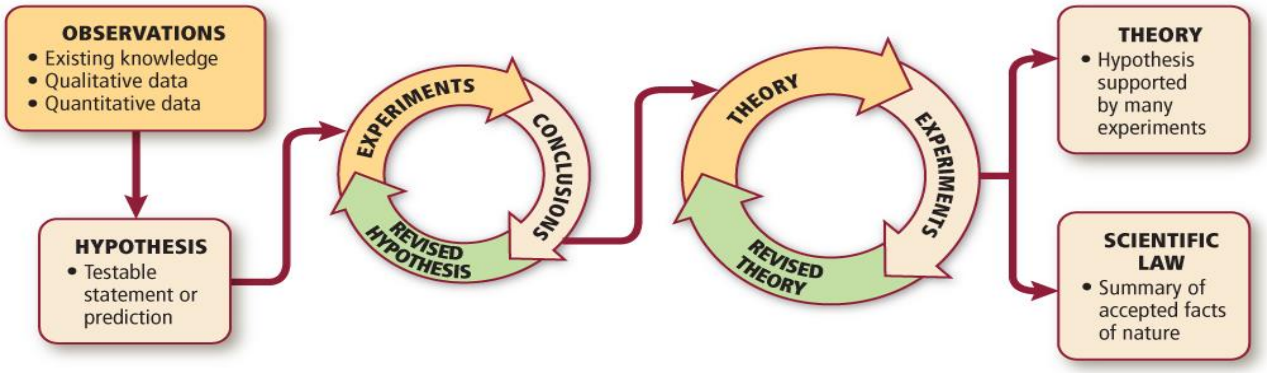
## Some Branches of Chemistry

| Branch | Some Branches of Chemistry | |
|---|---|---|
| | Area of Emphasis | Examples of Emphasis |
| **Organic Chemistry** | Most carbon-containing chemicals | Pharmaceuticals, plastics |
| **Inorganic chemistry** | In general, a matter that does not contain carbon | Minerals, Metals, non-metals, and semiconductors. |
| **Physical chemistry** | The behavior and changes of matter and the related energy changes | Reaction rates, reaction mechanisms. |
| **Analytical chemistry** | Components and composition of substances. | Food nutrients, quality control. |
| **Biochemistry** | Matter and processes of living organisms. | Metabolism, fermentation. |
| **Environmental chemistry** | Matter an environment | Pollution, biochemical cycles. |
| **Industrial chemistry** | Chemical processes in the industry. | Paints, coatings. |
| **Polymer chemistry** | Polymers and plastics. | Textiles, coatings, plastics. |
| **Theoretical chemistry** | Chemical interactions. | Many areas of emphasis. |
| **Thermochemistry** | Heat is involved in chemical processes. | The heat of reaction. |

## Scientific method




**The scientific method** is an organized process used by scientists to do research and provides methods for scientists to verify the work of others.

**Observation** is the act of gathering information, and the first step of the scientific method.

A **hypothesis** is a tentative explanation for what has been observed.

An **experiment** is a set of controlled observations that test the hypothesis.

A **variable** is a quantity or condition that can have more than one value.

An **independent variable** is a variable you plan to change.

**The dependent variable** is the variable that changes in value in response to a change in the independent variable.

**A control** is a standard for comparison in the experiment.

A **conclusion** is a judgment based on the information obtained from the experiment.

# CHAPTER 1: Introduction to Chemistry

## Part 1: What is Chemistry?

**Chemistry**: is the study of matter and the changes that it undergoes

There are several **branches of chemistry**, including organic chemistry, inorganic chemistry, physical chemistry, analytical chemistry, and biochemistry.

**Analytical chemistry** is concerned with the types of substances and their components

**Atomic chemistry** is concerned with the study of theories of the structure of matter, such as bonds, orbital shapes, molecular and atomic spectra, and electronic structure.

**Safety rules in the laboratory:** wear a laboratory coat, wear goggles safety, wear gloves, and do not use eye lenses.

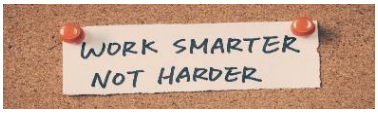
A **scientific method** is a systematic approach used in scientific study, whether it is chemistry, physics, biology, or another science.

-A **theory** is an explanation of a natural phenomenon based on many observations and investigations over time.

You might have heard of Einstein's theory of relativity or the atomic theory.

A **scientific law** is a relationship in nature that is supported by many experiments. Ex:

- The law of mass conservation" mass does not die and does not develop during a chemical reaction."
- Newton's laws
- Ideal gas law




**Q1** **Which field of science studies the composition and structure of matter?**

CH 1 **A** Physics **B** Biology **C** Chemistry **D** Geology

**Chemistry**: is the study of matter and the changes that it undergoes → C

**Q2** **The branch of chemistry that specializes in the study of compounds, their quantity, and types?**

CH 1 **A** Atomic chemistry **B** Biochemistry **C** Organic chemistry **D** Analytical chemistry

**Analytical chemistry** is concerned with the types of substances and their components → D

**Q3** **The science that studies theories of the structure of matter?**

CH 1 **A** Atomic chemistry **B** Biochemistry **C** Organic chemistry **D** Analytical chemistry

**Atomic** chemistry is concerned with the study of theories of the structure of matter, such as bonds, orbital shapes, molecular and atomic spectra, and electronic structure. → A

**Q4** **The sentence " mass does not die and does not develop during a chemical reaction" promises:**

CH 1 **A** Theory **B** Hypothesis **C** Scientific law **D** Conclusion

**A scientific law is a relationship in nature that is supported by many experiments. Ex:**
**- The law of mass conservation" mass does not die and does not develop during a chemical reaction."**
**- Newton's laws**
**- Ideal gas law** →C

**Q5** **Scientific methods are _____ approaches to solving problems.**

CH 1 **A** Dependent **B** Independent **C** Hypothetical **D** Systematic

**A scientific** method is a systematic approach used in scientific study, whether it is chemistry, physics, biology, or another science. → D

**Q6** **Which of the following is not of safety rules in the lab?**

CH 1 **A** wearing eye lens **B** wearing gloves **C** wearing a lab coat **D** wearing goggles safety.

**Safety rules in the laboratory:** wear a laboratory coat, wear goggles safety, wear gloves, and do not use eye lenses. → A

**1** **The branch of chemistry that is interested in the study of isotopes, bonds, and electronic distribution?**

Do it? **A** Organic Chemistry **B** Atomic Chemistry **C** Physical Chemistry **D** Inorganic Chemistry

**2** **Earth attracts all objects to its surface. This statement is a(n) ____.**

Do it? **A** Theory **B** Hypothesis **C** Scientific law **D** Conclusion

**3** **Which of the following is considered a safety rule in the laboratory?**

Do It? **A** Taste the chemicals **B** Not using gloves **C** Do not run inside the laboratory **D** D- Using eye lenses

**4** **Energy is neither created nor destroyed, but transformed from one form to another**

Do It? **A** Theory **B** Hypothesis **C** Scientific law **D** Conclusion

**5** **The branch of chemistry that focuses on carbon-containing chemicals is called**

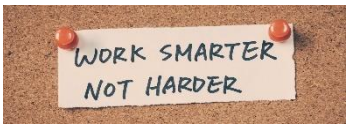
Do it? **A** Analytical chemistry **B** Biochemistry **C** Inorganic chemistry **D** Organic chemistry

## Part 2: Chemistry and matter?

A **substance**, which is also known as a **chemical**, is a matter that has a definite and uniform composition.
**ozone ($O_3$)** is formed in the higher regions of the stratosphere, and most of it is stored in the lower stratosphere.
Scientists use a variety of equipment, including this Brewer spectrometer, to take ozone measurements.
Three hundred Dobson units (300 DU) is considered the normal amount of ozone in the stratosphere
The ozone layer protects the Earth from harmful ultraviolet rays.

**Chlorofluorocarbons (CFCs)** Thomas Midgley, Jr. synthesized the first chlorofluorocarbons in 1928. A chlorofluorocarbon (CFC) is a substance that consists of chlorine, fluorine, and carbon. Several different substances are classified as CFCs.
They are all made in the laboratory and do not occur naturally. CFCs are non-toxic and stable—they do not readily react with other substances. At the time, they seemed to be ideal coolants for refrigerators. By 1935, the first self-contained home air-conditioning units and eight million new refrigerators in the United States used CFCs as coolants. In addition to their use as refrigerants, CFCs were also used in plastic foams and as propellants in spray cans.
CFCs did not pose a threat to the environment because they are so stable, and consequently, many scientists were not alarmed. Scientists had noticed and measured two separate phenomena: the protective ozone layer in the atmosphere was thinning, and increasingly large quantities of CFCs were drifting into the atmosphere.

**Weight** is a measure not only of the amount of matter but also of the effect of Earth's gravitational pull on that matter. This force is not exactly the same everywhere on Earth and actually becomes less as you move away from Earth's surface at sea level. You might not notice a difference in your weight from one place to another, but subtle differences do exist.

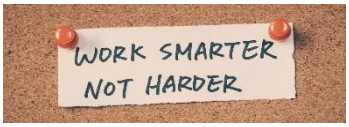



**Q7** **A chemical is characterized as having a structure**
**CH 1**
**A** Certain and changeable
**B** Indefinite and constant
**C** Indefinite and changeable
**D** Definite and constant
A **substance**, which is also known as a **chemical**, is a matter that has a definite and uniform composition. →D

**Q8** **Ozone gas is present in the... layer**
**CH 1**
**A** Mesosphere **B** Ionosphere
**C** Stratosphere **D** Exosphere
Ozone ($O_3$) is formed in the higher regions of the stratosphere → C

**Q9** **When oxygen molecules combine with single oxygen atoms it forms**
**CH 1**
**A** Ozone **B** Nitrogen
**C** Chlorine **D** Bromine
When oxygen gas ($O_2$) is exposed to ultraviolet radiation in the upper regions of the stratosphere, ozone ($O_3$) is formed → A

**Q10** **One of the substances that cause the breakdown of ozone.**
**CH 1**
**A** Carbon compounds
**B** Chlorofluorocarbons (CFCs)
**C** Nitrogen gas
**D** Methane gas
CFCs are synthetic substances made of chlorine, fluorine, and carbon that are thinning the ozone layer. → B




**6** **Which of the following is not matter?**
**Do it?**
**A** atoms
**B** Ultraviolet rays
**C** Air
**D** The sun

**7** **The amount of ozone in the stratosphere is measured by …**
**Do it?**
**A** Brewer spectrometer **B** Voltmeter
**C** Barometer **D** Anemometer

**8** **The amount of ozone that should be present in the atmosphere is -------- Dobson**
**Do it?**
**A** 100 **B** 200 **C** 300 **D** 400

**9** **If you weigh 100 Newtons while standing on flat ground, your weight is on top of the mountain**
**Do it?**
**A** 100 N **B** 102 N **C** 98 N **D** 200 N

**10** **If you have a sample of table salt that has a mass of 20 grams and you are standing on the fourth floor, if you take it down to the ground floor, the mass of that sample is**
**Do it?**
**A** 21 g **B** 19 g **C** 30 g **D** 20 g

**11** **Which of the following appliances increase CFCs in the atmosphere?**
**Do it?**
**A** Refrigerators **B** Microwave ovens
**C** Washing machines **D** Televisions

## Part 3: Scientific Research

- Scientists conduct **pure research (Theoretical)** to gain knowledge for the sake of knowledge itself.
- **Applied research** is research undertaken to solve a specific problem.

**Ex:**
Scientists continue to monitor the number of CFCs in the atmosphere and the annual changes in the amount of ozone in the stratosphere.
Scientists continue to conduct research to find replacement chemicals for CFCs that are now banned.

- **Chance discoveries** occur when scientists obtain results that are far different from what they expected.

**Ex.** Alexander Fleming's discovery of Penicillin.

- **Qualitative data** is obtained through observations that describe color, smell, shape, or some other physical characteristic that is related to the five senses.
- **Quantitative data** is obtained from numerical observations that describe how much, how little, how big or how fast.
- Much of matter and its behavior is **macroscopic**, meaning that it can be observed without a microscope.
- The **structure, composition, and behavior** of all matter can be described on the submicroscopic (atomic) level.
- **Chemistry** explains events on the atomic level (submicroscopic) that cause macroscopic observations.
- **A model** is a verbal, visual, or mathematical explanation of experimental data.

**Q11 CH 1** **What are accidental discoveries, like penicillin, called?**

**A** Applied discoveries
**B** Chance discoveries
**C** Pure discoveries
**D** Newton's Law

**Chance discoveries** occur when scientists obtain results that are far different from what they expected.
**Ex.** Alexander Fleming's discovery of Penicillin. → B

**Q12 CH 1** **What kind of research solves specific problems?**

**A** Pure **B** Applied
**C** Exploratory **D** Model

- **Applied research** is research undertaken to solve a specific problem. → B

**Q13 CH 1** **Which of the following properties of matter can be explained on a submicroscopic level?**

**A** Structure **B** Composition
**C** Behavior **D** All the above

All the three properties of matter, structure, composition, and behavior can be explained on a submicroscopic level. → D

**Q14 CH 1** **which of the following is a Quantitative property of the paper**

**A** It's texture **B** It's color
**C** It's size **D** It's smells

**Quantitative data** is obtained from numerical observations that describe how much, how little, how big or how fast. → C

**Q15 CH 1** **which of the following is a Qualitative data**

**A** Color **B** Area
**C** Length **D** volume

**Qualitative data** is obtained through observations that describe color, smell, shape, or some other physical characteristic that is related to the five senses. → A

**Q16 CH 1** **A model is a(n) ____.**

**A** visual, verbal, and/or mathematical explanation of how things occur.
**B** An explanation that is supported by many experiments.
**C** Description of a relationship in nature.
**D** Tentative explanation about what has been observed.

**A model** is a verbal, visual, or mathematical explanation of experimental data. → A

**12 Do It?** **Which of the following is qualitative data?**

**A** Volume of gas **B** Color of paper
**C** Length of pen **D** Paper area

**13 Do It?** **The research that was developed to solve the problem of the ozone hole only by a specialized group of scientists is**

**A** Theoretical
**B** Applied
**C** Both theoretical and applied
**D** Not considered a research

**14 Do It?** **A sample with a mass of 100 grams, this information is classified as**

**A** Qualitative data
**B** Quantitative data
**C** Both Qualitative and Quantitative data
**D** Scientific law

Chapter 1: Do It Answer key

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| B | C | C | C | D | B | A | C | C | D |
| 11 | 12 | 13 | 14 | | | | | | |
| A | B | B | B | | | | | | |