Name _____ Date _____ Class _____

CHAPTER 1

Introduction to Chemistry

Section 1.1 A Story of Two Substances

In your textbook, read about the ozone layer.

Use each of the terms below just once to complete the passage.

atmosphere	oxygen gas	ozone	ozone hole
stratosphere	troposphere	ultraviolet radiation	

Earth's **(1)** _____ is made up of several layers. The air we breathe makes up the lowest level. This layer is called the **(2)** _____. The next layer up is called the **(3)** _____. This level contains a protective **(4)** _____ layer.

Ozone forms when **(5)** _____ is struck by ultraviolet radiation in the upper part of the stratosphere. The ozone forms a layer around Earth, which absorbs **(6)** _____. Without ozone, you are more likely to get a sunburn or possibly skin cancer. The thinning of the ozone layer, called the **(7)** _____, is worrisome because without ozone all organisms on Earth are subject to harm from too much radiation.

In your textbook, read about chlorofluorocarbons.

For each statement below, write *true* or *false*.

_____ **8.** CFC is another name for a chlorofluorocarbon.

_____ **9.** CFCs are made up of carbon, fluorine, and cesium.

_____ **10.** All CFCs are synthetic chemicals.

_____ **11.** CFCs usually react readily with other chemicals.

_____ **12.** CFCs were developed as replacements for toxic refrigerants.

Section 1.2 Chemistry and Matter

In your textbook, read about chemistry and matter.

Define each term.

1. chemistry

_____

2. matter

_____

3. mass

_____

Write each term below under the correct heading. Use each term only once.

air	magnetic field	car	feeling	heat	human body
light	radio	radio wave	flashlight	textbook	thought

Made of Matter	Not Made of Matter
4. _____	10. _____
5. _____	11. _____
6. _____	12. _____
7. _____	13. _____
8. _____	14. _____
9. _____	15. _____

For each statement below, write *true* or *false*.

_____ **16.** The mass of an object can vary with the object's location.

_____ **17.** A mass measurement includes the effect of Earth's gravitational pull on the object being measured.

_____ **18.** Scientists measure the amount of matter in terms of mass.

_____ **19.** Subtle differences in weight exist at different locations on Earth.

_____ **20.** Your mass on the Moon would be smaller than your mass on Earth.

Section 1.2 *continued*

Identify each branch of chemistry described.

21. The study of the matter and processes of living things

_____

22. The study of carbon-containing chemicals

_____

23. The study of the components and composition of substances

_____

24. The study of matter that does not contain organic chemicals

_____

25. The study of the behavior and changes of matter and the related energy changes

_____

For each branch of chemistry in Column A, write the letter of the item in Column B that pertains to that branch.

Column A	Column B
_____ **26.** Organic chemistry	**a.** the behavior and changes of matter and the related energy changes
_____ **27.** Physical chemistry	**b.** in general, matter that does not contain carbon
_____ **28.** Biochemistry	**c.** most carbon-containing chemicals
_____ **29.** Analytical chemistry	**d.** matter and processes of living organisms
_____ **30.** Inorganic chemistry	**e.** components and compositions of substances

Answer the following questions.

31. Compare the macroscopic world with the submicroscopic world.

_____

_____

_____

32. Why are chemists interested in the submicroscopic description of matter?

_____

_____

_____

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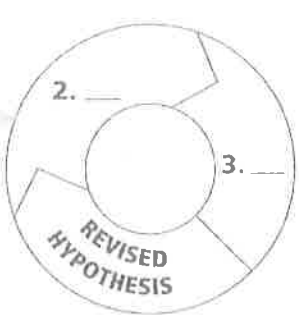
Section 1.3 Scientific Methods

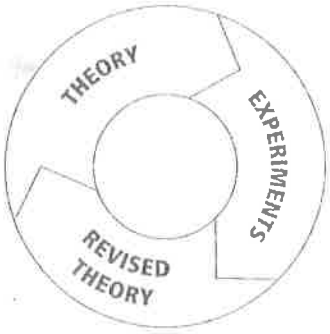
In your textbook, read about a systematic approach that scientists use.

Use the words below to complete the concept map. Write your answers in the spaces below the concept map.

conclusions	experiments	hypothesis	scientific law	theory

OBSERVATIONS
- Existing knowledge
- Qualitative data
- Quantitative data





4. _____
- Hypothesis supported by many experiments

1. _____
- Testable statement or prediction

5. _____
- Facts of nature accepted as truth

1. _____
2. _____
3. _____
4. _____
5. _____

For each item in Column A, write the letter of the matching item in Column B.

Column A	Column B
_____ **6.** Refers to physical characteristics such as color, odor, or shape	**a.** observation
_____ **7.** Refers to mass, volume, and temperature measurements	**b.** qualitative data
_____ **8.** A variable controlled by the experimenter	**c.** quantitative data
_____ **9.** The act of gathering information	**d.** independent variable
_____ **10.** Changes in value based on the value of the controlled variable	**e.** dependent variable

Section 1.3 *continued*

Circle the letter of the choice that best completes the statement.

11. A constant is a factor that
- **a.** changes during an experiment.
- **b.** changes from one lab group to another.
- **c.** is affected by the dependent variable.
- **d.** is not allowed to change during an experiment.

12. A control is a
- **a.** variable that changes during an experiment.
- **b.** standard for comparison.
- **c.** type of dependent variable.
- **d.** type of experiment.

13. A hypothesis is a(n)
- **a.** set of controlled observations.
- **b.** explanation supported by many experiments.
- **c.** tentative explanation of observations.
- **d.** law describing a relationship in nature.

14. A theory is a(n)
- **a.** set of controlled observations.
- **b.** explanation supported by many experiments.
- **c.** tentative explanation of observations.
- **d.** law describing a relationship in nature.

15. A model is a(n)
- **a.** visual, verbal, and/or mathematical explanation of how things occur.
- **b.** explanation that is supported by many experiments.
- **c.** description of a relationship in nature.
- **d.** tentative explanation about what has been observed.

In the space at the left, write the word or phrase in parentheses that correctly completes the statement.

_____ **16.** Molina and Rowland used a (model, scientific method) to learn about CFCs in the atmosphere.

_____ **17.** Their hypothesis was that CFCs break down in the stratosphere due to interactions with (ultraviolet light, oxygen).

_____ **18.** Molina and Rowland thought that these interactions produced a chemical that could break down (chlorine, ozone).

_____ **19.** To test their (data, hypothesis), Molina and Rowland examined interactions that occur in the stratosphere.

_____ **20.** Based on their data, Molina and Rowland developed a (hypothesis, model) that explained how CFCs destroy ozone.

_____ **21.** Molina and Rowland concluded that (chlorine, radiation) formed by the breakdown of CFCs in the stratosphere reacts with ozone and destroys it.

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Section 1.4 Scientific Research

In your textbook, read about types of scientific investigations.

For each description below, write *A* for applied research or *P* for pure research.

_____ **1.** Is undertaken to solve a specific problem

_____ **2.** Seeks to gain knowledge for the sake of knowledge itself

_____ **3.** Is used to find CFC replacements

_____ **4.** Was conducted by Molina and Rowland

In your textbook, read about students in the laboratory and the benefits of chemistry.

Answer the following questions.

5. When should you read the label on a chemical container?

6. What do scientists usually do when a scientific problem first arises?

7. What kinds of clothing should not be worn in the lab?

8. What is technology?

9. Which type of research would you be more interested in working in—pure research or applied research? Why?

Name _____ Date _____ Class _____

CHAPTER 1

Introduction to Chemistry

Reviewing Vocabulary

Match the definition in Column A with the term in Column B.

Column A		Column B
_____	**1.** A systematic approach used in all scientific study	**a.** chemical
_____	**2.** Anything that takes up space and has mass	**b.** chloroflurocarbon
_____	**3.** A chemical that protects organisms from UV radiation	**c.** model
_____	**4.** Any substance with a definite composition	**d.** matter
_____	**5.** A visual, verbal, or mathematical explanation of how things occur	**e.** ozone
_____	**6.** The study of matter and the changes it undergoes	**f.** scientific method
_____	**7.** The act of gathering information	**g.** conclusion
_____	**8.** A judgment based on the information obtained during an experiment	**h.** technology
_____	**9.** The practical use of scientific research	**i.** chemistry
_____	**10.** A chemical made up of chlorine, fluorine, and carbon	**j.** observation

Compare and contrast each pair of related terms.

11. qualitative data, quantitative data

12. hypothesis, theory

13. dependent variable, independent variable

Understanding Main Ideas (Part A)

Circle the letter of the choice that best completes the statement or answers the question.

1. Which of the following is NOT matter?
   a. atoms **b.** ultraviolet radiation **c.** air **d.** the Sun
2. At the end of an experiment, the scientist forms a conclusion based on the
   a. variable. **b.** scientific law. **c.** data obtained. **d.** control.
3. Which of the following is a set of controlled observations that tests a hypothesis?
   a. mass **b.** experiment **c.** weight **d.** constant
4. The branch of chemistry that focuses on carbon-containing chemicals is called
   a. analytical chemistry. **b.** inorganic chemistry. **c.** biochemistry. **d.** organic chemistry.
5. How should you prepare an acid solution?
   a. Add the water to the acid all at once.
   b. Add the acid to the water all at once.
   c. Add the water to the acid very slowly.
   d. Add the acid to the water very slowly.

Answer the following questions.

6. Compare the macroscopic world with the submicroscopic world.

_____

_____

_____

7. Explain the relationship between CFCs and the depletion of the ozone layer.

_____

_____

_____

8. What effects might the ozone hole have on humans and other organisms? Explain.

_____

_____

_____

9. List three safety precautions you can take before entering the laboratory.

_____

_____

_____

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Understanding Main Ideas (Part B)

Identify each piece of data as either *qualitative* or *quantitative*.

_____ **1.** red-

_____ **2.** 100 pounds

_____ **3.** 105°C

_____ **4.** tall

_____ **5.** round

_____ **6.** smells like bananas

_____ **7.** 40 mph

_____ **8.** pink with purple polka dots

_____ **9.** cold

_____ **10.** 78 books

Identify each kind of investigation as an example of *pure research* or *applied research*.

11. A researcher analyzes different compounds that might be sources of cancer drugs.

_____

12. Researchers study the components of living cells.

_____

13. Researchers look for a vaccine to prevent AIDS infection.

_____

14. A researcher works on ways to improve agricultural yields.

_____

15. A researcher observes chimpanzees in their natural habitat to learn about their behavior.

_____

16. A researcher analyzes the composition of Jupiter's atmosphere.

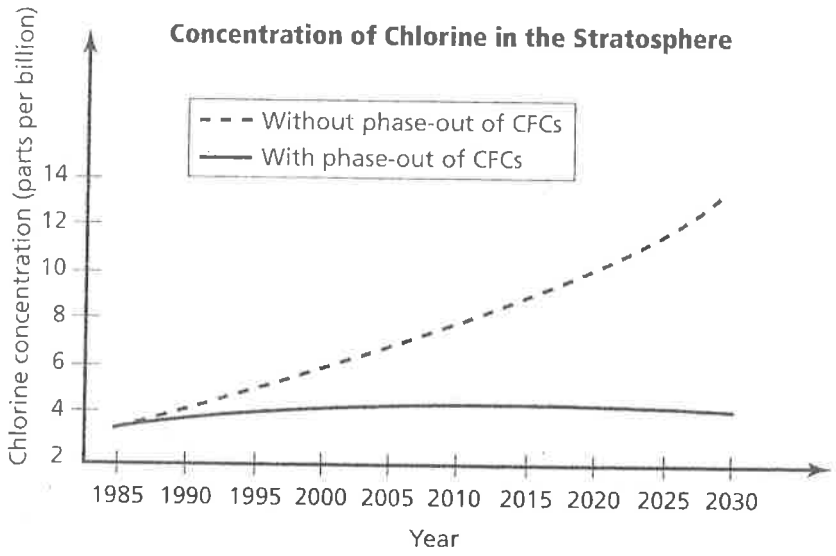
_____

17. A researcher designs a more efficient internal-combustion engine.

_____

Thinking Critically

In 1988, the international community formed an agreement to limit the production of CFCs. More than 140 countries agreed to phase out the production of the chemicals, starting in 1996. The graph below compares the predicted chlorine concentrations in the stratosphere with and without the 1996 phase-out of CFCs.



1. What does the graph predict will happen to chlorine concentrations if CFCs are phased out?

2. What is the independent variable in these predictions? What is the dependent variable in these predictions? Explain.

3. What conclusion can be made based on the predicted data?

4. Write a hypothesis scientists might test based on the graph.

Name _____ Date _____ Class _____

CHAPTER [illegible]

Applying Scientific Methods

A chemist is studying the effects of minerals on plant growth. She knows that phosphorus stimulates plant growth. She decides to test the effects of different phosphorus concentrations on corn plants over a 20-day period.

1. What hypothesis might the chemist be testing?

2. What is the independent variable in the chemist's experiment? What is the dependent variable?

3. List three possible constants in the chemist's experiment.

4. What quantitative data is the chemist likely to collect over the course of her experiment?

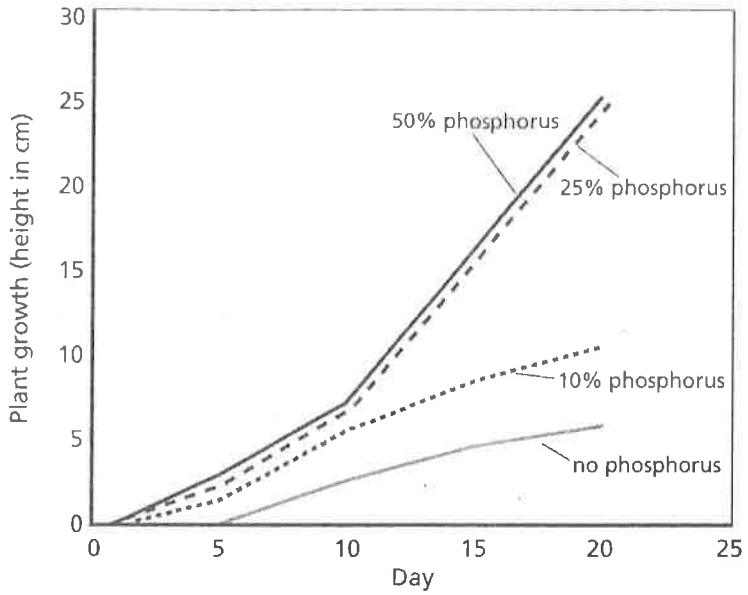
5. What qualitative data is the chemist likely to collect over the course of her experiment?

6. The chemist decides to apply the following concentrations of phosphorus to the corn plants: 0% phosphorus, 10% phosphorus, 25% phosphorus, and 50% phosphorus. Draw a table that the chemist might use to record her data over the course of her experiment.

Applying Scientific Methods, *continued*

After 20 days, the chemist organized her data into the following graph.

Effects of Phosphorus Concentration on Corn-Plant Growth



7. Based on the graph, what conclusions might the chemist make?

8. What practical application might the chemist's experiment have?

9. What subsequent experiment might the chemist want to conduct to build on her experiment?