Inorganic pharmaceuti

Lecture No. 1

Introduction

- **Pharmaceutical Chemistry** is a branch of chemistry that focuses on the design, development, and synthesis of pharmaceutical compounds.
- Pharmaceutical chemistry plays a crucial role in the development of new medications and therapies, influencing the options for various diseases.
- **Inorganic pharmaceutical chemistry** is a specialized field of chemistry that focuses on the study of inorganic compounds used in medicine. This includes understanding how these inorganic substances can function as therapeutic agents.

Key Areas of Inorganic Pharmaceuti

- **Metal-Based Drugs:** Use of inorganic compo
  as **platinum** (e.g., cisplatin) and gold, whi
  other therapies.
- **Diagnostic Agents:** Development of contrast age
  such as MRI and CT (**gadolinium** complexes).
- **Antimicrobial Agents:** Study of inorganic compo
  properties, including certain **metal**
- **Bioinorganic Chemistry:** Understanding of the **metals**
  systems, including enzyme function (**hemoglobi**
  and electron transfer processes.
- **Nanomaterials:** Investigation of inorganic
  systems and targeted therapy.

Classification of Inorganic Pha

Inorganic medicines may be categor
their chemical structure, proposed

1. Based on Chemical Composition

- **Metal-Based Drugs**
  - Transition Metal Complexes: e.
  - Alkali and Alkaline Earth Meta
- **Metal Ions:**
  - Essential Trace Elements: e.g.
    important for enzyme function
  - Toxic Metals: e.g., arsenic, w
    certain cancers.

Classification of Inorganic Pha

2. Based on Therapeutic Use

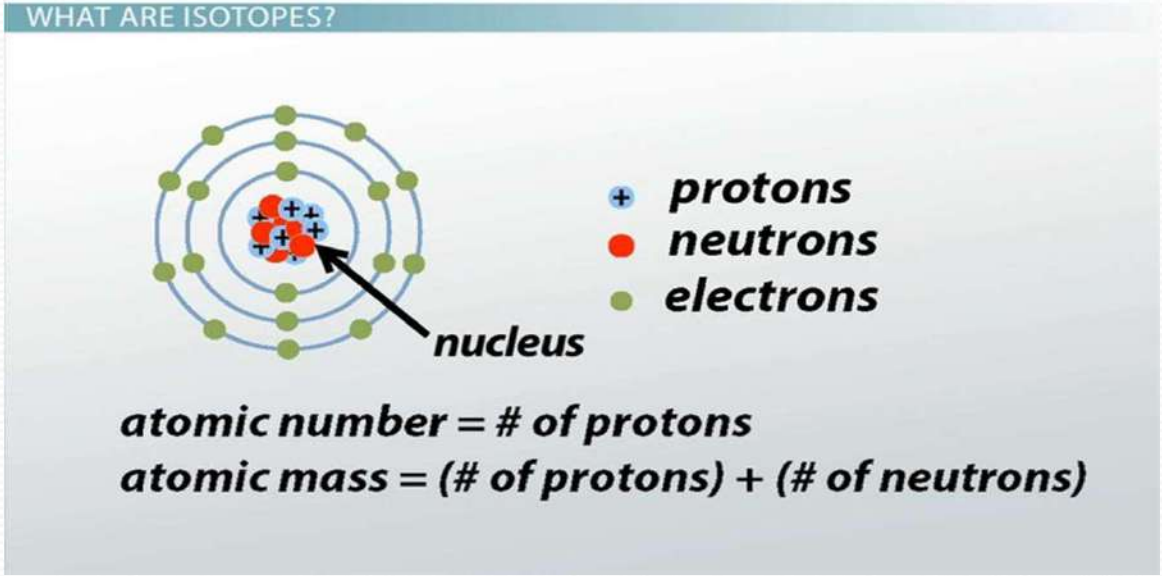
- **Anticancer Agents**
  - Platinum compounds (e.g., cispl
  - Organometallic compounds.
- **Antimicrobial Agents**
  - Silver compounds (e.g., silver
  - Metal oxides (e.g., zinc oxide)
- **Diagnostic Agents**
  - Contrast agents (e.g., gadolini
- **Hormonal and Metabolic Regulators**
  - Lithium for mood stabilization.
  - Iron supplements for anemia.

Structure and

Atomic and Mo
Structure/ Com

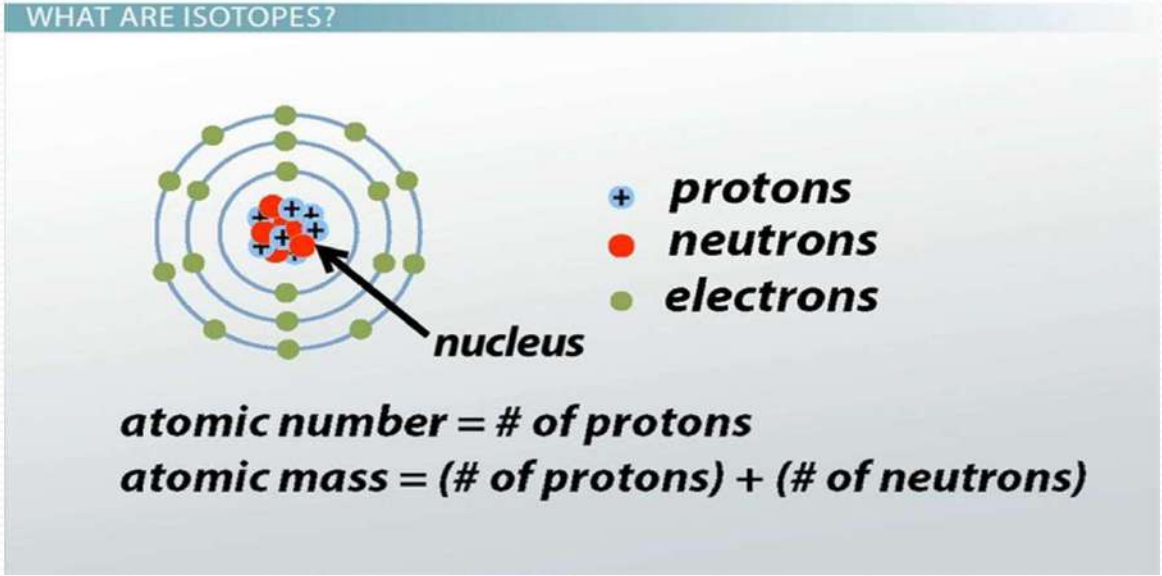
Atomic Orbitals

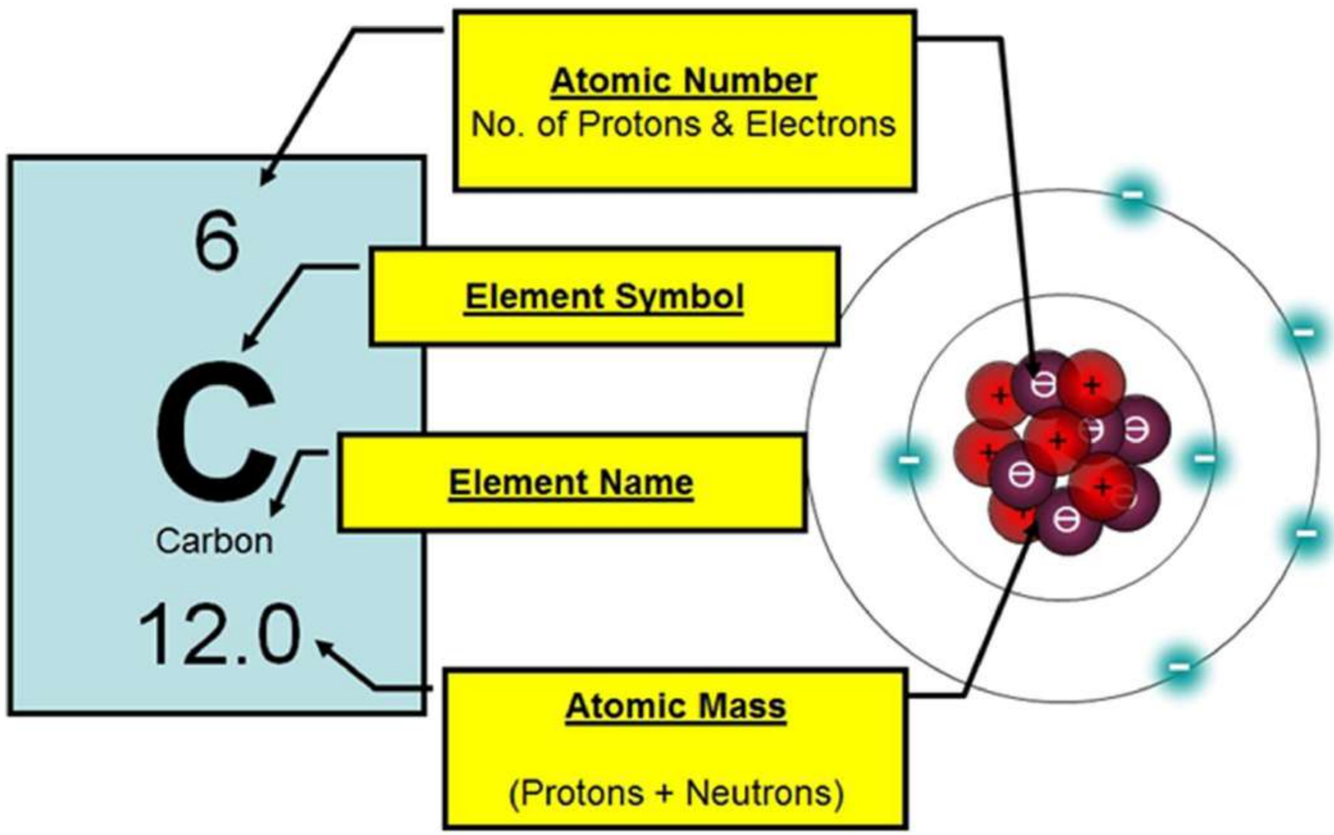
- The Bohr Model of the atom:
  - The **nucleus** (**protons** and **neutrons**) and other particles (Positrons, neutrinos, etc.)
  - **Electrons** exist in the nucleus in defined
  - **Neutral atoms** have an equal number of protons and electrons.



Atomic Orbitals

- Atomic number: number of protons (p)
- Atomic mass: the sum of protons and number of neutrons (p + n)
- **isotopes** an element have the same ***different number of neutrons***
  - mass number is different for chemical element





Note: increasing or decreasing number of has charge (ion formation) for example $^{+}$ has (1 1 P ... (... 7) and 18 e).

At first we will notice the atomic numbers –

Even number or Odd number …

Let's start with Even numbers :-

Atomic Mass = 2 x Atomic number

Symbol	H	He	Li	Be	B	C	N	O	F	Ne	Na	Mg	Al	Si	P	S	Cl	Ar	K	Ca
Atomic Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Atomic Mass		4		8		12		16		20		24		28		32		36		40

For the Odd numbers :-

Atomic Mass = 2 x Atomic number +1

Symbol	H	He	Li	Be	B	C	N	O	F	Ne	Na	Mg	Al	Si	P	S	Cl	Ar	K	Ca
Atomic Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Atomic Mass	3	4	7	8	11	12	15	16	19	20	23	24	27	28	31	32	35	36	39	40

H Ar Cl N Be

Symbol	H	He	Li	Be	B	C	N	O	F	Ne	Na	Mg	Al	Si	P	S	Cl	Ar	K	Ca
Atomic Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Atomic Mass	1	4	7	9	11	12	14	16	19	20	23	24	27	28	31	32	35.5	40	39	40

Atomic Orbitals

- Isotopes: are atoms of the e
  number of → different in atomic n
- Isotopes of an element react
  because reaction involves el
  effect on chemical reaction)

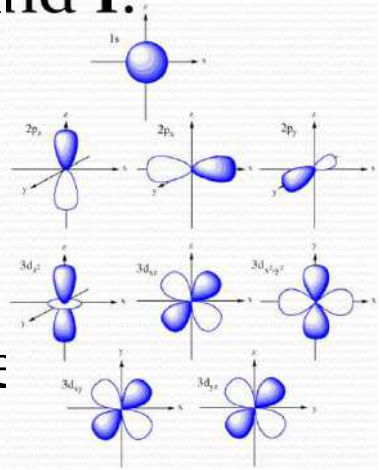
Number of Neutrons = Atomic Mass – Atomic Number

Number of Neutrons = 12 – 6 = 6	Number of Neutrons = 13 – 6 = 7	Number of Neutrons = 14 – 6 = 8
$^{12}_{6}C$	$^{13}_{6}C$	$^{14}_{6}C$
Carbon-12 98.9%	Carbon-13 1.1%	Carbon-14 <0.0001%

Isotopes of Carbon

Atomic Orbitals

- Atomic orbitals: regions of
  of an atom where an electro
- Atomic orbitals allow atoms
  The most commonly s, p, and d or
- In chemistry it's all t
- Each electrons can be r
  quantum numbers.



Atomic Orbitals

A. Principle quantum number, (n)

- Highest principle quantum number
- Indicates the size of the orbital
- An increase in n means increasing distance from the nucleus
- In periodic Table, each row number