1.1.2 Scope of Chemistry

The study of modern chemistry has many branches, but can generally be broken down into five main disciplines, or areas of study:

i. **Physical chemistry:** It is the study of macroscopic properties, atomic properties, and phenomena in chemical systems. A physical chemist may study such things as the rates of chemical reactions, the energy transfers that occur in reactions, or the physical structure of materials at the molecular level.

ii. **Organic chemistry:** It is the study of substances containing carbon. Carbon is one of the most abundant elements on Earth and is capable of forming a tremendously vast number of chemicals (over twenty million so far). Most of the chemicals found in all living organisms are based on carbon.

iii. **Inorganic chemistry:** It is the study of substances that are not primarily based on carbon. Inorganic chemicals are commonly found in rocks and minerals. One current important area of inorganic chemistry deals with the design and properties of materials involved in energy and information technology.

iv. **Analytical chemistry:** It is the study of the composition of matter. It focuses on separating, identifying, and quantifying chemicals in samples of matter. An analytical chemist may use complex instruments to analyze an unknown material in order to determine its various components.

v. **Biochemistry:** It is the study of chemical processes that occur in living things. It may cover anything from basic cellular processes up to understanding disease states so that better treatments can be developed.

All of the aforementioned disciplines of Chemistry are highly engaged in taking measurements, making observations, and using them to come to conclusions. Chemistry is about looking for patterns in the way substances behave. Because living and non living things are made of matter Chemistry affects all aspects of life and most natural events. The scope of Chemistry can be extended to explaining the natural world, preparing people for career opportunities, and producing informed patriot citizens.

The scope of chemistry includes agriculture, medicine food production, and building construction (Figure 1.2).

Figure 1.2 Some chemical products.

Chemistry, however, is not only involved in providing useful substances in the areas of development and technology, but it can also result in very dangerous substances that can negatively affect human being's life and the environment (eg. fluorochlorohydrocarbons, oxides of nitrogen, carbon, and Sulphur).

Multiple Choice Questions

1. **What are the five main disciplines of modern chemistry?**

   A) Physical, Organic, Inorganic, Analytical, Biochemistry

   B) Physical, Organic, Biochemistry, Environmental, Theoretical

   C) Organic, Analytical, Biochemistry, Medicinal, Industrial

   D) Physical, Environmental, Inorganic, Chemical Engineering, Biochemistry

2. **Which discipline of chemistry focuses on macroscopic properties and phenomena in chemical systems?**

   A) Organic Chemistry B) Physical Chemistry

C) Analytical Chemistry D) Inorganic Chemistry

3. **What does organic chemistry primarily study?**

   A) Non-carbon substances B) Carbon-containing substances

   C) The properties of metals D) Chemical reactions in living organisms

4. **Inorganic chemistry is concerned with substances that are:**

   A) Primarily based on carbon B) Not primarily based on carbon

   C) Exclusively gases D) Organic compounds only

5. **What is the focus of analytical chemistry?**

   A) Studying energy transfers in reactions B) The composition of matter

   C) The properties of living organisms D) Developing new materials

6. **Which branch of chemistry studies chemical processes in living organisms?**

   A) Physical Chemistry B) Analytical Chemistry

   C) Organic Chemistry D) Biochemistry

7. **Which of the following is NOT a branch of chemistry mentioned in the text?**

   A) Theoretical Chemistry B) Physical Chemistry

   C) Organic Chemistry D) Inorganic Chemistry

8. **What does physical chemistry study?**

A) Chemical reactions in living things

B) The design of new materials

C) Rates of chemical reactions and energy transfers

D) The composition of unknown materials

9. **Which branch of chemistry involves the use of complex instruments to analyze materials?**

A) Physical Chemistry

B) Biochemistry

C) Inorganic Chemistry

D) Analytical Chemistry

10. **Carbon is capable of forming:**

A) A few thousand chemicals

B) Over twenty million chemicals

C) No chemicals at all

D) Only organic compounds

11. **What are fluorochlorohydrocarbons an example of?**

A) Beneficial substances

B) Dangerous substances

C) Organic compounds

D) Inorganic compounds

12. **Which area of chemistry focuses on the design and properties of materials for energy technology?**

A) Organic Chemistry

B) Biochemistry

C) Inorganic Chemistry

D) Analytical Chemistry

13. **What is one of the primary goals of studying chemistry?**

A) To create dangerous substances

B) To explain the natural world

C) To ignore environmental impacts

D) To limit career opportunities

14. **Chemistry affects which of the following aspects of life?**

A) Only non-living things

B) Only technological development

C) Both living and non-living things

D) Only the environment

15. **Biochemistry may cover basic cellular processes up to:**

A) The study of rocks

B) Understanding disease states

C) Theoretical concepts

D) Chemical engineering

16. **What do all disciplines of chemistry engage in?**

A) Creating harmful chemicals

B) Making observations and taking measurements

C) Ignoring chemical properties

D) Focusing solely on theoretical studies

17. **Which branch of chemistry would likely study the structure of materials at the molecular level?**

A) Organic Chemistry

B) Analytical Chemistry

C) Physical Chemistry

D) Inorganic Chemistry

18. **What is the main concern of biochemistry?**

A) Studying inorganic materials

B) Analyzing chemical reactions in laboratories

C) Investigating chemical processes in living organisms

D) Understanding physical properties of matter

19. **What can chemistry help produce?**

A) Only harmful substances

B) Informed citizens and career opportunities

C) Unused materials

D) Irrelevant knowledge

20. **Which of the following describes analytical chemistry?**

A) Focus on chemical reactions

B) Study of the composition of matter

C) Investigation of energy transfers

D) Research on organic compounds

21. **What type of substances does inorganic chemistry primarily deal with?**

A) Organic compounds

B) Carbon-based substances

C) Substances found in rocks and minerals

D) Synthetic materials

22. **Chemistry can result in substances that can negatively affect:**

A) Only technology

B) Human beings and the environment

C) Only non-living things

D) Only organic materials

23. **Which discipline is primarily concerned with the rates of chemical reactions?**

A) Organic Chemistry

B) Physical Chemistry

C) Analytical Chemistry

D) Inorganic Chemistry

24. **The study of organic chemistry is significant because:**

A) It focuses on non-carbon substances

B) Most chemicals in living organisms are based on carbon

C) It does not involve living organisms

D) It is the least studied branch

25. **What is the overarching aim of chemistry as described in the text?**

A) To complicate natural events

B) To create new harmful substances

C) To explain patterns in how substances behave

D) To ignore the natural world