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ABSTRACT

This is one form of three performance checks booklets (A, B, and C) for Level II of the Intermediate Science Curriculum Study (ISCS). The three booklets are considered one of four major subdivisions of a set of individualized evaluation materials for Level II of the ISCS. This booklet (form B), developed to assess the students' achievement of the objectives of Level II, contains a set of performance checks equivalent to the performance checks of the other two forms (A and C). Each performance check has its own code number which indicates the unit number and identifies whether it is based on core material or excursions. Directions for students' use of performance checks are also included. (HM)

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INTERMEDIATE SCIENCE CURRICULUM STUDY

ISCS

ED178275

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INDIVIDUALIZED TESTING SYSTEM

Performance Checks

ISCS LEVEL II
FORM B

SE 028 468

SILVER BURDETT
GENERAL LEARNING CORPORATION
Morristown, New Jersey · Park Ridge, Ill. · Palo Alto · Dallas · Atlanta

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INDIVIDUALIZED TESTING SYSTEM

ALL LEVELS	**Individualizing Objective Testing** (an ITP Module) **Evaluating and Reporting Progress** (an ITP Module)
LEVEL I	**Performance Objectives**, ISCS Level I **Performance Checks**, ISCS Level I, Forms A, B, and C **Performance Assessment Resources**, ISCS Level I, Parts 1 and 2
LEVEL II	**Performance Objectives**, ISCS Level II **Performance Checks**, ISCS Level II, Forms A, B, and C **Performance Assessment Resources**, ISCS Level II, Parts 1 and 2
LEVEL III	**Performance Objectives**, ISCS Level III **Performance Checks**, ISCS Level III, ES-WB, Forms A, B, and C WYY-IV, Forms A, B, and C IO-WU, Forms A, B, and C WW-CP, Forms A, B, and C **Performance Assessment Resources**, ISCS Level III, ES-WB WYY-IV IO-WU WW-CP

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FOREWORD

To implement an educational approach successfully, one must match the philosophy of evaluation with that of instruction. This is particularly true when individualization is the key element in the educational approach. Yet, as important as it is to achieve this match, the task is by no means simple for the teacher. In fact, without specific resource materials to help him, he is apt to find the task overwhelming. For this reason, ISCS has developed a set of individualized evaluation materials as part of its Individualized Teacher Preparation (ITP) program. These materials are designed to assist teachers in their transition to individualized instruction and to help them tailor their assessment of students' progress to the needs of all their students.

The two modules concerned with evaluation, *Individualizing Objective Testing* and *Evaluating and Reporting Progress*, can be used by small groups of teachers in in-service settings or by individual teachers in a local school environment. Hopefully, they will do more than give each teacher an overview of individualized evaluation. These ITP modules suggest key strategies for achieving both subjective and objective evaluation of each student's progress. And to make it easier for teachers to put such strategies into practice, ISCS has produced the associated booklets entitled *Performance Objectives, Performance Assessment Resources,* and *Performance Checks.* Using these materials, the teacher can objectively assess the student's mastery of the processes, skills, and subject matter of the ISCS program. And the teacher can obtain, at the moment when they are needed, specific suggestions for remedying the student's identified deficiencies.

If you are an ISCS teacher, selective use of these materials will guide you in developing an individualized evaluation program best suited to your own settings and thus further enhance the individualized character of your ISCS program.

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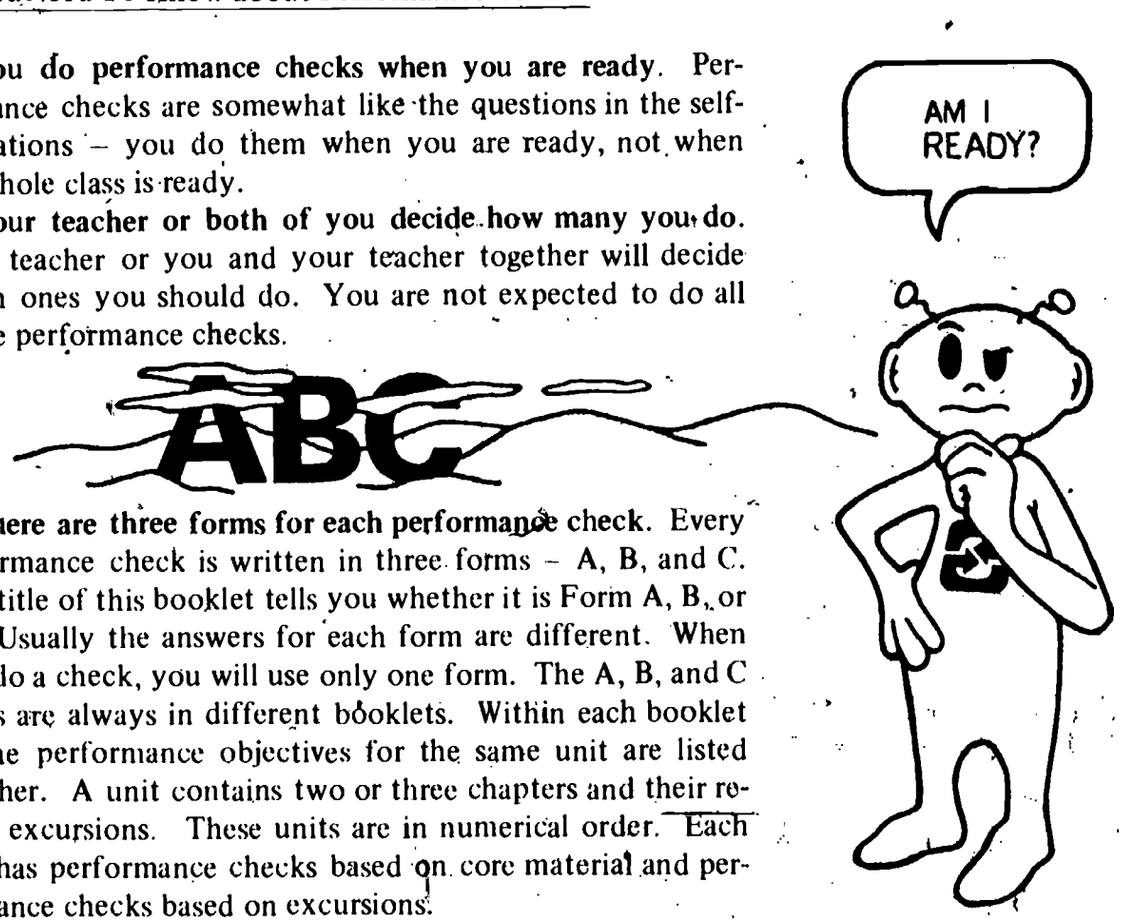
NOTES TO THE STUDENT

Now that you have completed several chapters, excursions, and self-evaluations, you are ready to help your teacher determine how well you are doing. The performance checks in this book will provide your teacher with this information. Then your teacher can help you with things you may not understand and can keep a record of your progress.

Read the next section carefully. It explains some important things about the performance checks in this book, and it gives you specific suggestions for using them.

What You Need To Know about Performance Checks

1. **You do performance checks when you are ready.** Performance checks are somewhat like the questions in the self-evaluations – you do them when you are ready, not when the whole class is ready.
2. **Your teacher or both of you decide how many you do.** Your teacher or you and your teacher together will decide which ones you should do. You are not expected to do all of the performance checks.



3. **There are three forms for each performance check.** Every performance check is written in three forms – A, B, and C. (The title of this booklet tells you whether it is Form A, B, or C.) Usually the answers for each form are different. When you do a check, you will use only one form. The A, B, and C forms are always in different booklets. Within each booklet all the performance objectives for the same unit are listed together. A unit contains two or three chapters and their related excursions. These units are in numerical order. Each unit has performance checks based on core material and performance checks based on excursions.
4. **Each performance check has its own number.** The number is in the outside margin of the page and will look like this: 03-Core-17A or 05 Exc 17-2-2A. These numbers mean

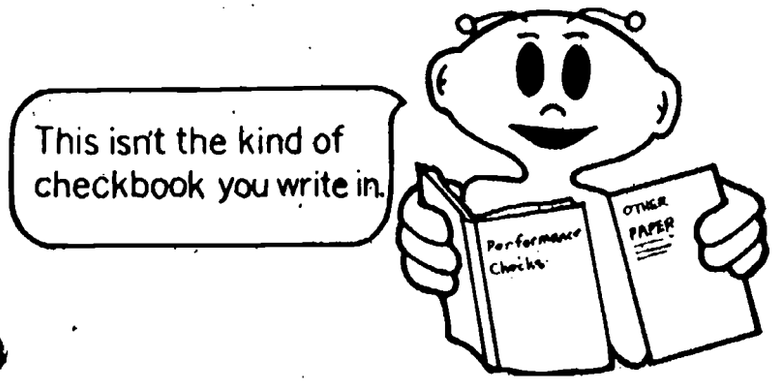
03	-	Core	-	17	A	and	05	-	Exc	17-2	- 2	A
unit		based on core material		check number	form of the check		unit		based on excursion material	excursion number	check number	form of the check

5. **Each performance check is separated from the other.** There is a line before each performance check and one after it. Some performance checks have several parts, so do everything called for between the lines. If there is no line at the bottom of a page, the check is continued onto the next page.

6. **Sometimes you will need to use equipment.** If special materials are needed, they will be in boxes labeled with the same number and sometimes the same letter too as the performance check for which you need them.

7. **Some performance checks have two or more answers.** If more than one answer is correct, you must select all the correct choices. In such cases selecting just one answer is not enough.

8. **Some performance checks have no answers.** Occasionally, you may be asked to do something that is impossible and to explain your answer. If so, say that the task is impossible and explain why.



9. **You share books of performance checks and YOU DO NOT WRITE IN THEM.** Write your answers on other paper. Give the number and form of the performance check for each answer you write. If you are to draw a graph, your teacher may provide you with grid paper.

10. **Your teacher or his assistant will collect and mark your checks.** And sometimes you must ask him to watch or assist you as you do a check.

11. **Sometimes a review procedure will be suggested.** If you can't do a performance check, you may be asked to review a part of the text or a self-evaluation question. You may then be checked on the same material, so be sure you understand the material you review. Get help if you need it.

An Antarctic exploration team sent back only the information given in the table below about samples X and Y. Nothing else is known about them. **01-Core-1B**

1. Can you be certain that substances X and Y are different substances?
2. Explain your answer.

	SAMPLE X	SAMPLE Y
Volume	23 cc	27.6 cc
Color	blue	blue
Mass	20 g	24 g
Texture	rough	smooth

What are two actions you would take if you spill an unknown or a dangerous chemical on yourself or someone else? **01-Core-2B**

Get any materials you need in addition to those in box 01-Core-3 to complete this item. Place ¼ of a teaspoon of powder from the bag into a beaker. Add about 5 drops of the acid in bottle D to the powder. Record the observations that you make. **01-Core-3B**

Get a piece of rock and a piece of shell from the supply area and enough of the powder from bottle 01-Core-4B to cover the bottom of a test tube. You may use any or all of the following: a balance, a bottle of hydrochloric acid (HCl), a magnifying glass, safety glasses, and a graduated cylinder. **01-Core-4B**

1. Is the powder more like rock or shell?
2. Explain your answer.

Get two baby-food jars. Label one X and the other Y. At the supply area are two bags, one labeled 01-Core-5X and the other labeled 01-Core-5Y. Now get a small sample of powder from each of the two bags. Also get a dropper bottle of hydrochloric acid (HCl). If your room has an acid area, do your test there. **01-Core-5B**

1. Which sample is rock powder?
2. Which sample is shell powder?
3. How did the observations you made allow you to identify which powder came from rock and which powder came from shell?

Jean crushed a solid object that she found on the bottom of a stream. Which of its properties will probably change the least? **01-Core-6B**

a. Its roughness
b. Its size
c. Its reaction with HCl
d. Its shape

01-Core-7B

Suppose you were to shrink in size so that you were able to walk inside a piece of iron.

1. Draw a diagram showing how the inside of this piece of pure iron might look to you.
2. Explain your diagram.

01-Core-8B

Choose the best answer below. A scientific model is

a. a description of the way it really is inside of matter.
b. invented in the minds of people to explain observations.
c. a statement of things that the best scientists have observed, using scientific instruments.
d. unchangeable.

01-Core-9B

Select any statements below which are part of the particle model of matter.

a. Heat energy increases the motion of matter particles.
b. Matter particles are closest together in a solid.
c. There is only one kind of matter particle.
d. Matter particles move at a constant speed.
e. Matter particles can move.

01-Core-10B

Select the letter of the choice below which best completes the statement. A scientific model

a. always provides correct answers to scientific questions.
b. is true because it comes from nature, and nature is always right.
c. should be thrown out if an experiment does not work as the model predicts.
d. is used because it helps to explain observations and to predict other observations, not because it is known to be correct.

01-Core-11B

Select the statements which are true about a scientific model.

a. It helps to interpret sets of observations.
b. It is an observation.
c. It can include a physical object or a set of objects.
d. It can be a mental picture.

01-Core-12B

Copy the numbers of the words below. Tell whether each substance is found at ordinary room temperature as a solid, a liquid, or a gas. Write S (for solid), L (for liquid), or G (for gas) after its number on your paper.

1. Cider
2. Rayon
3. Oxygen
4. Steel
5. Wood
6. Air
7. Fuel oil
8. Sandpaper

01-Core-13B

Scientists often make use of a scientific model. List two things that a good scientific model does.

Define *mass* by completing the following sentence. Mass is ____. **01-Core-14B**

Copy the list of words below. Place a P after those things which are made up of particles. Place an M after those things which are matter. You may place both a P and an M after the same word. **01-Core-15B**

1. Water
2. Air
3. Soap
4. Tea
5. Thought.

On your paper, copy the five words listed below. Place an M after those things which have mass. Place an X after those things made up of matter. You may place both an M and an X after a word. **01-Core-16B**

1. Bean
2. Tea
3. Film
4. Air
5. Spirit

Suppose you were given a balloon filled with carbon dioxide. What would you have to show about carbon dioxide to prove that it is matter? **01-Core-17B**

Get a balance and a set of gram masses. Then, from box 01-Core-18, get a small air piston and a rubber stopper. Find the mass of each of the objects from the box as closely as possible. Write the name of each object and its mass on your answer sheet. **01-Core-18B**

If a jar contains 75 cc of water, what is the water volume in ml? **01-Core-19B**

Get bottle 01-Core-20B, and fill it with water to the line marked on the side. Use a graduated cylinder to determine the volume of water in the bottle. **01-Core-20B**

Harlin's Shoe Store gave away 500 balloons filled with a gas. **01-Core-21B**

1. Is the gas in the balloons matter?
2. How do you know?

Fill a large beaker ¾ full of water. Turn a small beaker upside down, and place it under the water. Slowly turn it right side up. What, if any, is the state or form of matter coming from the beaker? **01-Core-22B**

01-Core-23B On the sketch provided by your teacher, mark the place in your ISCS room where each of the following is normally stored.

1. Bucket of sand
2. Fire blanket
3. Safety goggles
4. CO_2 or soda-acid fire extinguishers
5. First-aid kit

01-Core-24B Your teacher will observe you for this check when he can.

01-Core-25B Your teacher will observe you for this check when he can.

01-Core-26B Your teacher will observe you for this check when he can.

01-Core-27B Your teacher will observe you for this check when he can.

01-Core-28B Your teacher will observe you for this check when he can.

01-Exc 2-2-1B Listed in Column A below are six quantities commonly measured in science. Copy them onto your paper.

From Column B, choose the metric unit used to express each of these quantities and write it on your paper after the quantity it matches.

Column A (Quantities)	Column B (Units)
1. Mass	gram/cc (ml)
2. Volume	feet/second
3. Speed (distance/time unit)	ton
4. Temperature	meter/second
5. Length	gram
6. Density (mass/unit volume)	quart
	foot
	°C
	milliliter
	°F
	centimeter
	ounce/cu in

01-Exc 2-3-1B Suppose that it's the year 2050, and you have just landed on the planet Xeno in a distant galaxy. Somehow you feel that your weight is much different than it was on earth. Your weight on the planet Xeno is determined by three factors. Name two of them.

Select the letter of the property of a solid that would be different on the earth, Mars, and Jupiter. 01-Exc 2-3-2B

a. Mass
b. Weight
c. Volume
d. Color

Select the letter of the choice below which lists the important factors that determine your weight on earth. 01-Exc 2-3-3B

a. Your mass and distance from the center of the earth, and the earth's mass
b. Your mass and distance from the center of the earth, and the earth's volume
c. Your mass and volume, and the earth's mass
d. None of these

Get jars D and C from box 02-Core-1 at the supply area. What is the state of the matter, if any, in each of the jars? 02-Core-1B

Jean and Sandy decided to do exactly the same experiment separately. Later each described her experiment. Both said they were doing the same things, but their results and conclusions were very different. Jean and Sandy argued that at least one of them must have done something that was different from what she thought she had done. 02-Core-2B

1. Is it possible that both girls had done exactly the same experiment?
2. Explain your answer.

Kevin mixed nitric acid and shell. A gas was given off. He tested the gas with a burning match, which went out. Mr. Thorn asked him if the gas was nitrogen. Kevin said, "It might be, but I don't know for sure." 02-Core-3B

1. Was Kevin right in saying that he could not tell what the gas was even though he had tested it with a burning match?
2. Explain your answer.

Operational definition I: Hydrogen is a gas which explodes or pops in a flame, doesn't affect limewater, and doesn't affect phenol red. 02-Core-4B
Operational definition II: Hydrogen is a gas which is colorless, odorless, and tasteless.

Operational definition II says hydrogen can be detected or identified by observing the properties of the gas itself. It takes less work than the first operational definition.

1. Is operational definition II as useful as operational definition I?
2. Explain your answer.

Bill observed the behavior of the gases hereon and thereon. His data are shown in the table below. 02-Core-5B

TEST	GAS	
	Hereon	Thereon
Reaction with a certain solution	turns yellow	turns yellow
Reaction with a lighted match	explodes	goes out
Reaction with phenol red	turns it green	turns it green
Effects on the nose	no odor	no odor

Bill then wrote the following operational definition for *hereon*. Hereon (1) turns a certain solution yellow, (2) turns phenol red to green, and (3) has no odor.

1. Is this a good operational definition for *hereon*?
2. Explain your answer.

02-Core-6B All the statements below are true. Select the letters of any of the statements which are operational definitions.

a. Carbon dioxide is a colorless, odorless, and tasteless gas.
b. Chlorine is one of several greenish poisonous gases.
c. Cadmium particles in a solution are the only particles which form a yellow solid when sulfide particles are added.
d. Iodine is a purple gas that forms when a substance that contains it is heated.

02-Core-7B Consider the following facts.

a. Carbonate particles are present in many substances.
b. Only substances containing carbonate particles react with acids to produce carbon dioxide gas.
c. Many carbonates, like perchlorates and peroxides, give off a gas when heated.
d. Most substances which contain carbonate particles are white.

Choose the one statement above that is an operational definition for *carbonate particles*.

02-Core-8B Sue collected the gas given off by some soda pop. She also collected the gas given off by mixing baking powder and water. She found that both gases caused limewater to turn cloudy white and phenol red to turn yellow. How could soda pop and baking powder, which are so different, both give off gases which react the same way?

02-Core-9B Samples of air, hydrogen, carbon dioxide, and an unknown gas were tested. The results are shown in the table below. Write the numbers of the samples on your paper. After each number, write the name of the gas described by the test results.

GAS TESTED	TEST RESULTS		
SAMPLE	PHENOL RED	LIMEWATER	BURNING MATCH
1	no change	no change	keeps it burning
2	turns it clear	no change	puts it out
3	no change	no change	explodes
4	turns it yellow	turns it cloudy	puts it out

02-Core-10B

1. Name the reactants in the reaction below.
2. Name the products in the reaction below.

sodium sulfate + silver nitrate → silver sulfate + sodium nitrate

02-Core-11B Write a word statement for the following chemical reaction. Lead sulfate and hydrogen are formed when sulfuric acid and lead react.

Copy the list of words below onto your answer sheet. Place a G after the things which are gases. Place an M after those things which are matter. You may place both a G and an M after a word. **02-Core-12B**

1. Oxygen
2. Air
3. Sand
4. Steam
5. Carbon dioxide

Bill studied the reactions below. **02-Core-13B**

A: dark green solution + zinc → white solid (A) + colorless liquid
B: yellow-green solution + zinc → orange solid (B) + colorless liquid
C: greenish-blue solution + zinc → orange solid (C) + colorless liquid
D: green solution + zinc → orange solid (D) + colorless liquid

He then tested the orange solids and collected the data below.

ORANGE SOLIDS	REACTION WITH ACID	BURNED	DISSOLVED IN WATER
B	pink gas	slowly	all
C	pink gas	slowly	all
D	colorless gas	explodes	some

Which of the colored solutions in the reactions above probably contain similar matter particles?

Select any of the procedures below in which a control is used. **02-Core-14B**

a. Jake wanted to know if rats grew faster if they were fed meat and cereal or just cereals. He divided his rats into three groups. He fed group 1 just cereal. He fed groups 2 and 3 cereal and different amounts of meat.
b. Rob heated solid, blue copper sulfate. It turned white, and something that looked like water came out of the test tube. Rob wondered if it was water. He didn't have any water, but he had a colorless salt solution handy. He added half the salt solution to the white crystals, and they turned blue.
c. Gina wanted to see if a new plant food worked. She added the plant food to a tray of pepper plants. The plants grew very well.
d. Joan wanted to know if sugar candy caused cavities. She checked the teeth of a person who ate a lot of candy and one who ate some candy.

What is a control in an experiment? **02-Core-15B**

Give a reason for using a control when an experiment is being done. **02-Core-16B**

A sample of a new and unknown powder has been brought to earth from the moon. You are a scientist at one of the NASA laboratories. What would you need to do to identify the matter particles that are in the powder? **02-Core-17B**

02-Core-18B

Theron blue turns pink if X matter particles are present. Braten orange turns green if Y matter particles are present. Theron blue solution is put into four test tubes. Braten orange solution is put into four other test tubes. A small amount of solution 1, 2, 3, or 4 is added to each sample of braten orange and theron blue. The results are shown in the table below.

SOLUTION ADDED	BRATEN ORANGE	THERON BLUE
1	turns green	no change
2	no change	no change
3	turns green	turns pink
4	no change	turns pink

Select any of the following which agree with the data in the table.

a. Solution 3 contains just Y type particles.
b. Solutions 1 and 2 contain X type particles.
c. Solutions 1 and 4 contain the same type particles.
d. Solutions 1 and 3 contain Y type particles.
e. Solution 4 contains neither X nor Y particles.

02-Core-19B

Suppose there are 1,000,000,000,000 known kinds of matter.

1. Would the number of different kinds of matter particles be greater than, less than, or equal to 1,000,000,000,000?
2. What evidence do you have for your answer?

02-Exc 3-1-1B

Below are three reactions. What clue do the three reactions give you about the make-up of the solutions?

hydrochloric acid (solution) + baking soda → carbonic acid
lemon juice (solution) + baking soda → carbonic acid
vinegar (solution) + baking soda → carbonic acid

02-Exc 4-1-1B

There are many variables in the problem below. Name the variable which changes because other things are changed on purpose.

Problem: A toothpaste manufacturer wants to know which of three chemicals will best eliminate tooth decay.

02-Exc 4-1-2B

In the following problem, identify at least two variables which must be kept constant if the experiment is to have usable results.

Problem: A shampoo manufacturer wants to know which of three formulas will best eliminate dandruff.

02-Exc 4-2-1B

Excursion 4-2 showed you a more sensitive test for detecting the element iodine. What are the main steps in making that test? If you would like to review the less sensitive procedure, you may look at page 55 in your text.

There are thousands of substances in the world which are different from each other in some way. Yet when they are burned, they all produce carbon (soot), carbon dioxide, or both. Excursion 4-3 gave you experience with several of them. What conclusion about the makeup of these materials can you make?

02-Exc 4-3-1B

Copy the list of words below onto your paper. Write E after those things which are made up of elements or combinations of elements. Write M after those things which are made up of matter. You may put an E and an M after the same word. **03-Core-1B**

1. Darkness
2. Rubber
3. Beauty
4. Stone
5. Skin

What is the term used for matter that is made up of one and only one kind of atom? **03-Core-2B**

What is the name given to the particles of matter which make up elements? **03-Core-3B**

If each of the numbers in the diagrams below represents a different kind of atom, which diagram best represents an element? **03-Core-4B**

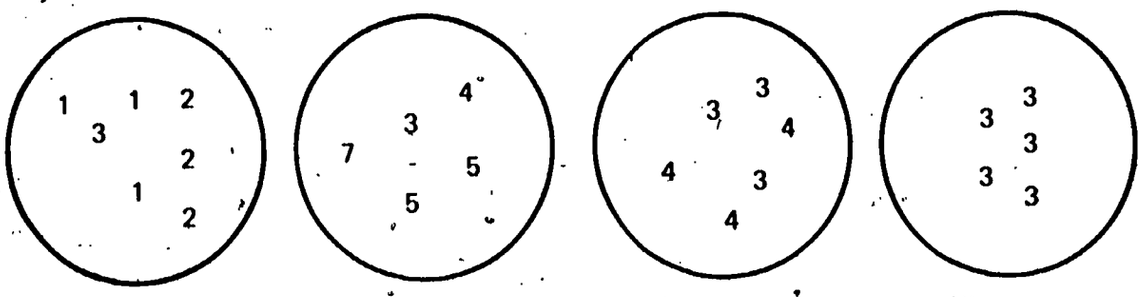


Diagram a Diagram b Diagram c Diagram d

Copy the list of words below onto your paper. Write M after those things which are matter. Write A after those things which are made up of atoms. You may put both an M and an A after a word. **03-Core-5B**

1. Hair
2. Wood
3. Electricity
4. Rain
5. Money

Jan has samples of 30 different elements. According to the model you and Iggy developed for matter, how many different kinds of atoms does Jan have? **03-Core-6B**

a. Several billion
b. 60
c. Probably about 6 or 7
d. 30
e. Impossible to tell

03-Core-7B How many materials are there that cannot be broken down into other materials by chemical means?

a. About 100
b. About 30,000
c. About 4,000
d. About 500,000

03-Core-8B Draw a diagram showing how a small piece of the element gold might look when magnified enough for you to see the gold atoms. Explain your diagram.

03-Core-9B In the formula for sodium bromide (NaBr), Na is the symbol for the element sodium. How many kinds of atoms does the symbol Na stand for?

03-Core-10B Iggy has a nut and bolt combination made up of two long bolts (Lo), one brown nut (Br), and three red nuts (Re). Select the formula below which fits Iggy's combination.

a. $2LoBr_3Re$
b. Lo_2BrRe_3
c. $2LoBrRe_3$
d. Lo_2Br_3Re
e. $2Lo_3BrRe$

03-Core-11B Neal wrote the formulas shown below for his four combinations of nuts (Al and St) and bolts (Fl and Cu). Write the total number of parts represented in each of Neal's formulas.

1. Cu_2St_3
2. $CuAlSt_2$
3. $FlSt$
4. $FlAl_3$

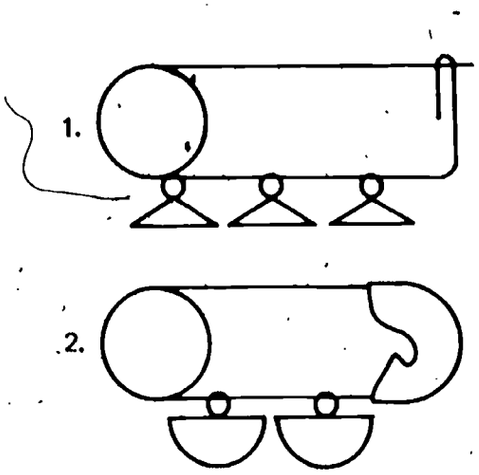
03-Core-12B Sue used the symbols Bo for short bolts and Hx for hexagonal nuts. When she put a pile of these nuts and bolts together in a certain way, her combination was $2Bo_2Hx_3$.

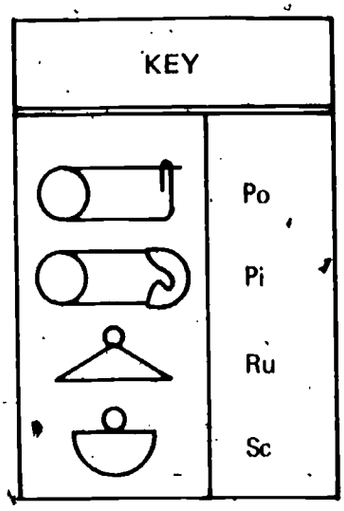
1. How many hexagonal nuts were in each unit of the combination?
2. How many units of the combination did Sue make?
3. How many short bolts were present in the total number of units of the combination formed?

03-Core-13B Using your knowledge of symbols, formulas, elements, and particles, answer this question. How many different kinds of particles are in each of the following formulas?

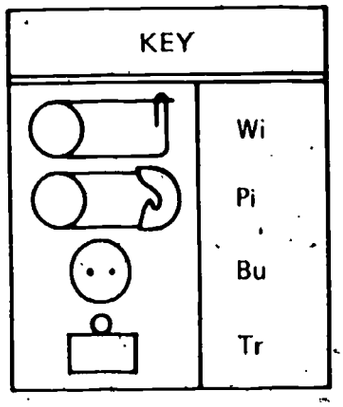
1. Na_3Sb_4
2. Na_2GeF_6

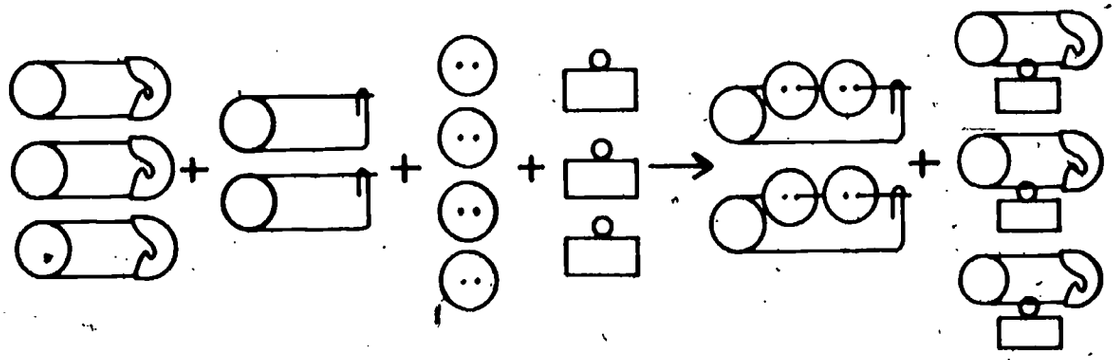
Using the key shown below, write a formula for each of the two pin-button combinations pictured. **03-Core-14B**





Describe the reaction below in terms of symbols and numbers. The key gives the symbols for the pins and buttons used. **03-Core-15B**





The formula for a nut and bolt combination is $Bl_2Hx_3Sq_2$. What does this formula tell you about the order in which the parts are combined? **03-Core-16B**

03-Core-17B Select any of the choices below which will complete the sentence. Dan brought a sample of purple substance to school. It is possible that the substance contains ... kind(s) of atoms.

a. 6
b. 2
c. 1
d. a or c
e. a, b, or c

03-Core-18B Bonnie brought her brothers Clyde and Skeeter an unknown rock and asked them what kind of things were in it. Skeeter said, "There's more than a million different substances and so there are millions of different elements. It's impossible to tell what's in that rock." Clyde said that it was possible to find out what elements the rock contained.

1. Do you agree with Skeeter or Clyde?
2. Explain why he is correct.

03-Core-19B You and Iggy have developed a particle model. The model claims that only a small number of different kinds of atoms are needed to make all known substances. How can this be true?

03-Core-20B Kate dissolved salt in water, sugar in coffee, and instant tea in water. What are the mixtures Kate formed called?

03-Core-21B When ammonium chloride is added to water and the two are stirred, the solid disappears. What happens to the solid?

03-Core-22B When 11 grams of solid, purple iodine crystals are dissolved in 50 grams of alcohol, the purple solid disappears and the alcohol turns purplish. The solution weighs 61 grams.

1. The number of atoms present in the iodine and alcohol before dissolving is (equal to, greater than, or less than) the number of atoms present in the 61 grams of solution. Choose the phrase in parenthesis which completes the sentence correctly.
2. Explain your answer.

03-Core-23B Sandy has a beaker of a solution. She tests a 30 ml sample of it and finds that it contains a dissolved gas. She says she cannot be sure if the rest of the liquid contains the dissolved gas because she has tested only a sample.

1. Could other samples of the liquid differ?
2. Explain your answer.

03-Core-24B Cover the bottom of a test tube with solid, white lead nitrate and sodium chloride. Have your teacher check the amount of the solid you have in the test tube. Use an alcohol burner and any other materials you need, and heat the substance for two minutes. List your observations.

Carol mixed two colorless solutions and produced a canary yellow solid in a colorless solution. What happened to the atoms of the reactants to make the products so different from the reactants? **03-Core-25B**

Art was experimenting with two elements, onium and offium. He knew that onium reacted with many other elements, but offium was unknown to him. He heated the elements together and no reaction took place. Art concluded that offium wouldn't react with any element because it did not react with onium. **03-Core-26B**

1. Do you agree with Art's conclusion?
2. Explain your answer.

Sharon prepared the following reaction. **03-Core-27B**

hydrochloric acid + calcium carbonate (shell) →
calcium chloride + carbon dioxide + water

If there were 888 atoms of calcium used as reactants, how many atoms of calcium are present in the products?

a. Impossible to tell
b. Exactly 888
c. Probably 888 minus a few
d. Probably 888 plus a few
e. Either c or d

A silver nitrate solution reacts with a sodium bromide solution and forms a yellow solid called *silver bromide*. Amy mixes a solution of silver nitrate with a solution of sodium bromide. A yellow solid forms and settles to the bottom. Tell how Amy can find out if all the bromide particles are used up. **03-Core-28B**

Dave did the following reaction. **03-Core-29B**

iron + copper chloride → 9.1 g iron chloride + 6.4 g copper
(15.5 g total products)

1. Select the phrase which makes the following statement true. The mass of the reactant was (greater than, equal to, less than) 15.5 g.
2. Since you weren't there when Dave did the reaction, on what basis could you answer question 1?

03-Exc 5-1-1B

The names of the chemical elements come from a wide variety of sources. List the letters of all of the statements below which account for this variety. The elements were named

a. for their appearance.
b. for their odor.
c. for their color.
d. using Greek or German names.
e. by a systematic scientific process.
f. for continents, countries, and cities.
g. for gods, goddesses, and goblins.
h. for famous people.
i. because they were slippery or moved quickly.
j. for the world region where they are formed.

03-Exc 6-1-1B

1. If 100,000 particles of potassium are dissolved in enough water to make 100 ml of solution, how many particles of potassium would you expect to find in a 15 ml sample of the solution?
2. State how the particles are distributed in the solution.

03-Exc 6-2-1B

For each of the four situations below, write the number of the situation and answer these two questions.

(a) Has a chemical reaction occurred?
(b) How do you know?

Situation 1. A clear blue solution is mixed with a colorless solution. No gas is released, and the resulting solution is clear orange.

Situation 2. A clear blue solution and a colorless solution are mixed in a beaker. A light yellow solid forms, no gas is released, the solution becomes light green, and the temperature of the beaker remains unchanged.

Situation 3. Two colorless solutions, A and B, are mixed. A colorless gas is given off, the resulting solution is colorless, and no solid is formed.

Situation 4. Solutions of chemicals X and Y are clear and colorless. When the solutions are mixed, no gas is given off. The resulting solution is clear and colorless and the same temperature as the solutions of X and Y.

03-Exc 6-3-1B

When barium chloride is added to copper sulfate, the barium particles combine with the sulfate particles. A cloudy white solid forms. Dave mixes 5 ml of barium chloride with 5 ml of copper sulfate. The cloudy white solid forms. Explain how he could find out if all the sulfate particles are used up.

Judy observed the following two reactions. **04-Core-1B**

$Zn + I_2 \rightarrow ZnI_2$
(element) (element) (compound)

$2K + Cl_2 \rightarrow 2KCl$
(element) (element) (compound)

Based on this evidence, she wrote in her *Record Book* that the elements zinc (Zn), potassium (K), iodine (I), and chlorine (Cl) were active, and therefore the following reactions will take place.

$Zn + K \rightarrow ZnK$
$Cl_2 + I_2 \rightarrow 2ClI$
$2K + I_2 \rightarrow 2KI$
$Zn + Cl_2 \rightarrow ZnCl_2$

1. Do you agree or disagree with Judy's conclusion?
2. Why?

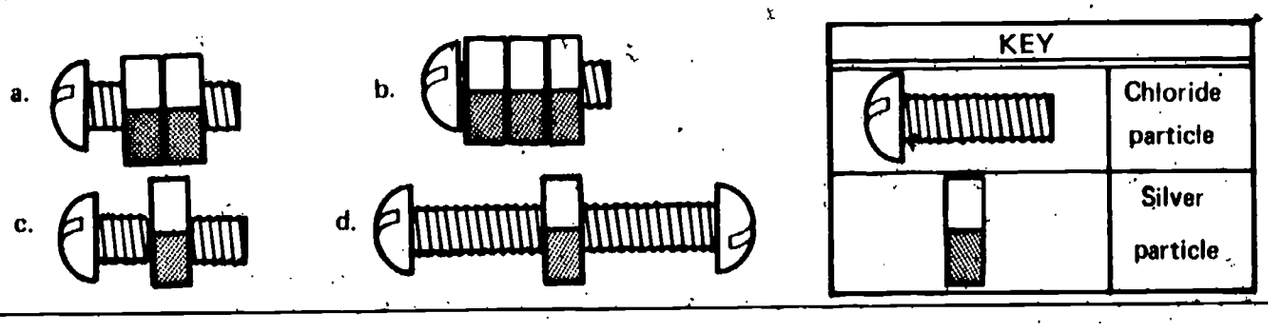
Steve had a bottle of an iodide solution. He put 40 ml of it into a graduated cylinder and 10 ml of it into a test tube. There are 30 iodide atoms in the 10 ml of solution in the test tube. How many iodide atoms are there in the graduated cylinder? **04-Core-2B**

a. 30
b. 15
c. About 7
d. 120
e. There is no way to tell.

Karl found during tests that 16 particles of sodium reacts with 8 particles of oxygen, producing 16 particles of sodium oxide. **04-Core-3B**

1. If Karl is given 12 particles of sodium, can he predict the number of particles of oxygen needed to use up all the particles?
2. Can he predict how many sodium oxide particles will be produced?
3. Explain your answers.

Sam has two solutions. One contains silver particles, and the other contains chloride particles. Suppose each ml of the chloride solution contains 4 chloride particles, and each ml of the silver solution contains 4 silver particles. He mixes 5 ml of the solution containing silver particles with 5 ml of the solution containing chloride particles. Select any of the combinations below which would cause you to predict that silver particles would be left over. **04-Core-4B**



04-Core-5B A blue copper nitrate solution is mixed with a colorless potassium sulfide solution. A black solid, copper sulfide, forms and settles to the bottom. How could you find out if all the sulfide particles in the potassium sulfide solution are used up?

04-Core-6B In Chapter 7, you heated the six test tubes with the yellow solid in them. Then you were given the following directions:

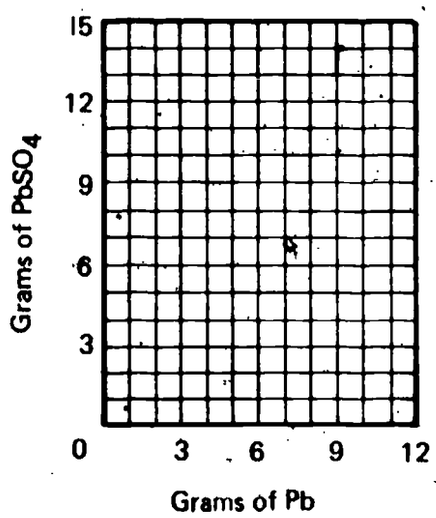
> Measure, in millimeters, the height of the yellow solid that has formed in each tube. The height of the pile of solid indicates the amount of product formed. The longer you wait to make the measurements, the more the solid will settle. Therefore, do your measuring today. And measure all the tubes as quickly, yet as carefully as you can.

These directions indicate that you must control a certain variable if your results are to be useful. Name that variable.

04-Core-7B A bicarbonate of soda solution was added to a vinegar solution. The bicarbonate of soda particles reacted, and carbon dioxide bubbles were given off. State how you could tell if there were still some unreacted bicarbonate of soda particles left after this reaction.

04-Core-8B Shawn combined lead and sulfuric acid in the following reaction. His data for six trials appear in the table below.

$$\underset{\text{(lead)}}{Pb} + \underset{\text{(sulfuric acid)}}{H_2SO_4} \rightarrow \underset{\text{(lead sulfate)}}{PbSO_4} + \underset{\text{(hydrogen)}}{H_2}$$



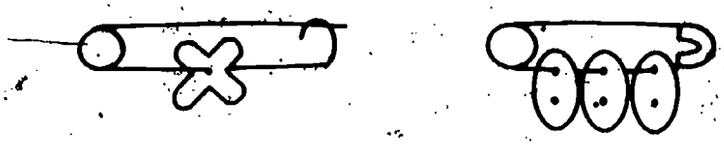
TRIAL	AMT. OF Pb (in g)	AMT. OF H_2SO_4 (in ml)	AMT. OF $PbSO_4$ (in g)
1	2	25	3
2	4	25	6
3	6	25	9
4	8	25	12
5	10	25	13
6	12	25	13

Study the table, and answer the following questions. If it will help you, get a piece of graph paper and plot the data on a grid like the one above.

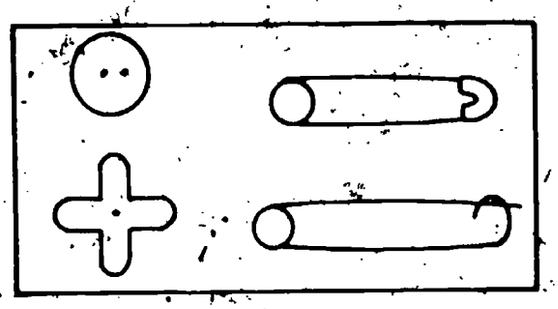
1. Which trials show an excess of Pb?
2. Which trials show an excess of H_2SO_4?

04-Core-9B What does the word *compound* mean as it is used in the following sentence? Lead iodide (PbI_2) is a compound.

04-Core-10B



Each pin and button combination shown above represents a different compound. In that case, what do the symbols shown in the box represent?



04-Core-11B

Luke developed a model for an important chemical system in the human body. Nobody could find an observation that wasn't explained by Luke's model. Joel asked Luke to review a different model for the same chemical subsystem. Luke refused and laughed, "Your model can't be good. It's different from mine, and mine explains all the observations made about the system."

1. Do you agree with Luke's reason for not looking at the other model?
2. Explain your answer.

04-Core-12B

Suppose Dr. Lenz made a microscope through which he could see all the atoms in a piece of matter. In a certain piece of material all the atoms were just alike. What sort of a material was it?

04-Core-13B

Select the best statement below about the models that scientists use.

a. It is not known if the models used by scientists are correct, but they are used because they help to predict and explain observations.
b. The models that scientists use are correct because they come from nature.
c. Models used by scientists state what actually happens in nature and therefore are correct.
d. A model used by scientists can predict new experiments. If one of the experiments does not work, the model is thrown out.

04-Core-14B

Pretend that a particle model for gravity is accepted by scientists. This would mean that

a. thinking about gravity as though it is made up of tiny particles has explained most of the observations made to date.
b. at least the best scientists have seen gravity particles.
c. scientists have direct proof that gravity exists as particles.
d. gravity is exactly like matter particles.
e. no other model can explain the observations made to date.

04-Core-15B Chapters 7 and 8 in your textbook asked whether atoms combine with each other in definite numbers. First, you worked with lead and iodine, and you answered the question yes. You then answered the same question, using copper sulfate ($CuSO_4$) and zinc (Zn). Why wasn't it enough to answer the question once?

04-Core-16B

SYSTEM

copper	+	nitric acid	→	copper nitrate	+	water	+	nitrogen dioxide
(reddish solid)		(yellowish solution)		(blue solution)				(orange-brown gas)

List the letters of any of the following which represent a component of the above system.

a. copper + nitric acid → copper nitrate + water + nitrogen dioxide
b. copper + nitric acid → nitrogen dioxide
c. copper
d. copper + nitric acid
e. nitrogen dioxide

04-Core-17B

SYSTEM

zinc	+	hydrochloric acid	→	zinc chloride	+	hydrogen
(metal)		(colorless solution)		(colorless solution)		(colorless gas)

Select the letters of any of the following which represent subsystems of the above system.

a. zinc + hydrochloric acid
b. zinc + hydrochloric acid → zinc chloride + hydrogen
c. zinc + hydrochloric acid → hydrogen
d. zinc
e. zinc chloride + hydrogen

04-Core-18B Get the following equipment:

1 alcohol burner
1 250-ml beaker
1 Celsius thermometer
1 burner support stand
100 ml of water

Get your teacher or an appointed observer to watch you. Use the alcohol burner to heat 100 ml of water. While the water is heating, measure and record its temperature every minute for three minutes.

04-Core-19B Tom studied a reaction and found that for every atom of aluminum (Al), three iodide (I) atoms were used to form a compound. He decided that an atom of Al always combine with three atoms of I. Sandy said that the number of atoms of aluminum that combine with three iodide atoms in the compound would have been different if Tom had started with different amounts of Al and I.

1. Do you agree with Tom or Sandy?
2. Why?

Ask your teacher to have someone observe you for this performance check. Get bottle 04-Core-20 and weigh out 4 grams of the white solid it contains. You may use any equipment you need. **04-Core-20B**

In box 04-Core-21 you will find eight solutions labeled A through H. Get five test tubes and any equipment you need. Mix the solutions as shown in the table below. For each numbered mixture, **04-Core-21B**

(a) tell whether or not a reaction takes place and
(b) if there is a reaction, state the evidence for it.

MIXTURE	½ DROPPER +	½ DROPPER
1	B	C
2	A	F
3	H	G
4	E	C
5	D	E

For each situation below: **04-Core-22B**

(a) state whether a reaction has occurred or not and
(b) if a reaction has occurred, state the evidence of the reaction.

Situation 1: When clear, blue solution A is mixed with colorless solution B, the beaker in which they are mixed grows hot. No gas is released, and the resulting solution is clear and blue.

Situation 2: Clear, blue solution A and colorless solution B are mixed in a beaker. A light yellow solid forms, no gas is released, the solution becomes light green, and the temperature of the beaker remains unchanged.

Situation 3: Solutions of two chemicals are clear and colorless. When the solutions are mixed, no gas is given off, and there is no temperature change. The resulting solution is clear and colorless.

Situation 4: Two colorless solutions are mixed. A colorless gas is given off, the resulting solution is colorless, and no solid is formed.

Examine the table below which shows the data collected in three trials. **04-Core-23B**

TRIAL	MASS OF PINK REACTANT	MASS OF ORANGE REACTANT	MASS OF PRODUCT
1	4 g	80 g	6 g
2	4 g	110 g	6 g
3	4 g	125 g	6 g

Notice that in each trial the amount of the orange reactant changes. Yet the amounts of the product is exactly 6 g in each case. Explain why.

04-Core-24B If m is the symbol for mass and you were asked to measure Δ m, what would you measure?

04-Core-25B Sodium carbonate reacted with vinegar in a beaker. The beaker's temperature rose 8°C. How could you tell if there were still some unreacted sodium carbonate particles in the beaker?

04-Core-26B Eloise has three beakers labeled 1, 2, and 3, each of which contains both the elements copper (Cu) and iodide (I). She analyzed a sample from the top and the bottom of each of the beakers. Her analyses are shown in the data table below.

BEAKER NUMBER	ATOMS OF Cu	ATOMS OF I
1 (top)	50	75
1 (bottom)	50	90
2 (top)	40	80
2 (bottom)	40	80
3 (top)	50	150
3 (bottom)	50	75

1. In which, if any, of the three beakers were Cu and I present as a single compound?
2. How do you know?

04-Core-27B Read the equation below.

$$Cu + 4HNO_3 \rightarrow Cu(NO_3)_2 + 2H_2O + 2NO_2$$

(copper) (nitric acid) (copper nitrate) (water) (nitrogen dioxide)

1. How many atoms of hydrogen (H) are present in the products?
2. How many atoms of oxygen (O) are present in the reactants?

04-Core-28B Tish reacted a blue-green solution of a compound containing particles L and M with a colorless solution of a compound containing particles X and Y. A black solid and a colorless solution were formed. What happened to the particles during the reaction to cause these changes?

04-Core-29B

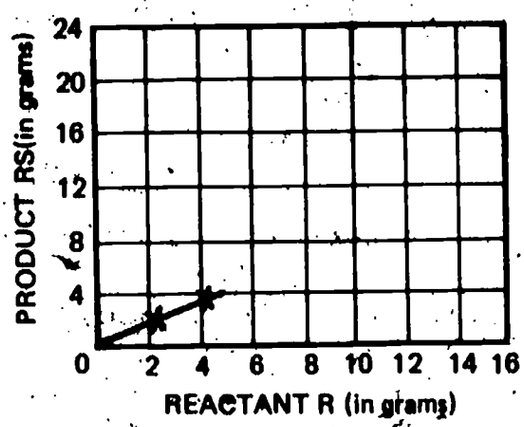
1. Is it possible for the reaction below to take place?
2. Explain your answer.

$$2KI + CuSO_4 \rightarrow PbSO_4 + ZnI_2$$

(potassium iodide) (copper sulfate) (lead sulfate) (zinc iodide)

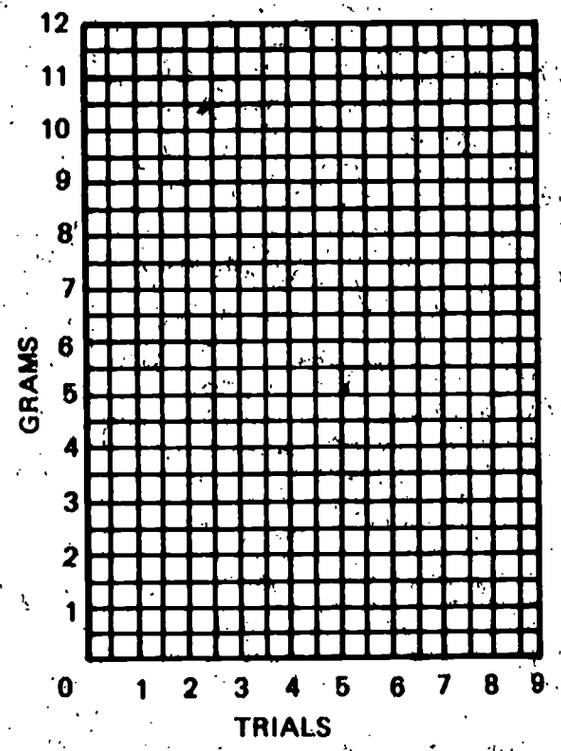
04-Exc 7-1-1B Suppose that you were given the following graph and asked to predict the amount of product RS formed when 6 g and 14 g of reactant R were reacted with a set amount of S.

1. Which, if either, of the two predicted values would you be less sure of?
2. Why?

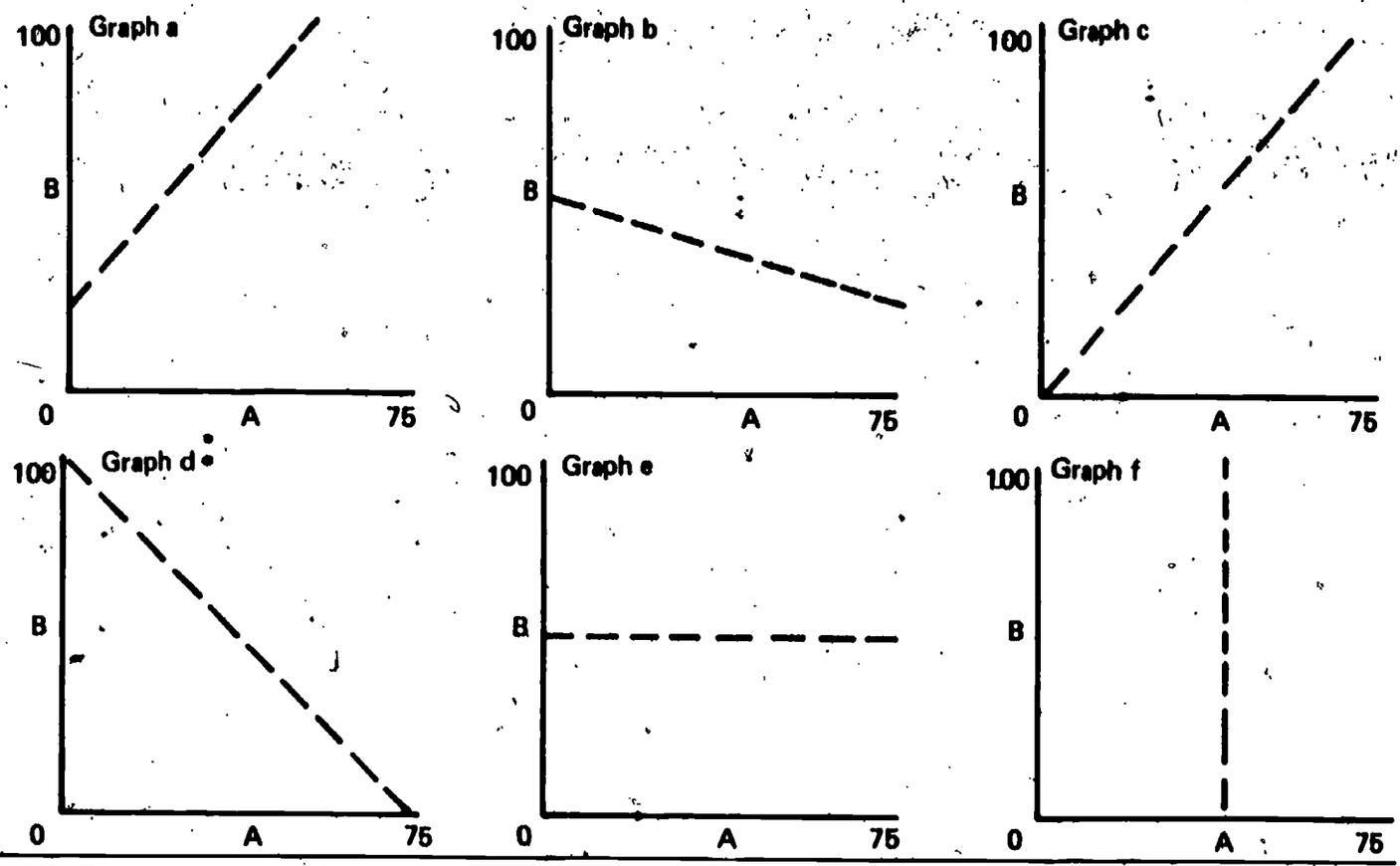


Get a piece of graph paper, label it like the grid below, and plot the data. Draw in the best-fit lines for the data. **04-Exc 7-1-2B**

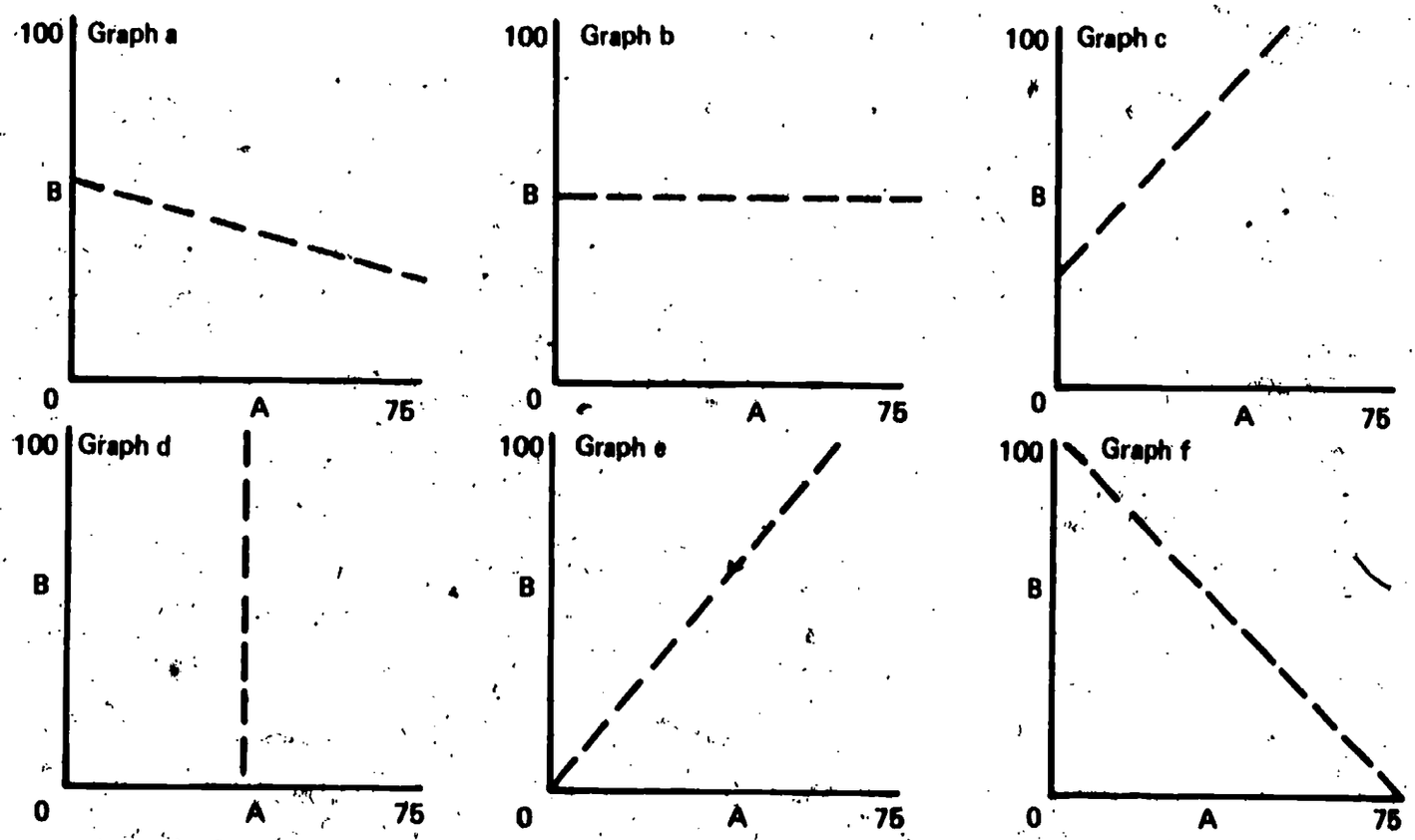
TRIAL	g OF COPPER
1	2.2
2	4.0
3	6.4
4	7.5
5	7.3
6	7.7



04-Exc 7-1-3B List the letters of any graphs which tell you that when A increases, B also increases.

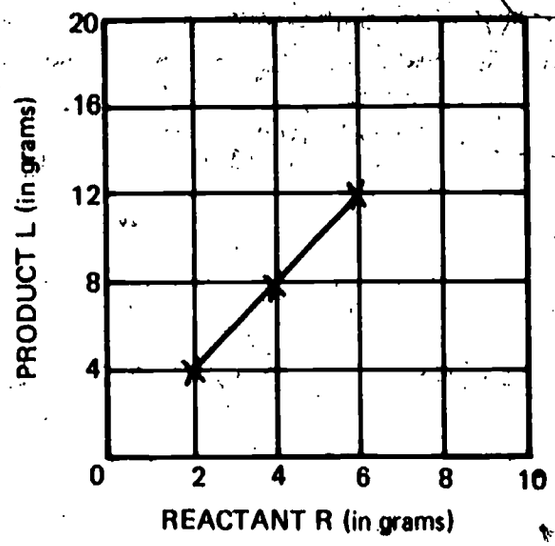


04-Exc 7-1-4B State the letters of any graphs which show one variable which stays the same while the other increases.



From the graph, determine how many g of product L would be formed if **04-Exc 7-1-5B**

1. 1 g of reactant R were used.
2. 3 g of reactant R were used.
3. 8 g of reactant R were used.
4. 5 g of reactant R were used.



Barry put 50 ml of milk into each of the five beakers shown below. Then in each beaker, he dissolved the different amounts of milk shake mix (MSM) shown. **04-Exc 7-2-1B**

1. Starting with the least concentrated solution, list the solutions in order of concentration.
2. Which is the more concentrated solution, c or d?

In 200 ml of Brand X cleaning solution, there are 120 grams of lye. What is the concentration of lye in the solution? State your answer in grams per milliliter (g/ml). **04-Exc 7-2-2B**

In 500 ml of Brand X solution used to clean ovens, there are 100 g of lye. Mrs. Smith used 100 ml of Brand X yesterday to clean her oven. How many grams of lye were in the 100 ml of solution she used? **04-Exc 7-2-3B**

Get the following equipment. **04-Exc 8-1-1B**

1 250-ml beaker
1 Celsius thermometer
water

Get your teacher or an appointed observer to watch you. Measure and record the temperature of the water.

04-Exc 8-2-1B

Art mixed two solutions to perform the following reaction:

lead nitrate + sodium sulfide → lead sulfide
(solution) (solution) (solid)

Lead sulfide is a white solid which forms and settles to the bottom of the solution. Art said there should be another product, sodium nitrate.

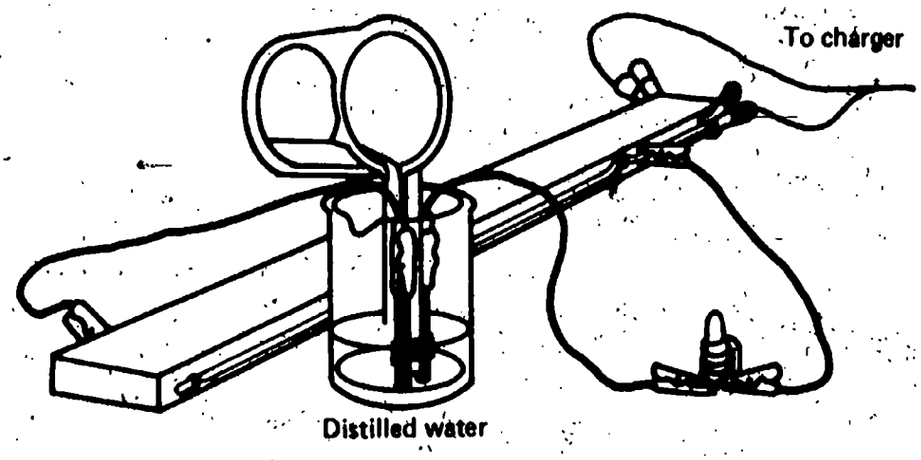
1. If Art is right, where is that product?
2. How could you get it?

04-Exc 8-3-1B

Carbonate (CO_3) is an atom team. If sodium carbonate (Na_2CO_3) reacts with calcium chloride ($CaCl_2$), which of the following would be a product of the reaction?

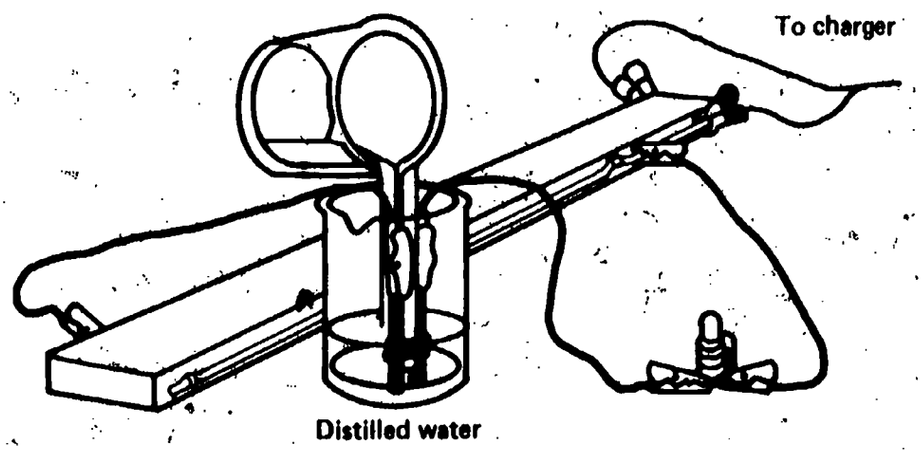
a. $CaCO_4$
b. $CaCO_2$
c. CaC
d. CaO
e. $CaCO_3$

In several activities in your text, you tried to determine whether or not copper sulfate ($CuSO_4$) in a solution will conduct electricity. First you put distilled water into the beaker and tested to see if it would conduct electricity, as shown below. Then you dissolved solid $CuSO_4$ in the water to make the solution and tested it. Why didn't you just put a solution of $CuSO_4$ into the beaker in the first place and skip the step using only distilled water? **05-Core-1B**



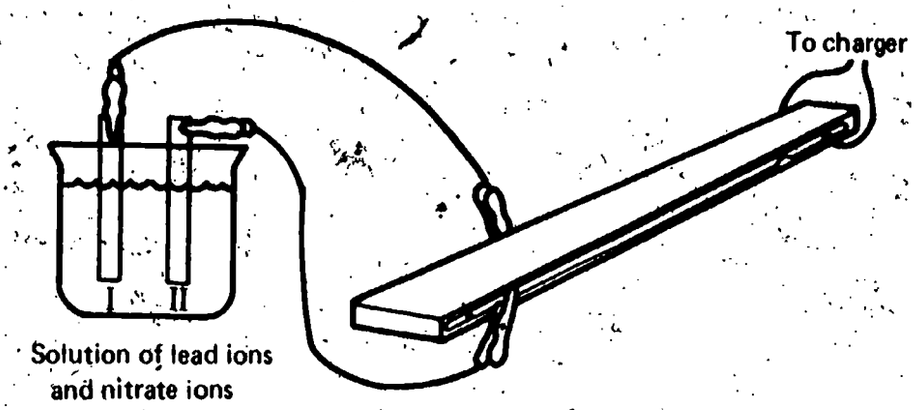
In an activity, you were asked to find out if the copper sulfate ($CuSO_4$) in a solution would conduct electricity. First you tested distilled water, as shown below. Then you made the test with a solution of $CuSO_4$ and water. What do you call something used in the way the distilled water was used in that activity? **05-Core-2B**

a. Control
b. System
c. Compound
d. Reactant



05-Core-3B

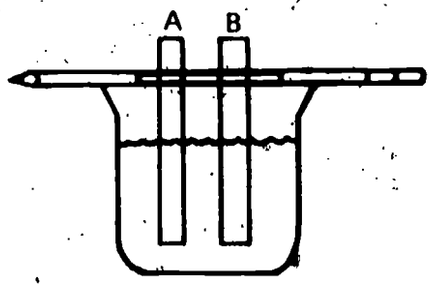
Ken set up his apparatus as shown below. Rod I was negative and attracted the lead ions. Rod II was positive and attracted the nitrate ions. When the class period ended, Ken disconnected his test leads and stored the equipment. Later, when he reconnected the test leads to the battery charging harness, he switched the connections. Rod I became positive, and Rod II became negative. How would this affect the flow of ions in the solution?



05-Core-4B

Tom put two carbon rods into a cobalt sulfate ($CoSO_4$) solution, exactly as shown below. He wanted the cobalt (Co) ions to move to carbon rod A. He left the equipment in place overnight so that the cobalt ions would have time to move.

1. When Tom comes to school in the morning, will the cobalt ions have moved to carbon rod A?
2. Explain your answer.



Solution of positive Co ions
and negative SO_4 ions

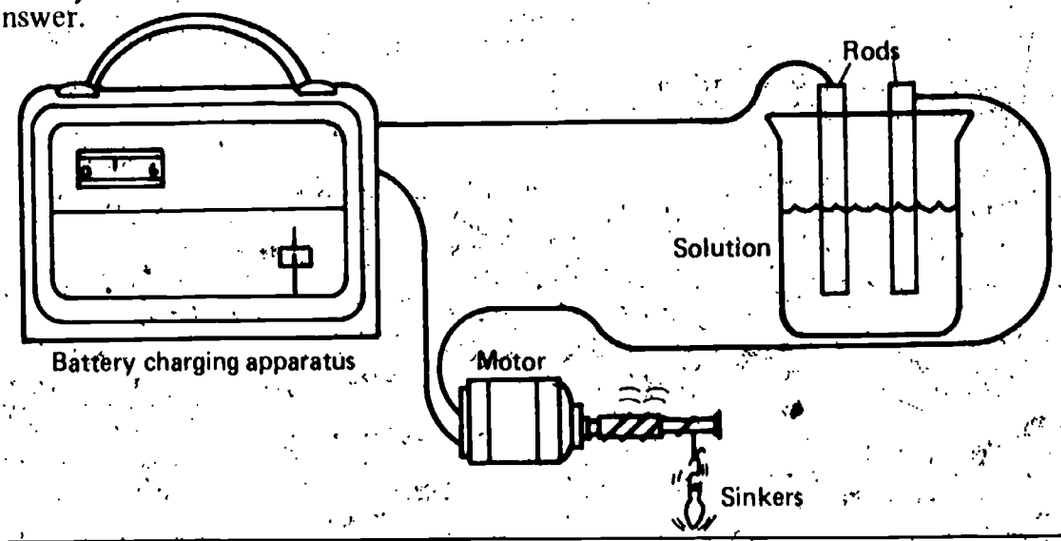
05-Core-5B

Select the phrase which best completes the following story. Jean noticed that after she had brushed her cat's fur for a short time, the fur on the cat's back began to be attracted to the brush. The brushing must have

a. caused the brush and the hair to be oppositely charged.
b. produced the same charges on the brush and the hair.
c. removed the charges on the cat's hair and the brush.
d. either b or c.

Look at the diagram. When the charging apparatus is plugged in, the motor lifts the sinkers. **05-Core-6B**

1. What kind of particles does this tell you are in the solution?
2. Explain your answer.

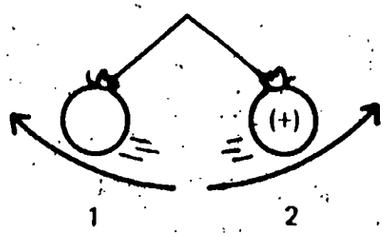


In the 1700's, Ben Franklin discovered that there were two types of electrical charge. What are they? **05-Core-7B**

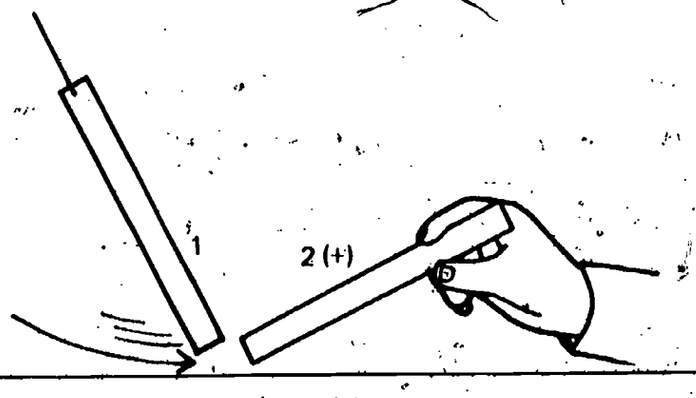
State the rule which tells what would happen if objects with like charges or objects with opposite charges are brought together. **05-Core-8B**

The balloons in the diagram below are repelling each other. Balloon 2 has a positive charge. **05-Core-9B**

1. What is the charge on balloon number 1?
2. State the rule on which you based your answer.



The two glass rods in the diagram attract each other. Glass rod 2 has a positive charge. What is the charge on glass rod 1? **05-Core-10B**



05-Core-11B Charges are produced on a plastic strip and a glass rod. How can you find out if the charges on the plastic strip and the glass rod are the same or different?

05-Core-12B Jan dissolved a compound in water. The solution formed contained chloride ions which had a negative charge.

1. If she put a positively charged rod and a negatively charged rod into the solution, would the chloride ions move toward or away from the positively charged rod?
2. Why?

05-Core-13B Get bottles 4, 5, and 6 from box 05-Core-13. Also get three test tubes. In separate test tubes, put about 3 ml of each solution. Decide what you need to do to find out if the sulfate ion is present in any of these solutions. Check your plan with your teacher. If it is all right to go on, get what you need and test the solutions. Record the bottle number of any solution which contains sulfate ions.

05-Core-14B You recently wrote an operational definition for the sulfate ion. What do such operational definitions of substances tell you?

05-Core-15B When you mixed shell and acid, it was the carbonate (CO_3) ion that reacted and gave off carbon dioxide gas.

1. Is the CO_3 ion made up of just one element?
2. If so, what is it? If not, how many elements are in the ion?

05-Core-16B Lead nitrate [$Pb(NO_3)_2$] and potassium iodide (KI) are compounds. According to the model you are developing, what kind of force holds the atoms in each of these compounds together?

05-Core-17B Paul found that the ions below had the charges shown. The plus sign represents a positive charge, the minus sign a negative charge.

Li^+, Cl^-, Br^-, Na^+, H^+, NO_3^-

Based on your experience, predict three pairs of two ions each that could combine to form compounds.

05-Core-18B

1. Select any ion pair or pairs below in which the paired ions will attract each other.
   a. K^+, NO_3^-
   b. NO_3^-, Cl^-
   c. Na^+, K^+
   d. Cl^-, Na^+
2. Tell why you chose as you did.

KEY	
+	Positive ion
-	Negative ion

05-Core-19B Mary Ann found that a white compound contained two kinds of particles. One kind, an aluminum ion, had a positive charge. The other kind was a chlorate particle.

1. What kind of charge would the chlorate particles have?
2. Explain why you predicted the charge you did.

The ISCS text has asked you many times to label things and to record any observations as you make them. The main reason for doing these things is that **05-Core-20B**

a. this stops you from making any mistakes.
b. in this course you are a scientist. Historians don't have to be so careful.
c. it is a helpful procedure for any investigation.
d. you aren't a scientists yet, so you still tend to forget.

Textbooks X and Y were written for students like you. Both books discuss the results of passing an electric current through a solution of zinc sulfate. **05-Core-21B**

Textbook X then says:

> The tiny zinc and sulfate ions do move toward the charged rods. The movement of the zinc and sulfate ions proves that matter is held together by the differently charged ions.

Textbook Y says:

> A particle model for matter assumes that atoms of zinc are very tiny. Therefore, they could move, and you wouldn't see them. This model is useful and may be applied to other substances as long as it is supported by your observations. To apply it to other substances, you will need more data.

Select the answer below which states both which book a scientist probably would prefer and why he would prefer it.

a. Book X; these are all facts that were proved in class.
b. Book Y; it involves a model.
c. Book Y; it says that the data supports the conclusion but experimenting must continue.
d. Book X; it states more facts than Book Y.
e. Either book; both talk about the same thing.

Assume that Dr. Margery Brown is a noted scientist who is well accepted by other scientists. She said, "Virus X is the cause of the St. Louis Flu." Other scientists would accept Dr. Brown's statement if she **05-Core-22B**

a. put it into a textbook she was writing.
b. produced a pure sample of the virus in her laboratory.
c. reported experiments with monkeys, some of which were injected with the virus and some of which were not.
d. found 100 people who would sign a statement saying that she was right.

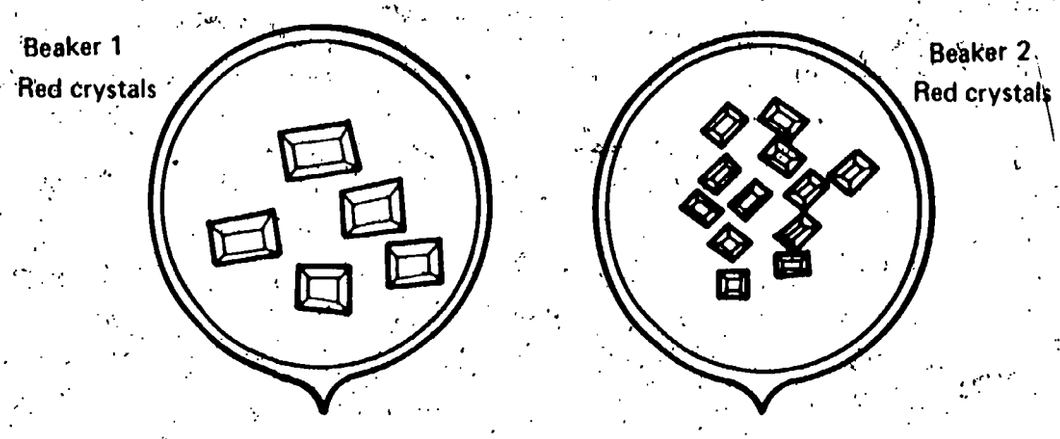
In Chapter 10 of your text, matter particles called *ions* were discussed. Which is the best statement about ions? **05-Core-23B**

a. Scientists have seen ions in solutions.
b. The idea of ions was thought up by scientists to explain the behavior of some matter particles.
c. No other model could explain your observations.
d. Because $CuSO_4$ and $CoSO_4$ are both composed of ions, all matter is made up of ions.

05-Exc 9-1-1B Suppose you fell into a solution and shrank. If you shrank to the size of matter particles, you could ride Iggy's Ion Express. If you want to ride to the city of Negative Rod, what would you be charged?

05-Exc 10-1-1B Last week Jack left beakers 1 and 2 of the same solution in two different places. Patty just found the beakers. The solutions had evaporated, leaving crystals which look like those in the diagram below.

1. Which of the solutions evaporated faster?
2. Explain your answer.



05-Exc 10-2-1B Open your textbook to Table 1 on page 472.

Frank filled in the table with the following data, working with a setup like the one shown on page 473, but using zinc metal strips and zinc nitrate solution.

	NEGATIVE STRIP	POSITIVE STRIP
Initial pointer position	6.8 cm	6.8 cm
Final pointer position	7.3 cm	6.0 cm
Change in position	down 0.5 cm	up 0.8 cm
Observations	zinc crystals forming	

On your answer sheet, explain the data above. Use a labeled diagram to illustrate your explanation.

One of the solutions that you put into a beaker to determine if it conducted electricity was lead nitrate. When you finished, you put the lead nitrate solution into the "used" jar. Since you didn't add any other chemicals to the lead nitrate, why couldn't you have put the solution back into the jar you got it from? **06-Core-1B**

Jean dissolved a sample of an element in water. She connected two carbon rods to the battery charger, making one rod positive and the other rod negative. Then, she placed them into the solution. The particles of the element were not attracted to either of the rods. Which of the following kinds of particles of the element are in the solution? **06-Core-2B**

a. Ions
b. Atoms
c. Either a or b
d. None of the above

Lois put two carbon rods, which were connected to a battery charger, into a solution of zinc chloride. The zinc ions moved toward the rod with a negative charge. What was the charge on the zinc ions? **06-Core-3B**

Bill took off his wool pullover sweater. As the uncharged sweater slid over his uncharged shirt, both became charged. Explain what happens to cause two neutral objects like the shirt and the sweater to become charged by sliding over one another. **06-Core-4B**

Mike rubbed a sheet of plastic with a silk cloth, and both became charged. He brought the silk near to the plastic sheet. **06-Core-5B**

1. Will the silk and the plastic attract or repel each other?
2. Why?

Write the letter of the best answer in each of the following cases. **06-Core-6B**

Case 1: If a plastic pen has a positive charge, it has

a. just positive charges.
b. no negative charges.
c. fewer positive charges than negative charges.
d. fewer negative charges than positive charges.

Case 2: If a plastic seat cover is negatively charged, it has

a. more negative charges than positive charges.
b. only negative charges.
c. no positive charges.
d. the same number of negative and positive charges.

Bill noticed that when a neutral balloon and a neutral piece of wool were rubbed together, they became oppositely charged. Explain how opposite charges were produced by rubbing two objects that had been neutrally charged. **06-Core-7B**

06-Core-8B Record the letter of the phrase below which correctly completes the sentence. All neutral objects have

a. equal numbers of positive and negative charges.
b. no positive or negative charges.
c. fewer negative than positive charges.
d. more negative than positive charges.

06-Core-9B Lori put a small piece of tissue paper on the top of her desk. She found that the tissue paper was attracted to two strips, one a vinyl strip with a positive charge and the other an acetate strip with a negative charge. What was the charge on the tissue paper?

06-Core-10B Art had two plastic bugs on a string. He rubbed one of them on his wool shirt and gave it a positive charge. The other bug had a neutral charge. He brought the neutrally and the positively charged plastic bugs together. They attracted each other so well that they stuck together for a few seconds. Then they repelled each other and continued to repel. Explain why they first attracted and then repelled each other.

06-Core-11B Write an operational definition for *neutrally charged particle of a powder.*

06-Core-12B Suppose you were asked to determine if a red solid you had never seen before was made up of ions, of one kind of atom, or of one kind of molecule. Select any of the following you would need to know to identify the kind of particle in the solid.

a. If the solid can be broken down into two or more simpler substances
b. The size and shape of the solid
c. If its powder was attracted to a positively charged acetate strip
d. If a solution of the solid will conduct electricity
e. The amount of the solid which will dissolve in water

06-Core-13B Dr. White found a procedure for breaking down large cellulose molecules into smaller units. Which of the following is a possible product of such a breakdown?

a. Other compounds (combinations of different atoms)
b. Smaller molecules
c. Elements
d. Atoms
e. All of these

06-Core-14B Fred brought a positively charged acetate strip and then a negatively charged vinyl strip near some fine-grained salt. The tiny grains of salt were attracted to both strips. Fred decided that salt must be made up of molecules, not ions.

1. Do you agree or disagree?
2. Why?

One atom of carbon and four atoms of hydrogen combine to form one molecule of methane gas. It would require a great deal of energy to separate those atoms once they have combined. **06-Core-15B**

1. What force holds the neutral molecule together?
2. Explain how this force can exist in a neutral molecule.

Methane, or natural gas, is a substance which is made up of atoms of carbon and hydrogen combined in definite numbers. What are such substances called? **06-Core-16B**

Neutral atoms of sodium lose a negative charge to atoms of iodine. The sodium atoms then become sodium particles with a charge. What do scientists call such atoms with a charge? **06-Core-17B**

Potato starch is made up of molecules. Write the letter of any of the following which are true statements about potato starch. **06-Core-18B**

a. It contains equal numbers of positive and negative ions.
b. It is a neutral particle.
c. When powdered, it is attracted to a positively charged acetate strip.
d. Its solution will not conduct electricity.
e. It contains no positive or negative charges.

Select the statement below which is part of the atomic model: **06-Core-19B**

a. Matter contains movable negative charges.
b. All atoms are the same size.
c. All atoms have an excess of positive charge.
d. There are no particles in liquids.

Read the following statement carefully. The particle model for matter that you have been developing is incomplete. You are working toward the same model which scientists have already developed and completed. **06-Core-20B**

1. Do you agree or disagree with this statement?
2. Why?

Pretend that a particle model for gravity had been accepted by scientists. This would mean that **06-Core-21B**

a. thinking about gravity as though it were made of tiny particles explained most of the observations made up to that time.
b. at least a few good scientists had seen particles of gravity with their own eyes.
c. scientists had direct proof that gravity exists as particles.
d. no other model could explain the observations made up to that time.
e. gravity is exactly like matter particles.

06-Core-22B

The energy model for heat is a model which scientists now use to explain the things that happen when objects are heated or cooled. Scientists accepted the energy model

a. because thinking about heat as energy is useful.
b. because it is the only way to explain heat.
c. because the President decreed that heat is a form of energy.
d. only when energy was finally seen in experiments.

06-Core-23B

If you are considering the concept of electrical charge, select the term from the list below which doesn't belong in the same group as the other three.

a. Neutral particles
b. Ions
c. Atoms
d. Molecules

06-Core-24B

Beside the number of each statement, write on your answer sheet the word *atom* for statements that are true of atoms. Write the word *ion* for statements that are true of ions. Write the word *both* if the statement is true of both atoms and ions.

1. They are responsible for conducting current in a solution.
2. They can be particles with an excess of negative charges.
3. In solution, they are attracted to a rod with a charge.
4. They contain positive and negative charges.
5. They are present in a piece of aluminum.

06-Core-25B

Gary tested the powders of three colored substances. He found that when they were dry, they were attracted both to positively and to negatively charged vinyl strips. He also found that their solutions would conduct electricity. Study the chart of his data below.

COLOR OF SUBSTANCE	CONDUCTS ELECTRICITY	ATTRACTED TO POSITIVE CHARGE	ATTRACTED TO NEGATIVE CHARGE
Red	yes	yes	yes
Yellow	yes	yes	yes
Green	yes	yes	yes

Based on these data, what can you conclude about the substances? Select the statement below which correctly describes the substances.

a. They are ionic, and each substance contains unequal amounts of positive and negative charges.
b. They are molecular, and each substance contains unequal amounts of positive and negative charges.
c. They are ionic, and each substance contains equal amounts of positive and negative charges.
d. They are molecular, and each substance contains equal amounts of positive and negative charges.

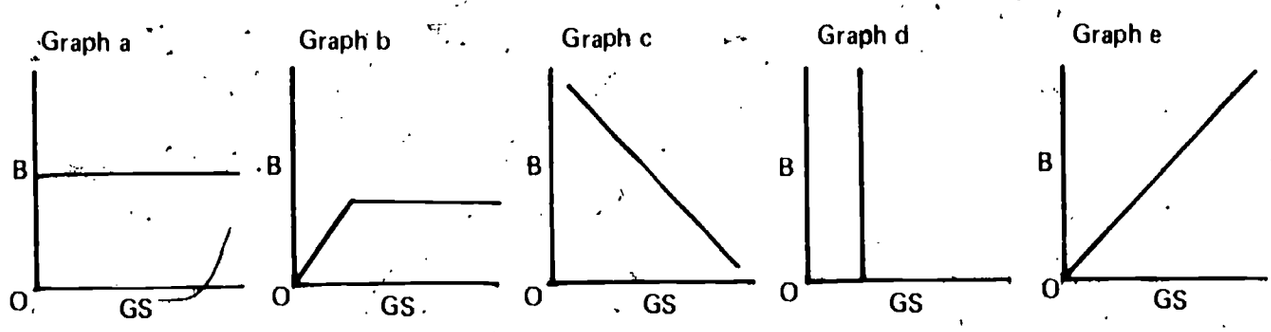
For centuries, people thought that water was an element. **06-Exc 11-1-1B**

1. Is it or isn't it?
2. Explain your answer.

John used a shortcut in doing the excursion "Strip Affects Drip." Instead of using one acetate strip and one vinyl strip, he used only a single vinyl strip. He gave it a negative charge and brought it near the stream of drips. The drips were attracted to the negatively charged strip. John then concluded that the drips were neutral. **06-Exc 11-2-1B**

1. Is this a good conclusion?
2. Explain your answer.

You may look at your book and notes for this question. If in Excursion 11-3, "Electrolytes Light," you were to draw a graph of your data, which of the following graphs best represents the general shape you would find? **06-Exc 11-3-1B**

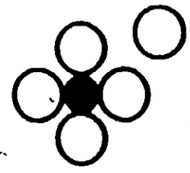


B = Brightness GS = Grams of salt

Suppose you had one silicon atom and five chlorine atoms. If silicon atoms have a combining power of 4 and chlorine atoms have a combining power of 1, which of the following diagrams shows the most likely combination of these six atoms? **06-Exc 12-1-1B**

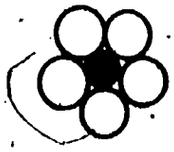
a.

b.



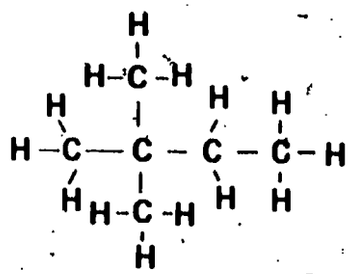
Key	
Chlorine atom	○
Silicon atom	●

c.



d.

06-Exc 12-1-2B Draw a structural formula for an isomer of the 6-carbon molecule shown below.



06-Exc 12-1-3B Amy and Beth both have white powders. They claim that the powders have the same chemical formula, $C_4H_4O_4$. Each tests her powder and reports the following results.

	AMY'S POWDER	BETH'S POWDER
Boiling point °C	150	280
Soluble in water	slightly	very

They repeat their tests several times to check their results.

1. Is it possible that both compounds really have the same formula?
2. Explain your answer.

Define *reaction rate* as it is used in the following sentence. The reaction rate of two chemicals can be varied. **07-Core-1B**

Sheri wants to find the concentration of iodine in a solution. Select any of the following things she needs to know to find the concentration. **07-Core-2B**

a. The solubility of iodine
b. The mass of the dissolved iodine
c. The total number of atoms in the solution
d. The volume of the solution
e. The name of the liquid in the solution

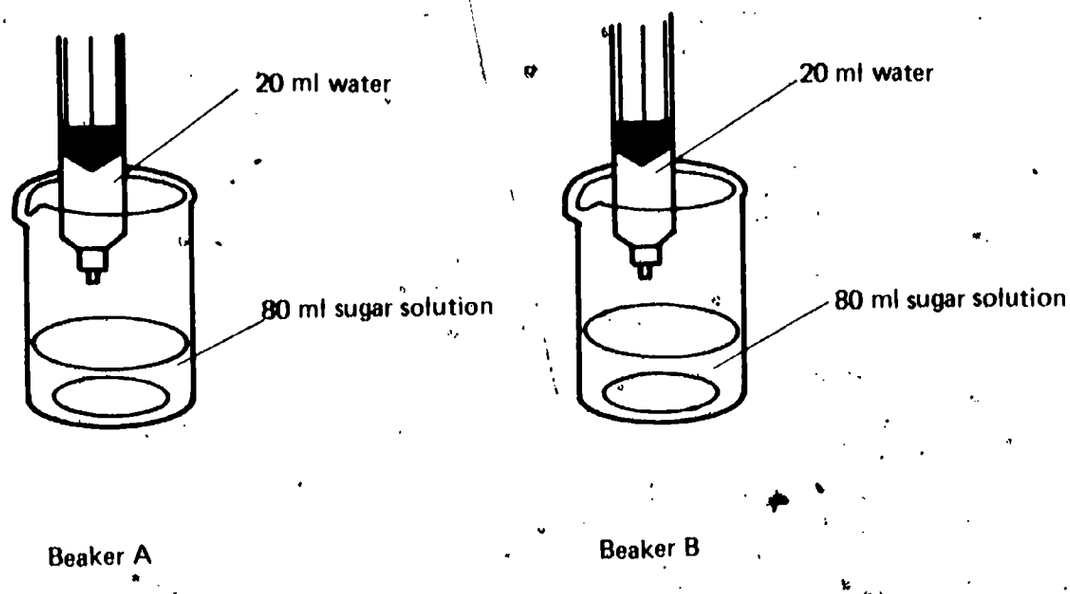
Explain what the word *concentration* means in the following sentence. The concentration of the instant coffee solution was too strong. **07-Core-3B**

Judy mixed two solutions and made the following observations. Which of her observations are ways of stating the rate of a reaction? **07-Core-4B**

a. The mixed solutions turned pink in 0.5 seconds.
b. The temperature rose 10°C in 30 seconds.
c. The total volume of the reaction was 28 ml.
d. Both solutions were made 48 hours before use.
e. Every minute, 5 grams of solid product formed.

Kathy pours 80 ml of a sugar solution into beaker A and 80 ml of the same sugar solution into beaker B. Then she adds 20 ml of water to each beaker. **07-Core-5B**

1. How do the concentrations of the solutions in beakers A and B compare with each other?
2. Give an explanation to support your answer.



07-Core-6B

BEAKER	VOLUME OF $CoSO_4$ SAMPLE (in ml)	VOLUME OF WATER ADDED (in ml)	TOTAL VOLUME OF FINAL SOLUTION (in ml)
A	30	50	80
B	80	0	80
C	40	40	80
D	10	70	80
E	60	20	80

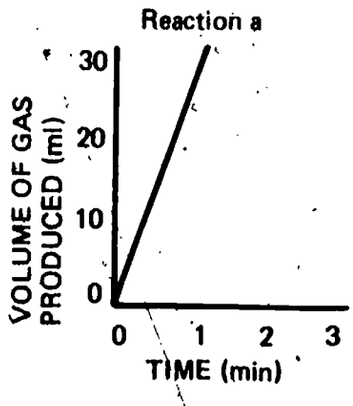
All the cobalt sulfate ($CoSO_4$) samples were taken from the same bottle and diluted with the volume of water recorded in the table above. Place the numbers 1 through 5 on your paper. Using the concentrations listed below and the beaker letters from the table, match each final solution described in the table with the proper concentration.

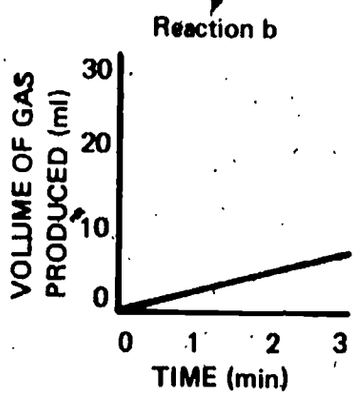
1. Most concentrated
2. Second most concentrated
3. Third most concentrated
4. Fourth most concentrated
5. Least concentrated

07-Core-7B

The graphs below show the results of two reactions of the same chemical system. The reactants in the system are sulfuric acid (H_2SO_4) and a colorless solution. One of the products is a gas. A different amount of H_2SO_4 is used in each reaction, but the amount of the colorless solution is the same in both reactions.

1. In which reaction is the greater amount of H_2SO_4 used?
2. How do you know?





07-Core-8B

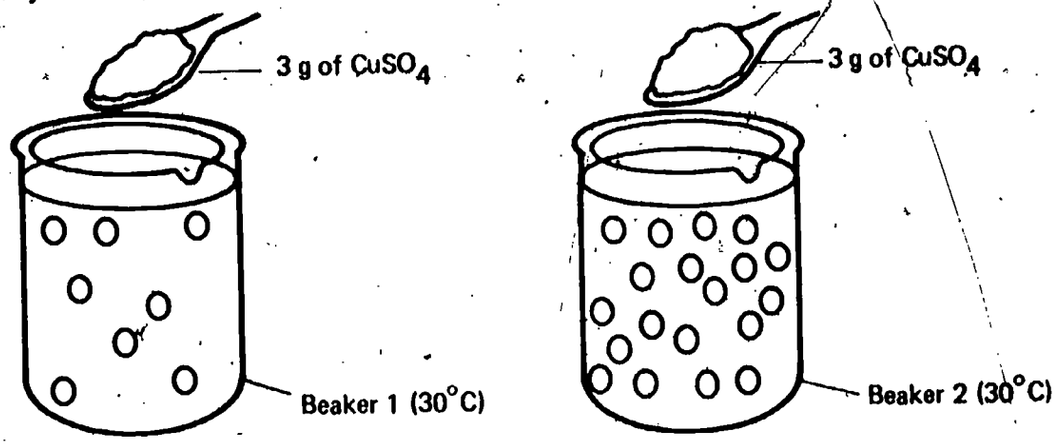
Reaction A: 5 ml copper sulfate + 10 ml water + 1 g zinc → copper
Reaction B: 5 ml copper sulfate + 5 ml water + 1 g zinc → copper

1. Would both of the reactions above have the same reaction rates?
2. If so, explain why. If not, name the variable that accounts for the difference.

Reaction A: 5 ml iron chloride + 15 ml water + 1 g zinc → iron **07-Core-9B**
Reaction B: 10 ml iron chloride + 10 ml water + 1 g zinc → iron

1. Would both reactions above have the same reaction rates?
2. Explain the two reasons for your answer in terms of particle collisions.

Both beakers shown below contain particles of dissolved reactant O. When three grams of copper sulfate ($CuSO_4$) are added to each of the beakers, 1 and 2, the reaction rates in the two beakers are different. In terms of particles, how would your model explain why the reaction rate will be faster in one beaker than in the other? **07-Core-10B**



07-Core-11B

STATE	PARTICLE SPEED
Solid	slowest
Liquid	medium
Gas	fastest

The table above is based on your particle model.

1. On the basis of its information, which of the reactions below would have the fastest reaction rate? (P stands for phosphorous and O for oxygen.)

   a. $4P\ (gas) + 5O_2\ (gas) \rightarrow 2P_2O_5\ (solid)$
   b. $4P\ (liquid) + 5O_2\ (gas) \rightarrow 2P_2O_5\ (solid)$
   c. $4P\ (solid) + 5O_2\ (gas) \rightarrow 2P_2O_5\ (solid)$

2. Explain your answer in terms of the particle model.

When your mother heats water for coffee, certain changes occur in the water. On your paper, list the numbers of the variables below. Based on your particle model and your experiences, indicate how each variable responds to heating by writing *increases, decreases,* or *remains the same* after the number of each variable. **07-Core-12B**

1. Volume
2. Number of particles
3. Kinetic energy of particles
4. Particle size
5. Rate of particle collision
6. Particle speed

07-Core-13B

Walt poured two samples of 35 ml of copper sulfate ($CuSO_4$) into two beakers. The samples were of the same concentrations, but one of the samples was at 25°C and the other was at 40°C. He added 2.5 g of zinc to each $CuSO_4$ sample. The warmer sample reacted faster. How does your model explain how temperature differences cause the reaction rates of two reactions to be different?

07-Core-14B

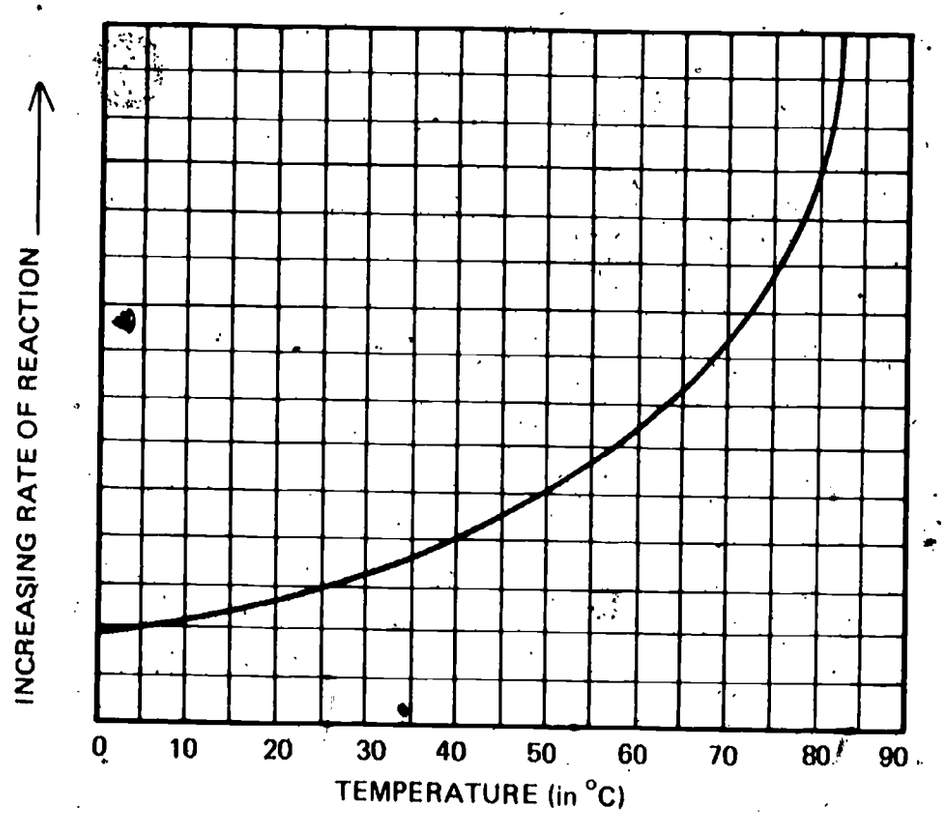
TRIAL	TEMPERATURE	REACTION	RATE
1	25°C	10 g iron + oxygen → rust	slowly
2	?	10 g iron + oxygen → rust	rapidly

1. What can you tell about the temperature of trial 2 as compared to that of trial 1?
2. How can you tell?

07-Core-15B

According to the graph below, which of the following temperature intervals produce the greatest change in reaction rate? Select the letter of the correct answer.

a. 70° to 80°C
b. 60° to 70°C
c. 40° to 50°C
d. 30° to 40° C



Lois collected the data shown in the table below. **07-Core-16B**

TRIAL	CONCENTRATION	TEMPERATURE	CATALYST
1	10 ml HCl + 4 pieces shell + 5 ml water	23°C	none
2	10 ml HCl + 4 pieces shell + 8 ml water	35°C	none

Trials 1 and 2 have the same reaction rates.

1. Are the collision rates the same in 1 and 2?
2. How would your particle model explain your answer?

Give an operational definition of *catalyst* which includes all the characteristics of a catalyst. **07-Core-17B**

07-Core-18B

1. Consider the two trials of the reaction below.

   Trial A.

   A 15 g sample of hydrogen peroxide (H_2O_2) is heated gently. This reaction gives off 5 ml of oxygen in 70 seconds.

   Trial B.

   A 15 g sample of H_2O_2 is heated with a little gold dust. This gives off 50 ml of oxygen in 70 seconds. The gold dust is unchanged.

Is gold dust a catalyst for the reaction?

2. Consider the two trials of the reaction below.

   Trial A.

   A 15 g sample of potassium chlorate ($KClO_3$) is heated. The reaction produces 2.5 ml of oxygen in one minute.

   Trial B.

   A 15 g sample of $KClO_3$ is heated with a little copper nitrate (blue-green). The reaction produces 2.6 ml of oxygen in one minute, and the blue-green crystals turn black.

Is copper nitrate a catalyst in the reaction?

3. Consider the two trials of the reaction below.

   Trial A.

   A 10 ml sample of sulfuric acid and 5 g of sodium sulfate react to produce 25 ml of sulfur dioxide gas in 30 seconds.

   Trial B.

   Some water is added to the 10 ml of sulfuric acid and 5 g of sodium sulfate. Only 15 ml of sulfur dioxide gas are produced in 30 seconds.

Is water a catalyst for the reaction?

Kay wanted to find out if aluminum is a catalyst for the zinc-hydrochloric acid reaction. Design a procedure to find out. The reaction rate is indicated by the rate at which hydrogen gas is produced. Include statements of (1) which variables should be kept constant (HINT: What things cause a reaction rate to change?) and (2) which variables should vary. Also (3) include a test to show if aluminum reacts or causes the reaction. **07-Core-19B**

07-Core-20B

Mike heard that copper was a catalyst for the reaction between hydrochloric acid (HCl) and zinc. He took three test tubes in which HCl and zinc were reacting and added ¼ teaspoon of copper to one, ½ teaspoon to the second, and 1 teaspoon to the third. The reaction rate did not change in any of the three test tubes. In additional trials, he plans to add 2 and 3 teaspoons of copper to two other zinc-HCl reactions he has set up.

1. Are these new trials necessary to find out if copper is a catalyst for the reaction?
2. Explain your answer.

07-Core-21B

Three students heated potassium chlorate ($KClO_3$) with other substances to identify a catalyst for this reaction.

$$2KClO_3 \rightarrow 2KCl + 3O_2$$

Sally Upson said, "Manganese dioxide is the catalyst for this reaction."
Margo Downs said, "Iron oxide is the catalyst for this reaction."
Lynn Underdown said, "Gold is the catalyst for this reaction."

1. How many of these students could be correct?
2. Why?

07-Core-22B

$$Fe\ (iron) + HCl \rightarrow H_2$$

Hydrogen gas (H_2) can be collected by water displacement. Changing the temperature, changing the concentration of reactants, or adding a catalyst can change reaction rates. Write a procedure which you could use to tell if changing the concentration of HCl would change the reaction rate. Be sure to tell what things you would not vary, as well as what you would vary. (HINT: What variables affect reaction rates?)

07-Core-23B

Jeff read that platinum is a catalyst for the reaction between sulfur dioxide and oxygen. He concluded that platinum would, therefore, be a catalyst for the reaction between zinc and copper sulfate.

1. Do you agree?
2. Explain your answer.

07-Core-24B

Select the two variables which affect the rate of a chemical reaction.

a. The color of the reactants
b. The shape of the reaction container
c. The temperature of the reactants
d. The presence of a catalyst with the reactants
e. The color of the products

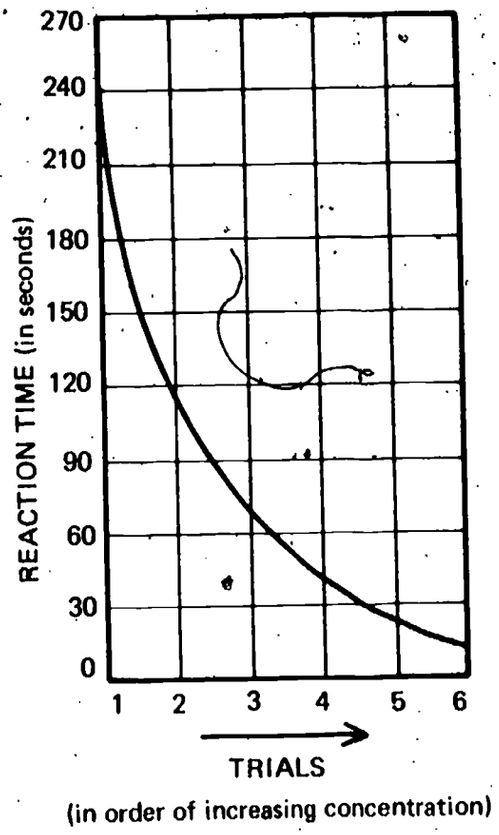
07-Core-25B

From each set of parentheses select the words which make the following sentence true. A reaction will be fastest if a catalyst is (present, not present), if the concentration of the reactants is (high, low, medium) and if the temperature is (high, low, medium).

07-Exc 13-1-1B

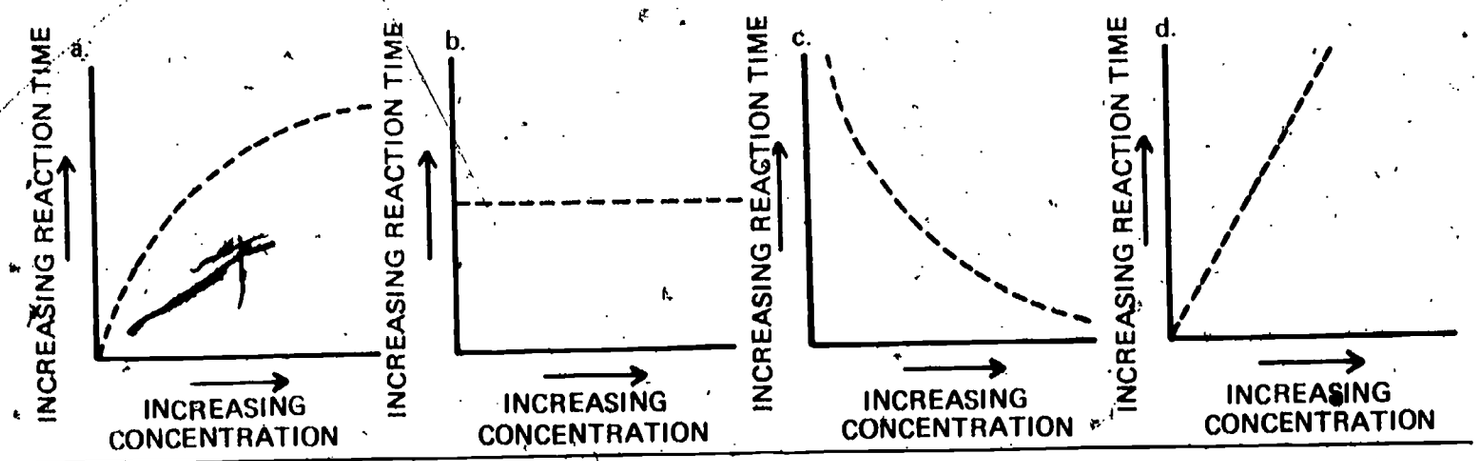
Study the graph.

1. In which trial is there the greatest number of collisions between particles of reactants per second?
2. Explain your answer in terms of concentration and reaction time.



07-Exc 13-1-2B

Janet studied the effect of changes in the concentration of HCl on the reaction time of the reaction shell + HCl → carbon dioxide. She defined *reaction time* as the time needed to produce 20 ml of carbon dioxide gas. Which of the graphs below is probably the correct graph for her experiment?



07-Exc 13-2-1B

Consider the two cases below.

Case 1. Cement in a sack won't burn, even when heated with a torch.

Case 2. Cement dust in the air in a cement plant reacts so quickly at room temperature that a small spark can cause it to explode violently.

How can you explain the difference in reaction rates between Case 1 and Case 2?

07-Exc 14-1-1B

You saw in Excursion 14-1 that burning, a reaction involving air, takes place more slowly in cold air than in warm air. How would the particle model explain this in terms of the speed and collisions of particles?

07-Exc 15-1-1B

Before putting beans into the freezer, Mrs. Kaplan puts them into boiling water for 3 to 5 minutes. She does this because heating them nearly stops reactions in the beans which would cause them to spoil even when they are frozen. Explain what heat does that stops reactions in living things such as the beans.

07-Exc 15-1-2B

Temperatures well above 80°C are needed for breakfast cereals to react with oxygen to produce carbon dioxide + water rapidly enough to produce noticeable heat. Yet the same reaction – breakfast cereals plus oxygen – produces carbon dioxide and water and noticeable amounts of heat at 37°C in your body. Why?

In Chapter 16, you added sodium hydroxide (NaOH) solution to help drive off ammonia (NH_3) gas from fertilizers and raw meat. The NaOH solution you used was not very concentrated. What effect would using a more concentrated solution of NaOH have on the reaction? **08-Core-1B**

When you added sodium hydroxide (NaOH) to the fertilizer and tenderizer in Activity 16-11, ammonia (NH_3) gas would have been given off and bubbled through the Nessler's solution even if no heat had been applied. Why, then, did you heat the mixture? **08-Core-2B**

Before you begin, tell your teacher that you are going to do this check. **08-Core-3B**

Is there any change in the odor of Congo red when HCl is added to it? To answer this do the following.

1. Put 6 drops of Congo red into a test tube.
2. Smell it.
3. Add 2 drops HCl.
4. Smell the mixture.

Are the smells noted in steps 2 and 4 the same or different?

In Chapter 16, you found that egg white, urine, soy sauce, and uncooked meat all contained the elements nitrogen and hydrogen in the form of NH_3. If you had tested further, you would have found that carbon and oxygen were also present. How would you explain that these substances contain the same elements and yet are so different? **08-Core-4B**

Ken tested five samples for the presence of ammonia, sulfate, and copper. Using data from the table below, write the colors of any substances which you know contain nitrogen. **08-Core-5B**

SAMPLE COLOR	AMMONIA PRESENT	SULFATE PRESENT	COPPER PRESENT
Red	yes	yes	no
Green	no	yes	no
Blue	yes	no	no
Yellow	no	no	no
White	no	yes	yes

Gordon tested a green solid [$Fe(NO_3)_2$] and a blue solid [$Cu(NO_3)_2$] by putting each into a different flask with 10 ml NaOH and heating the two flasks. He bubbled each of the gases given off through test tubes of Nessler's solution. No color change was observed in the test tubes for gases from either of the substances. Gordon concluded that the substances did not contain nitrogen. **08-Core-6B**

1. Do you agree or disagree?
2. Explain your answer.

08-Core-7B

Before you begin, tell your teacher that you are going to do this check.

Get bottle B from box 08-Core-7. Using as much of the substance as you can get on the end of a wooden splint, test it for ammonia. Open your textbook and follow the Nessler's test procedure outlined on pages 233 through 235. Report your results and conclusions.

08-Core-8B

Tell your teacher you are going to do this check before you begin.

Is there any change in the odor of Congo red when HCl is added to it? To answer this, do the following.

1. Put 6 drops of Congo red into a test tube.
2. Smell it.
3. Add 2 drops of HCl.
4. Smell the mixture.

Are the smells noted in steps 2 and 4 the same or different?

08-Core-9B

In Chapters 2 through 5, your investigations showed that the many substances in nature are made up of only about 100 elements. But, in Chapter 16, you as a scientist tested this concept again by testing many things to see if they contained nitrogen. Why do scientists keep testing accepted concepts?

08-Core-10B

You have used phenolphthalein indicator to tell when a citric acid reactant is used up. How do indicators work? Why do they change color when they do?

08-Core-11B

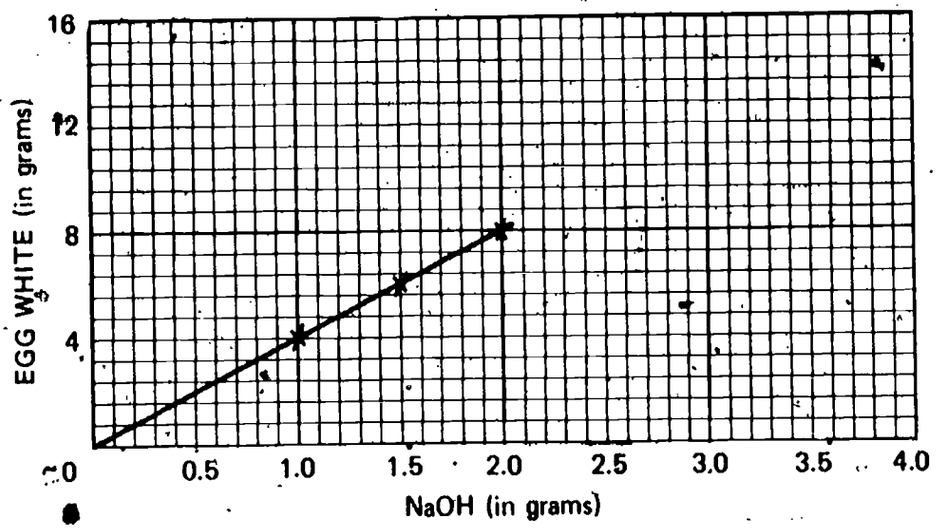
Kathy measured the volume of sodium hydroxide (NaOH) needed to react with 2, 3, 5, 6, and 7 ml samples of lemon juice, using phenolphthalein as the indicator. She then graphed the data and predicted how much NaOH would be needed to react with 9 ml of lemon juice. Explain why Kathy could make such a prediction.

08-Core-12B

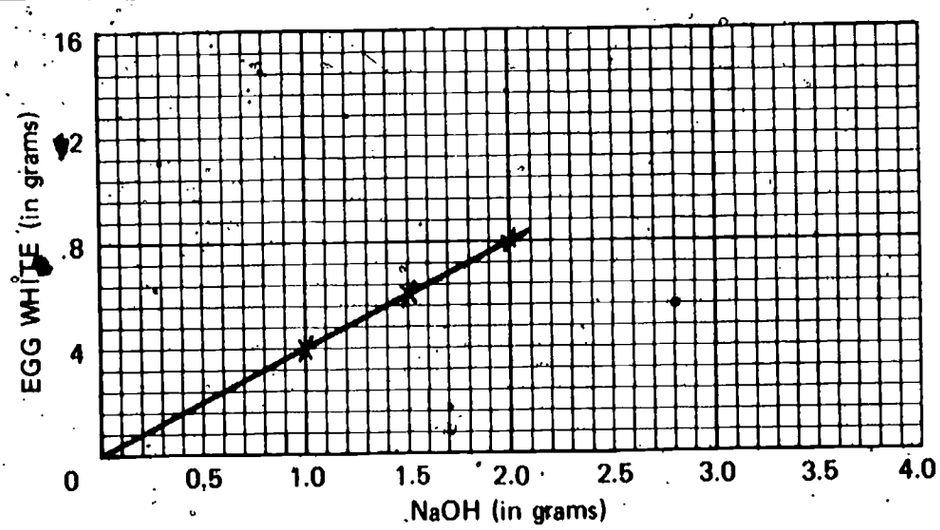
The chart shown below is part of Activity 17-3. First you added sodium hydroxide (NaOH) to 4 ml of citric acid until the color of the phenolphthalein changed. You then repeated the process, using another 4 ml of citric acid, and you averaged trials 1 and 2. Explain why doing two trials and finding the average is better than just doing the procedure once.

	VOLUME OF CITRIC ACID USED	ACTUAL VOLUME OF NaOH USED	PREDICTED VOLUME OF NaOH
Trial 1	4 ml		
Trial 2	4 ml		
Average	4 ml		

Margo collected the data from three trials of the reaction between NaOH and egg white. She then drew the graph shown below. How many grams of NaOH will react with 12 g of egg white? **08-Core-13B**



08-Core-14B



Sue plotted data from three trials of the reaction between NaOH and egg white. Her data are shown on the grid above.

1. How many grams of NaOH will react with 12 g of egg white?
2. The reason you can answer question 1 is that
   a. the relationship between egg white and NaOH changes only if more than 16 g of egg white is used.
   b. you have worked with NaOH and egg white before.
   c. reactants always combine in definite numbers.
   d. egg white particles have special reactions.

08-Core-15B

You are to find out how much dilute HCl (acid) can be neutralized by 1 g of the powder in bottle 08-Core-15B. To do this, use the following procedure.

1. Dissolve 1 g of the powder in 15 ml of H_2O.
2. Add 2 drops of Congo red.
3. Add acid in small quantities until you see a permanent color change.
4. Find the amount of acid neutralized.
5. Make a second trial, repeating steps 1, 2, 3, and 4, and then average the amount of acid in the two trials.

08-Exc 16-1-1B

Chef Brockett put 100 g (80 cc) of dough into cupcake A. After putting dough into the other cupcake papers, he added 20 g (16 cc) more of dough to cupcake A. He increased the mass (g) and the volume (cc) of cupcake A.

1. What did he do to the density of the dough in cupcake A?
2. Explain your answer.

08-Exc 16-1-2B

Get 100 ml of the solution in bottle 08-Exc 16-1-2B. Find the density of the solution. Return the used solution to your teacher.

08-Exc 16-1-3B

Sam had a job in a laundry. He noticed that one of the cleaning solutions had a density of 1.6 g/cc. After the number of each material below, state whether it would sink or float in the laundry solution.

MATERIAL	g/cc DENSITY
1. Sulfur	2.1
2. Rubber ball	1.3
3. Pumice rock	0.8
4. Penny	8.9

08-Exc 17-1-1B

In Activities 17-5 and 17-6, Art measured 1 gram of crushed antacid A on a balance. He put this amount into 10 ml of water and added 5 drops of Congo red. Then, as his partner stirred, he added the acid to the antacid A solution in 1- or 2-ml squirts. It changed to blue when all of antacid A was used up.

1. If Art used 5 ml of water in Activity 17-5, would this affect the amount of stomach acid that was neutralized?
2. Explain your answer.

08-Exc 17-2-1B

Fred bubbled a gas that smelled like rotten eggs through a solution. With each bubble, a small blob of yellow solid settled out of the colorless solution. Then, as bubbles of the gas came out of the delivery tube, no more solid formed. Afterward, no matter how fast Fred bubbled the gas through the solution, no more solid formed. Explain why this happened.

Get the bottles from box 08-Exc 17-3-1B. Test each solution with litmus, using clean glass stirring rods. After the number of each solution, indicate whether the solution is an acid, a base, or neither. **08-Exc 17-3-1B**

Linda used pH paper and found the pH of samples of acid solutions as shown in the chart below. **08-Exc 17-3-2B**

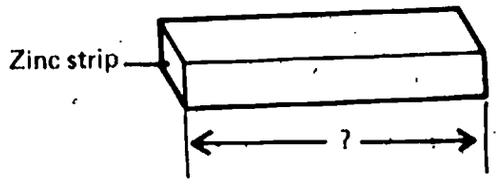
SAMPLE LETTER	pH
a	6
b	1
c	3
d	5
e	2

1. Which solution has the highest hydrogen ion (H^+ ion) concentration?
2. Which solution is the strongest acid?

Get the numbered bottles from box 08-Exc 17-3-3, the pH paper, the pH color scale, and 5 clean glass stirring rods. Copy the list of solutions below. Match each item with the letter of the bottle of solution it describes. **08-Exc 17-3-3B**

1. Acid, strong
2. Acid, weak
3. Neutral
4. Base, weak
5. Base, strong

Below is a diagram of a zinc strip. Use a metric ruler to measure its length correctly to the nearest 0.1 cm. **09-Core-1B**



Get the following supplies and equipment from the supply area. **09-Core-2B**

1 50-ml beaker	25 ml of vinegar
1 strip of zinc	2 test leads
1 strip of lead	1 voltmeter

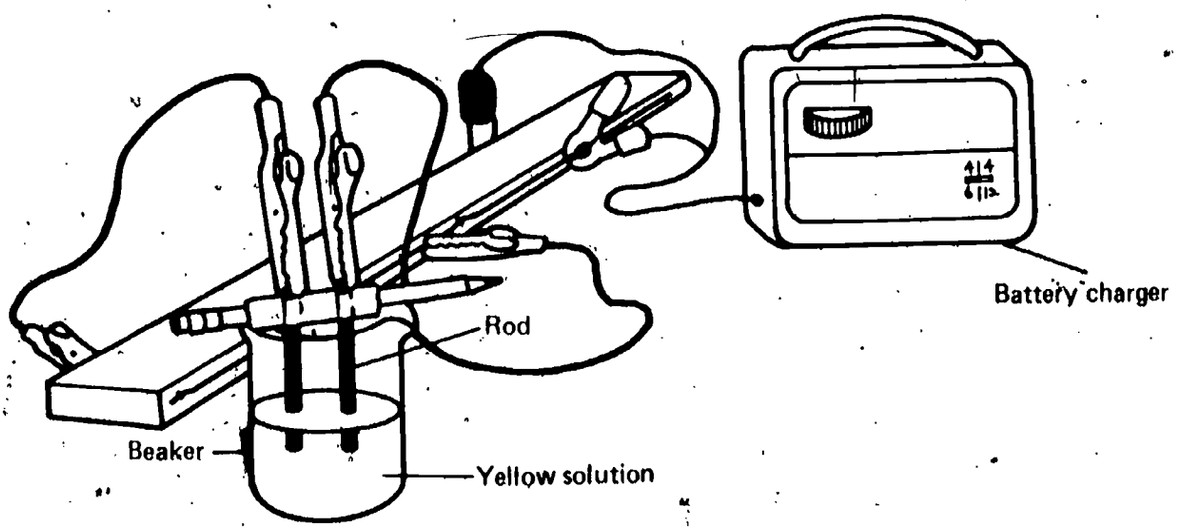
Set up a chemical system which might produce electricity.

1. Does it produce electricity?
2. How do you know whether or not this system produces electricity?

Select the letter of the correct answer. Once a battery has been charged, in what form is the energy stored in the battery? **09-Core-3B**

a. Light
b. Chemical
c. Nuclear
d. Kinetic
e. Electrical

09-Core-4B



Lorrie set up the equipment as pictured above. Before connecting the system to the charger, she observed that both rods were black and that the solution was yellow. After the system had been connected to the charger for five minutes, she noticed that one of the rods was covered with a bright silverish metal and that the solution had become colorless.

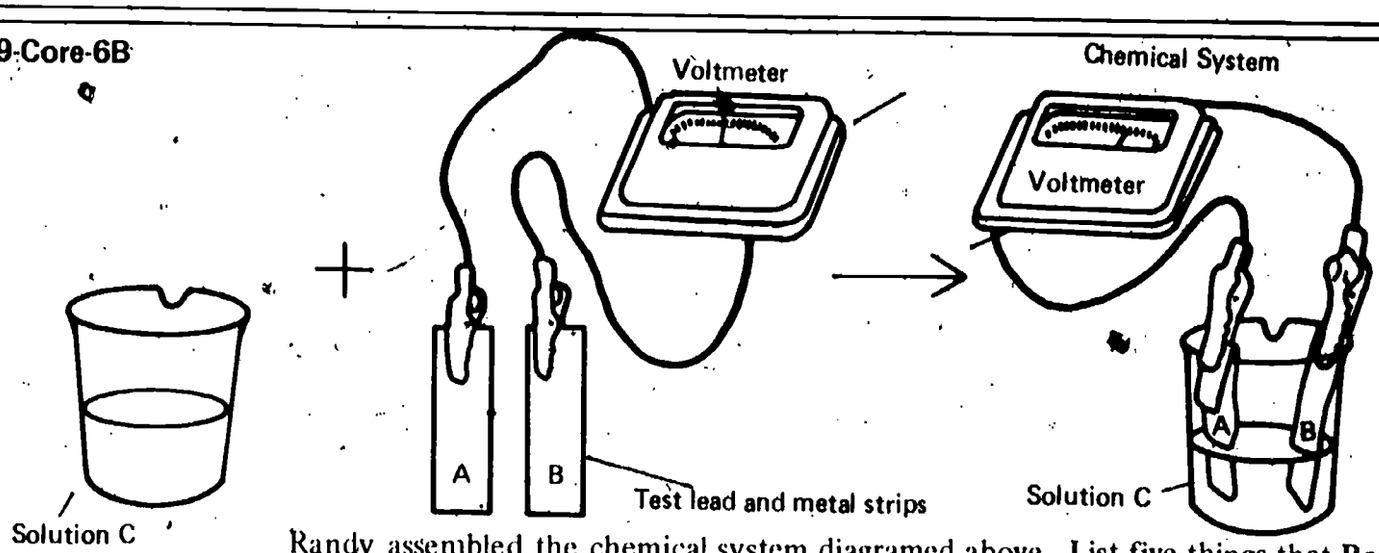
1. What kind of change occurred?
2. What kind of energy caused it?

09-Core-5B

In Chapter 18, you put a gray zinc powder into a blue solution. A reaction occurred. The zinc disappeared, the solution became colorless, and a red-brown copper formed. The reactants and products were very different.

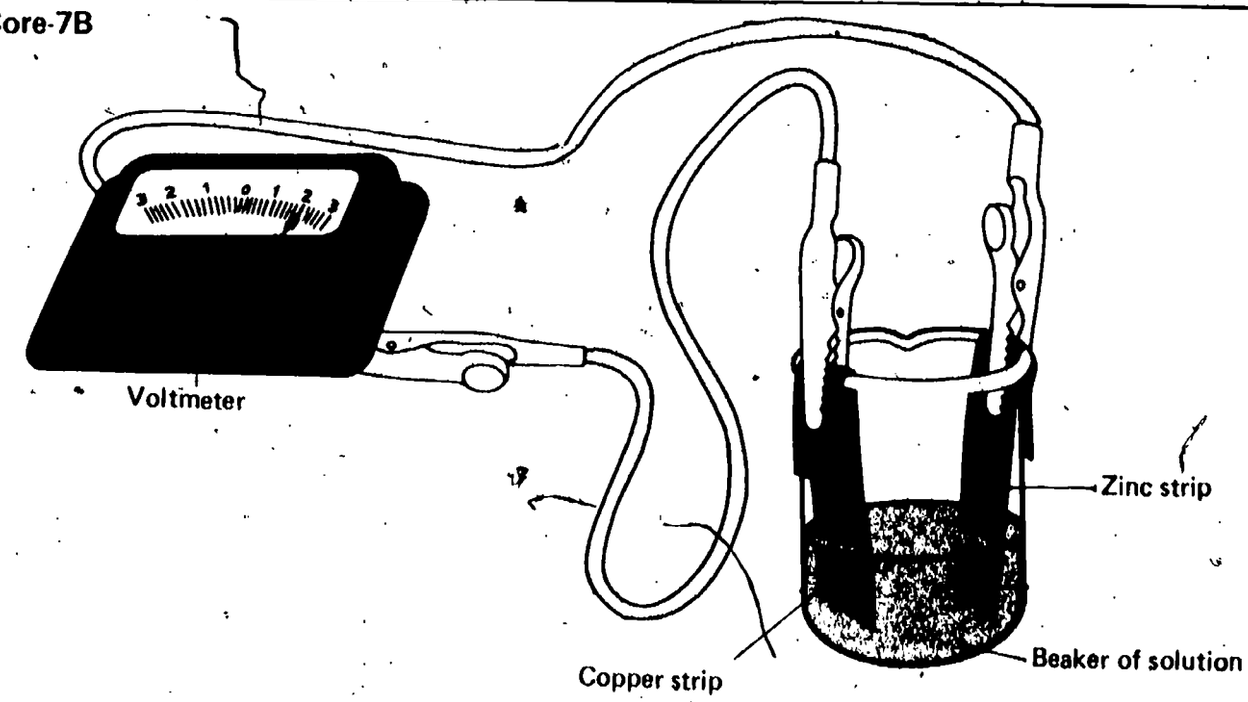
1. Were new particles (atoms) formed?
2. If so, name them. If not, how do you explain the fact that the reactant and products had such different properties?

09-Core-6B



Randy assembled the chemical system diagramed above. List five things that Randy might observe which would mean that there was a change in the chemical energy of the system. (Hint: Randy used additional ISCS equipment to make several of the observations.)

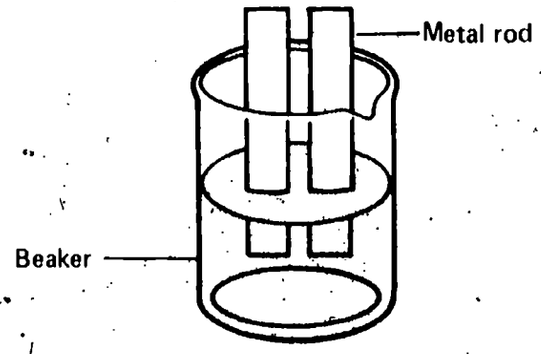
09-Core-7B



Art assembled the system shown in the above diagram. He found that it produced electrical energy.

1. What was happening to the chemical energy of the system?
2. Was any energy lost or gained?
3. Explain your answer to question 2.

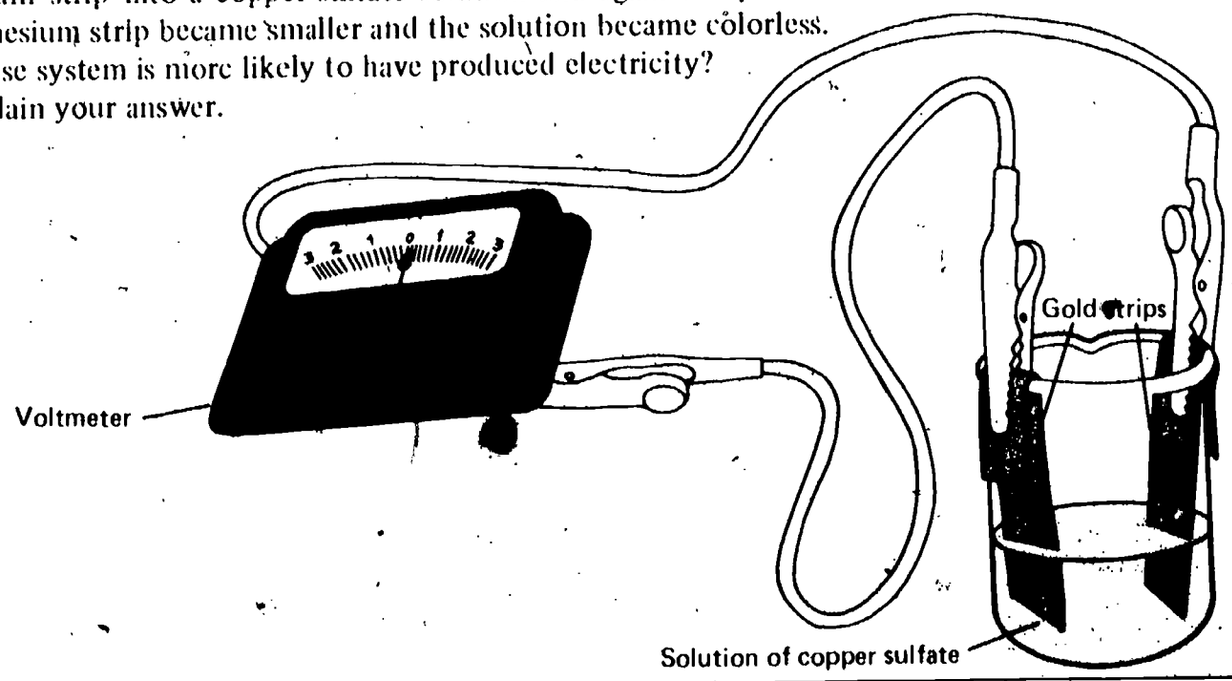
Gene put two rods of the same silver metal into a beaker of an orange solution. He connected the system to a charger. One of the rods turned blue-black and the other turned whitish. The solution turned green. He disconnected the system from the charger. He then connected the system to a bulb, and the bulb lit. Describe any visible changes that would occur in the beaker as the bulb continued to burn. **09-Core-8B**



Sandra's new cassette tape recorder contains rechargeable batteries. About once a week, she has to recharge the batteries. Name the process which describes the changes involving the particles inside the batteries when they are charged or discharged. **09-Core-9B**

Bill put two gold strips into a solution of copper sulfate and connected them as shown below. No changes in the strip or solution occurred. Gene put a carbon rod and a magnesium strip into a copper sulfate solution and again completed the circuit. The magnesium strip became smaller and the solution became colorless. **09-Core-10B**

1. Whose system is more likely to have produced electricity?
2. Explain your answer.



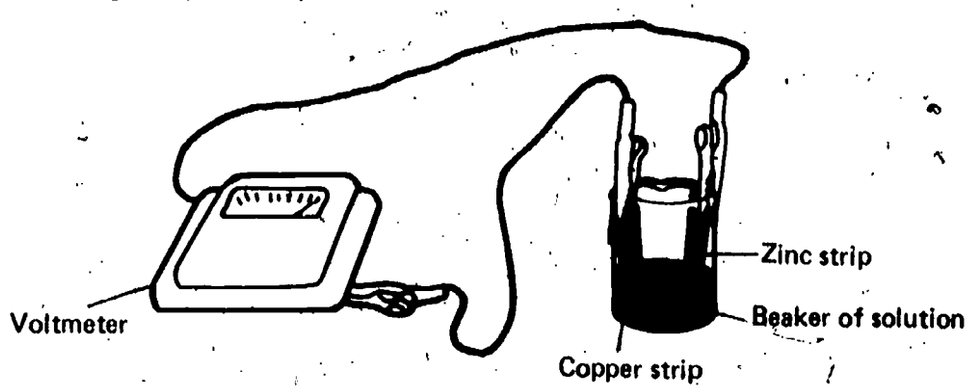
Larry recharges the batteries for his tape recorder on a charger which works the same way as the charger you used in class. **09-Core-11B**

1. What kind of energy is used to charge the battery?
2. What is the form of energy in the battery after it is disconnected from the charger?
3. What form of energy does the battery give off when it is in use?

09-Core-12B

William put together the chemical system shown in the diagram. He observed that the system produced electricity for half a class period. Then he studied the chemical system and reported that absolutely no changes had occurred in it.

1. Is it true that there would be no changes?
2. Explain your answer.



09-Core-13B

Scientists have operationally defined *work*. Write on your answer sheet the letters of any of the items below which fit that definition.

a. Dissolving salt in water
b. Returning equipment to the storage shelves
c. Pushing against a car so that it doesn't roll down a hill
d. Recombining atoms in a chemical reaction
e. Organizing an experiment in your mind

09-Core-14B

Steve put the battery from his snowmobile on a charger. When he calculated the amount of energy used to charge the battery, it was greater than the amount of energy the battery could release later.

1. Was energy destroyed or used up in charging the battery?
2. Explain your answer.

09-Core-15B

Consider the following reaction.

REACTANTS — PRODUCTS

vinegar + window cleaner → ammonium acetate + water + heat energy released

1. From the information given, the chemical energy of the reactants is (greater than, equal to, or less than) the chemical energy of the products.
2. Explain your answer.

09-Core-16B

Gene noted that the temperature of a liquid dropped when a solid was dissolved in it. On your answer sheet, write the letter of the correct conclusion about the energy in the system.

a. The energy in the system had been consumed.
b. The energy in the system had been changed into another form.
c. The energy in the system had been destroyed.
d. Both a and c are correct.
e. Both a and b are correct.

In an insulated Styrofoam cup, Julian dissolved 5 g of baking soda in 20 grams of water which was at 24°C. The temperature of the final solution was 22°C. The amount of energy present in the materials before dissolving was (less than, equal to, greater than) the energy present in the 25 grams of matter after dissolving. **09-Core-17B**

Get enough white copper sulfate from the jar labeled 09-Core-18 to cover the bottom of a test tube. Hold the test tube so that you can feel the bottom of it, and slowly add 7 drops of water. **09-Core-18B**

1. Did a chemical reaction occur?
2. Were the particles combining or were they separating in the test tube?
3. How can you tell?

Richard mixed a salt solution at a temperature of 32°C, with a solution of silver nitrate, also at a temperature of 32°C. As he mixed them, a milky, white solid formed, and the temperature rose to 34°C. Use your particle model to explain what caused the temperature change. **09-Core-19B**

Phil dissolves solid ammonium chloride (NH_4Cl) in some water, and the temperature of the liquid drops from 25°C to 23°C. According to the ISCS particle model, what causes the temperature to drop when the NH_4Cl dissolves? **09-Core-20B**

A 15 g-mass of lead nitrate has in it a certain amount of stored energy in the form of chemical energy. How could you release some of this chemical energy? Select your answer from the choices below. **09-Core-21B**

a. The 15 g mass can be melted.
b. The 15 g mass can be reacted to form a different compound.
c. The 15 g mass can be frozen.
d. All of the above are correct.
e. None of the above are correct.

Glucose is a compound found in fruit. It contains a great deal of chemical energy. What must happen to glucose or to any compound so that it will give up its chemical energy? **09-Core-22B**

In the next chapter, you will be working with two dangerous liquids Winkler solution and concentrated sulfuric acid. Assume the two bottles in box 09-Core-23B contain these two liquids. Gather the materials necessary to mix 10 ml of the acid with 10 ml of Winkler solution. Ask your teacher to observe you. Mix the liquids and report your observations. **09-Core-23B**

Winkler solution and concentrated sulfuric acid are very strong and dangerous chemicals. You will be working with them in the next chapter. List three things that you should do if they should spill on someone. **09-Core-24B**

09-Exc 18-1-1B The chemical cell described in Excursion 18-1 wouldn't give off electrical energy until after it was charged. Why couldn't the system give off energy before it was charged?

09-Exc 18-2-1B Show your teacher the procedure you developed for Excursion 18-2. Your task is to defend what you did or to make a satisfactory change in any part of it that your teacher objects to.

09-Exc 19-1-1B Below is a list of energy conversions. Choose four of them. Write the numbers of your four selected energy conversions on your paper, and then cite an example after each.

1. Electrical to light
2. Electrical to chemical
3. Electrical to mechanical (motion)
4. Chemical to heat
5. Chemical to electrical
6. Motion energy to heat

09-Exc 19-2-1B Pete made the four solutions shown in the chart below. On your answer sheet, state after the number of each reaction whether it is endothermic or exothermic.

REACTION	SOLID ADDED TO WATER	WATER TEMP, (in °C)	SOLUTION TEMP. (in °C)
1	NH_4I	23	21
2	NaI	25	28
3	$NaNO_3$	24	20
4	LiOH	22	29

09-Exc 19-2-2B When a solid like "slated lime," which is made up of ions, dissolves in water, two processes which involve energy occur.

1. Name the two processes and tell what is occurring in each.
2. The temperature of the water rises 3 degrees during the dissolving process. Which of the two processes mentioned in question 1 involves the greater amount of energy in this instance?

Preparing for their experiments with ICR's and yeast beasts, three students did the following: **10-Core-1B**

Larry washed the glassware with tap water and then with distilled water.

Frank washed the glassware in soapy water. He did not rinse them, but he dried them carefully with paper towels.

Glenn used the glassware right off the shelf.

1. Which student used the best procedure?
2. What is wrong with both of the other procedures?

Suppose you collected three water samples from a lake, and you wanted to identify the sample which contained the most dissolved oxygen. You would add Winkler solutions #1 and #2, starch, H_2SO_4, and $Na_2S_2O_3$. **10-Core-2B**

1. What data would you collect?
2. How would the data tell you which water sample contained the most oxygen?

In your work with ICR's, you have studied oxygen. What kind of information would you need to know about a substance like oxygen to write an operational definition for it? **10-Core-3B**

Open your book to Chapter 20 and use it to help you write an operational definition for *dissolved oxygen*. **10-Core-4B**

All year you have done reactions in beakers. In Chapters 20 and 21, where you studied ICR's, oxygen, and carbon dioxide, you were asked to use jars that you could cap tightly. Why was it important to the activity that you cap the jars tightly? **10-Core-5B**

On Friday, Dick used a procedure identical to that used for bottle 1, below. He found that it took 36 drops of $Na_2S_2O_3$ to remove the color from a mixture of 3 drops of H_2O_2, 150 ml of water, Winkler solutions, H_2SO_4, and starch which he has just made. On Monday, he did the following, using bottles 1 and 2. **10-Core-6B**

Bottle 1

1. Put in 150 ml water.
2. Added 3 drops H_2O_2.
3. Added nothing, but capped the bottle.
4. Waited 12 minutes.
5. Removed nothing.
6. Added Winkler solutions and H_2SO_4.
7. Added 8 drops of $Na_2S_2O_3$.
8. Added 1 drop of starch solution.
9. Added 28 drops of $Na_2S_2O_3$ to remove color.

Bottle 2

1. Put in 150 ml water.
2. Added 3 drops H_2O_2.
3. Added 2 ICR's, and capped the bottle.
4. Waited 12 minutes.
5. Removed the ICR's.
6. Added Winkler solutions and H_2SO_4.
7. Added 4 drops of $Na_2S_2O_3$.
8. Added 1 drop of starch solution.
9. Added 10 drops of $Na_2S_2O_3$ to remove color.

1. What term describes bottle 2 as it is used by Dick today in this activity?
2. Since Dick recorded his results Friday for the same procedure used in bottle 1, why did he have to do the same reaction on Monday as part of this activity?

10-Core-7B

Bob put two ICR's into each of two jars, A and B. Each jar already contained 120 ml of water and 4 drops of hydrogen peroxide (H_2O_2). After 15 minutes, he removed the ICR's from jar A and tested the water for the amounts of oxygen and carbon dioxide it contained. Twenty minutes after the start of the activity, he removed the ICR's from jar B and tested for amounts of oxygen and carbon dioxide.

1. Which sample, if either one, will contain less oxygen?
2. Which sample, if either one, will contain more carbon dioxide?
3. Explain why you answered as you did.

10-Core-8B

Barb had a gallon of pond water. She tested a sample of it, using phenol solution, and found that the water contained carbon dioxide. Barb said she was not sure if the rest of the water contained carbon dioxide because she had tested only a small sample.

1. Does the rest of the water contain carbon dioxide?
2. Explain your answer.

10-Core-9B

In the Apollo missions in which the U.S. landed men on the moon, there were three astronauts per mission. Suppose the concentration of men had been five per space capsule.

1. What would the increase in concentration of men do to the rate at which oxygen was used up?
2. What would it have done to the rate at which carbon dioxide was produced?
3. Why?

10-Core-10B

Look at Activities 21-8 and 21-9 in your text. In these activities, you studied the effect of temperature on the reaction rate of fish. The temperature in the jar containing the fish dropped slowly during the 20 minutes in which the jar was in the ice water. Why not put the fish directly into distilled ice water so that they would be at the lower temperature for the full 20 minutes?

10-Core-11B

In Lake Delaware, the temperature in early spring is about 4°C. In July, the water temperature rises to 25°C.

1. How would this warming of the lake water affect how often a turtle must surface to take in new oxygen and release carbon dioxide?
2. Explain your answer in terms of reaction rates.

10-Core-12B

Selects all of the following things which are evidences that chemical reactions take place in living things.

a. Concentrations are altered.
b. New materials (products) are formed.
c. Some materials (reactants) are used up.
d. Temperatures of living things alter the rate of new material formation.
e. All of the above are correct.

Andy collected two samples of oxygen, one by passing an electric current through water and a second from the living plant, elodea. Andy said he could tell the oxygen produced from the living elodea because it would react differently from the oxygen produced by an electric current. **10-Core-13B**

1. Do you agree or disagree with Andy's statement?
2. Why?

Matt's dad told him that a chemical reaction makes a certain racing car run. He said the reactants were alcohol and oxygen. **10-Core-14B**

1. From what you know about chemical reactions, predict what should happen to the amount of alcohol in the gas tank as the motor runs if the reaction is taking place.
2. Why does this happen?

You used phenol red to indicate how much carbon dioxide (CO_2) was present in water. Lynn says, "CO_2, like anything else, feels more active sometimes than other times. When it feels more active, a given amount of CO_2 will react with more phenol red than when it feels less active." **10-Core-15B**

1. Do you agree or not?
2. Why?

You found that two fish removed oxygen from the water. There are two possible reasons that this happens. Either fish only absorb and store oxygen, or fish use the dissolved oxygen in a chemical reaction. **10-Core-16B**

1. What evidence do you have from the activities that you have done in class which would help you choose one of the above?
2. How does this evidence help you choose?

Which of the following is the *best* statement fitting both your model for chemical reactions and the results of your activities with the ICR? **10-Core-17B**

a. They *prove* that chemical reactions take place inside the ICR as they do in test tubes involving nonliving systems.
b. They *suggest* that reactions take place inside of ICR's as they do in test tubes involving only nonliving systems.
c. They *establish proof* that chemical reactions do not occur inside of ICR's as they do in test tubes involving only nonliving things.
d. They *definitely show* that your model must be true.
e. a and d

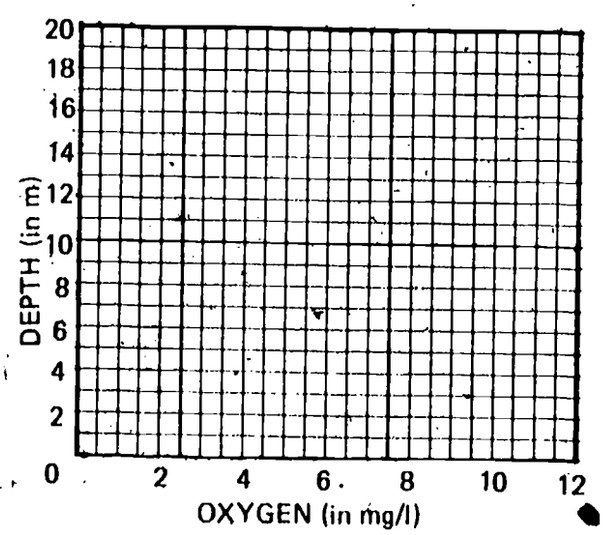
Sharon took her temperature before leaving school. It was 37°C. She walked through the cold and snow, and as soon as she got home, she took her temperature again. It was still 37°C. Certain processes convert the energy in food into heat that keeps human body temperature from dropping even on very cold days. What are these processes called? **10-Core-18B**

10-Exc 21-1-1B A hospital lab has four containers of equal size containing samples of breath from four experimental animals. Suppose there are no Winkler solutions available. How can you find out which sample of breath contains the most oxygen?

10-Exc 21-2-1B Get a piece of graph paper from your teacher, and label it as shown on the grid below. Graph the data about Lake Wilbur given below. Then for each kind of fish listed, place an X on the grid at the lowest depth at which it could survive. Beside the X, write the name of the fish.

DISSOLVED OXYGEN IN LAKE WILBUR	
DEPTH (in m)	OXYGEN (in mg/liter)
0	10.0
2	9.8
4	9.4
6	5.2
8	2.2
10	1.5
12	1.2
14	0.8
16	0.5
18	0.5

LOWEST CONCENTRATION OF DISSOLVED OXYGEN AT WHICH FISH CAN SURVIVE FOR 24 HOURS	
TYPE OF FISH	DISSOLVED OXYGEN (in mg/l)
Bass	7.3
Crappie	2.0
Perch	3.5



Get the box labeled 11-Core-1. It contains five stoppered test tubes of varying concentrations of glucose solution. Each tube also contains five drops of Benedict's solution. Arrange the test tubes in order, beginning on the left with the tube with the lowest glucose concentration and ending with the tube with the highest concentration. Show your teacher your ordering. **11-Core-1B**

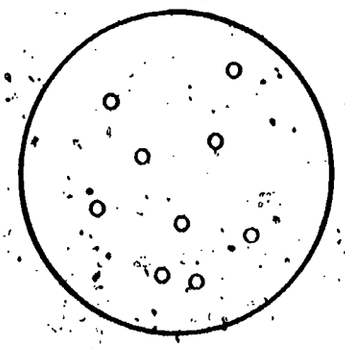
Get 7 drops of each of the four solutions in the bottles in 11-Core-2B. Put each solution into a separate test tube, which is labeled with the number of the bottle you get the sample from. Your task is to judge the amount of glucose in each sample, using the procedure stated in Activities 22-12 through 22-14. **11-Core-2B**

Put the solutions in order from lowest glucose content to highest glucose content. On your paper, list the numbers of the test tubes in that order.

A cat breathes in oxygen which reacts and is released as carbon dioxide (CO_2). What is the source of the element carbon in the CO_2? **11-Core-3B**

a. It is present in some form in the cat's body.
b. It is created by the cat's body.
c. It is present only in burnt table scraps.
d. The cat's body makes it from other elements.
e. Both b and d above are sources.

Suppose that the figure below shows the number of yeast beasts in ¼ of a drop of a yeast solution. Calculate the number of drops you would expect to find in the entire drop of yeast solution. **11-Core-4B**



When you ground up the yeast beasts, you killed them by tearing them apart. Yet the ground up yeast beasts cause the breakdown of glucose into carbon dioxide and water to happen faster than do whole yeast beasts. Why? **11-Core-5B**

Glucose is broken down into carbon dioxide (CO_2) and water by yeast. During the breakdown, the yeast organisms grow and become more numerous. In other words, the mass of the yeast increases. The reaction which takes place is shown below. **11-Core-6B**

glucose + yeast → water + CO_2 + more yeast

1. If 13 grams of glucose were put into the reaction container, would 13 grams of CO_2 and water be formed?
2. Explain your answer.

11-Core-7B

Case 1. Art wanted to react beef in a beaker to break it down into a simpler substance. He found he had to add catalysts to the beaker.

Case 2. Art sat down to eat a large beef roast. He wanted his stomach to carry out a reaction in which the beef was broken down into a simpler substance. It did so, and he didn't have to add any catalysts to his stomach.

Explain why Art had to add a catalyst in case 1, but not in case 2.

11-Core-8B

Toast sitting in the kitchen will not react with oxygen to produce carbon dioxide (CO_2) and water rapidly enough to give off noticeable heat at 37°C. Yet the same reaction at 37°C in your body produces CO_2, water, and noticeable amounts of heat. Explain why this occurs.

11-Core-9B

The following reaction takes place in potato plants.

carbon dioxide + water → glucose + oxygen

Herb says that this reaction will never be carried out in a test tube. He says that the catalysts that are required are produced in the plant and even with the catalysts present, the reaction will not take place outside of a living plant.

1. Do you agree or disagree with Herb's statement?
2. Why?

11-Core-10B

In a cartoon in Chapter 23, Miss Yeast Beast says that she contains catalysts.

1. Do you contain catalysts?
2. What evidence supports your answer? (Hint: Marshmallows and ice cream release energy inside you at body temperature.)

11-Core-11B

Now that you have worked with the yeast and fish, list three variables you think affect reaction rates in living things.

11-Core-12B

1. Suppose that you put 4 chemical systems into a closet. Each system is made up of a test tube filled with diluted HCl and 17 small peices of zinc. Suppose you also put enough zinc, HCl, and test tubes into the cupboard to make up 100 such systems. Then you shut the door. If you returned in an hour, would you find fewer than 4, exactly 4, or more than 4 chemical systems in the closet?
2. Suppose you put 4 yeast beasts (chemical systems) into a cup of warm water and sugar. Tomorrow, would there be fewer than 4, exactly 4, or more than 4 chemical systems in the closet?
3. What is the difference between the HCl-zinc chemical system and the yeast beasts system which explains your answers to questions 1 and 2?

11-Core-13B

Bruce says, "I was warned several times not to overheat the yeast beasts or I would kill them. But it turns out that it is the catalyst inside them that was important to the reaction. Since I had ground the yeast to let the catalyst out, I could have heated it as much as I wanted and the reaction would have gone quicker."

1. Do you agree or disagree with Bruce?
2. Why?

Select the letter of the chemical reaction in which oxygen is a reactant. **11-Core-14B**

a. A log burning
b. Sodium chloride and calcium chloride dissolving in the same test tube
c. Water boiling
d. Nail polish drying

Define the unit of heat *kilocalorie* in terms of water. **11-Core-15B**

How is *calorie* defined in terms of water? **11-Core-16B**

Sandy found the change in heat energy of a 17 gram sample of water when its temperature rose 9°C. She multiplied 17 grams by 9°C and got the number 153. Choose the letter of the answer below that includes the unit of heat in which this problem should be answered. **11-Core-17B**

a. 153 Btu
b. 153 meters
c. 153 newtons
d. 153 calories
e. 153 kilocalories

Get any equipment you need, and heat 150 ml of water for two minutes. You are to calculate the change in the heat energy of the water during the heating period. Record and label all the measurements you make. **11-Core-18B**

If m is the symbol for mass and you were asked to measure Δm, what would you measure? **11-Core-19B**

How many calories of heat energy are required to raise the temperature of 40 grams of water from 9°C to 90°C? **11-Core-20B**

Which of the following variables are important but are ignored when you use the ISCS cola-can heat-measuring device to calculate the heat of the marshmallow-oxygen reaction? **11-Core-21B**

a. The color of the marshmallows
b. Heat lost to the surrounding air
c. Heat lost to the can
d. All of the above

Select the variables which affect the amount of temperature change when an alcohol solution is being heated. **11-Core-22B**

a. The age of the alcohol being heated
b. The amount of heat supplied per minute
c. The person who is heating it
d. The amount of time the heat is supplied
e. The amount of matter heated

11-Core-23B	The main form in which energy is put into your body is chemical. In your body, it is converted into other forms of energy. List two of the forms into which the chemical energy is converted.
11-Core-24B	The sugar found in fruit contains a great deal of chemical energy. 1. What must happen to the sugar so that it will give up its chemical energy? 2. What happens to the atoms in the sugar as its chemical energy is changed?
11-Core-25B	Honey contains a great deal of energy. In what form is this energy stored?
11-Core-26B	1. Can people be considered HCR's (human chemical reactors)? 2. If they can, name three reactants and three products of an HCR. If not, what is their source of energy?
11-Exc 22-1-1B	Kissin' Cousin Connie's Coffee Cake recipe from 1870 includes both yeast and gluclose. On the basis of what you learned in Excursion 22-1, state what yeast and glucose do to dough and how they do it.
11-Exc 23-1-1B	Eloise wants to find out if tannic acid is a substance that will act as a catalyst for the breakdown of starch. If the tannic acid is a catalyst, what visible result should she observe after mixing together the tannic acid, starch, and the iodine solution?
11-Exc 24-1-1B	Barry cooled 18 g of water by packing the container in ice. The temperature dropped from 42°C to 22°C. How many calories of heat were lost?
11-Exc 24-1-2B	Mom's apple pie contains 266 Calories per slice. If all the energy in the pie were released as heat energy, how many grams of water can this much heat energy raise 1°C?

Get your textbook, and use it to do this check. In the left-hand column are statements of five assumptions from the particle model. In the right-hand column is a list of ISCS activities that you have done, each of which involves one of these assumptions. Number your answer sheet 1 through 5. After the number of each assumption, write the letters of all of the activities listed which are related to it. A number may have more than one letter matched with it. (Hint: Read all the assumptions before reading any of the activities. If you have trouble matching any of the activities, look in your text for that activity and find out what assumptions are related to it.)

Assumptions of the Particle Model

1. All matter is composed of particles.

2. Some matter is composed of electrically charged particles called *ions*.

3. Chemical reactions are rearrangements of matter particles.

4. Chemical reactions often release heat energy or absorb it.

5. Increasing the temperature of reactants increases the rate of a reaction.

Activities

a. When particles such as lead (Pb) and nitrate (NO_3) in lead nitrate [$Pb(NO_3)_2$] crystals are separated by dissolving, the temperature drops.

b. It took more phenol red to get a pink color in warm water from which a goldfish had been removed than in cold water from which a goldfish had been removed.

c. This idea is proposed to explain the behavior of water when heated.

d. A goldfish used up more oxygen in warm water than in cold water.

e. This idea is used to explain differences in the reactions of rock and shells with HCl.

f. When the colorless solutions of lead nitrate [$Pb(NO_3)_2$] and potassium iodide (KI) reacted, a yellow solid, lead iodide (PbI_2), was formed. The yellow solid contained atoms of lead (Pb) and iodide (I_2). No new elements were found in the solid.

g. Foods burn, and body temperature is often above room temperature.

h. Zinc (Zn) and HCl produced hydrogen at a faster rate when hot than when cold.

i. Solutions of copper sulfate ($CuSO_4$) and cobalt sulfate ($CoSO_4$) let electricity pass through them to light a light bulb.

j. The amount of reaction between zinc (Zn) and copper sulfate ($CuSO_4$) could be determined by measuring ΔT.

12-Core-1BB

Get your textbook, and use it to do this check. In the left-hand column are statements of five assumptions from the particle model. In the right-hand column is a list of ISCS activities that you have done, each of which involves one of these assumptions. Number your answer sheet 1 through 5. After the number of each statement, write the letters of all of the activities listed which are related to it. A number may have more than one letter matched with it. (Hint: Read all the assumptions before reading any of the activities. If you have trouble matching any of the activities, look in your text for that activity and find out what assumptions are related to it.)

Assumptions of the Particle Model

1. Compounds are combinations of different atoms in definite numbers.

2. In chemical reactions, matter particles are not created or destroyed.

3. All matter is composed of particles.

4. Some matter is composed of electrically charged particles called *ions*.

5. Molecules are made of atoms and can be broken down into atoms or simpler molecules.

Activities

a. When different quantities of zinc (Zn) were reacted with a fixed quantity of copper sulfate ($CuSO_4$), there was either Zn or $CuSO_4$ left over when the reaction stopped.

b. Solutions of copper sulfate ($CuSO_4$) and cobalt sulfate ($CoSO_4$) let electricity pass through them to light a light bulb.

c. When sucrose is heated, water and carbon are formed.

d. This idea is used to explain differences in the reactions of rock and shells with HCl.

e. When different quantities of lead nitrate [$Pb(NO_3)_2$] were reacted with the same quantity of potassium iodide (KI), sometimes iodide (I) atoms were left over and sometimes lead (Pb) atoms were left over.

f. When sucrose is heated with HCl, fructose and glucose are formed.

g. Potassium iodide (KI) solution and lead nitrate [$Pb(NO_3)_2$] solution were mixed and reacted. The combined mass of the solutions after they reacted was the same as the total masses of the two before they reacted.

h. The copper particles in a solution of copper sulfate ($CuSO_4$) move toward a negatively charged rod, whereas the sulfate particles move toward a positively charged rod.

i. When electricity is passed through water, the elements oxygen and hydrogen are released.

j. This idea is proposed to explain the behavior of water when heated.