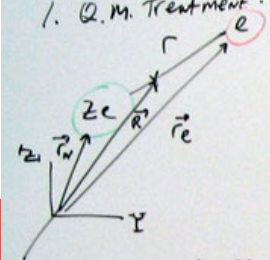


CHEMISTRY

Physical Chemistry:

Examples:

1. A... H ATOM
1. Q.M. Treatment ...



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

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

$\psi(\vec{r}) = \psi(r, \theta, \phi)$
 $= R(r) Y(\theta, \phi) \Rightarrow \begin{cases} \textcircled{1} \Delta^2 Y(\theta, \phi) = -l(l+1) Y(\theta, \phi) \Rightarrow Y_{m_l}^{(l)}(\theta, \phi) \quad \begin{matrix} l=0,1,2,\dots \\ m_l=0,\pm 1,\dots,\pm l \end{matrix} \\ \textcircled{2} \frac{d^2 r R(r)}{dr^2} + \left\{ \left(\frac{\Gamma}{r} \right) - \frac{l(l+1)}{r^2} \right\} r R(r) = E r R(r) \end{cases}$