Interactive Classroom

Glencoe Science

CHEMISTRY

MATTER AND CHANGE

Chapter 1

Introduction to Chemisty

Mc Graw Hill Glencoe

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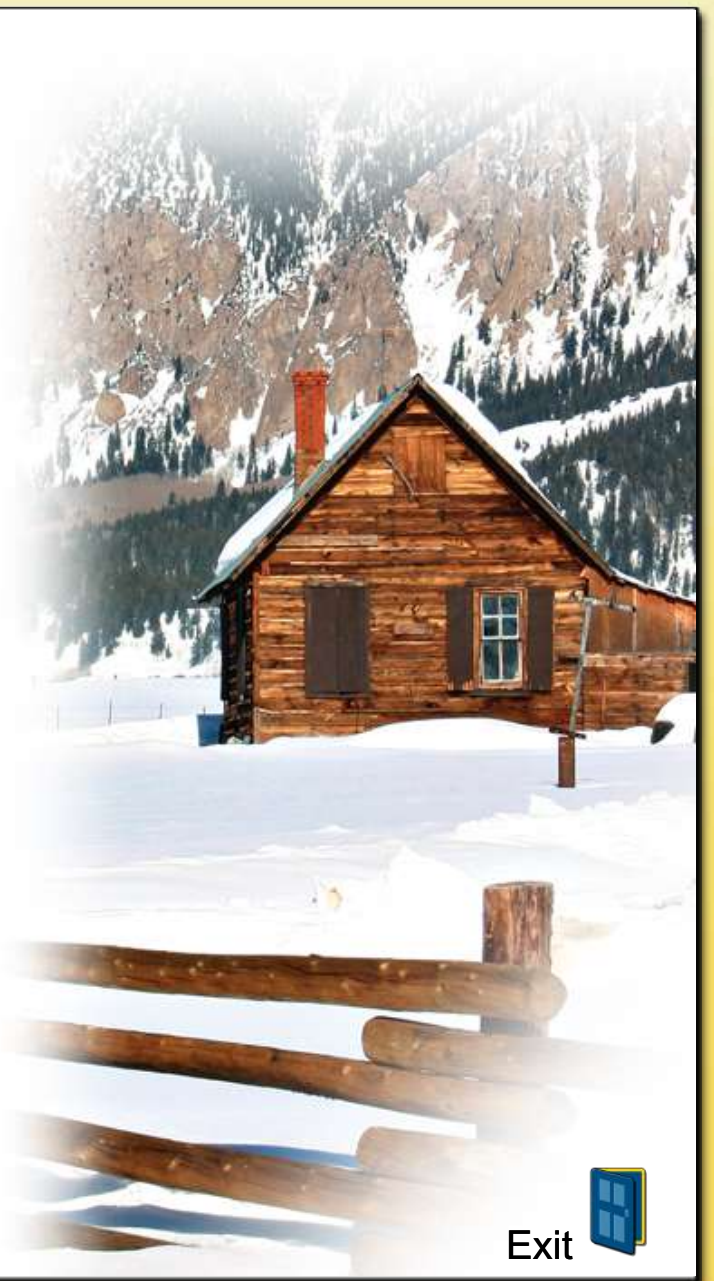
Introduction to Chemistry



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Section 1.1 A Story of Two Substances

Objectives

- **Define** substance.
- **Explain** the formation and importance of ozone.
- **Describe** the development of chlorofluorocarbons.

Review Vocabulary

matter: anything that has mass and takes up space

New Vocabulary

chemistry

substance

MAIN Idea

Chemistry is the study of everything around us.

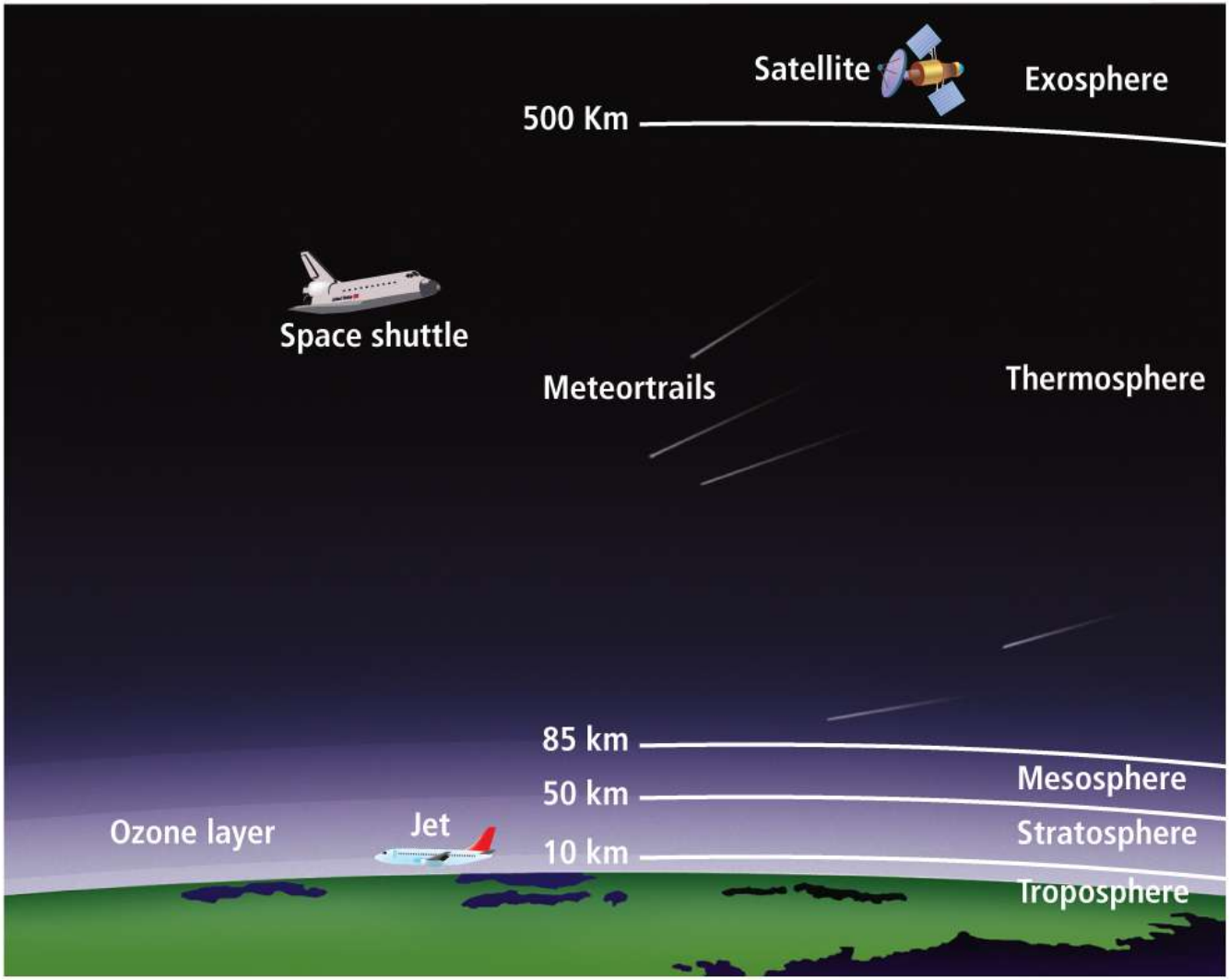
Why Study Chemistry?

- All the “stuff” in the universe is made from building blocks formed in stars.
- These building blocks and everything made from them are called *matter.*
- **Chemistry** is the study of matter and the changes it undergoes.

The Ozone Layer

- Ultraviolet light damages living organisms.
- Earth's atmosphere contains a layer of ozone that absorbs ultraviolet light and protects living organisms.

The Ozone Layer (cont.)

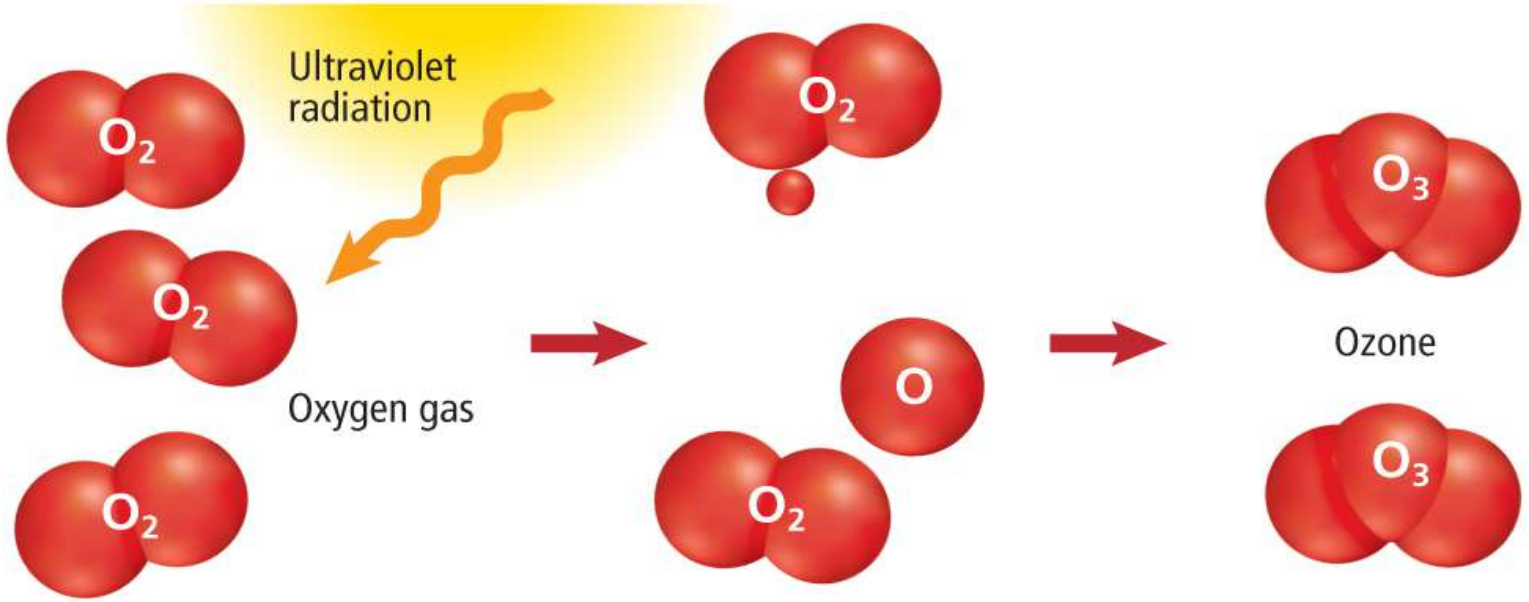


The Ozone Layer (cont.)

- Ozone is a substance in the atmosphere made up of oxygen.
- A **substance**, also known as a chemical, is matter that has a definite composition.

The Ozone Layer (cont.)

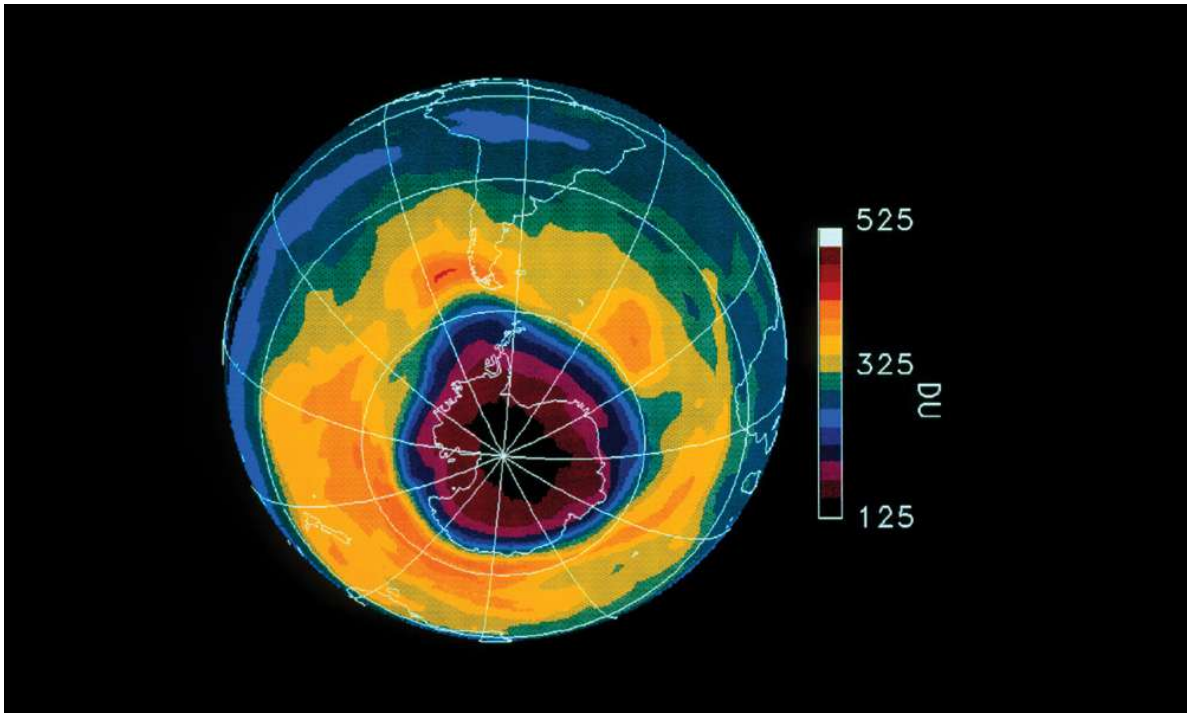
- Ozone is formed when oxygen gas (O_2) is exposed to ultraviolet radiation.



Formation of ozone

The Ozone Layer (cont.)

- In the mid-1980s, Scientists detected thin areas in the ozone layer over Antarctica.
- What could be causing the ozone hole?

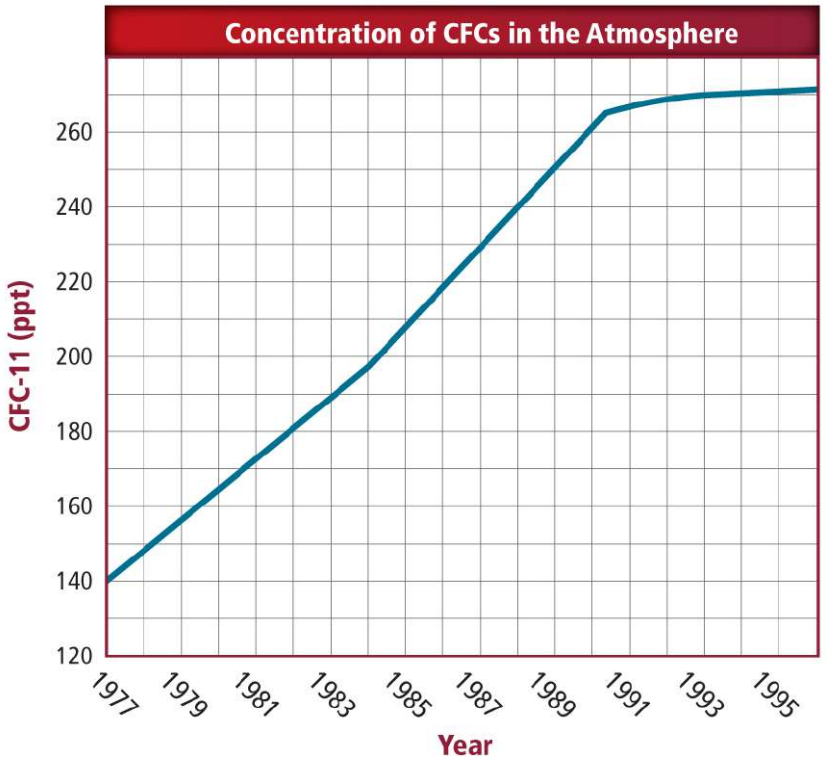


Chlorofluorocarbons

- Chlorofluorocarbons (CFCs) are used as coolant in refrigerators and propellant in aerosol cans.
- CFCs were considered safe because they are non-toxic and don't react with other chemicals.

Chlorofluorocarbons (cont.)

- CFCs were first detected in the atmosphere in the 1970s, and the concentrations continued to increase through the 1990s.



- Was there a connection between ozone thinning and increasing CFCs in the atmosphere?

CheckPoint

Section 1.1 Assessment

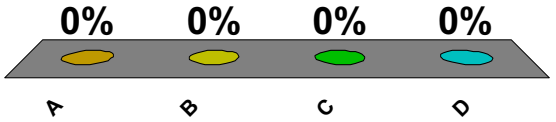
All of the "stuff" in the universe is made from _____.

A. mixtures

B. matter

C. ozone

D. mass



CheckPoint

Section 1.1 Assessment

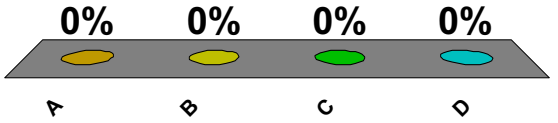
Which of the following protects living organisms from harmful ultraviolet light?

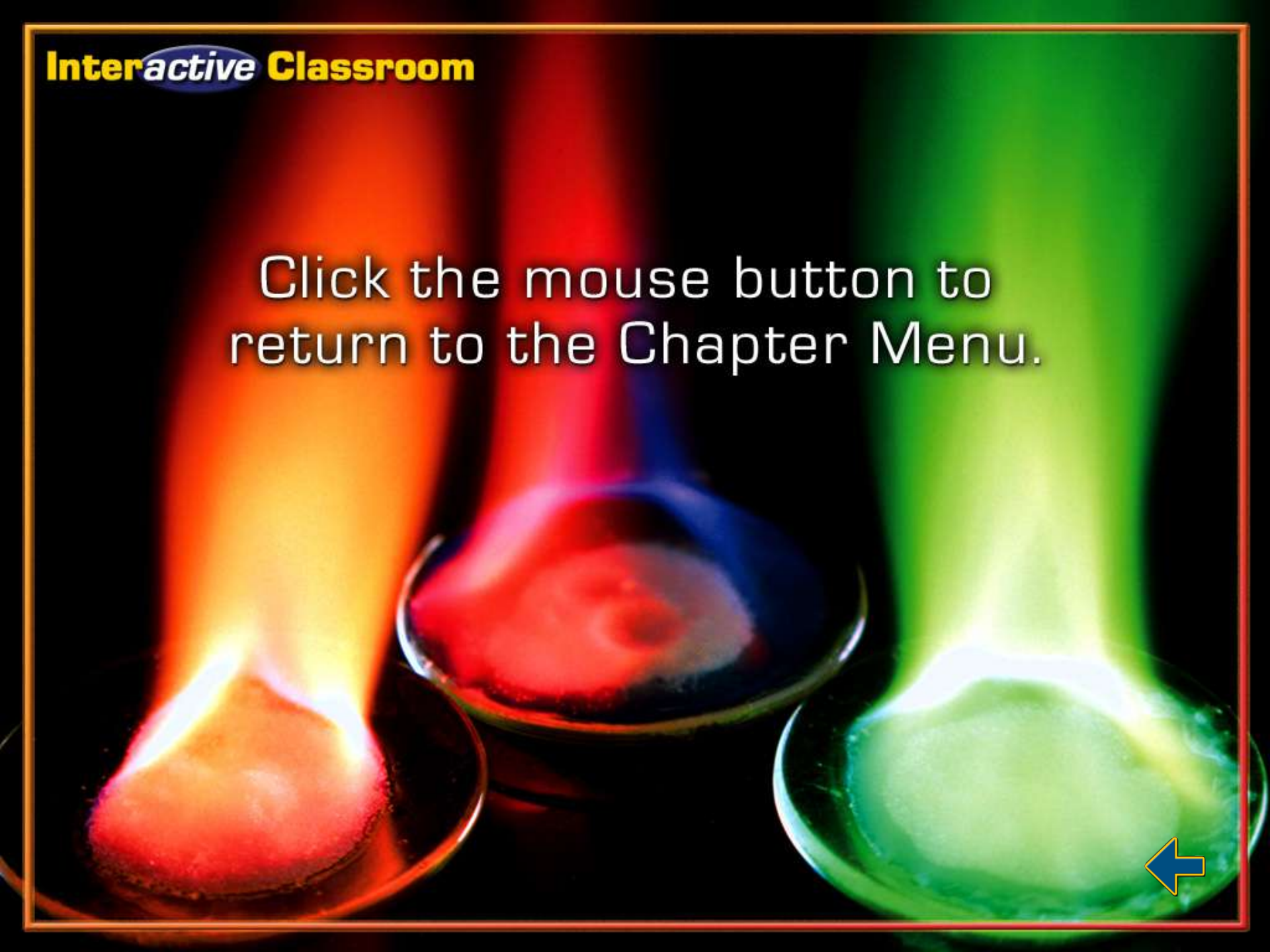
A. CFCs

B. oxygen gas

C. exosphere

D. ozone

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Section 1.2 Chemistry and Matter

Objectives

- **Compare and contrast** mass and weight.
- **Explain** why chemists are interested in a submicroscopic description of matter.
- **Identify** the area of emphasis for various branches of chemistry.

Review Vocabulary

technology: a practical application of scientific information.

New Vocabulary

mass

weight

model

MAIN Idea

Branches of chemistry involve the study of different kinds of matter.

Matter and its Characteristics

- Matter has many different forms.
- **Mass** is a measurement that reflects the amount of matter.
- **Weight** is a measure of mass and the force of gravity on an object.
- Weight can change from place to place, but mass is constant.

Matter and its Characteristics (cont.)

- 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.

Matter and its Characteristics (cont.)

- Chemistry explains events on the atomic level that cause macroscopic observations.
- A **model** is a verbal, visual, or mathematical explanation of experimental data.

Chemistry: The Central Science

- Chemistry is traditionally broken into branches that focus on specific areas such as:
  - Organic chemistry
  - Inorganic chemistry
  - Physical chemistry
  - Analytical chemistry
  - Biochemistry
  - Environmental chemistry
  - Industrial chemistry
  - Polymer chemistry
  - Theoretical chemistry
  - Thermochemistry

Chemistry: The Central Science (cont.)

Table 1.1 Some Branches of Chemistry

Branch	Area of Emphasis	Examples of Emphasis
Organic chemistry	most carbon-containing chemicals	pharmaceuticals, plastics
Inorganic chemistry	in general, matter that does not contain carbon	minerals, metals and nonmetals, 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 and the environment	pollution, biochemical cycles
Industrial chemistry	chemical processes in industry	paints, coatings
Polymer chemistry	polymers and plastics	textiles, coatings, plastics
Theoretical chemistry	chemical interactions	many areas of emphasis
Thermochemistry	heat involved in chemical processes	heat of reaction

Concepts In Motion
Click here to view an animated version of this graphic.

CheckPoint

Section 1.2 Assessment

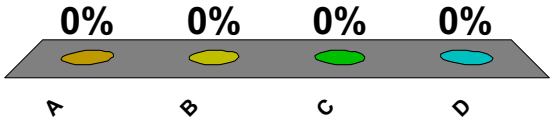
_____ is anything that has _____ and takes up space.

A. Weight; mass

B. Mass; matter

C. Matter; weight

D. Matter; mass



CheckPoint

Section 1.2 Assessment

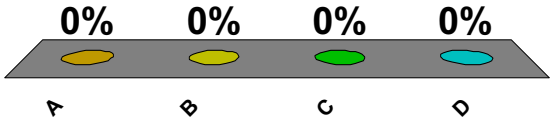
Chemistry tries to explain _____ observations based on _____ observations.

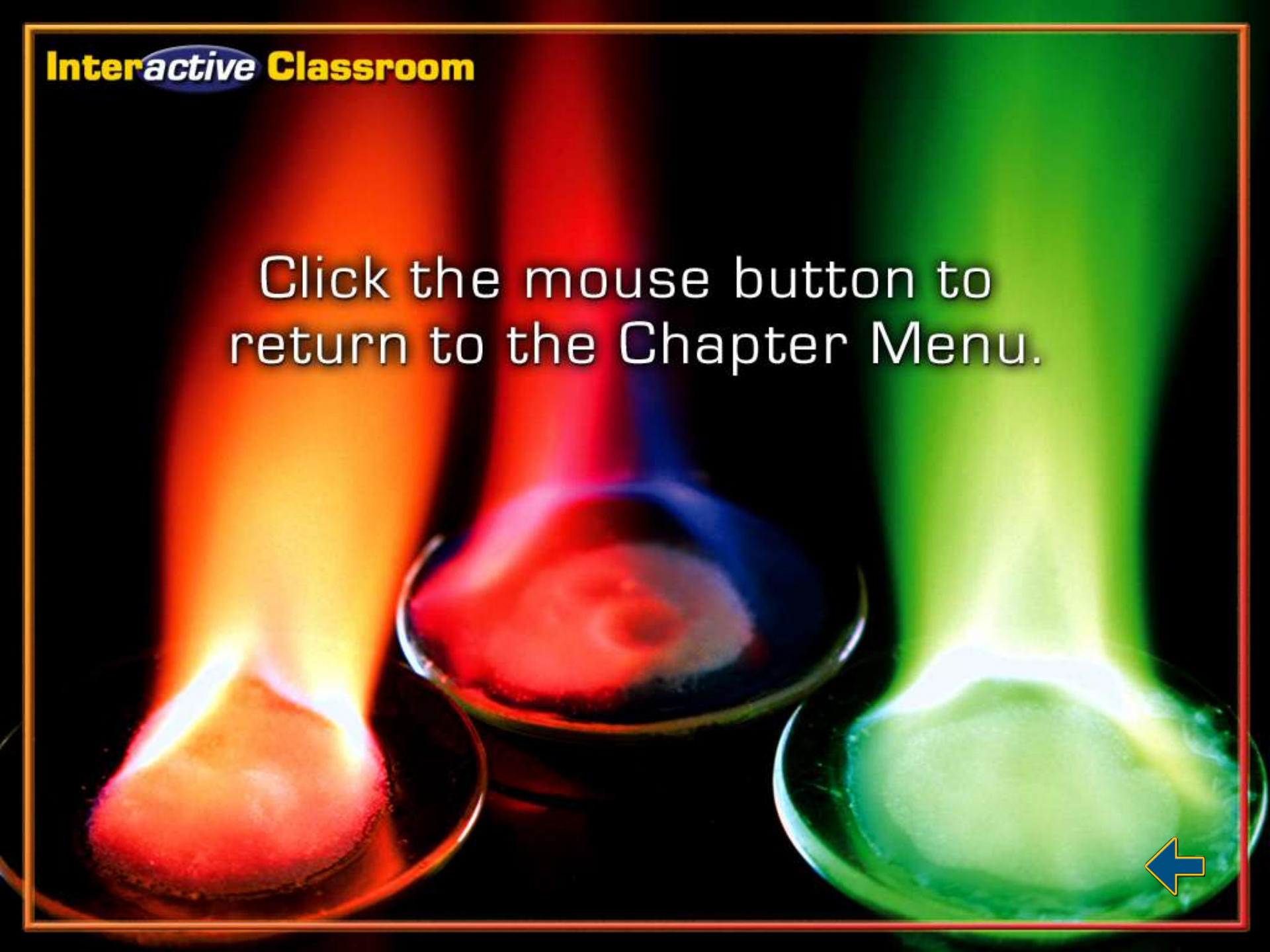
A. atomic; submicroscopic

B. macroscopic; nuclear

C. macroscopic; submicroscopic

D. microscopic; macroscopic

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Section 1.3 Scientific Methods

Objectives

- **Identify** the common steps of scientific methods.
- **Compare and contrast** types of data.
- **Identify** types of variables.
- **Describe** the difference between a theory and a scientific law.

Review Vocabulary

systematic approach: an organized method of solving a problem.

Section 1.3 Scientific Methods (cont.)

New Vocabulary

scientific method
qualitative data
quantitative data
hypothesis
experiment
independent variable
dependent variable
control
conclusion
theory
scientific law

MAIN Idea

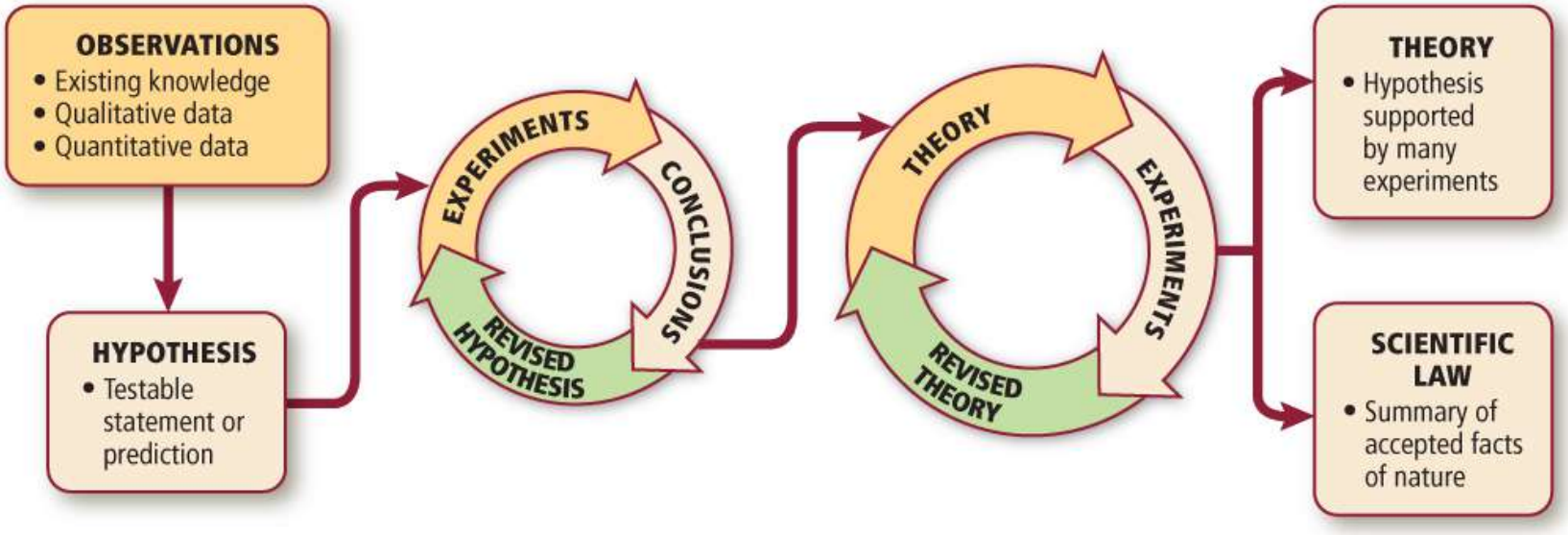
Scientists use scientific methods to systematically pose and test solutions to questions and assess the results of the tests.

A Systematic Approach

- The **scientific method** is a systematic approach used in scientific study, whether it is chemistry, physics, biology, or another science.
- It is an organized process used by scientists to do research, and provides methods for scientists to verify the work of others.

A Systematic Approach (cont.)

- The steps in a scientific method are repeated until a hypothesis is supported or discarded.



A Systematic Approach (cont.)

- An observation is the act of gathering information.
  - **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.

A Systematic Approach (cont.)

- A **hypothesis** is a tentative explanation for what has been observed.
- An **experiment** is a set of controlled observations that test the hypothesis.

A Systematic Approach (cont.)

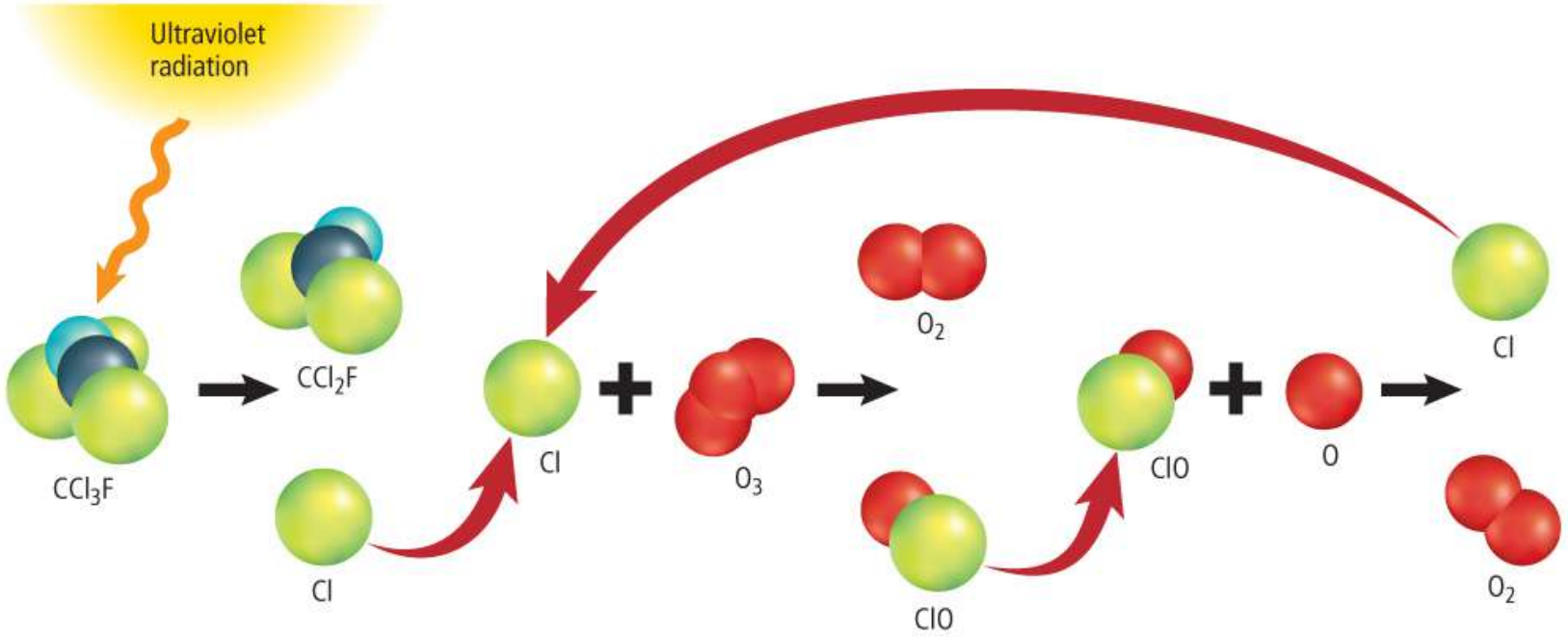
- A variable is a quantity or condition that can have more than one value.
  - An **independent variable** is the variable you plan to change.
  - The **dependent variable** is the variable that changes in value in response to a change in the independent variable.

A Systematic Approach (cont.)

- A **control** is a standard for comparison in the experiment.
- A **conclusion** is a judgment based on the information obtained from the experiment.
  - A hypothesis is never proven, only supported or discarded.
  - A model can be used to make predictions.

A Systematic Approach (cont.)

- Molina and Rowland's model showed how CFCs could destroy ozone.



Concepts In Motion
Click here to view an animated version of this graphic.

Theory and Scientific Law

- A **theory** is an explanation that has been repeatedly supported by many experiments.
  - A theory states a broad principle of nature that has been supported over time by repeated testing.
  - Theories are successful if they can be used to make predictions that are true.

Theory and Scientific Law (cont.)

- A **scientific law** is a relationship in nature that is supported by many experiments, and no exceptions to these relationships are found.

CheckPoint

Section 1.3 Assessment

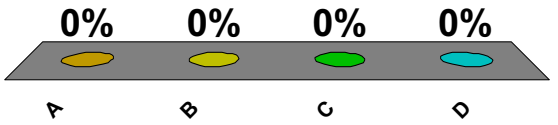
Quantitative data describes observations that are _____.

A. numerical

B. conditions

C. independent

D. hypotheses



CheckPoint

Section 1.3 Assessment

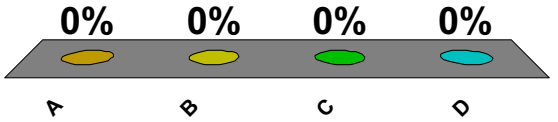
Scientific methods are _____ approaches to solving problems.

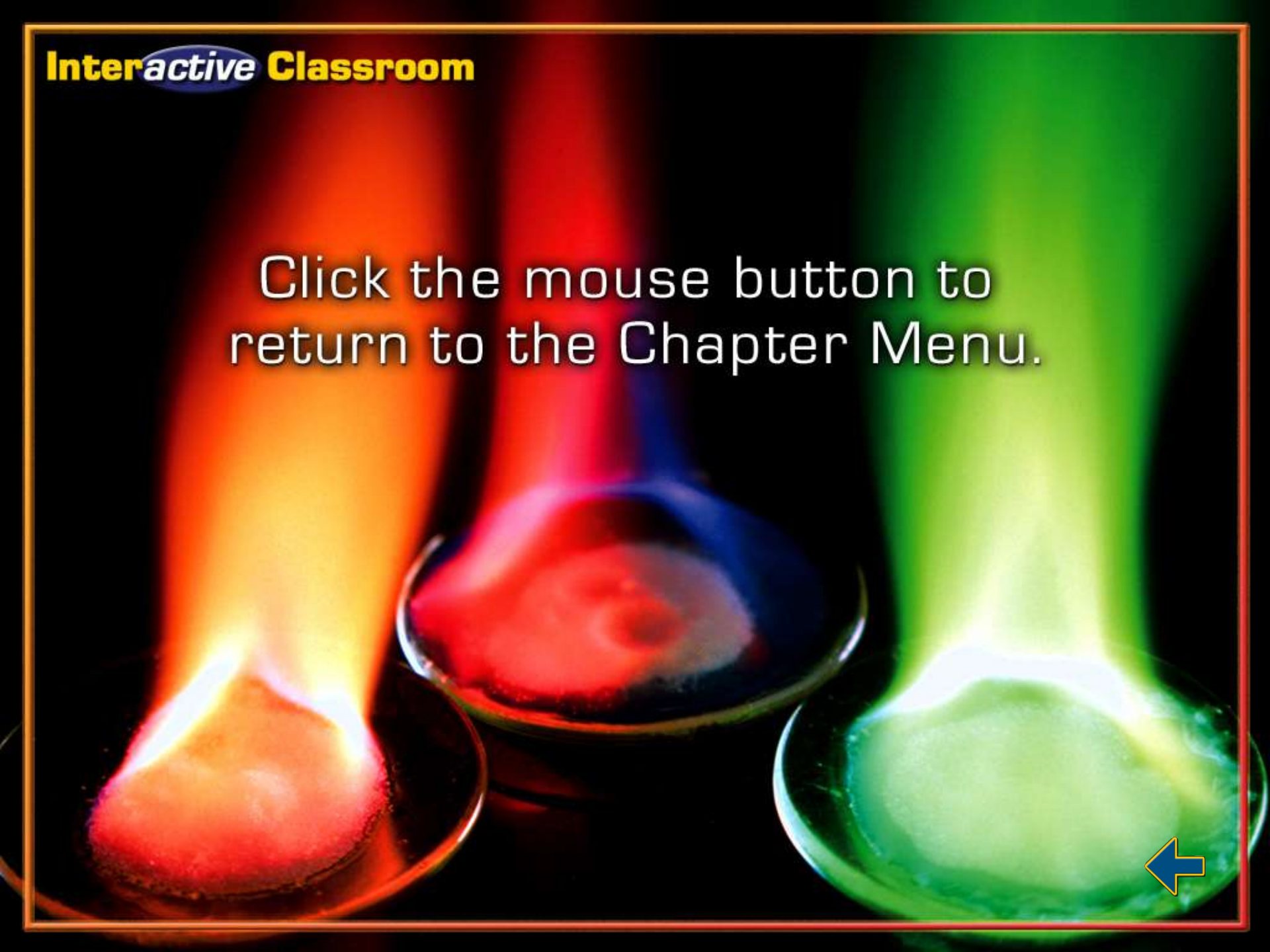
A. dependent

B. independent

C. hypothetical

D. systematic

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Section 1.4 Scientific Research

Objectives

- **Compare and contrast** pure research, applied research, and technology.
- **Apply** knowledge of laboratory safety.

Review Vocabulary

synthetic: something that is human-made and does not necessarily occur in nature

New Vocabulary

pure research

applied research

MAIN Idea

Some scientific investigations result in the development of technology that can improve our lives and the world around us.

Types of Scientific Investigations

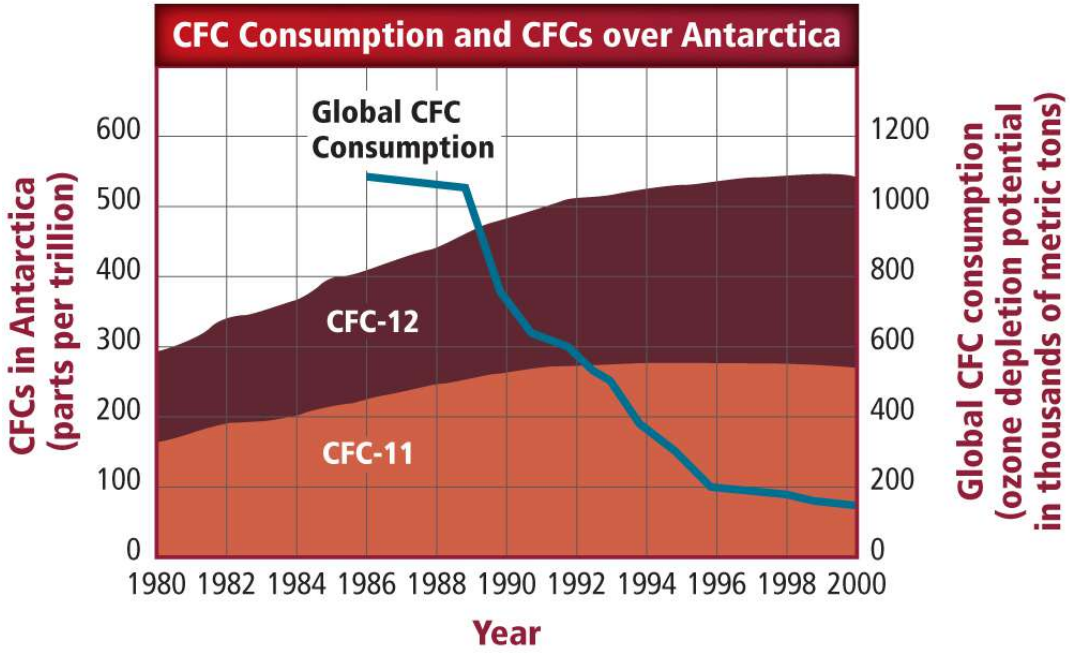
- **Pure research** is research to gain knowledge for the sake of knowledge itself.
- **Applied research** is research undertaken to solve a specific problem.
- Chance discoveries occur when scientists obtain results that are far different from what they expected.

Students in the Laboratory

- You are responsible for your safety and the safety of others around you.
- Refer to Table 1.2 on page 19 of your textbook for a list of safety rules in the the laboratory.

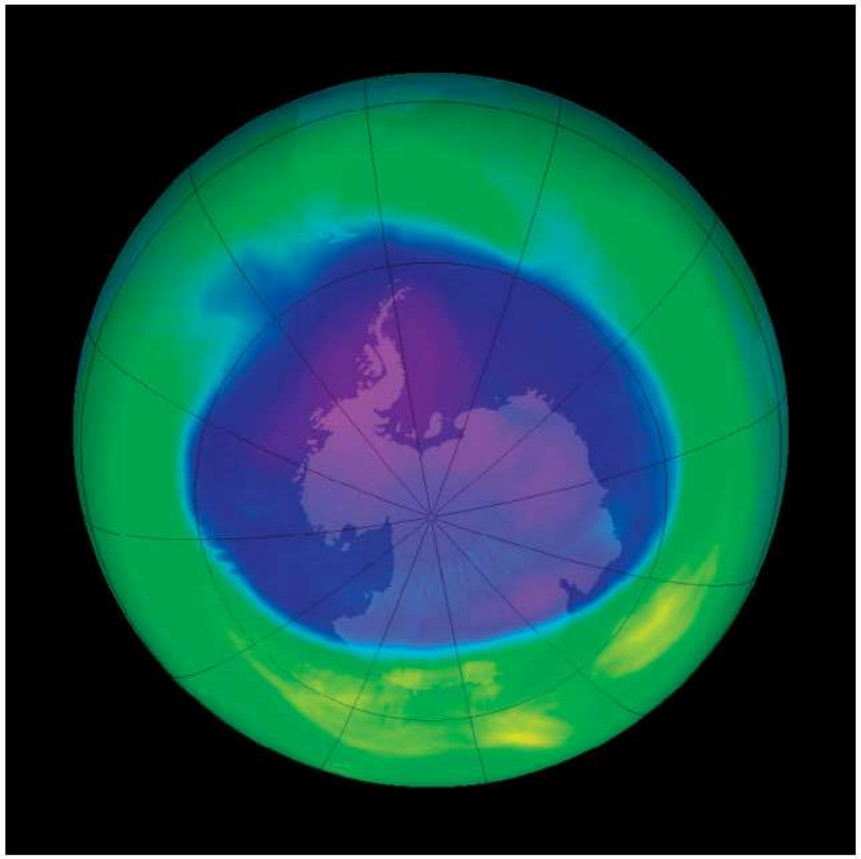
The Story Continues

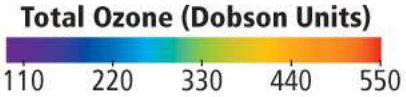
- Applied research showed that CFCs and a few other chemicals react with ozone.
- Many nations agreed in 1987 to the Montreal Protocol, to phase out CFC use.



The Story Continues (cont.)

- Scientists have learned the ozone thinning occurs over Antarctica every spring.





The Benefits of Chemistry

- Chemists solve many real problems we face today such as:
  - Ozone depletion
  - Finding cures for diseases
  - Reducing the weight of cars

CheckPoint

Section 1.4 Assessment

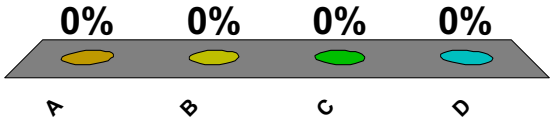
What are accidental discoveries, like penicillin, called?

A. applied discoveries

B. chance discoveries

C. pure discoveries

D. Newton's Law



CheckPoint

Section 1.4 Assessment

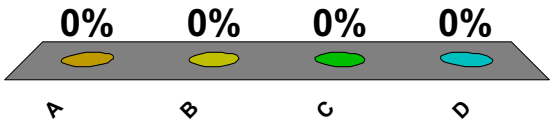
What kind of research solves specific problems?

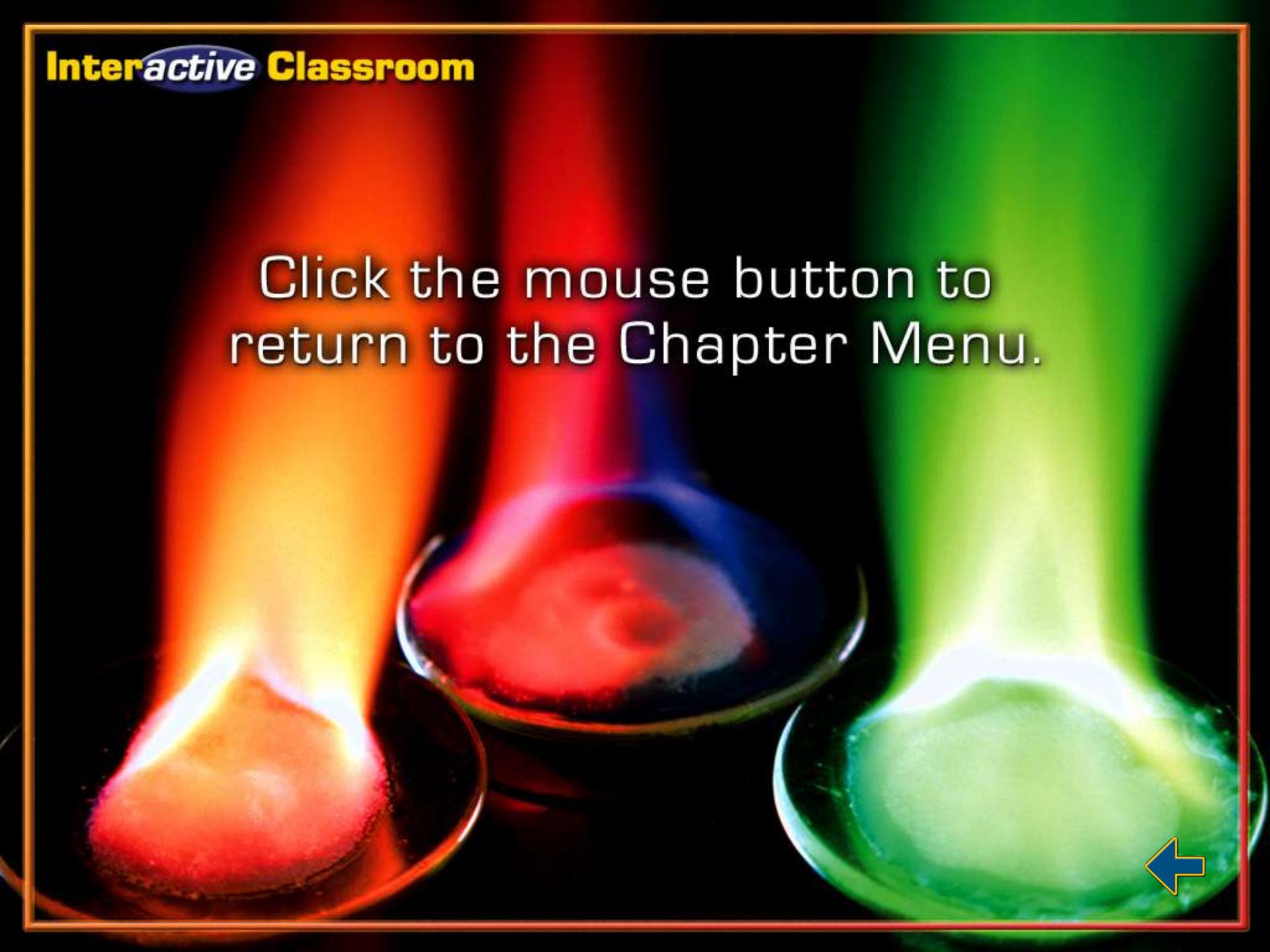
A. pure

B. exploratory

C. applied

D. model

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Study Guide

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Standardized Test Practice

Image Bank

Concepts in Motion

Click a hyperlink to view the corresponding feature.

Study Guide

Section 1.1 A Story of Two Substances

Key Concepts

- Chemistry is the study of matter.
- Chemicals are also known as substances.
- Ozone is a substance that forms a protective layer in Earth's atmosphere.
- CFCs are synthetic substances made of chlorine, fluorine, and carbon that are thinning the ozone layer.

Study Guide Section 1.2 Chemistry and Matter

Key Concepts

- Models are tools that scientists, including chemists, use.
- Macroscopic observations of matter reflect the actions of atoms on a submicroscopic scale.
- There are several branches of chemistry, including organic chemistry, inorganic chemistry, physical chemistry, analytical chemistry, and biochemistry.

Study Guide Section 1.3 Scientific Methods

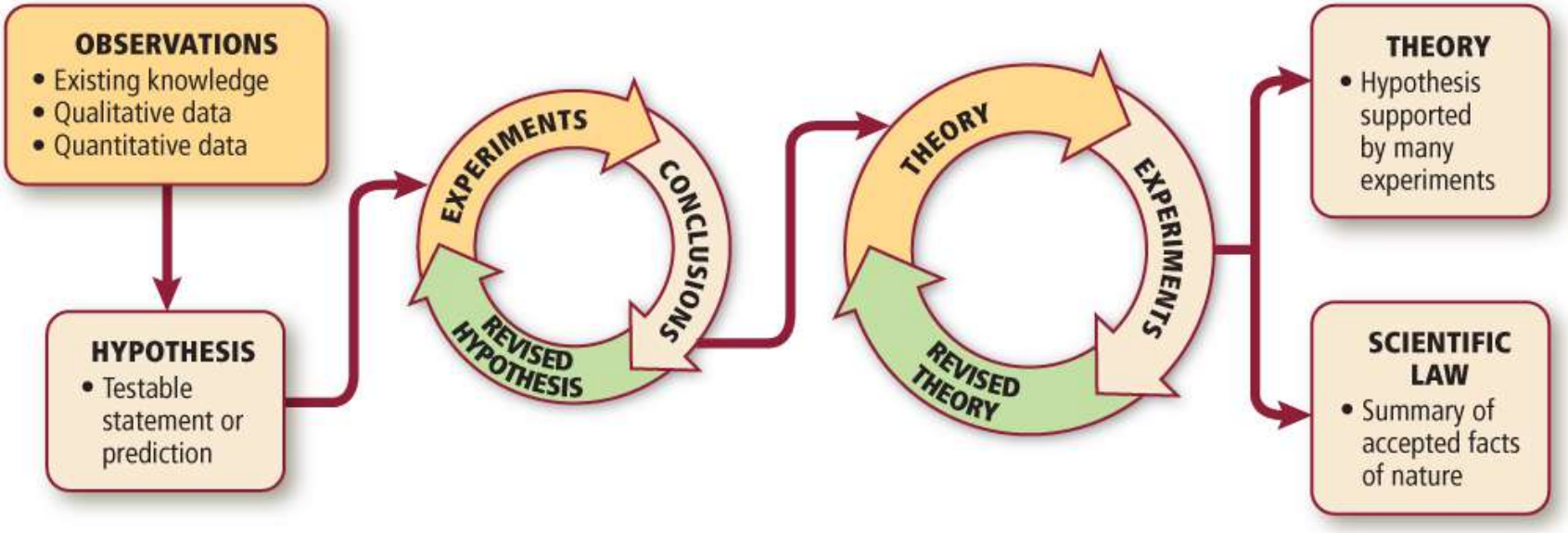
Key Concepts

- Scientific methods are systematic approaches to problem solving.
- Qualitative data describe an observation; quantitative data use numbers.
- Independent variables are changed in an experiment. Dependent variables change in response to the independent variable.
- A theory is a hypothesis that is supported by many experiments.

Study Guide

Section 1.3 Scientific Methods (cont.)

Key Concepts



Study Guide

Section 1.4 Scientific Research

Key Concepts

- Scientific methods can be used in pure research or in applied research.
- Some scientific discoveries are accidental, and some are the result of diligent research in response to a need.
- Laboratory safety is the responsibility of everyone in the laboratory.
- Many of the conveniences we enjoy today are technological applications of chemistry.

Chapter Assessment

CheckPoint

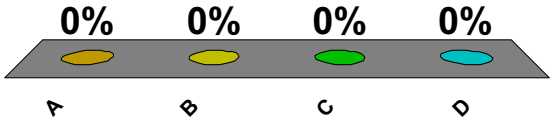
Which of the following has a definite composition?

A. building block

B. variable

C. substance

D. mixture



Chapter Assessment

CheckPoint

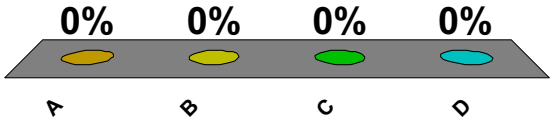
What varies with changes in gravitational force?

A. matter

B. weight

C. mass

D. composition



Chapter Assessment

CheckPoint

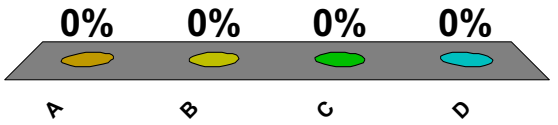
Which of the following would be an example of quantitative data?

A. blue socks

B. square peg

C. six kilograms

D. loud noise



Chapter Assessment

CheckPoint

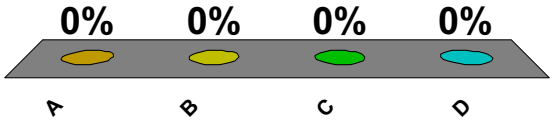
Which of the following is an example of qualitative data?

A. 1.35 kilograms

B. red flower

C. eight pieces

D. three kilometers



Chapter Assessment

CheckPoint

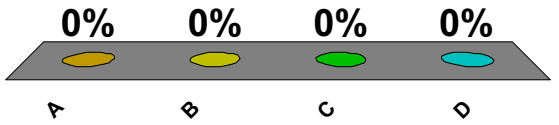
What is the discovery of nylon an example of?

A. pure research

B. applied research

C. variables

D. chance discovery



Standardized Test Practice

CheckPoint

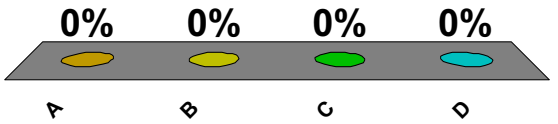
_____ is/are anything that has mass and takes up space.

A. Solids

B. Building block

C. Forces

D. Matter



Standardized Test Practice

CheckPoint

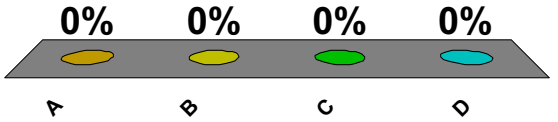
Which type of variables are controlled by the scientist?

A. independent

B. dependent

C. pure

D. response



Standardized Test Practice

CheckPoint

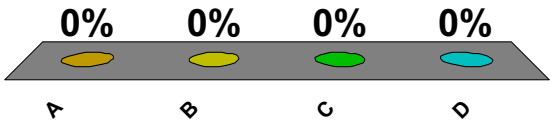
Weight is a measure of _____ and _____.

A. force; gravity

B. mass; gravity

C. matter; mass

D. gravity; motion



Standardized Test Practice

CheckPoint

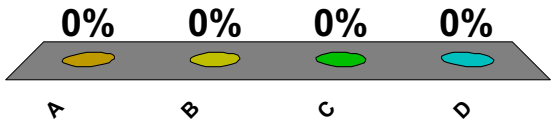
Producing heat resistant plastics is an example of what kind of research?

A. independent

B. dependent

C. pure

D. applied



Standardized Test Practice

CheckPoint

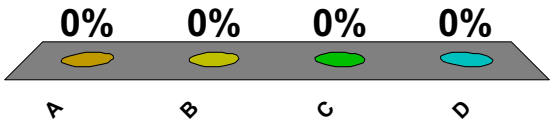
Which of the following describes a systematic approach to solving problems?

A. pure research

B. hypothetical method

C. theoretical method

D. scientific method



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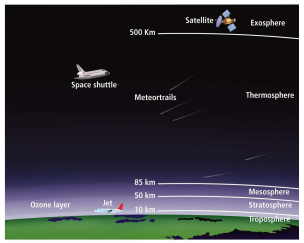
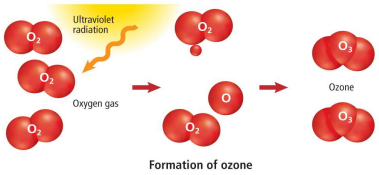
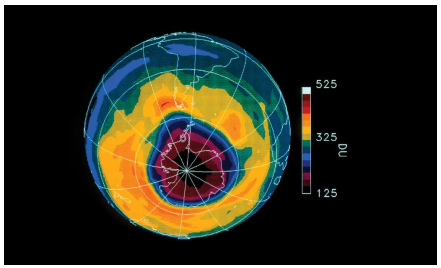






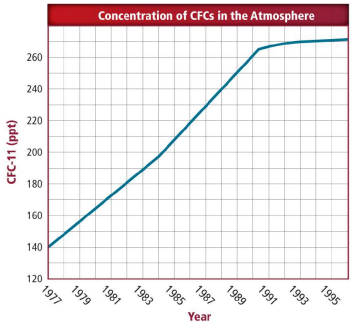
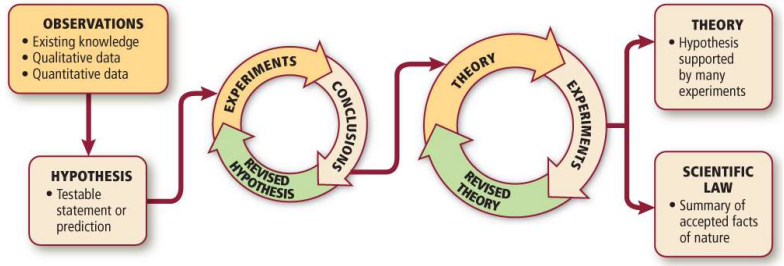
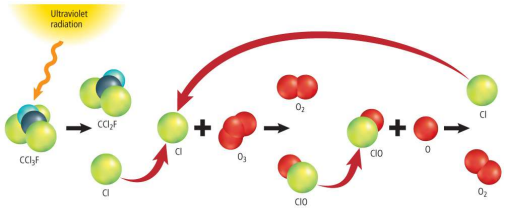
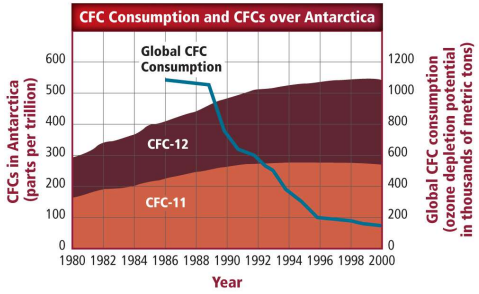


Table 1.1 Some Branches of Chemistry

Branch	Area of Emphasis	Examples of Emphasis
Organic chemistry	most carbon-containing chemicals	pharmaceuticals, plastics
Inorganic chemistry	in general, matter that does not contain carbon	minerals, metals and nonmetals, 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 and the environment	pollution, biochemical cycles
Industrial chemistry	chemical processes in industry	paints, coatings
Polymer chemistry	polymers and plastics	textiles, coatings, plastics
Theoretical chemistry	chemical interactions	many areas of emphasis
Thermochemistry	heat involved in chemical processes	heat of reaction







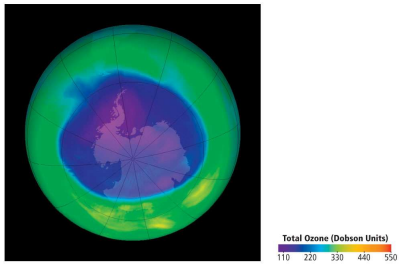


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Image Bank

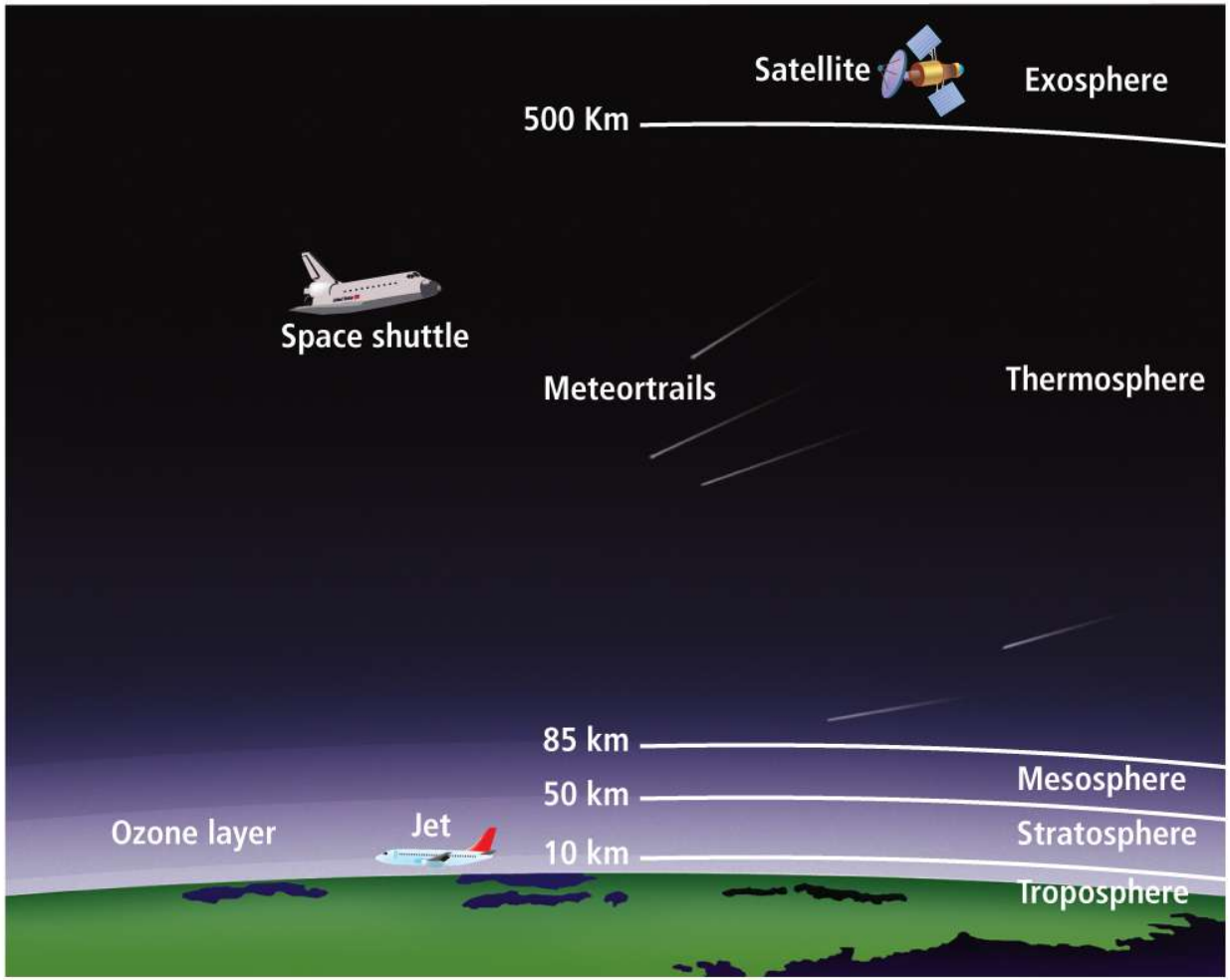
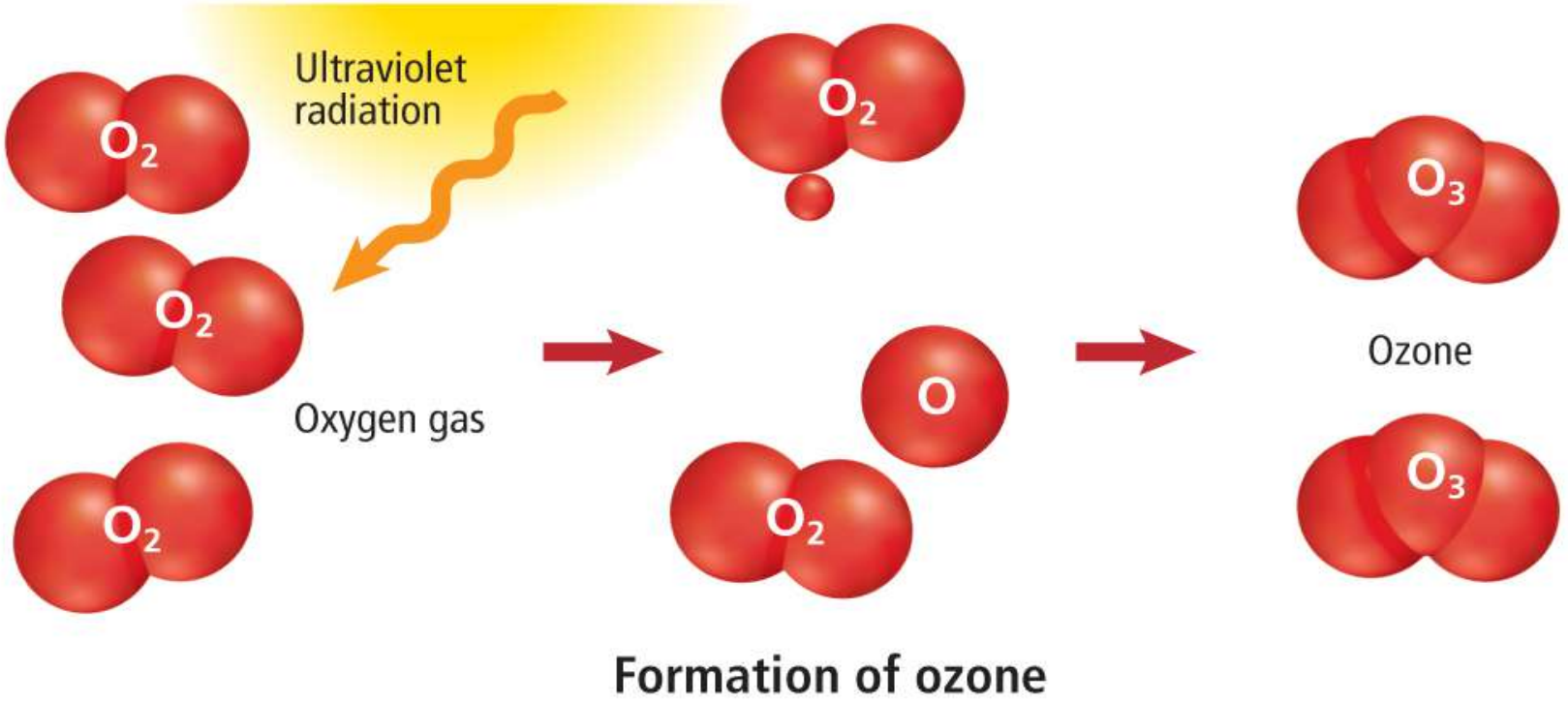
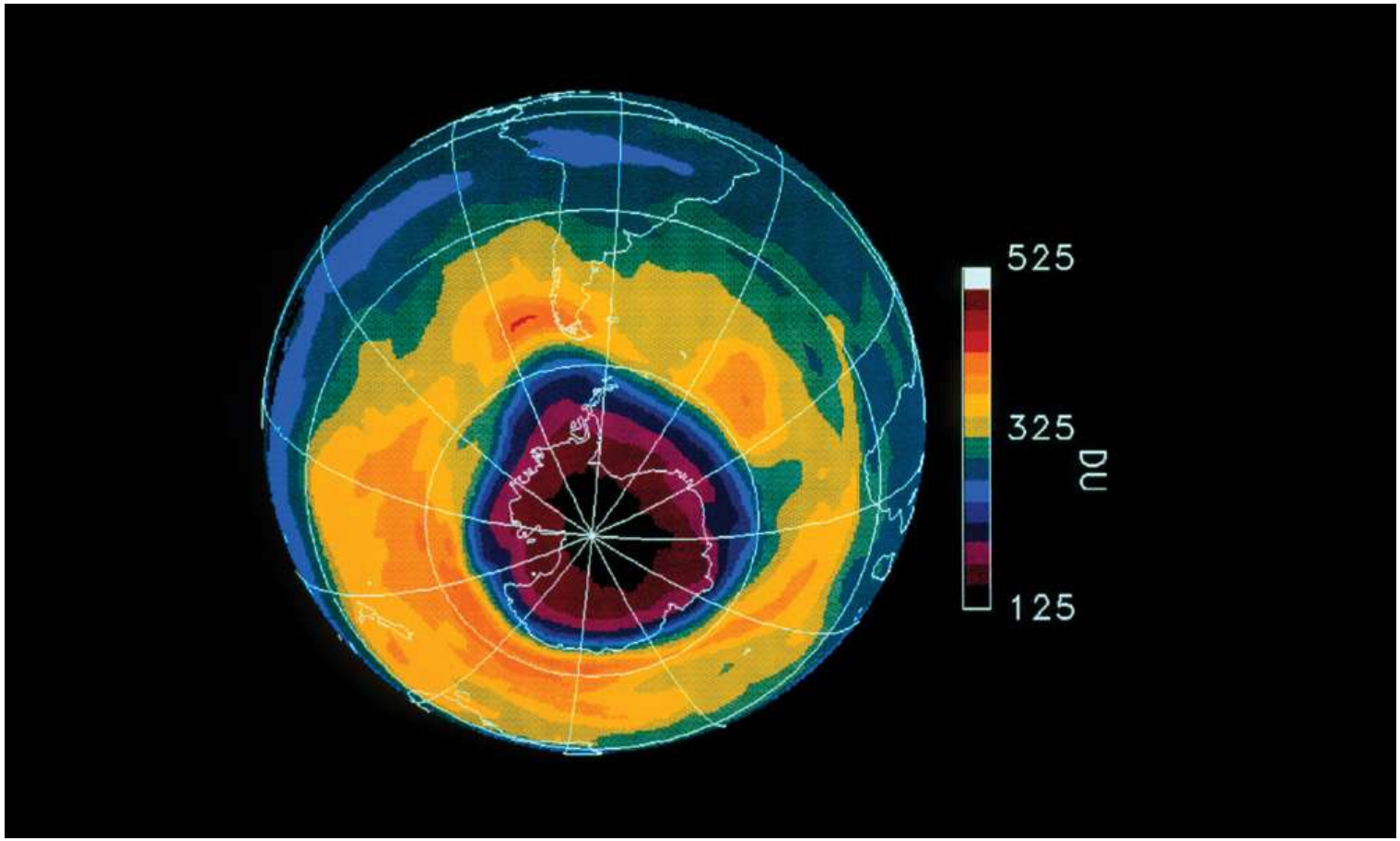

Satellite
Exosphere
500 Km
Space shuttle
Meteortrails
Thermosphere
85 km
Mesosphere
50 km
Ozone layer
Jet
Stratosphere
10 km
Troposphere

Image Bank



Formation of ozone

Image Bank



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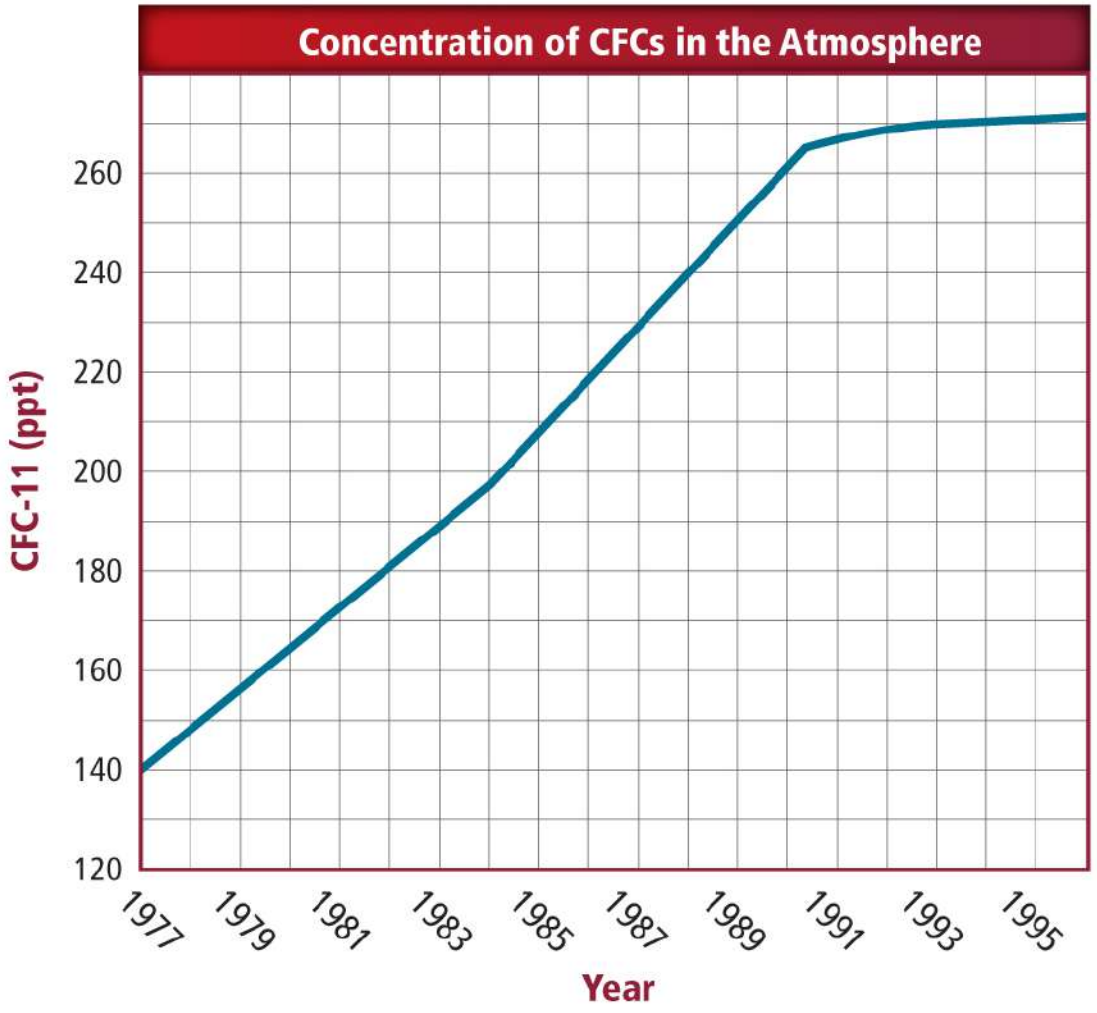
Concentration of CFCs in the Atmosphere
CFC-11 (ppt)
260
240
220
200
180
160
140
120
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
Year

Image Bank

Table 1.1	Some Branches of Chemistry	
Branch	**Area of Emphasis**	**Examples of Emphasis**
Organic chemistry	most carbon-containing chemicals	pharmaceuticals, plastics
Inorganic chemistry	in general, matter that does not contain carbon	minerals, metals and nonmetals, semiconductors
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Image Bank

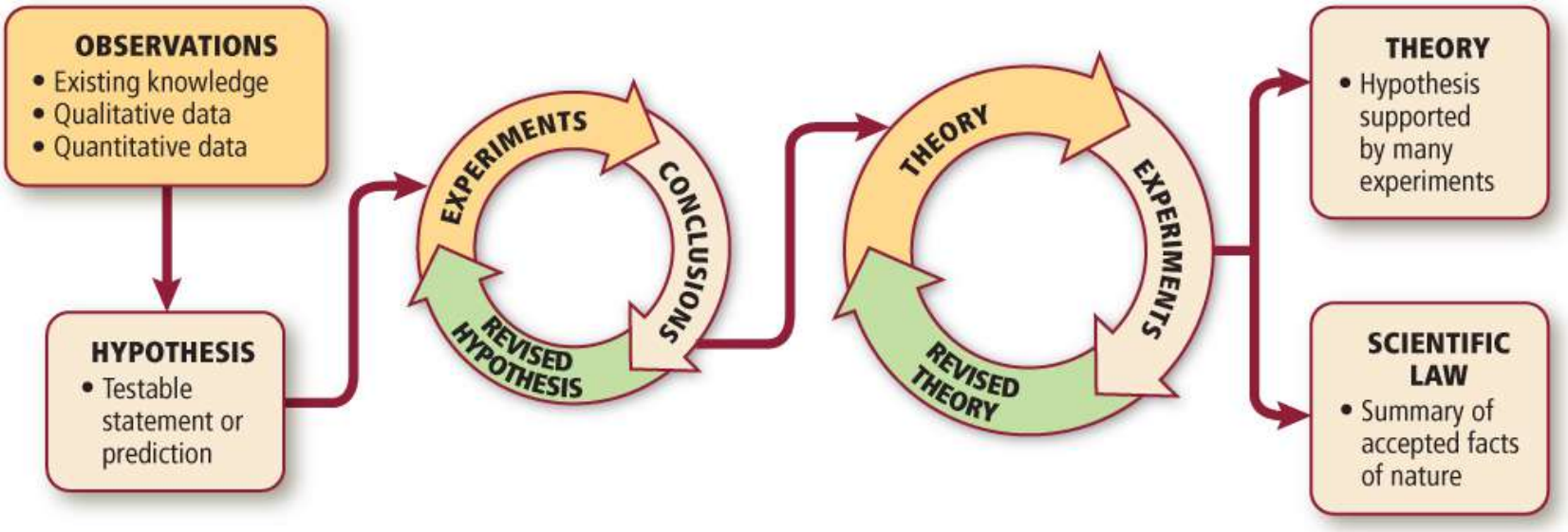
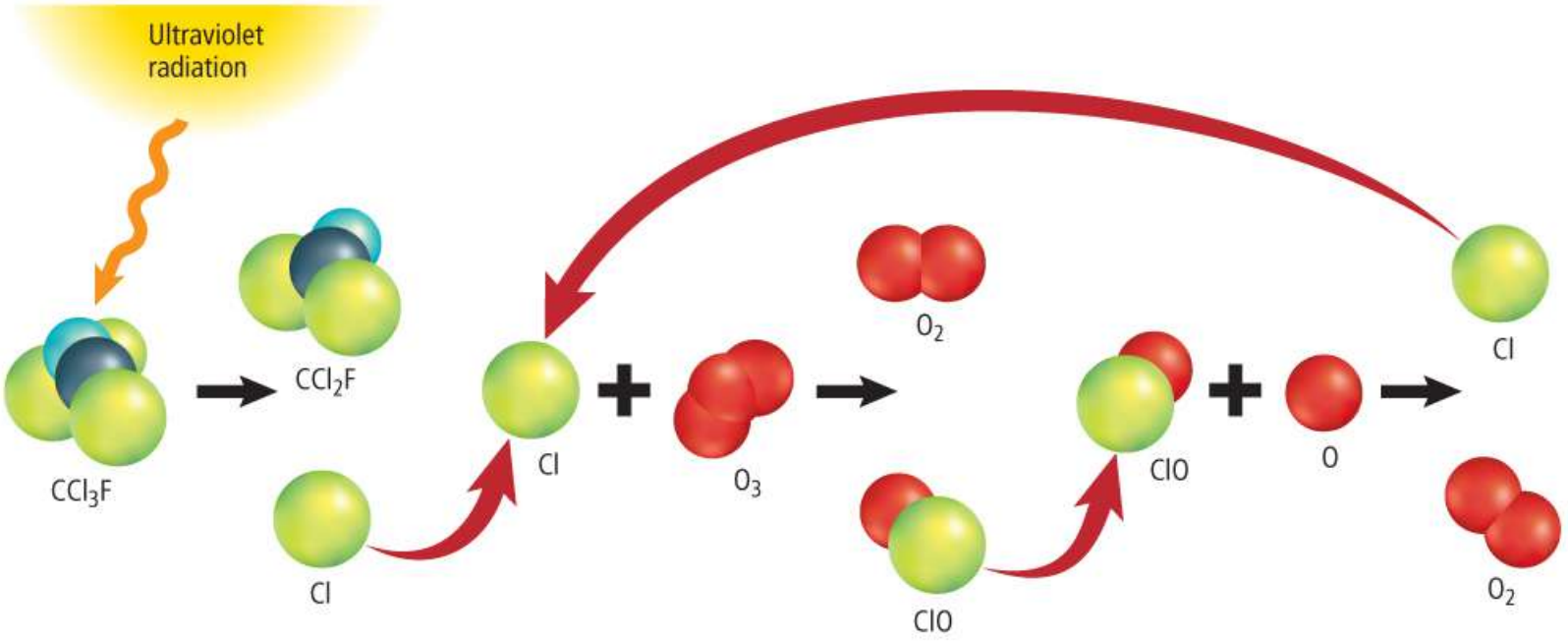

OBSERVATIONS
• Existing knowledge
• Qualitative data
• Quantitative data
HYPOTHESIS
• Testable statement or prediction
EXPERIMENTS
CONCLUSIONS
REVISED HYPOTHESIS
THEORY
EXPERIMENTS
REVISED THEORY
THEORY
• Hypothesis supported by many experiments
SCIENTIFIC LAW
• Summary of accepted facts of nature

Image Bank



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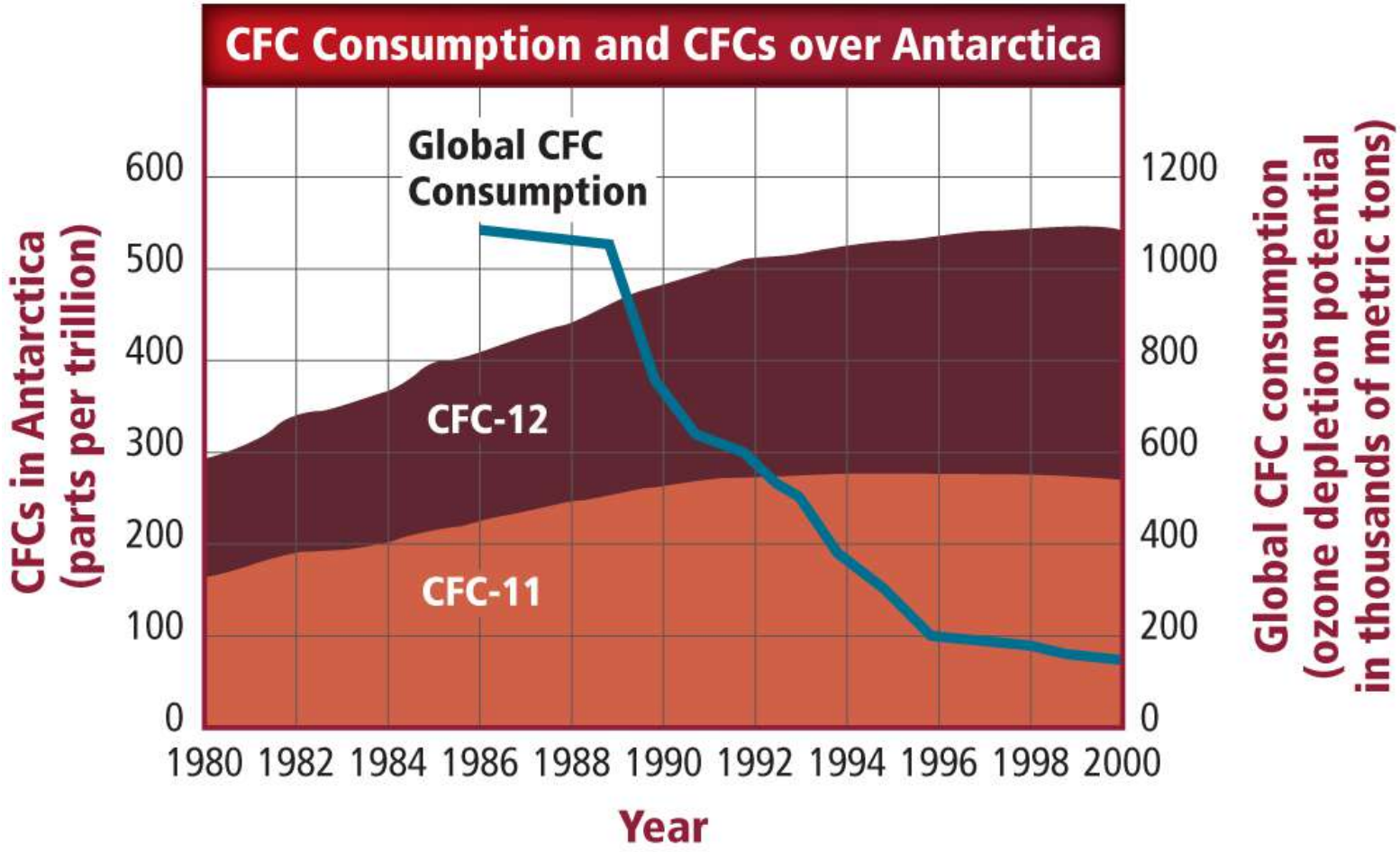
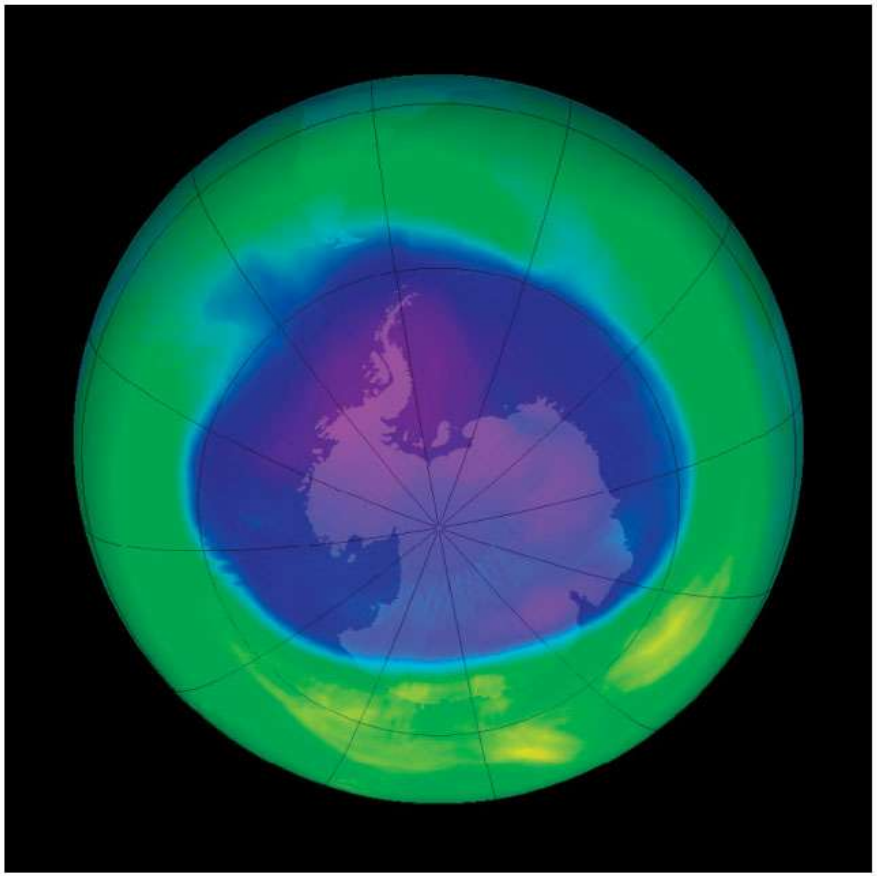

CFC Consumption and CFCs over Antarctica
Global CFC Consumption
CFC-12
CFC-11
CFCs in Antarctica (parts per trillion)
0
100
200
300
400
500
600
Global CFC consumption (ozone depletion potential in thousands of metric tons)
0
200
400
600
800
1000
1200
1980 1982 1984 1986 1988 1990 1992 1994 1996 1998 2000
Year

Image Bank



Concepts In MOtion

Table 1.1 Some Branches of Chemistry

Figure 1.3Ozone Depletion

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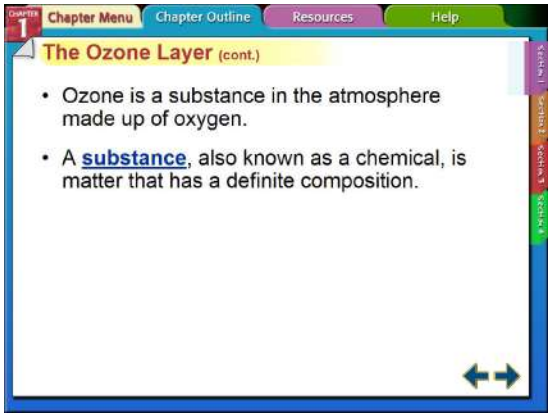

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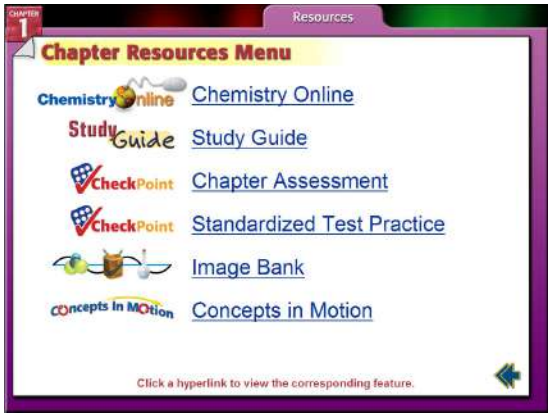
Simple navigation buttons will allow you to progress to the next slide or the previous slide.



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The “Return” button will allow you to return to the slide that you were viewing when you clicked either the Resources or Help tab.

To exit the presentation, click the Exit button on the Chapter Menu slide or hit Escape [Esc] on your keyboards while viewing any Chapter Outline slide.