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ABSTRACT

This is part two of two performance assessment resources booklets for Level II of the Intermediate Science Curriculum Study (ISCS). The two booklets are considered one of four major subdivisions of a set of individualized evaluation materials for Level II of the ISCS developed as a part of the ISCS Individualized Teacher Preparation (ITP) program. Each booklet is a teacher's handbook to be used in identifying the appropriate performance checks with which to evaluate each student. Each also indicates how to set up testing situations, correct responses, and give remedial help. This manual (part 2) covers the last six units of Level II (7-12) in 13 chapters. Each unit begins with a summary table that includes the objectives and performance checks of the unit. Immediately following each summary table comes the bulk of the resource material for each objective introduced in that unit. Suggestions of ways teachers can use the manual are also included. (HM)

ISCS
INTERMEDIATE SCIENCE CURRICULUM STUDY

INDIVIDUALIZED TESTING SYSTEM

Performance Assessment Resources

ISCS LEVEL II
PART 2

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

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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THE ISCS INDIVIDUALIZED TESTING SYSTEM

The ISCS individualized testing system for each level of ISCS is composed of four major subdivisions:

1. The ITP modules *Evaluating and Reporting Progress* and *Individualizing Objective Testing*,
2. *Performance Objectives*,
3. *Performance Checks* in three alternate forms, and
4. *Performance Assessment Resources*.

Evaluating and Reporting Progress presents a comprehensive overview, with many refinements, for individualizing the grading and reporting of students' progress, based on both subjective and objective criteria. The module *Individualizing Objective Testing* describes more specifically those ISCS evaluation materials which have objective criteria – the performance objectives, checks, and resources – and it presents practical suggestions for their use. These two modules should be considered prerequisite to successful use of the other ISCS evaluation materials.

Each of the *Performance Objectives* booklets contains a composite list of selected measurable objectives considered important to a given level of the ISCS program. However, many of the long-range goals and aims that are at the heart of the ISCS program do not lend themselves to being expressed as measurable performance objectives. Thus, these booklets should not be construed as being all-inclusive anthologies of all the possible learning outcomes of ISCS.

Each of three *Performance Checks* booklets contains an equivalent but alternative set of performance checks which were developed to assess the students' achievement of the objectives stated in the *Performance Objectives* booklets.

The *Performance Assessment Resources* booklet is a teacher's handbook to be used in identifying the appropriate performance checks with which to evaluate each student. The booklet also indicates how to set up testing situations, correct responses, and give remedial help.

NOTES TO THE TEACHER

An overview of evaluation, including both objective and subjective criteria, is given in the module *Evaluating and Reporting Progress* and many aspects of this booklet are described in more detail in Chapter 3 of the module *Individualizing Objective Testing*. These notes are meant to augment, not replace, Chapter 3 of that module. As you use this booklet, you will begin to see ways to modify its suggestions to meet your needs better. You are encouraged to enter your modifications at the points at which they apply. Only by altering these materials will you evolve an evaluation system best suited to your own classroom environment. It is important to remember that only principles involved in objective criterion-referenced evaluation are applied in this booklet. Therefore, you will obviously want to incorporate subjective criteria also.

Units and Chapters

There are at least two *Performance Assessment Resources* booklets for each level of ISCS. These booklets are divided into units, thus breaking up a single level of the ISCS program into easily handled sections of correlative chapters and related excursions. The relationship between the units and the chapters of *Probing the Natural World/2* are shown in Table 1.

LEVEL II

UNIT	CHAPTERS
1	1 and 2
2	3 and 4
3	5 and 6
4	7 and 8
5	9 and 10
6	11 and 12
7	13 thru 15
8	16 and 17
9	18 and 19
10	20 and 21
11	22 thru 24
12	25

Table 1

Most units include the objectives and performance checks for two chapters and their related excursions. You will recall that the number before the hyphen in the identification number for an excursion states the chapter to which it is related. The individual objectives and performance checks for each unit are to be selected and used when the student has completed the designated chapters and any excursions he wishes to do. This delay should ensure that there is no premature assessment of the student's achievement of concepts and skills which may be introduced early in a unit, but which require development throughout the unit. Thus, subdividing units for assessment purposes should be done with great care. Keep this in mind if you decide to spot check students as they proceed through units, rather than conducting a formal evaluation at the end of the unit.

Summary Table

Each unit begins with a double-spread "Performance Check Summary Table." The left-hand page of the "Summary Table" serves as a table of contents for the unit. It provides a great deal of information about the objectives pertinent to the unit. Usually about twenty-five objectives for each unit are introduced for the first time in each "Summary Table." A maximum of ten relevant objectives from previous units are reintroduced.

On the left-hand side of the "Summary Table" is a list of code numbers, each of which is unique to one objective within the level. Two examples of code numbers and their meanings are illustrated in Figure 1 below.

03 - Core - 17 and 05 - Exc 19-2 - 2

03	Core	17	05	Exc	19-2	2
unit	based on core material	17th objective in unit	unit	based on excursion material	excursion number	2nd objective for excursion

Figure 1

The core objectives appear first in an order that corresponds roughly to the text development. Exceptions to this ordering were made to place objectives based on related processes or content together. Objectives based on remedial excursions are numbered as core objectives because they involve skills essential to success in core activities. Next are listed the general or enrichment excursion objectives, and these are followed by objectives from prior units which are again considered important to the students' progress. These repeated objectives are easily spotted, as a capital R (for Repeated) appears after their identifying code number, giving a listing such as 03-Core-17R. The specific resource aids to be used with repeated objectives are given in the units designated by the code number (unit 3 in the just-cited example), and the information is not repeated each time within the textual material that follows the "Summary Table."

Each objective code number is followed by a short descriptive statement of that objective. These short statements were written, using the students' vocabulary. They should be helpful in communicating the objectives to the students should you desire to do so. Ways to involve your students in selecting the objectives are discussed in the module *Individualizing Objective Testing.*

The right side of the "Summary Table" is made up of eleven columns. Letters are used in the first five to designate the characteristics of the performance check. The letters and their meanings are as follows:

M - Completing the check requires regular ISCS materials.
O - An observer should view the student's performance as he does the check.
P - Completing the check requires the use of specially prepared materials.
Q - The answer to the check is of the quick-scoring variety.
T - The check will require more than three minutes of the student's time.

Check marks in the next four columns help the teacher assign appropriate performance checks to individual students. The first of these columns is entitled "Basal." Achieving the objectives checked in this column is considered essential to the student's progress. These performance checks may be assigned to any student; however, better students will find that many of these offer little or no challenge.

Check marks in the columns headed "Math," "Reading," and "Concept" indicate performance checks which require a higher level of computational skills, a higher reading level, or a greater ability to think abstractly than the performance checks for most other objectives. Performance checks which have no marks in any of these four columns are considered to be more than basal, but the skills which they require are within the capabilities of most students.

A tenth column lists the action verb that identifies the theoretical mental process required of the student to complete the performance check for the objective. A precise definition of each of the verbs used to designate mental processes is given in the module *Individualizing Objective Testing.*

Finally, in the eleventh column, space is provided for notes. Although you will find an occasional comment printed here, this space is mainly for your notes. It's a good place to put any special instructions or preparations you have found helpful.

As mentioned earlier, some objectives are repeated objectives – ones that have appeared in previous units. When such an objective is listed again in the "Summary Table," its classification as basal or as presenting math, reading, or conceptual difficulties is likely to be different. This change most often derives from a change in purpose. The first time a concept of skill is introduced, the intent may be only to introduce students to it. When reintroduced in a later unit, the skill or concept is frequently developed and used extensively. Thus, in the "Summary Table" for the earlier unit, objectives related to a concept are likely to be classified as conceptually difficult for many students, whereas in the later units, the same objective might be reclassified as basal.

Organization of Resources

Immediately following each "Summary Table" comes the bulk of the resource material for each objective introduced in that unit. Once more, each objective is identified by its code number, but this time it appears in bold, black print in the outer margin directly beside the applicable resource. A pair of horizontal lines separates the resources for each objective from those for the previous and following objectives. When no horizontal line appears at the bottom of a page, the resource material for the objective is continued on the next page.

The functions of the various component resources provided for the objectives are listed below. Two of the components (Regular Supplies and Special Preparations) only appear when they are needed for a particular check. When the performance check does not require any supplies, the supply headings are omitted. Observe the functional descriptions carefully – they are the keys to the types of resource materials provided in the *Performance Assessment Resources* booklet.

COMPONENTS	FUNCTION
Descriptive Statement	This statement duplicates the one that appears in the "Summary Table." If you misread a code number and find yourself looking at material for the wrong objective, this should stop you and send you back to the Table to check. More important, it should briefly indicate to you the basic purpose of the objective.
Objective	The underlined verb in this statement of the objective indicates the theoretical mental process that the student will perform. The phrase following it indicates the content or process skill which the student must perform. A complete description of the verbs and their meanings can be found in the ITP module *Individualizing Objective Testing*.
Regular Supplies	This section lists any ISCS equipment that the student will need – regular equipment that is being used in the unit on which the student is being evaluated or in previous units.
Special Preparations	Don't overlook this section. It lists and describes marerials the teacher must collect or prepare in some way. Included are special solutions, special packaging, and labels required for materials for evaluation purposes. The section also specifies particular grids that the students will need for graphing.

Student Action	This is a general description of what the student should do in responding to any of the three performance checks based on the objective. If his expected response is to state a general principle, it is listed in this section. If the three performance checks require specific answers, they are provided below the general statement in the student action.
Performance Check A	Performance Check A is fully stated to allow for a quick review of the statement of the tasks as they are presented to the student. Performance Checks B and C generally present slightly different situations or wording but ask students to perform equivalent tasks.
Remediation	This final section outlines suggested action that can be taken if the student fails to achieve the objective. In some of the remediations, the listed steps are sequential; in others the steps represent options from which it is suggested that you select one or two. Some remediations suggest referring the student to review sections of the core, doing an excursion, or reviewing a self-evaluation question and its response.

How to Find It

Locating a particular objective whose number you know is easy. Just thumb through the pages watching for the unit number which appears in large black print above the word *core* or *excursion* in the margins. But suppose you wish to locate an objective pertinent to a given section or chapter of the text and you don't know the number. Here is a procedure to follow:

1. Determine the unit in which the chapter occurs, using Table 1.
2. Thumb through this booklet until you find that unit number as the beginning digits of any code number appearing in large black print in the outer margin.
3. Look for the "Summary Table" at the beginning of that unit.
4. Use the "Summary Table" to determine the number of the objective you seek.

Be Selective

The resource books for each level contain many more objectives and resources than any one teacher can use. If you add objectives and resources, and you probably will, your list will expand further. The most successful user of this catalog will be the teacher who picks and chooses selectively to meet the specific needs of his students. Therefore, once you are familiar with this book, it is imperative that you establish a system of selecting and assigning checks to the student. Suggestions on how to establish such a system are given in Chapter 3 of the module *Individualizing Objective Testing*.

Whatever selection and assignment system you develop, it must give due regard to individual student's differences. For example, if you administer too many recall performance checks to a high-ability student, he will not only be bored but you will also fail to assess his progress adequately. Too many difficult items administered to a low-ability student leads to frustration and reinforcement of the "I knew I couldn't do it" attitude. On the other hand, even the best students need their egos inflated by some questions that they can answer easily. And, the less able student needs to be appropriately challenged. Be careful, too, of placing too much emphasis on objectives. This may lead students to place undue emphasis on tests, thus slowing their progress to the extent that they lose interest in the story line.

Assigning Performance Checks

How many performance checks should be assigned to a student? This question has no fixed answer. The primary concern is that performance checks provide the needed feedback to both you and the student. If, in your judgment, evaluating a student on a particular unit is unnecessary, then don't do it. If you feel a student needs to be evaluated, then assign an appropriate selection of performance checks. *Individualizing Objective Testing* makes suggestions about how to do this. In no case should any student be assigned all the performance checks or even a random sampling of them. Such a practice would subject the student to tasks which would be either unduly difficult and time-consuming or perhaps too simple for him and therefore meaningless, time-wasting activities.

You may wish to specify the equivalent form (A, B, or C) of performance checks that the student should do when assigning the specific performance check numbers. There is, of course, no difference in their difficulty level. In any case, have the student record both the number and the letter of the specific performance check he does. These numbers and letters should appear on his answer sheet, as they will be needed to check his response. Since the numbers are unique within each ISCS level, there is no need to use a student's time copying the performance checks. Listing the number with the response is sufficient. It's a good idea to remind students frequently that their answers must go on separate paper not in the *Performance Checks* books.

As you assign checks, keep the supply situation in mind. You won't want too much of some equipment tied up in Special Preparations at any one time. To avoid this, keep abreast of the range of your students' progress and prepare only those materials you anticipate needing, referring to the P's appearing in the third column on the right-hand page of the "Summary Table." Batteries, of course, will need replacement or recharging occasionally, and specially boxed supplies should be checked periodically for missing or nonfunctioning parts.

At the back of Part 2 of the *Performance Assessment Resources*, you will find grids identical to those the students must use in certain performance checks. The grids at the back are suitable for reproduction. You may make copies directly, using one of the well-known commercial copiers. For large quantities at low cost, make a master by the thermo process and use it to make duplicates. If you make copies in either of these ways, your students will not be wasting time drawing grids, and you will feel free to assign objectives that need grids.

Chapters 13 thru 15

Excursions 13-1 thru 15-1

Performance Check

Summary Table

Objective Number	Objective Description
07-Core-1	Defines *reaction rate*
07-Core-2	Selects variables related to the concentration of a solution
07-Core-3	Defines *concentration* of a solution
07-Core-4	Selects indicators of reaction rate
07-Core-5	Relates the concentrations from equal dilutions of equal samples of a solution
07-Core-6	Orders solutions according to their concentration
07-Core-7	Interprets graphs of the relationship between amounts of reactants and the rate of product formation
07-Core-8	States the effect of concentration on reaction rate
07-Core-9	States the effect of the concentration of reactants on collision rates
07-Core-10	States the effect of different numbers of reactant particles on reaction rates
07-Core-11	Selects and explains the state of matter in which reactions occur most rapidly
07-Core-12	Indicates how properties change during heating
07-Core-13	Explains the effect of temperature increase on reaction rate
07-Core-14	Relates differences in temperatures to reaction rates
07-Core-15	Reads and analyzes a curved-line graph
07-Core-16	States relationships among reaction rate, collision rate, temperature, and concentration
07-Core-17	Gives an operational definition for *catalyst*

	Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
						√				recalls	
				Q		√				classifies	
						√				recalls	
				Q		√				classifies	
						√				applies	
				Q		√				classifies	
						√				applies	
				Q		√				applies	
						√				applies	
						√				applies	
									√	generates	
				Q						classifies	
						√				applies	
						√				applies	
				Q	T				√	applies	
									√	applies	
						√				recalls	

Objective Number	Objective Description
07-Core-18	Decides whether certain additives are catalysts of reactions
07-Core-19	States a design to test if a substance is a catalyst
07-Core-20	Judges the amount of catalyst necessary to affect a reaction
07-Core-21	Judges a situation in which more than one catalyst is proposed for a specific reaction
07-Core-22	States the method for showing how concentration affects reaction rate
07-Core-23	States specificity of catalysts for given reactions
07-Core-24	Selects the variables affecting the rate of a chemical reaction
07-Core-25	Selects conditions which produce the fastest reaction rate
07-Exc 13-1-1	Interprets a graph of the relationship between reaction time and the concentration of
	reactants.
07-Exc 13-1-2	Recognizes a graph of reaction time versus concentration
07-Exc 13-2-1	Explains why powdered material burns more rapidly than compact material
07-Exc 14-1-1	Explains why reactions occur more slowly in cold air than in warm air
07-Exc 15-1-1	Explains why vegetables are cooked slightly before being frozen
07-Exc 15-1-2	Explains why some reactions occur at lower temperatures inside the body
01-Core-24 thru 28R	(Student's responsibilities)
03-Core-25	States what happens to atoms in a chemical reaction
04-Exc 7-1-3R	Selects graphs which show two variables increasing together

	Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
				Q		√				classifies	
									√	applies	
										applies	
										applies	
						√				applies	
										applies	
				Q		√				classifies	
				Q		√				classifies	
										applies	
				Q						identifies	
										applies	
										applies	
										applies	
										applies	
		O				√				chooses	
						√				applies	
				Q		√				classifies	

Objective Number	Objective Description
04-Exc 7-2-1R	Lists solutions in order of concentration
04-Exc 8-1-1R	Handles a thermometer, using the accepted procedure
05-Core-1R	States the purpose of a control in an experiment
06-Core-20R	Recognizes the continuous development of scientific models

	Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
				Q		√				classifies	
	M	O				√				manipulates	
						√				applies	
						√				applies	

07 Core 1

Defines *reaction rate.*

The student recalls the definition that reaction rate is the speed at which a reaction takes place.

Student Action: Responding to the effect that reaction rate is the speed at which a reaction takes place.

Performance Check A: Define the term *reaction rate* as it is used in the following sentence. The reaction rate between mixed hydrogen and oxygen is amazing.

Remediation: (1) Check the student's answer to question 13-18 and Self-Evaluation 13-4. If he got them right, ask him to explain what the question is asking. (2) Have the student review items 1, 2, and 3 at the top of page 193.

07 Core 2

Selects variables related to the concentration of a solution.

The student classifies the mass of the dissolved substance and the volume of the solution as the variables involved in determining the concentration of a solution.

Student Action: Selecting the variables determining the concentration as mass of solute and the volume of the solution.

A: d and e
B: b and d
C: c and e

Performance Check A: Hal wants to state the concentration of a sugar solution. Select any of the following things he must know.

a. The brand name of the sugar dissolved
b. The speed with which the solution formed
c. The color of the solution
d. The mass of the sugar dissolved
e. The volume of the solution

Remediation: (1) Check the student's answer to question 13-7. (2) Have him review the last paragraph on page 192. (3) Have him do Excursion 7-2.

07 Core 3

Defines *concentration* of a solution.

The student recalls the definition that the concentration of a solution is the amount of dissolved substance in a definite amount of solution or liquid (solvent).

Student Action: Responding with the notion that the concentration of a solution is the amount of dissolved substance in a definite amount of solution or liquid (solvent).

Performance Check A: Write a definition for *concentration* as it is used in the following sentence. The concentration of the instant lemonade drink solution is so great that it tastes bitter.

Remediation: (1) Check the student's response to Self-Evaluation 13-5. (2) Review the last paragraph on page 192.

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07 Core 4

Selects indicators of reaction rate.

The student classifies from a list those statements which involve indicators of reaction rate.

Student Action: Selecting at least two of the three items taken from the list of four below:

(1) the amount of product formed per time period,
(2) the speed at which the reactants are used up,
(3) the time required for the first noticeable changes, and
(4) the temperature change per time unit.

A: a, c, and d
B: a, b, and c
C: b, c, and d

Performance Check A: Barry mixed two solutions and made the following observations. Which of his observations are ways of stating the rate of a reaction?

a. One of the reactants was used up in 5 seconds.
b. The total volume of the reaction was 28 ml.
c. In 3 seconds, 20 grams of a yellow solid formed.
d. The mixed solutions turned blue in 0.5 seconds.
e. Three cc of the product weighed 5 grams.

Remediation: (1) Review the student's response to Self-Evaluation 13-6. (2) Have him review the three numbered statements at the top of page 193. (3) For each of the ways of studying reaction rate listed on page 193, have the student identify an activity in Chapters 13, 14, or 15 which uses it.

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07 Core 5

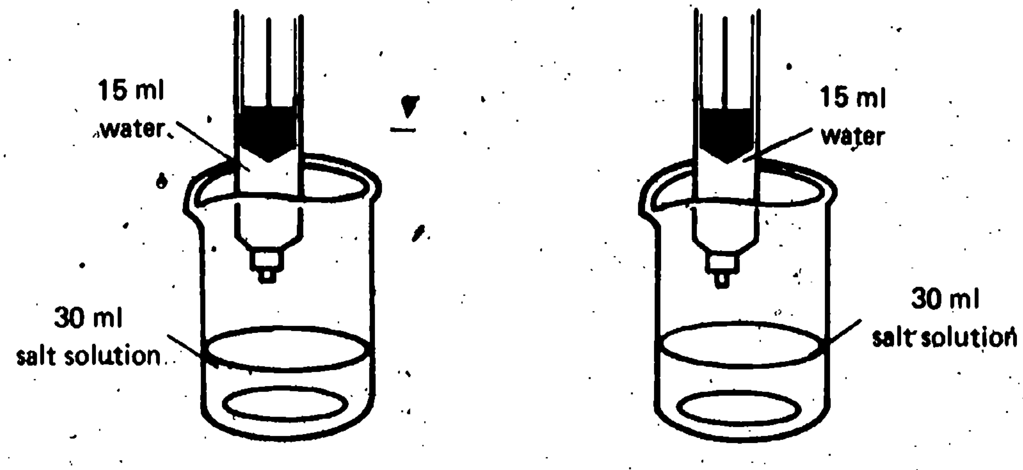
Relates the concentrations from equal dilutions of equal samples of a solution.

The student applies the principle that equal samples of a solution equally diluted will have the same resulting concentration.

Student Action: Stating that the concentrations are equal and, in effect, that if equal samples of a solution are equally diluted, the concentrations of the resulting solutions are equal.

Performance Check A: Jane pours 30 ml of a salt solution into beaker A and 30 ml of the same solution into beaker B. She then adds 15 ml of water to each beaker.

1. How do the concentrations of the solutions in beakers A and B compare with each other?
2. Explain your answer.



Beaker A   Beaker B

Remediation: (1) Have the student check his answer to Self-Evaluation 13-8. (2) Have him review pages 435 through 437. (3) Have him answer questions 1 and 2 on page 436 in terms of using 2 grams of salt in each of the beakers in Activity 1.

O7 Core 6

Orders solutions according to their concentrations.

The student classifies solutions according to their concentrations from the most to the least concentrated.

Student Action: Ordering the solutions in the increasing order of the amount of solvent added.

A: 1. A, 2. E, 3. C, 4. B, 5. D
B: 1. B, 2. E, 3. C, 4. A, 5. D
C: 1. C, 2. E, 3. D, 4. A, 5. B

Performance Check A:

BEAKER	VOLUME OF KI SAMPLE (in ml)	VOLUME OF WATER ADDED (in ml)	TOTAL VOLUME OF FINAL SOLUTION (in ml)
A	100	0	100
B	40	60	100
C	70	30	100
D	10	90	100
E	80	20	100

All the potassium iodide (KI) 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 statement of its concentration.

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

Remediation: Review pages 436 and 437 of Excursion 7-2.

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07 Core 7

Interprets graphs of the relationship between amounts of reactants and the rate of product formation.

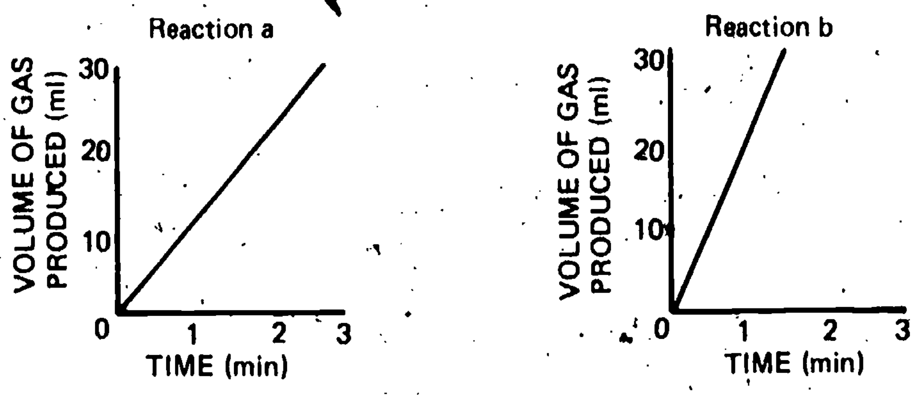
The student applies the rule that the amount of product formed in a given amount of time is proportional to the amounts of the reactants used in the reaction as long as enough of both reactants are available.

Student Action: Selecting the graph which indicates the greater volume of gas produced and stating in effect that the greater the rate at which the product is formed, the greater the amount of reactant used in the reaction.

A: Reaction b
B: Reaction a
C: Reaction b

Performance Check A: The graphs below show the results of two reactions of the same chemical system. The reactants in the system are hydrochloric acid (HCl) and a colorless solution. One of the products is a gas. A different amount of HCl 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 HCl used?
2. How do you know?



Remediation: (1) Have the student review Activity 13-1 and its related questions. (2) Also review Figure 13-1 on page 194 and the related text material.

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07 Core 8

States the effect of concentration on reaction rate.

The student applies the concept that reaction rates vary with concentration.

Student Action: Stating that the reaction rates of the trials would be different because of the difference in the concentration of the reactants. Accept "amount of water" as the variable and help the student to relate his response to the term *concentration.*

Performance Check A:

Reaction A: 10 ml HCl + 20 ml water + 1 g zinc → hydrogen
Reaction B: 10 ml HCl + 10 ml water + 1 g zinc → hydrogen

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

Remediation: (1) Have the student review Self-Evaluation 13-10 and its acceptable response. (2) Review Figure 13-1 and the first paragraph on page 194.

---

07 Core 9

States the effect of the concentration of reactants on collision rates.

The student applies the concept that collision rates vary with the concentration of the reactants.

Student Action: Responding negatively and stating in effect that a change in the amount and the concentration of a reactant causes a change in reaction rate by increasing the number of contacts between particles of the reactants.

Performance Check A:

Reaction A: 10 ml HCl + 15 ml water + 1 g iron powder → hydrogen
Reaction B: 5 ml HCl + 20 ml water + 1 g iron powder → hydrogen

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

Remediation: (1) Have the student review Activities 13-7 through 13-10, his answer to 13-19 and the subsequent paragraph. (2) Also review the student's answer to question 13-27 and the subsequent paragraph.

---

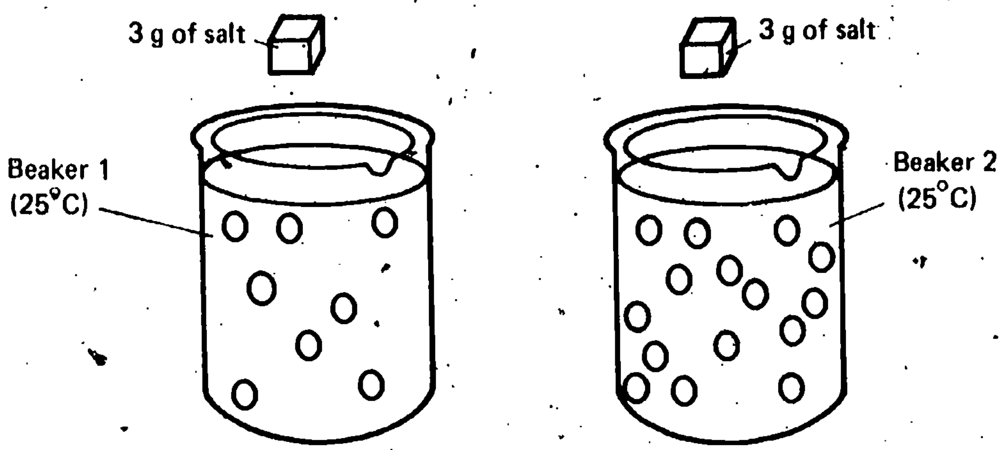
07 Core

States the effect of different numbers of reactant particles on reaction rates.

The student applies the concept that the number of collisions varies with the number of particles present.

Student Action: Stating in effect that if more particles of a reactant are present in one reaction than in the other, the reacting particles will collide more frequently where the particles of reactants are more numerous and therefore react more often than in the reaction with fewer particles.

Performance Check A: Both beakers below show dissolved particles of substance O. Blocks of salt with masses of 3 g are put into each of the beakers, 1 and 2, and reactions of O + salt occur. In terms of particles, how would your model explain that the reaction rate will be faster in one of the beakers than in the other? 10



Remediation: (1) Check the student's response to Self-Evaluation 13-7. (2) Have him review Figure 13-1 and the first paragraph on page 194.

07
Core
11

Selects and explains the state of matter in which reactions occur most rapidly.

The student generates a statement to explain why the reaction of gaseous reactants is more rapid than the reactions of solid or liquid reactants.

Student Action: Selecting the reaction in which the reactant whose state varies is a gas and stating that the reaction is fastest because gaseous particles move faster than liquid or solid particles and therefore the most particle contact results.

A: c
B: a
C: b

Performance Check A:

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? (S stands for sulfur and O for oxygen.)

   a. S (solid) + O_2 (gas) → SO_2 (gas)
   b. S (liquid) + O_2 (gas) → SO_2 (gas)
   c. S (gas) + O_2 (gas) → SO_2 (gas)

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

Remediation: (1) Have the student review pages 361 and 362. (2) Ask him to state what would happen if hot water were heated even more. (3) Ask him in which state the particles are moving fastest, solid, liquid, or gaseous. Therefore, in which state would reactions then take place most rapidly?

---

07 Core 12

Indicates how properties change during heating.

The student classifies volume, kinetic energy, speed, collision rates, number, and particle size as increasing, decreasing, or remaining the same during heating.

Student Action: Indicating that volume, kinetic energy, speed, and collision rates increase, whereas the number of particles and size of the particles remains the same.

A: 1. increases, 2. remains the same, 3. increases, 4. remains the same, 5. increases, 6. increases

B: 1. increases, 2. remains the same, 3. increases, 4. remains the same, 5. increases, 6. increases

C: 1. increases, 2. remains the same, 3. increases, 4. remains the same, 5. increases, 6. increases

Performance Check A: In Chapter 14, you heated some HCl. On your paper, list the numbers of the variables listed below. Based on your particle model and your experience, indicate how that variable responds to heating by writing *increases, decreases,* or *remains the same* after the number of each variable.

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

Remediation: (1) Review page 361 of Excursion 1-1 and the student's response to question 14-9. (2) If his answer to question 14-9 is wrong, review the paragraph below question 4-12.

---

07 Core 13

Explains the effect of temperature increase on reaction rate.

The student applies the concept from the heat-as-energy model that the number of collisions between particles increases as the temperature increases.

Student Action: Stating that at higher temperatures matter particles move faster, collide more frequently, and therefore react more rapidly.

Performance Check A: Norman poured two samples of 30 ml of hydrochloric acid (HCl) into two jars. The samples had the same concentrations, but one of the samples was at 20°C and the other was at 35°C. He added 1 g of zinc to each HCl sample. The warmer sample reacted faster. Use your model to explain how temperature differences cause the rates of two reactions to be different.

Remediation: (1) Check the student's answers to the Checkup on page 210 and refer him to part B of Excursion 1-1. (2) Have the student check his response to Self-Evaluation 14-6. (3) Have him review Activity 14-1 and explain the differences in terms of particle collisions. (4) Have him review the two paragraphs which follow question 14-12.

---

07 Core 14

Relates differences in temperatures to reaction rates.

The student applies the concept that the rate of a reaction varies directly with the temperature.

Student Action: Stating correctly whether the unknown temperature is higher or lower than the known and in essence that the unknown temperature is higher than the temperature of the trial whose temperature is given if the rate of the reaction of unknown temperature is faster than the rate of the reaction whose temperature is given or the reverse if the trial of known temperature is faster than the trial of unknown temperature.

A: Higher
B: Higher
C: Lower

Performance Check A:

TRIAL	TEMPERATURE	REACTANTS	RATE
1		100 ml milk + 1 ml lemon juice	soured quickly
2	10°C	100 ml milk + 1 ml lemon juice	soured slowly

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

Remediation: (1) Review the answers to questions 14-7 and 14-8 and the following paragraph. (2) Review the paragraph below question 14-12.

---

07 Core 15

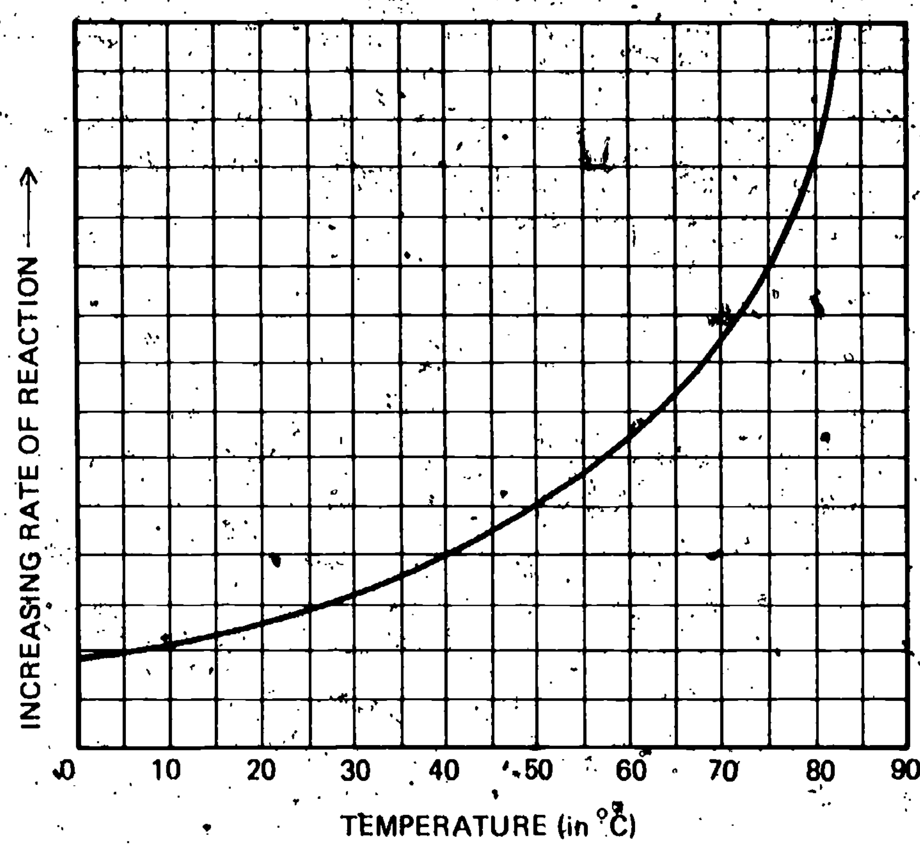
Reads and analyzes a curved-line graph.

The student applies the process of reading and analyzing a curved-line graph.

Student Action: Indicating the interval in which the highest temperature change occurs as producing the greatest change in the rate of reaction.

A: d
B: a
C: d

Performance Check A:



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

a. 0° to 20°C
b. 20° to 40°C
c. 40° to 60°C
d. 60° to 80°C

Remediation: (1) Help the student calculate the increase in the rate of reaction for a given temperature interval. (Assign any rate you wish to the y-axis, for example, milliliters per second.) (2) Have him repeat the calculation on another interval by himself. (3) Have him proceed on his own to repeat the calculation for each interval given in the check and tell you which increase is the largest.

---

07 Core

States relationships among reaction rate, collision rate, temperature, and concentration.

The student applies the concepts governing collision rates and reaction rates when temperature and concentration are variables.

Student Action: <u>Responding</u> affirmatively and <u>stating</u> in effect that many particles moving slowly can have as many contacts as fewer particles moving more rapidly.

Performance Check A: Sam collected the data shown in the table below.

TRIAL	CONCENTRATION	TEMPERATURE	CATALYST
A	10 ml $KMnO_4$ + 5 ml $H_2C_2O_4$ + 5 ml water	35°C	none
B	10 ml $KMnO_4$ + 5 ml $H_2C_2O_4$ + 8 ml water	40°C	none

Trials A and B have the same reaction rates.

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

Remediation: Have the student review the paragraph below question 14-12 on page 213. Discuss this and review the performance check with him.

16

Gives an operational definition for *catalyst*.

The student recalls the operational definition for *catalyst* which includes all of its characteristics.

Student Action: Stating the definition that a catalyst is a substance which increases the rate of reaction, but does not cause the reaction nor act as a reactant.

Performance Check A: Write an operational definition of the word *catalyst* which includes all the characteristics of a catalyst.

Remediation: (1) Have the student review the third paragraph on page 221. (2) Ask him what he would have to know to be able to tell if a given substance is a catalyst for a given reaction.

07 Core 17

Decides whether certain additives are catalysts of reactions.

The student classifies catalysts from pairs of reactions in which the volume of gas produced in a specific amount of time is the variable.

Student Action: Indicating as catalysts additives which cause an increase in the speed of the reaction but do not react themselves or cause the reaction.

A: 1. no, 2. yes, 3. no
B: 1. yes, 2. no, 3. no
C: 1. yes, 2. no, 3. no

Performance Check A:

1. Consider the two trials of the reaction below.

   Trial A.

   A 20 g sample of zinc nitrate is heated. The reaction produces 15 ml of oxygen in one minute.

   Trial B.

   A 20 g sample of zinc nitrate is heated with a little copper nitrate (blue-green). The reaction produces 15.5 ml of oxygen in one minute, and the blue-green crystals turn black.

07 Core 18

Does copper nitrate act as a catalyst for the reaction?

2. Consider the two trials of the reaction below.

Trial A.

A 10 g sample of hydrogen peroxide (H_2O_2) is heated gently. The reaction gives off 1 ml of oxygen in 30 seconds.

Trial B.

A 10 g sample of H_2O_2 is heated with a little gold dust. This gives off 40 ml of oxygen in 30 seconds. The gold dust is unchanged.

Does gold dust act as a catalyst for the reaction?

3. Consider the two trials of the reaction below.

Trial A.

A 20 ml sample of vinegar and 4 g of baking soda react to produce 25 ml of gas in 30 seconds.

Trial B.

A little ammonium hydroxide is added to the 20 ml of vinegar and 4 g of baking soda. The ammonium hydroxide is used up, and 10 ml of gas is produced in 30 seconds.

Does ammonium hydroxide act as a catalyst for the reaction?

Remediation: Have the student read the third paragraph on page 221 and then explain to you why his answer was wrong.

O7 Core 19

States a design to test if a substance is a catalyst.

The student applies the concepts of testing for a catalyst.

Student Action: Stating a design which includes the following: (1) the idea that only one variable should be varied (using or withholding the substance being used as a catalyst), (2) that all other variables (temperature, concentration or amount of reactants used, and the method of measuring reaction rates) should be held constant, and (3) a test to establish if the substance reacts or causes the reaction. Answers will vary, but the three elements above must be included.

Performance Check A: Sue wanted to know if a copper BB is a catalyst for the hydrochloric acid-shell reaction. Design a method to find out. The rate of the reaction is indicated by the rate at which carbon dioxide gas is produced. Include statements of (1) which variables should be kept constant (HINT: What things cause the reaction rate to change?) and (2) which variables should vary. Also (3) include a test to show if the BB reacts or causes the reaction.

Remediation: (1) Check the student's answers to question 15-19 and Self-Evaluation 15-9. (2) Have him review Activities 15-5 through 15-7. (3) With his book open, have him describe to you the design he failed to give earlier. (You may wish to ask leading questions to draw him out.)

Judges the amount of catalyst necessary to affect a reaction.

07 Core 20

The student applies the concept that only small amounts of a catalyst are needed to get an increase in the rate of a reaction.

Student Action: Responding negatively and that if the substance were a catalyst, small amounts of it would have affected the reaction rate.

Performance Check A: Frank heard that manganous sulfate ($MnSO_4$) was a catalyst for the reaction between hydrochloric acid (HCl) and shell. To three test tubes in which HCl and shell were reacting, he added ¼ teaspoon of $MnSO_4$ 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 further trials he plans to add 2 and 3 teaspoons of $MnSO_4$ to two other test tubes of HCl-shell.

1. Are these additional trials necessary to find out if $MnSO_4$ is a catalyst for the reaction?
2. Explain your answer.

Remediation: (1) Have the student review the third paragraph on page 221 and explain to you why his answer and explanation are incorrect. (2) Have the student review his answer to Self-Evaluation 15-3.

Judges a situation in which more than one catalyst is proposed for a specific reaction.

07 Core 21

The student applies the concept that there is often more than one catalyst for a reaction.

Student Action: Responding that all the students could be right because there is often more than one catalyst for a reaction.

Performance Check A: Three students had been studying the reaction of burning sulfur dioxide to form sulfur trioxide.

$2SO_2 + O_2 \rightarrow 2SO_3$

Al Green said, "I've found that platinum is a catalyst for the reaction."
Bill Brown said, "I've found that vanadium pentoxide is a catalyst for the reaction."
Gina White said, "I've found that ferric oxide is a catalyst for the reaction."

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

Remediation: (1) Check the student's answers in Table 15-1 on page 223. (2) Refer him to Excursion 15-1. (3) This point is summarized in item 3 on page 224. (4) The point is evaluated in Self-Evaluation 15-7.

States the method for showing how concentration affects reaction rate.

07

The student applies the procedures to show whether concentration affects the rate of a reaction and of measuring reaction rate in terms of the rate of product formation.

Core 22

Student Action: Stating the procedure which includes (1) varying the concentration of the single reactant being studied, (2) keeping the concentration of other reactants constant, (3) keeping the temperatures of the reactants constant, (4) not altering the use or nonuse of a catalyst, and (5) recording the interval between the time the chemicals are mixed and the time the indicator begins to work.

Performance Check A: The rate of a reaction like the one below often changes with a change in temperature, with a change in concentration, or when a catalyst is used.

HCl + eggshells → CO_2

The carbon dioxide (CO_2) gas can be collected in test tubes by water displacement. Describe a procedure you could follow which would show if changing the concentration of the HCl would change the reaction rate. In your procedure include what things should be varied and what should be kept constant: (HINT: What variables affect reaction rates?)

Remediation: (1) Have the student review Activities 13-7 through 13-10 and his answer to Self-Evaluation 13-11. (2) Then ask him if it would be fair to heat one of the samples and not the others or to add a catalyst to one sample and not to the other. (3) Ask him if it would be advisable to vary several concentrations at once.

O7 Core 23

States specificity of catalysts for given reactions.

The student applies the concept of the limited applicability of a given catalyst.

Student Action: Responding negatively and, in effect, that a substance is a catalyst to a specific reaction or to several reactions, but not necessarily to others.

Performance Check A: Casey heated potassium chlorate ($KClO_3$) and a little manganese dioxide (MnO_2). Oxygen was given off faster than when $KClO_3$ was heated without the MnO_2. Casey concluded that since MnO_2 is a catalyst for the $KClO_3$ reaction, it must be a catalyst for the reaction between HCl and shell.

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

Remediation: (1) Have the student review Activities 15-8 and 15-9 on pages 222 and 223 with particular emphasis on question 15-23. (2) Activity 15-6 and subsequent questions also show this principle. (3) Check the student's response to Self-Evaluation 15-4.

O7 Core 24

Selects the variables affecting the rate of a chemical reaction.

The student classifies the variables that affect the rate of a chemical reaction.

Student Action: Selecting those two of the following variables that appear in the list of options in each check: (1) the temperature of reactants, (2) the concentration of reactants, and (3) the presence of a catalyst.

A: a, c

B: c, d

C: b, e

Performance Check A: Select the two variables which affect the rate of a chemical reaction.

a. The concentration of reactants
b. The color of the reactants
c. The temperature of the reactants
d. The student who does the reaction
e. The shape of the container used for the reactants

Remediation: (1) Review the first and second paragraphs on page 225. (2) Check the student's response to Self-Evaluation 13-3. (3) Have the student cite an activity in which the variables he failed to identify affect the rate of a reaction.

---

07 Core 25

Selects conditions which produce the fastest reaction rate.

The student classifies high concentration, high temperature, and the presence of a catalyst as the combination that results in the fastest reaction rate.

Student Action: Selecting the variables which indicate high concentration, high temperature, and the presence of a catalyst.

A: High, high, present
B: Present, high, high
C: High, high, used

Performance Check A: From each set of parentheses select the choice which makes the statement true. A reaction will probably go fastest if the concentration of the reactants is (high, medium, low), if the temperature is (high, medium, low), and if a catalyst is (present, absent).

Remediation: (1) Have the student reread the two paragraphs following question 14-12. (2) Have him review the first and second paragraphs on page 225.

---

07 Exc 13-1 1

Interprets a graph of the relationship between reaction time and the concentration of reactants.

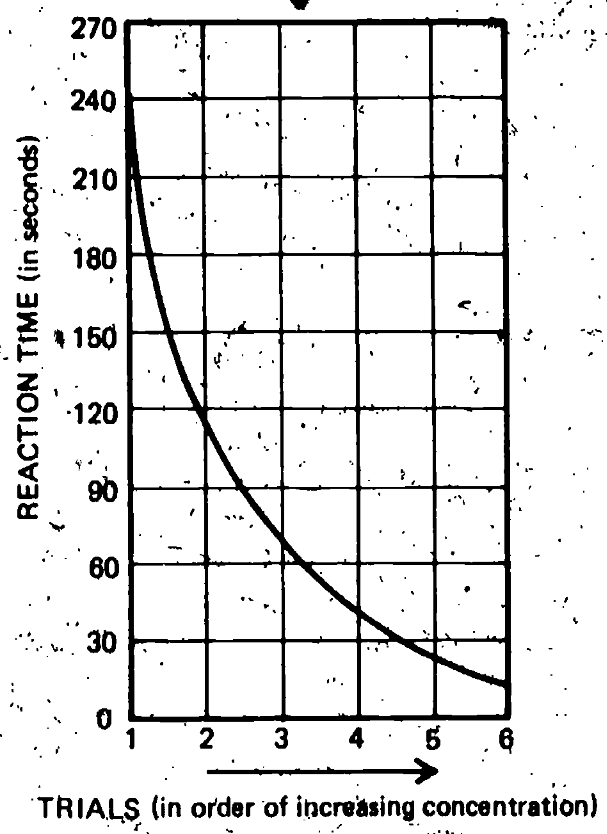
The student applies the concept that reaction time varies inversely with the concentration of the reactants.

Student Action: Selecting the trial with the shortest reaction time and stating, in effect, that the greater the concentration, the greater the number of collisions and the shorter the reaction time.

A, B, and **C:** Trial 6

Performance Check A: 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.



Remediation: (1) The student should review the completed Figure 2 in Excursion 13-1. (2) Find out if he understands that as the reaction rate goes up, the time of the reaction decreases. (Review Table 1.) (3) If the student does understand the relationship of concentration-reaction rate and collision, have him review the paragraph above Figure 13-1, as well as Figure 13-1.

07
Exc 13-1

Recognizes a graph of reaction time versus concentration.

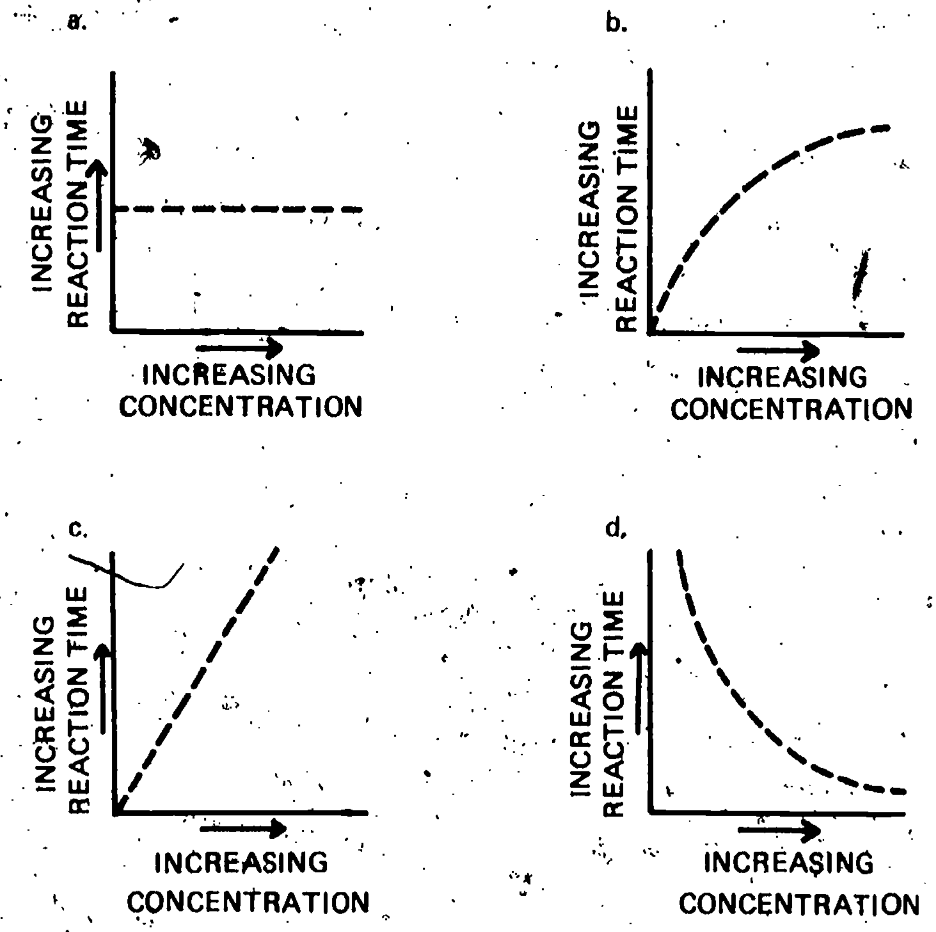
The student identifies the graph for a plot of reaction time versus concentration.

Student Action: Selecting the graph showing a concave curved line which slopes downward from left to right.

A: d
B: c
C: b

2

Performance Check A: Bill studied the effect of changes in the concentration of HCl on the reaction time of the reaction zinc + HCl → hydrogen. He defined *reaction time* as the time needed to produce 20 ml of hydrogen gas. Which of the graphs below is probably the correct graph for his experiment?



Remediation: (1) Have the student reconsider his completion of Table 1, page 500. (2) Check the graph he drew for Figure 2, page 501, and discuss the labeling of the X axis, which represents concentration data.

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07 Exc 13-2 1

Explains why powdered material burns more rapidly than compact material.

The student applies the concept of the effect of surface area on reaction rate.

Student Action: Stating that increasing the surface area of a reactant speeds up the rate of the reaction and that in the dust form the reactant has more surface area than in the compact state.

Performance Check A: Consider the two cases below.

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

Case 2. Flour dust in the air in a flour mill 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?

Remediation: (1) Check the student's response to questions 17, 18, and 19 on page 508. (2) Show the student zinc powder and ask him how he could convert the small pieces shown in Figure 1, page 508, to the powder form and what this would do to the surface area of zinc.

---

07 Exc 14-1 1

Explains why reactions occur more slowly in cold air than in warm air.

The student applies the concept from the particle model concerning the direct relationship between temperature and collision rate.

Student Action: Stating that particles in cool air move more slowly than those in warm air, thus colliding less often and, therefore, reacting more slowly.

Performance Check A: In Excursion 14-1, you saw that reactions involving air take place more slowly in cold air than in warm air. How would the particle model explain this in terms of particle speed and collisions?

Remediation: (1) Check the student's responses in Tables 1 and 2 of Excursion 14-1. Does he infer the relationship between cold and reaction rate from those tables? (2) Determine if he has the concept that cold and heat have opposite effects on molecular speed. (3) If the student can verbalize the step above, refer him to the paragraph following question 14-12 and then have him try again to answer the question in the check.

---

07 Exc 15-1 1

Explains why vegetables are cooked slightly before being frozen.

The student applies the concept that heat destroys the catalysts in living things.

Student Action: Responding that heating vegetables destroys the catalysts which hasten spoilage.

Performance Check A: Vegetables are put into boiling water for 3 to 5 minutes before they are frozen. This nearly stops the reactions that otherwise cause spoiling even when the vegetables are frozen. Explain what heating does that stops the chemical reaction in the vegetables (living things).

Remediation: (1) Have the student review Activities 8 and 9 on pages 519 and 520. (2) Check questions 20, 21, and 22 and the following paragraphs on page 520 with the student. (3) Be sure he understands spoilage as a chemical reaction in living things. Also be sure he understands the role of catalysts in living things. (4) Have him review the performance check.

---

07 Exc 15-1 2

Explains why some reactions occur at lower temperatures inside the body.

The student applies the concept that the presence of a catalyst will cause the rate of a reaction to be higher at lower temperatures.

Student Action: Responding that human beings, like all living things, contain catalysts which allow for rapid reaction rates at low temperatures.

Performance Check A: Temperatures well above 80°C are needed for the juices from a hamburger to react with oxygen to produce carbon dioxide and water rapidly enough to produce noticeable heat. Yet the same reaction – hamburger juices plus oxygen – produces carbon dioxide and water and noticeable amounts of heat at 37°C in your body. Why?

Remediation: (1) Check the student's answers to questions 15-6, 15-7, 15-16, and 15-17. Then have him read the paragraphs at the bottom of page 217 and the top of page 221. (2) Did the student conclude from Excursion 15-1 that living things contain catalysts?

Chapters 16 and 17 — Performance Check

Excursions 16-1 thru 17-3 — Summary Table

Objective Number	Objective Description
08-Core-1	Relates changes in concentration to changes in rates of reaction
08-Core-2	States the effect of heating on the rate of a reaction
08-Core-3	Checks for odor change in vapors
08-Core-4	Explains varied combinations of the same elements in two or more substances
08-Core-5	Selects compounds which contain nitrogen
08-Core-6	States a use for Nessler's solution
08-Core-7	Tests for NH_3 in a substance
08-Core-8	Tests for changes in odor
08-Core-9	States why scientific concepts are continually tested
08-Core-10	Gives an explanation for the color change of an indicator
08-Core-11	States that atoms of substances react in definite numbers
08-Core-12	States a reason for averaging repeated measurements
08-Core-13	Shows extrapolation of a linear relationship
08-Core-14	Extrapolates reactant amounts and selects the reason extrapolation can be done
08-Core-15	Neutralizes an acid with a base
08-Exc 16-1-1	Relates the density of a substance to its quantity
08-Exc 16-1-2	Measures and calculates density
08-Exc 16-1-3	Indicates the relationship between density and floating

Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
					√				applies	
					√				applies	
M	O		Q	T	√				manipulates	
									applies	
			Q						classifies	
									generates	
M	O	P	Q	T					manipulates	
M	O		Q	T	√				chooses	
					√				applies	
								√	generates	
					√				applies	
					√				applies	
			Q						applies	
			Q		√				applies	
M		P		T					manipulates	
								√	applies	
M		P	Q	T		√		√	applies	
			Q						applies	

Objective Number	Objective Description
08-Exc 17-1-1	Predicts the effect of dilution on the neutralizing ability of an antacid
08-Exc 17-2-1	Explains why a reaction stops
08-Exc 17-3-1	Uses litmus paper to test solutions
08-Exc 17-3-2	Selects solutions which show the relationship between pH and H^+ ion concentration
08-Exc 17-3-3	Measures the strengths of acid and base solutions
01-Core-24 thru 28R	(Student's responsibilities)
02-Core-8R	Explains similar test results from different substances
03-Core-18R	Explains why many substances but few elements are known
04-Core-3R	Uses the concept that atoms combine in definite numbers
04-Core-15R	Recognizes the reason for basing conclusions on many cases
04-Core-19R	States the rule of the combination of atoms in definite numbers (ratios)
04-Exc 7-1-5R	Extrapolates and interpolates from a graph

Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
									applies	
									applies	
M		P	Q	T					manipulates	
			Q					√	applies	
M		P	Q	T					manipulates	
	O				√				chooses	
					√				applies	
					√				applies	
					√				applies	
					√				applies	
			Q		√				applies	
					√				applies	

O8 Core 1

Relates changes in concentration to changes in rates of reaction.

The student applies the relationship of the concentration of reactants and the rate of their reaction to a problematical situation.

Student Action: Responding that an increase in concentration of a reactant increases the rate of reaction.

Performance Check A: The sodium hydroxide (NaOH) solution you used in Chapter 16 to release ammonia (NH_3) from egg whites and fertilizers was not very concentrated. What effect would the use of a much stronger concentration of NaOH have on the reaction?

Remediation: (1) Give the student the answer to question 13-25 and ask him to answer question 13-26 and explain it. (2) Have him review page 194, especially Figure 13-1. (3) The concept involved in this objective is reviewed on page 225.

O8 Core 2

States the effect of heating on the rate of a reaction.

The student applies the concept that the speed of a reaction varies with its temperature.

Student Action: Responding that heating increases the speed of a reaction.

Performance Check A: In Activity 16-11 when you added sodium hydroxide (NaOH) to the meat, egg white, and other substances, ammonia (NH_3) would have been given off and bubbled through the Nessler's solution even if you had not heated the mixture. Why, then, did you heat it?

Remediation: (1) Ask the student what happened when he heated HCl in the HCl-shell reaction on pages 206 and 207. (2) This is an application of the concept stated in the paragraph at the bottom of page 213. Have him review this material and state what it tells him about temperature.

O8 Core 3

Checks for odor change in vapors.

The student manipulates solution A to smell it safely.

Regular Supplies:

phenolphthalein solution	HCl (3.0M)
NaOH (1.0M)	phenol red
Congo red	test tubes
	dropper bottle

Student Action: Waving his hand back and forth over the solution, rather than putting the bottle or beaker near his nose and inhaling. The student's observations are irrelevant to scoring this objective. The checks duplicate those in O8-Core-8, and the two objectives can be evaluated together.

Performance Check A: Before you begin, tell your teacher that you are going to do this check.

Is there any change in the odor of phenolphthalein when sodium hydroxide ($NaOH$) is added to it? To answer this, do the following.

1. Put 6 drops of phenolphthalein into a test tube.
2. Smell it.
3. Add 2 drops of $NaOH$.
4. Smell the mixture.

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

Remediation: (1) Have the student review the safety note and Activity 16-1 on page 228. (2) Ask him to propose reasons why this procedure in necessary.

O8 Core 4

Explains varied combinations of the same elements in two or more substances.

The student applies the concept that the same elements can compose different substances when put together in different orders or combinations.

Student Action: Stating that the given substances can haye different properties and yet be composed of the same elements if the elements are put together in different orders or combinations.

Performance Check A: In Activity 16-11, you found that uncooked meat, potato, urine, and soy sauce contain NH_3. If you had tested further, you would have found that they contain carbon and oxygen, as well as nitrogen and hydrogen. How do you explain that these substances contain the same elements and yet are so different?

Remediation: (1) Review the responses to Self-Evaluations 16-9 and 16-10 with the student. (2) Have him read page 69. (3) Have him read the paragraphs following question 16-18 on page 239.

O8 Core 5

Selects compounds which contain nitrogen.

The student classifies compounds as containing or not containing nitrogen.

Student Action: Selecting the samples in which ammonia is present as those containing nitrogen.

A: Orange and purple
B: Red and blue
C: Green and pink

Performance Check A: Bob tested five substances for ammonia, sulfate, and copper. His results are shown in the table below. Write the colors of any substances which you know contain nitrogen.

SUBSTANCE TESTED	AMMONIA PRESENT	SULFATE PRESENT	COPPER PRESENT
Blue	no	no	no
Orange	yes	yes	no
Purple	yes	no	no
Red	no	yes	yes
Black	no	yes	no

Remediation: (1) Have the student check his answer to question 16-18 and Self-Evaluation 16-4 with you. (2) Also, review his answer to question 16-4 on page 229 and the paragraph that follows it.

O8 Core 6

States a use for Nessler's solution.

The student generates the explanation that Nessler's solution is a test specific to NH_3, not nitrogen.

Student Action: Responding that he disagrees with the conclusion that a negative test for NH_3 is a negative test for nitrogen, and giving as an explanation that Nessler's solution is a test for NH_3, and nitrogen in any other combination would not be detected by it.

Performance Check A: Otis tested a white solid ($NaNO_3$) and a yellow liquid (HNO_3) by putting each into a different flask with 10 ml of sodium hydroxide (NaOH) and then heating the two flasks. He bubbled the gases given off through 5 ml of Nessler's solution. No color change was observed in the Nessler's solution for gases from either of the substances. Otis concluded that the substances did not contain nitrogen.

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

Remediation: (1) Have the student use the chart in Chapter 5, page 60, to tell what elements are present in the given substance. (2) Have him review the last two paragraphs on page 229. (3) Review the student's answer to question 16-17, tell him that air is almost 80% nitrogen, and ask if the two substances (NH_3 and nitrogen) would have the same operational definition. (4) Ask the student to identify the substances in Table 16-2 which contain nitrogen in the form of NH_3. Then ask him if one of the substances which tested negative for NH_3 could have contained nitrogen in a different combination.

Tests for NH_3 in a substance.

08 Core 7

The student manipulates given materials to test for the presence of ammonia in a substance.

Regular Supplies: wooden splint, burner and stand, test tubes, flask with stopper, Nessler's solution, NH_4NO_3, 4.5 cm rubber tubing, plastic straw

Special Preparations: In box 08-Core-7, place the lettered bottles A, containing NH_4NO_3; B, containing NaCl; and C, containing NH_4Cl. It is advisable to grind each material with a mortar and pestle to give it a texture different from that seen in class activities.

Student Action: Adding NaOH and boiling chips to the sample, heating it, passing the gas through a mixture of Nessler's solution and NaOH, and correctly stating that ammonia is present if the Nessler's solution changes to an orange-yellow color.

A: Ammonia present
B: Ammonia not present
C: Ammonia present

Performance Check A: Before you begin, tell your teacher that you are going to do this check.

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

Remediation: (1) Review the student's responses to Self-Evaluations 16-1 through 16-3. (2) Have him review Activities 16-7 through 16-9 on pages 234 through 235. (3) Have him outline the procedure. (4) Then have him carry out his outlined procedure.

Tests for changes in odor.

08 Core 8

The student chooses to use safety glasses to protect his eyes.

Regular Supplies: standard phenolphthalein indicator, NaOH (1.0M), Congo red indicator, HCl (3.0M), test tubes, dropper bottle

Student Action: Putting on a pair of safety glasses before beginning a procedure. The student's observations are irrelevant to scoring this objective. The checks for this objective duplicate those used in objective 08-Core-3, and the two objectives can be evaluated together.

Performance Check A: Tell your teacher that you are going to do this check before you start it.

Is there any change in the odor of phenolphthalein when sodium hydroxide (NaOH) is added to it? To answer this, do the following.

1. Put 6 drops of phenolphthalein into a test tube.
2. Smell it.
3. Add 2 drops of NaOH.
4. Smell the mixture.

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

Remediation: (1) Have the student read the safety note and look at the drawing on page 228 and the safety note on page 4. (2) Have him propose a reason or reasons for this procedure.

---

08 Core 9

States why scientific concepts are continually tested.

The student applies the concept of the tentativeness of scientific concepts.

Student Action: Stating that scientific concepts are treated as being supported by evidence but not as proven to be true and that they are changed if not supported by further investigation.

Performance Check A: Earlier in this course you discovered that the millions of substances in our world are made up of 100 or so elements. Now, in Chapter 16, you as a scientist tested this concept again by testing many things to see if they contain nitrogen. Why do scientists keep testing accepted concepts?

Remediation: (1) Review the summary on page 239 with emphasis on the fact that evidence is not proof. (2) Review the paragraphs between questions 7 and 8 on page 354 and page 355.

---

08 Core 10

Gives an explanation for the color change of an indicator.

The student generates an explanation for the behavior of an indicator.

Student Action: Responding that a substance which acts as an indicator changes color as the result of a chemical reaction with one of the reactants after all of the other reactant is used up.

Performance Check A: You have used Congo red indicator to tell when an antacid reactant is used up. How do indicators work? Why do they change color when they do?

Remediation: (1) Have the student put two drops of phenolphthalein into a beaker of water and then add sodium hydroxide (NaOH) solution. (2) Ask if a new substance was formed when the two solutions were mixed and how he could tell. Was a reaction involved? (3) Have the student review the top paragraph on page 242 which states when an indicator acts. (4) Then have the student review Activities 17-1 through 17-3 and identify why and when the indicator changed color.

---

08 Core 11

States that atoms of substances react in definite numbers.

The student applies the concept that atoms of substances react in definite numbers (ratios).

Student Action: Responding to the effect that when atoms of substances react, they do so in definite numbers.

Performance Check A: Karen measured the volume of sodium hydroxide (NaOH) needed to react with 1, 2, 4, 5, and 6 ml samples of vinegar, using phenolphthalein as the indicator. She then graphed the data and predicted how much NaOH would be needed to react with 8 ml of vinegar. Explain why Karen could make such a prediction.

Remediation: (1) Have the student read the first four paragraphs of page 241. (2) Have him review Tables 17-1 and 17-2 and tell why he could predict values in Table 17-2 from values in 17-1. (3) Review with him his responses to Self-Evaluations 17-2 and 17-3.

---

08 Core 12

States a reason for averaging repeated measurements.

The student applies the reasoning behind averaging repeated measurements to a particular example.

Student Action: Responding to the effect that repeating measurements and finding their average is a way of balancing unavoidable experimental errors of measurements which cause results to be too high or low.

Performance Check A: In Activity 17-3, you added sodium hydroxide (NaOH) to five different volumes of citric acid. Then you filled in the chart below. For each volume of citric acid used, you added NaOH until the phenolphthalein changed color. You repeated the process, using the same volume of citric acid. Then you averaged trials 1 and 2. Explain why doing the process twice and finding an average is better than doing it 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		

Remediation: (1) Check Tables 17-1 and 17-2 to be sure the student averaged his trial data. Have him explain why he did so. (2) If he can't explain why, ask him to identify which of each set of trials is most accurate and why. (3) When he is not able to give a logical reason, point out that the average falls in the center of his data and thus balances errors which gave data which are too high and data which are too low.

---

08 Core 13

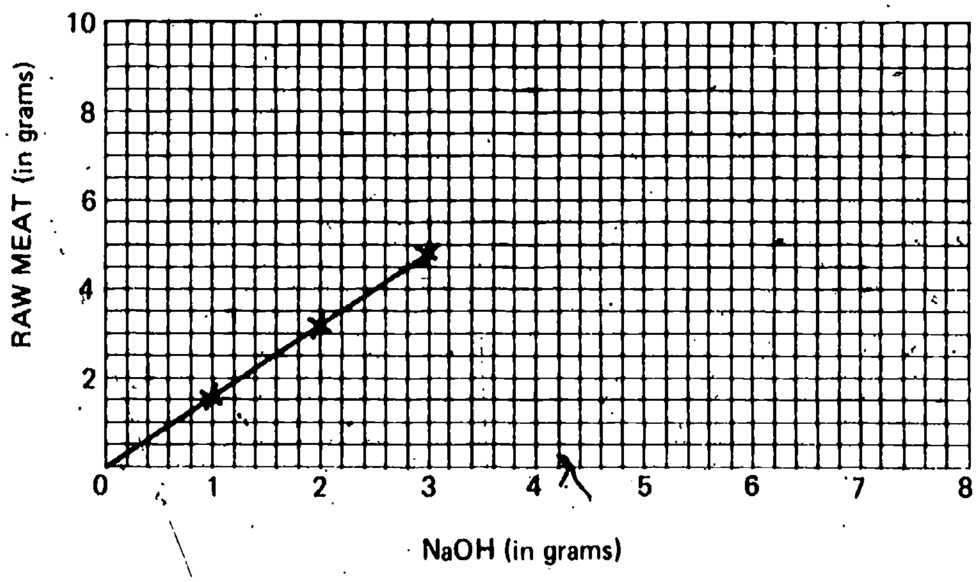
Shows extrapolation of a linear relationship.

The student applies the procedure of extending the curve of a graph and reading the value of the unknown coordinate corresponding to the value of the known coordinate.

Student Action: Stating a value which is within ±0.5 gram of the accepted value.

- **A:** 8 grams of meat
- **B:** 3 grams of NaOH
- **C:** 10 grams of fertilizer

Performance Check A: Kevin ran three trials of the reaction between raw meat and NaOH. He then drew the graph shown below. How many grams of meat will react with 5 g of NaOH?



Remediation: See steps 1 through 3 of the Remediation for 08-Core-14.

08

Extrapolates reactant amounts and selects the reason extrapolation can be done.

The student applies the procedure of graphic extrapolation and the concept that when two reactants combine, they do so in definite numbers.

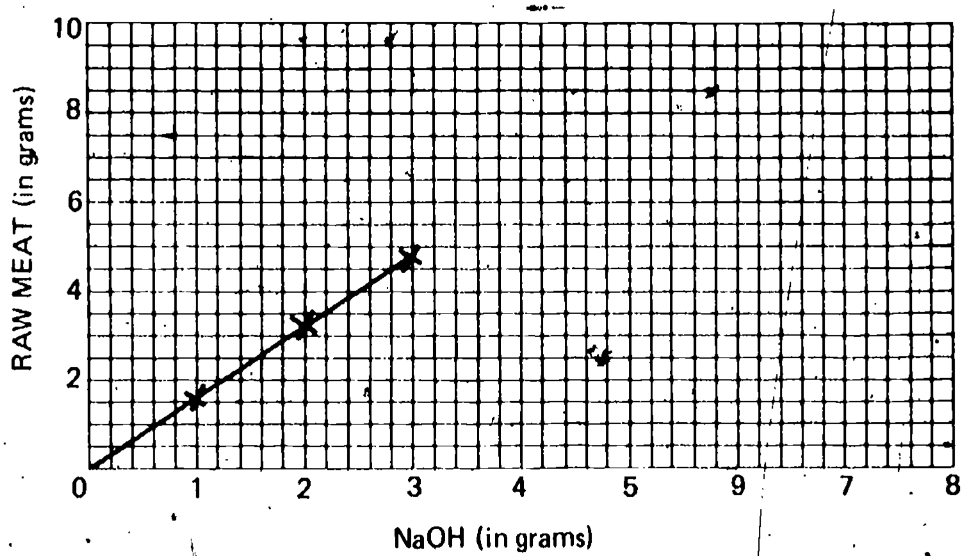
Core 14

Student Action: Stating the value of the unknown coordinate and selecting an option to the effect that when two reactants combine, they do so in definite numbers.

A: 1. 8 grams of raw meat, 2. b
B: 1. 3 grams of NaOH, 2. c
C: 1. 10 grams of fertilizer, 2. d

Performance Check A: John ran three trials of the reaction between raw meat and NaOH. His data are plotted on the grid below.

1. How many grams of meat will react with 5 g of NaOH?
2. The reason you can answer question 1 is that
   a. meat particles have special reactions.
   b. reactants always combine in definite numbers.
   c. you have worked with NaOH and meat before.
   d. the relationship between meat and NaOH changes only if more than 10 g of NaOH is used.



Remediation: (1) Review the procedure for finding one of the coordinate values when given the other, using points marked on the line of the graph. (2) Review the notion of line extension based on the concept that the relationship remains the same, and check his response to Self-Evaluation 17-1. (3) Have the student read page 247 as a caution about changing relationships. (4) Then, review with him the development of the concept that reactants always react in definite numbers, pages 126 and 127.

O8 Core 15

Neutralizes an acid with a base.

The student manipulates the materials to neutralize an acid with a base according to the procedure outlined.

Regular Supplies:

vinegar	graduated cylinder
Congo red	air piston
HCl (0.1M)	stirring rod
beakers or baby-food jars	dropper bottle

Special Preparations: Mix baking soda ($NaHCO_3$) and three different amounts of NaCl in the three jars labeled 08-Core-15 A, 08-Core-15 B, and 08-Core-15C. The NaCl is a soluble filler. Thus, the reaction would take less acid. You must perform the three neutralizations to establish an acceptable value.

Student Action: Reporting an average result of the neutralization of within ±2 ml of the value obtained by the teacher.

Performance Check A: You are to find out how much vinegar (acid) can be neutralized by 1 g of the powder in bottle 08-Core-15 A. 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.

Remediation: (1) Have the student review Activities 17-5 through 17-7 on pages 250 and 251 and identify what he did wrong. (2) Have him do an alternate performance check.

---

08 Exc 16-1 1

Relates the density of a substance to its quantity.

The student applies the concept of density.

Student Action: Responding that the density of a substance is unaltered by variations in its mass and volume because the density of any substance is independent of the amount of the substance present.

Performance Check A: John used 250 g (150 cc) of modeling clay to model a car. Then he added 50 g (30 cc) more. Notice that he increased the mass (g) and the volume (cc).

1. What does this do to the density of the clay?
2. Explain your answer.

Remediation: (1) Have the student review pages 524 through 526. (2) Have him explain to you the effect of adding more carbon rods (or iron bolts) on the mass, the volume, and the density. (3) Get him to verbalize why the density remains constant though the mass and the volume both change.

---

08 Exc 16-1 2

Measures and calculates density.

The student applies the concept that the density of a material is equal to its mass divided by its volume.

Regular Supplies: water, food coloring, graduated cylinder, 1 beaker or baby-food jar, 1 ISCS balance, 1 set of standard masses

Special Preparations: Prepare three 1 liter (1 quart) bottles of differently colored water and number them 08-Exc 16-1-2A, 08-Exc 16-1-2B, and 08-Exc 16-1-2C. You may wish to return the students' used solutions back to the bottle.

Student Action: Reporting the volume and mass of the water to within ±0.25 g/ml.

Performance Check A: Get 90 ml of the solution in bottle 08-Exc 16-1-2A. Find the density of the solution. Return the used solution to your teacher.

Remediation: (1) Be sure the student remembered to subtract the mass of the beaker. (2) Check his knowledge of the meaning of *density*. If it is weak, have him reread pages 527 and 528. (3) Have the student review Table 3 on page 526 and explain how he found the density of the carbon rods and bolts. (4) Have him explain what procedure he used. His volume and mass should be numerically equal.

---

08 Exc 16-1 3

Indicates the relationship between density and floating.

The student applies the relationship between densities and the buoyancy of objects in a given liquid.

Student Action: Selecting those substances with densities greater than that of the liquid as sinking and those substances with densities less than that of the liquid as floating.

A: 1. float, 2. sink, 3. sink, 4. float
B: 1. sink, 2. float, 3. float, 4. sink
C: 1. float, 2. sink, 3. sink, 4. float

Performance Check A: Dennis had a beaker full of mercury, whose density is 13.6 g/cc. He also had the four things shown in the table below. After the number of each thing, indicate whether or not it would float or sink in mercury.

MATERIAL	g/cc DENSITY
1. Penny	8.9
2. Tungsten wire	19.4
3. Gold	19.0
4. Iron ball	7.9

Remediation: (1) Check the student's knowledge of the meaning of the term *density*. Does it include the notion of amount/unit of volume? If not, have him review pages 527 and 528. (2) Have the student review "Density on Trial," pages 529 through 532, and check his answers to questions 26 through 30 with him to establish the notion that things less dense than the medium float and those more dense sink. (3) Check his graph and have him explain his answers to questions 32, 34, and 36. (4) Ask question 31 in terms of the check which the student did. (5) Have him do an alternate check.

O8 Exc 17-1 1

Predicts the effect of dilution on the neutralizing ability of an antacid.

The student applies the concept that it is the quantity of a reagent present that determines the quantity of other reagents it reacts with.

Student Action: Responding negatively and to the effect that no matter how it is diluted, the quantity of reagent is unchanged.

Performance Check A: In Activities 17-5 and 17-6, Dale 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 Dale used 20 ml of water in Activity 17-5, would this affect the amount of stomach acid that was neutralized?
2. Explain your answer.

Remediation: (1) Check the student's predictions in question 2 of this excursion and questions 5, 6, and 7. (2) Then, refer him to Figure 1 of this excursion and have him explain it. (3) If he still seems unsure, have him read the last paragraph on page 537 and all of page 538.

O8 Exc 17-2 1

Explains why a reaction stops.

The student applies the concept that reagents will react in definite numbers (ratios).

Student Action: Stating that a given amount of the reagent specified will react with a definite amount and no more of another reagent.

Performance Check A: Jack added vinegar to a solution of baking soda, and the reaction bubbled furiously. Then, suddenly, the reaction stopped, and no matter how much more vinegar he added, the bubbling would not start again. Explain why this happened.

Remediation: (1) Check the student's answers to question 2 on page 539. If he is correct, ask him to explain how he could tell. If he is incorrect, ask him to try this question again and then, if he is correct, to explain it. (2) Have him check Activities 7-3 and 7-4 and Table 7-5 and to tell you what the table tells him. (3) Ask him to explain why his graph in Activity 7-7 goes up at first and then has a flat horizontal line. (4) Have him review page 542.

Uses litmus paper to test solutions.

The student manipulates the materials and tests the solutions to determine if they are acids, bases, or neither.

08 Exc 17-3 1

Regular Supplies: 3 stirring rods
red litmus paper
blue litmus paper

Special Preparations: In box 08-Exc 17-3-1A place three numbered bottles, bottle 1 containing HCl (0.1M), bottle 2 containing NaOH (0.2M), and bottle 3 containing distilled water. In box 08-Exc 17-3-1B place three numbered bottles, bottle 1 containing NaOH (0.2M), bottle 2 containing distilled water, and bottle 3 containing HCl (0.1M). In box 08-Exc 17-3-1C place three numbered bottles, bottle 1 containing distilled water, bottle 2 containing HCl (0.1M), and bottle 3 containing NaOH (0.2M).

Student Action: Labeling the solution which turns red litmus to blue as a base, the one which turns blue litmus to red as an acid, and the one which produces no change as neither.

A: 1. acid, 2. base, 3. water
B: 1. base, 2. water, 3. acid
C: 1. water, 2. acid, 3. base

Performance Check A: Get the bottles from box 08-Exc 17-3-1A. 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.

Remediation: (1) Have the student review Activity 1 and subsequent questions 1 through 5. (2) Check his operational definition in response to question 5. (3) Have him review his response to the performance check and then do an alternate check.

Selects solutions which show the relationship between pH and H^+ ion concentration.

The student applies the concept that pH and H^+ ion concentration vary inversely.

08 Exc 17-3 2

Student Action: Selecting the solution with the lowest pH as having the highest H^+ ion concentration and as being the strongest acid.

A: 1. c, 2. c
B: 1. b, 2. b
C: 1. e, 2. e

Performance Check A: Jean used pH paper and found the pH of samples of acid solutions as shown in the chart.

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

SAMPLE LETTER	pH
a	6
b	3
c	2
d	4
e	5

Remediation: (1) If the student doesn't understand the relationship between pH and H^+ ion concentration, have him check the diagram at the bottom left of page 550. (2) Then have him order the substances in Table 2 from lowest to highest H^+ ion concentration.

---

08 Exc 17-3 3

Measures the strengths of acid and base solutions.

The student manipulates the solutions, the pH paper, and the pH scale to determine the strengths of acid and base solutions.

Regular Supplies: 5 clean glass stirring rods
pH paper
pH color scale

Special Preparations: Fill five bottles with the solutions listed below and label them with the appropriate letters.

- **A:** ¼ vinegar, ¾ water
- **B:** NaOH (1.0M)
- **C:** water
- **D:** ¼ household ammonia, ¾ water
- **E:** HCl (3.0M)

Put the bottles in box 08-Exc 17-3-3.

Student Action: Placing drops of the solution on the paper and comparing the resulting color spots with the color scale for the paper and reporting the solution whose spot is nearest to the red as most acid and the solution nearest to the blue as most basic.

A, B, and C: 1. E, 2. A, 3. C, 4. D, 5. B

Performance Check A: Get the lettered 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.

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

Remediation: Have the student explain how he got the answer to column 1 of Table 2, page 549, and from there, how he calculated his answers in column 2. If he has column 1 right but not 2, refer him to the top of page 550.

Chapters 18 and 19 | Performance Check

Excursions 18-1 thru 19-2 | Summary Table

Objective Number	Objective Description
09-Core-1	Measures length in centimeters.
09-Core-2	Sets up a chemical system as a battery and tests it
09-Core-3	Recognizes the form in which energy is stored in a battery
09-Core-4	Recognizes the nature and cause of the change as a solid is deposited on an electrode
09-Core-5	Tells whether or not new atoms are formed during a chemical reaction
09-Core-6	Lists observations that indicate a change in the chemical energy of a system
09-Core-7	Explains what happens to stored chemical energy as electricity is produced
09-Core-8	Describes discharging reactions
09-Core-9	Tells what changes occur while a battery is charging and while it is discharging
09-Core-10	Relates a chemical reaction to the flow of electricity
09-Core-11	States the forms of energy involved when a battery is charging, discharging, and storing energy
09-Core-12	Judges the condition of a chemical system after it has been producing electricity
09-Core-13	Recognizes examples of *work* as defined operationally
09-Core-14	Explains the difference between input energy and output energy
09-Core-15	Recognizes where energy is stored in a reaction that releases heat
09-Core-16	Decides what happens to energy during the dissolving process
09-Core-17	Recognizes the effect of dissolving on the amount of energy in a closed system

			Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
			M			Q		√				manipulates	
			M			—	T					manipulates	
						Q						recalls	
						Q		√				classifies	
								√				applies	
								√				applies	
								√				applies	
						Q						applies	
								√				applies	
								√				applies	
						Q						classifies	
								√				applies	
						Q		√				classifies	
								√				applies	
								√				applies	
						Q		√				applies	
						Q		√				applies	

Objective Number	Objective Description
09-Core-18	Tests for and explains whether or not a reaction has occurred
09-Core-19	States the cause of a temperature increase as two solutions are combined
09-Core-20	Explains the temperature drop that occurs when some solids dissolve
09-Core-21	Recognizes what is required to release energy from a compound
09-Core-22	Tells what causes a substance to release its chemical energy
09-Core-23	Mixes dangerous liquids
09-Core-24	States what to do if chemicals are spilled on someone
09-Exc 18-1-1	Explains why a battery must be charged
09-Exc 18-2-1	Tells how to determine where zinc goes in a Zn-$K_2Cr_2O_7$ cell
09-Exc 19-1-1	Gives examples of specified energy conversions
09-Exc 19-2-1	Recognizes whether a reaction is endothermic or exothermic
09-Exc 19-2-2	Explains the energy processes involved in dissolving an ionic solid
01-Core-24 thru 28R	(Student's responsibilities)
03-Core-25R	States what happens to atoms in a chemical reaction
05-Core-1R	States the purpose of a control in an experiment
05-Core-3R	States how reversing battery connections affects ion flow
05-Core-16R	Names the force holding matter together

	Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
	M		P		T	√				applies	
						√				classifies	
						√				applies	
				Q		√				applies	
						√				applies	
	M	O	P	Q	T	√				chooses	
						√				recalls	
										applies	
									√	generates	
						√				classifies	
				Q						applies	
										applies	
		O				√				chooses	
						√				applies	
						√				applies	
						√				applies	
				Q		√				applies	

09 Core 1

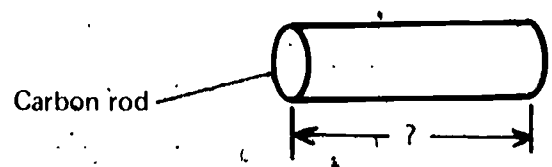
Measures length in centimeters.

The student manipulates a metric ruler to measure a length in centimeters.

Regular Supplies: metric ruler

Student Action: Reporting the length of the pictured object to within ±0.1 cm.
- **A:** 2.8 cm
- **B:** 3.7 cm
- **C:** 3.2 cm

Performance Check A: Below is a diagram of a carbon rod. Use a metric ruler to measure its length correctly to the nearest 0.1 cm.



Remediation: (1) If you have an ISCS Level I text, refer the student to Excursion 1. (2) Show the student that millimeters are tenths of centimeters, and have him measure some common objects for you.

09 Core 2

Sets up a chemical system as a battery and tests it.

The student manipulates the materials listed to set up a chemical system as a battery and determines if the chemical system produces electricity.

Regular Supplies:

1 50-ml beaker	1 lead strip
1 copper strip	25 ml vinegar
20 ml HCl (0.1M)	1 carbon rod
1 voltmeter	2 test leads
1 zinc strip	20 ml $K_2Cr_2O_7$ solution

Student Action: Responding that his chemical system produces electricity and to the effect that the movement of the needle of the voltmeter is evidence of it.

Performance Check A: Get the following supplies and equipment from the supply area.

1 50-ml beaker	20 ml HCl (0.1M)
1 strip of zinc	2 test leads
1 strip of copper	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?

Remediation: (1) Have the student compare his circuit with the circuits shown in Activity 18-4 or Activity 18-6 on page 257 and page 259. (2) Have him review Self-Evaluation 18-8. (3) Have him connect a charged and an uncharged battery to his voltmeter. Ask him in which case there was a flow of electricity and how he could tell.

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09 Core 3

Recognizes the form in which energy is stored in a battery.

The student recalls that electrical energy is stored in a battery as chemical energy.

Student Action: Selecting "chemical."

A: c
B: b
C: d

Performance Check A: Select the letter of the correct answer. Once a battery has been charged, in what form is the energy stored in the battery?

a. Electrical
b. Sound
c. Chemical
d. Mechanical
e. Heat

Remediation: Have the student reread pages 262 and 263 and revise his answer to this check.

---

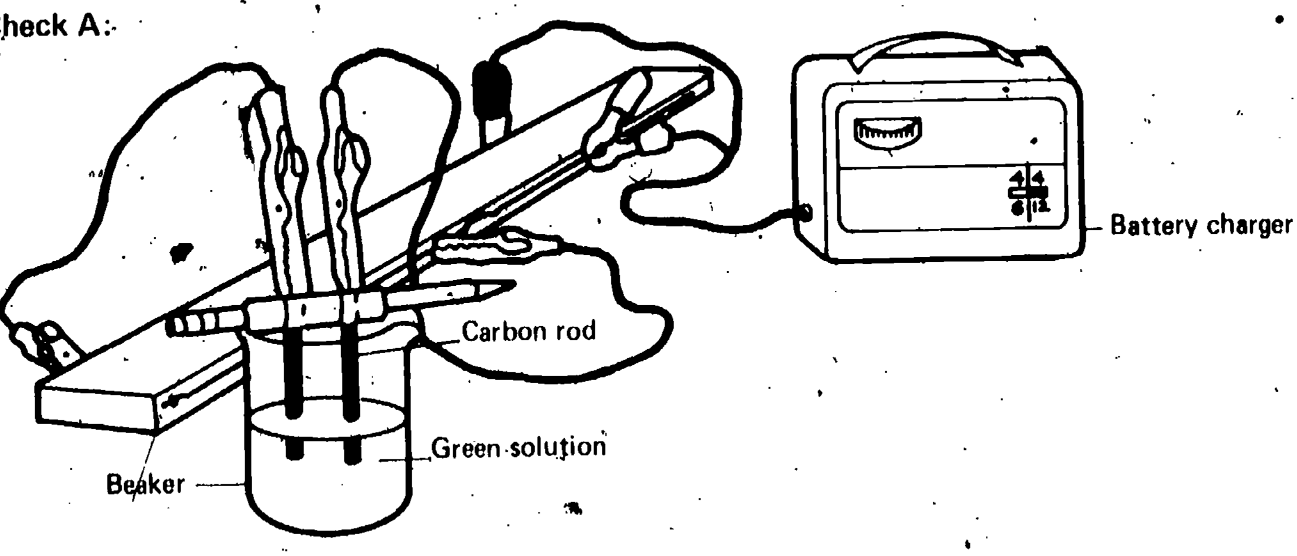
09 Core 4

Recognizes the nature and cause of the change as a solid is deposited on an electrode.

The student classifies the nature and cause of color changes in a system and the simultaneous formation within that system of a solid coating onto the electrodes.

Student Action: Stating that (1) the change is a chemical change and (2) electrical energy is its cause.

Performance Check A:



Monty put together the equipment as pictured above. Before he connected it to the battery charger, he let it sit for five minutes. He noted that both carbon rods were black and the solution was deep green. After the system had been connected for four minutes, he noticed that one of the rods had become light gray and the solution was much lighter.

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

Remediation: (1) If the student does not know the indicators of a chemical reaction, refer him to Excursion 6-2, page 415. (2) Have the student review Activity 18-10 on page 262 and questions 18-17 and 18-18.

O9 Core 5

Tells whether or not new atoms are formed during a chemical reaction.

The student applies the concept that in a chemical reaction; the atoms of the reactants are recombined into the products.

Student Action: Responding negatively and that in a reaction, atoms of the reactants are being recombined into different combinations (compounds) which have different properties.

Performance Check A: In Activity 18-3, you put two silver-gray lead strips into a beaker of colorless sodium sulfate (Na_2SO_4) solution. Then you passed an electrical current through the system and a brown material and a gray-white material formed. The reactant materials were different from the product materials.

1. Were new particles (atoms) formed?
2. If so, name them. If not, explain how the brown stuff came into being although the reactants were so different from it.

Remediation: (1) Does the student know the indications of a chemical reaction? If not, have him review Excursion 6-2. (2) If he does not understand that no new particles (atoms) are produced in a chemical reaction, have him review Chapter 6, pages 75 through 77, and page 82. (3) Have him review his answer to the check and revise it.

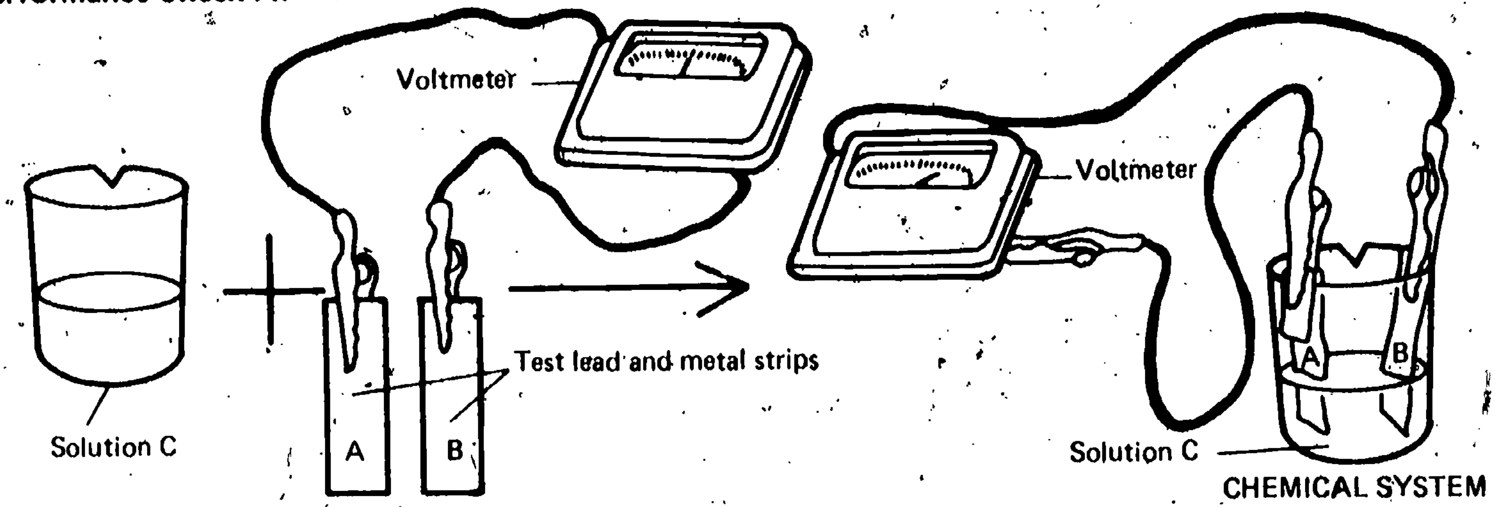
O9 Core 6

Lists observations that indicate a change in the chemical energy of a system.

The student applies the concept of the operational definition of a chemical reaction and the rule that the chemical energy of a chemical system can be changed only if it undergoes a chemical reaction.

Student Action: Listing at least three of the following: (1) a new solid is produced, (2) a gas is produced, (3) the temperature changes, (4) the color changes, and (5) a flow of electricity is produced.

Performance Check A:



List five things you could observe which would indicate that a change is taking place in the chemical energy of a system like the one diagramed above. (Hint: Some of the observations you could make would require additional ISCS equipment.)

Remediation: (1) Have the student review (a) the paragraph at the bottom of page 263, (b) the top paragraph on page 422, and (c) the paragraph at the bottom of page 113. (2) If time permits, you may wish to have the student do Excursion 6-2.

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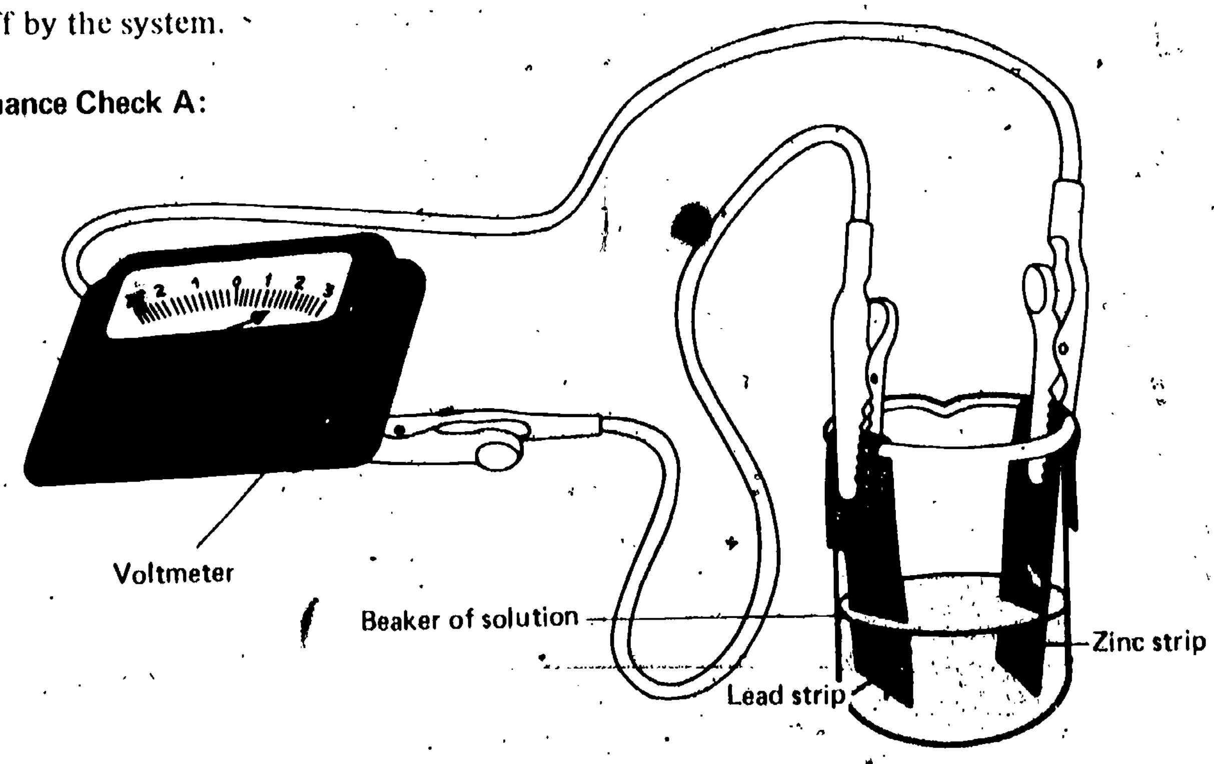
09 Core 7

Explains what happens to stored chemical energy as electricity is produced.

The student applies the concepts of conservation of energy to the energy conversion of a battery.

Student Action: Responding that the chemical energy decreased or that it was converted to electrical energy and to the effect that no energy was lost because energy can be neither created nor destroyed, but only converted from one form to another. Sophisticated students may correctly argue that a small amount of heat energy is given off by the system.

Performance Check A:



Linda put two different metal strips into a solution and connected them to a voltmeter, as shown in the diagram. The meter showed that electrical energy was being produced.

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.

Remediation: (1) If the student is hazy about energy conversions, have him review the paragraph in the middle of page 260 and that at the bottom of page 263. (2) In each case, have him verbalize the chemical systems before and after and the energy changes involved. (3) For the conversion concept, have the student do Excursion 19-1.

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09 Core 8

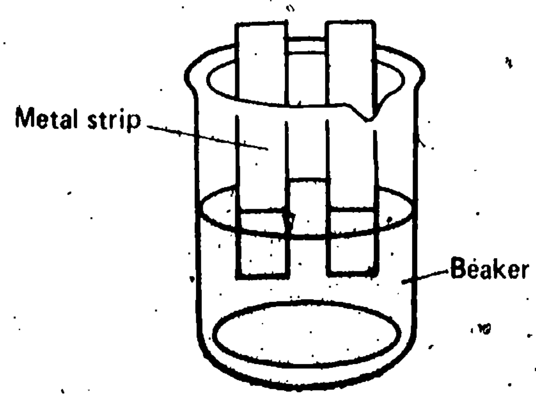
Describes discharging reactions.

The student applies the concept that discharging reactions in a rechargeable battery are the reverse of the charging reactions.

Student Action: Describing changes which are the reverse of the charging reactions.

A: 1. Solution becomes greenish, 2. strips turned to a gray color
B: 1. Solution becomes orange, 2. rods turned to a silvery color
C: 1. Solution becomes purple, 2. rods turn to a silvery metal

Performance Check A: Don put two strips of the same gray metal into a light green solution. He charged the system on the charger. One of the strips turned red-brown and the other turned greenish. The solution became colorless. He disconnected the system from the charger. Then he connected the strips to a motor, and the motor started. Describe the visible changes that would occur in the beaker as the motor continued to run.



Remediation: (1) Have the student check activities 18-10 through 18-13 and the subsequent paragraph on pages 262 and 263. (2) Have him revise his answer.

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09 Core

Tells what changes occur while a battery is charging and while it is discharging.

The student applies the concept that chemical reactions are involved in both the charging and discharging of a battery.

Student Action: Responding that chemical reactions (changes) occur during charging and discharging.

Performance Check A: Bob has a radio which contains several rechargeable batteries. Occasionally the batteries must be recharged. Name the process which describes the changes involving the particles inside a battery when it is charged or discharged.

Remediation: (1) Have the student review items 1 and 2 at top of page 264 and Self-Evaluation 18-4. (2) Have him find an example of items 1 and 2 in the text.

9

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09 Core 10

Relates a chemical reaction to the flow of electricity.

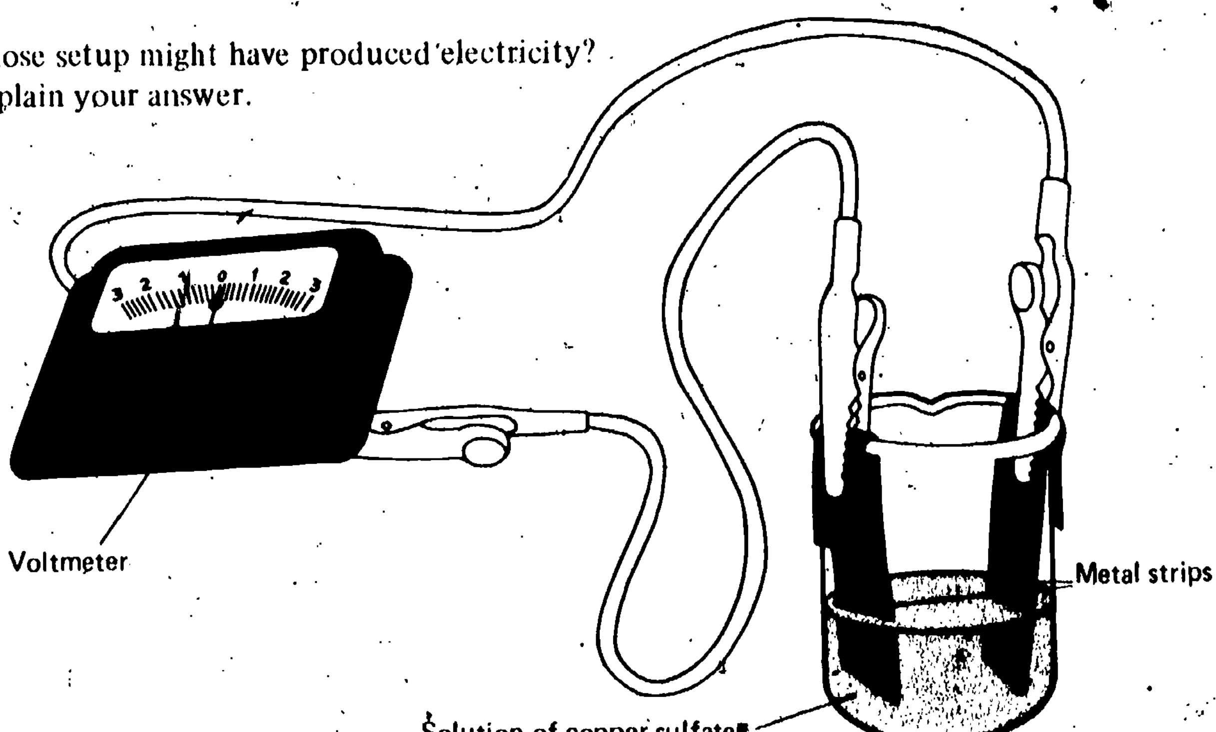
The student applies the concept that there is a direct relationship between the production of electricity and a chemical reaction in a battery.

Student Action: Stating that electricity might be produced if a chemical reaction occurs, whereas if no chemical reaction occurs, then no electricity is produced.

A: Sam's
B: Gene's
C: Pete's

Performance Check A: George put two nickel strips into a solution of copper sulfate. He observed no changes in the system. Sam put a copper and a magnesium strip into a copper sulfate solution. He observed changes in the color of the solution and the size of the magnesium strip. The systems were connected to the meter as shown below.

1. Whose setup might have produced electricity?
2. Explain your answer.



Remediation: (1) Have the student review Activities 18-5 through 18-7 and the related questions. (2) Have him read page 264, and Self-Evaluations 18-3, 18-5, and 18-6. (3) Have him try again to do the performance check and identify which person in the check used a system most like the lead-Na_2SO_4 system. (4) If the student's explanation focuses on just the physical changes, discuss the relationship of the physical changes to a chemical reaction.

09 Core 11

States the forms of energy involved when a battery is charging, discharging, and storing energy.

The student classifies (1) the form of energy used to charge a battery, (2) the form of energy in a charged battery, and (3) the form of energy released from it.

Student Action: Responding that the energy used in charging the battery is electrical, the energy in a charged battery is chemical (or potential), and the energy released from the battery is electrical.

Performance Check A: Mr. Jones is having his auto battery recharged, using a charger which is very much like Iggy's.

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

Remediation: (1) Have the student review pages 262 through 264 and page 277. (2) Then have him redo the performance check with you. (3) Questions 1 and 3 are best answered in the last paragraph on page 263. Question 2 is best answered on page 277.

09 Core 12

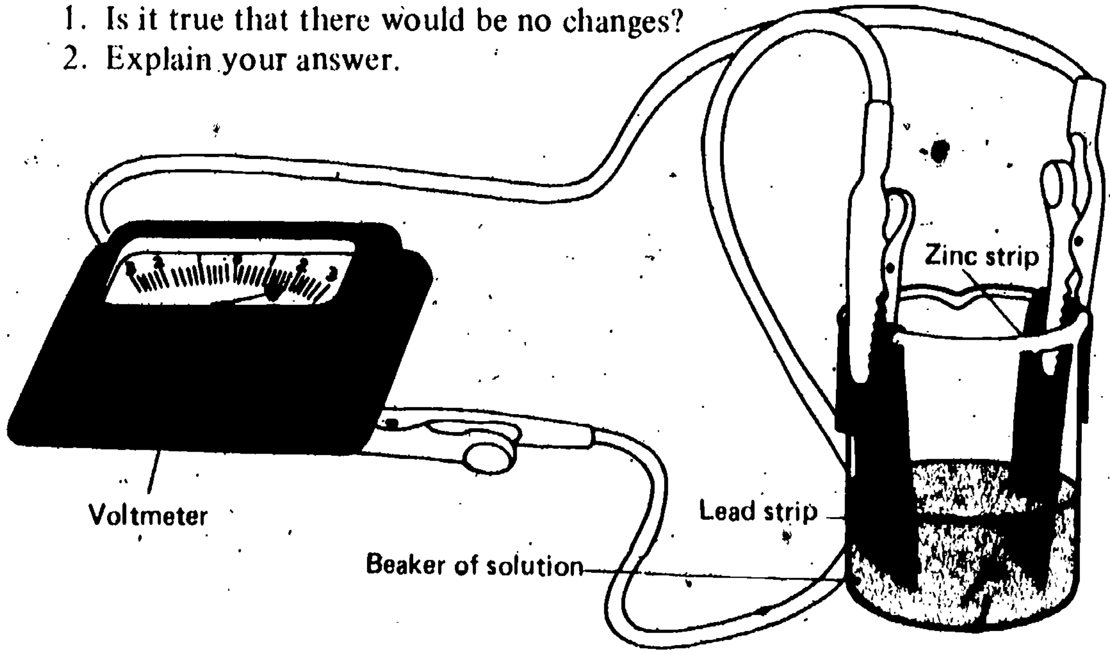
Judges the condition of a chemical system after it has been producing electricity.

The student applies the rule that the production of electricity from chemical systems implies the presence of chemical reactions.

Student Action: Responding negatively and in effect that a (chemical) reaction takes place as a chemical system produces electricity.

Performance Check A: Kevin set up the chemical system shown below. He observed the system producing electricity for half an hour. He then studied the chemical system and reported that absolutely no changes had occurred in the system.

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



Remediation: (1) Have the student explain his answer. Probe for what he thinks is the source of the electricity. (2) Review pages 258 through 260 and page 264. (3) If the student lists a series of physical changes as his explanation, discuss the relationship of such physical changes to the chemical reaction which released the electrical energy.

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09 Core 13

Recognizes examples of *work* as defined operationally.

The student classifies examples as involving or not involving *work* as defined operationally by scientists.

Student Action: Selecting examples which involve a force applied over a distance.

A: b, c, d
B: a, b, d
C: a, d, e

Performance Check A: Iggy has operationally defined *work*. Write on your answer sheet the letters of any of the items below which fit his definition.

a. Thinking about the answers to this check
b. Dissolving a solid in a liquid
c. Recombining particles in a chemical reaction
d. Pushing a book across the desk
e. Pushing against a solid wall

Remediation: (1) Have the student review the Checkup on page 267. (2) Have him review Excursion 19-1. After he has stated the operational definition of *work* for you, have him redo the performance check. (3) If he fails to classify dissolving as work, have him review Figure 19-2, page 273. (4) Should the concept of forces holding particles together trouble the student, it is stated in the bottom paragraph of page 276.

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09 Core 14

Explains the difference between input energy and output energy.

The student applies the concepts that energy can be converted from one form to another but is never destroyed.

Student Action: Responding negatively and in effect that since energy is not destroyed, some energy must have been changed into another form.

Performance Check A: Roy took his go-cart battery to the garage to get it charged. He found out from the mechanic that it took more electrical energy to charge the battery than he could get back from it.

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

Remediation: (1) Have the student review the Checkup on page 267 and Excursion 19-1 and Self-Evaluation 18-2. (2) Ask him to suggest what other form the energy could take. If he cannot answer, tell him that the temperature of the liquid in the battery goes up.

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09 Core 15

Recognizes where energy is stored in a reaction that releases heat.

The student applies the concepts of energy conservation and conversion.

Student Action: Selecting "greater than" and explaining that the energy released as heat had been stored as chemical energy in the reactants.

Performance Check A: Consider the following reaction.

REACTANTS | PRODUCTS

lye + hydrochloric acid → salt + water + heat energy released

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

Remediation: (1) Check the student's answers to questions 3 and 4 of the Checkup on page 267. If need be, have him do Excursion 19-1. (2) Help him to see the chain of reasoning that the sum of the heat energy and the chemical energy of the products is equal to the chemical energy of the reactants and that therefore the chemical energy of the products is less than the reactants.

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09 Core 16

Decides what happens to energy during the dissolving process.

The student applies the concepts of the conservation of energy.

Student Action: Selecting the option to the effect that the energy has changed form.

A: c
B: b
C: a

Performance Check A: Roy 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 used up and no longer existed.
b. The energy in the system had been destroyed.
c. The energy in the system had been changed into another form.
d. Both a and c are correct.
e. Both a and b are correct.

Remediation: (1) Refer the student to Excursion 19-1 and Self-Evaluation 18-2. (2) Then refer him to the paragraph at the top of page 273.

Recognizes the effect of dissolving on the amount of energy in a closed system.

09 Core 17

The student applies the concept that energy can be converted from one form to another.

Student Action: Selecting the option which indicates that there is no change in the amount of energy present.

A, B, and C: Equal to

Performance Check A: In an insulated Styrofoam cup, John dissolved 10 g of potassium nitrate 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 30 grams of matter after dissolving.

Remediation: (1) Find out if the student grasps the fact that the insulated cup stops energy from flowing in or out. (2) Have the student reread page 273. Ask if the test tubes and their contents could be considered as a system, the water as one subsystem, and the other chemicals as another subsystem. See page 108. (3) Check to see if he understands the notion that if one subsystem of a system loses energy to another subsystem of the system, the net result in the system is no change of energy.

Tests for and explains whether or not a reaction has occurred.

09 Core 18

The student applies the concepts that when two substances are mixed and a color change is observed, a reaction has occurred and that a rise in temperature indicates a combining of particles.

Regular Supplies: test tubes, water, 1 plastic spoon, 1 dropper

Special Preparations: Make anhydrous $CuSO_4$ by heating blue $CuSO_4$ until it turns white. Store it in a screw-cap jar labeled 09-Core-18.

Student Action: Responding (1) affirmatively, (2) that the particles combined, and (3) that he knows because the temperature increased.

Performance Check A: Get the white copper sulfate in jar 09-Core-18. Put enough of it into a test tube to cover the bottom. Hold the test tube so you can feel the bottom, and add 10 drops of water slowly.

1. Did a chemical reaction occur?
2. Did the particles combine or did they separate?
3. How can you tell?

Remediation: (1) Refer the student to the bottom half of page 273 for a capsule summary. (2) Refer him to Excursion 19-2 for an investigation of energy exchange in an endothermic reaction. (3) If the student is unsure of how to tell if a reaction has occurred, refer him to Excursion 6-2.

09 Core 19

States the cause of a temperature increase as two solutions are combined.

The student classifies the combining of particles as releasing energy.

Student Action: Stating that in a solution the combining of particles to form a solid releases energy and is the cause of the temperature change.

Performance Check A: Rhonda had a beaker of barium chloride solution and a beaker of sulfuric acid. Both solutions had a temperature of 28°C. When she mixed them, a white solid formed and the temperature rose to 30°C. According to the particle model, what caused the temperature increase?

Remediation: (1) Have the student review pages 275 through 277 and Self-Evaluation 19-2. (2) Check Table 19-3 and be sure he showed an increase in both cases. (3) Have him do Excursion 19-2, Part A.

09 Core 20

Explains the temperature drop that occurs when some solids dissolve.

The student applies the concept that energy must be expended to overcome the force of electrical attraction between particles in a solid when the solid dissolves.

Student Action: Stating that when a solid dissolves, energy is needed to overcome the electrical attraction between the particles of the solid.

Performance Check A: John dissolves some solid salt (NaCl) in water, and the temperature of the water drops 3°C. According to your particle model, what causes a temperature drop to occur when the NaCl dissolves?

Remediation: (1) Check the student's Table 19-1. Be sure that both lines show a negative change in temperature. (2) Have the student do or review Excursion 19-2, Part A. (3) Have the student review pages 271, 273, 276, and 277 and Self-Evaluation 19-1.

09 Core 21

Recognizes what is required to release energy from a compound.

The student applies the concept that a chemical reaction is required if the stored chemical energy of a compound is to be converted into another form of energy.

Student Action: Selecting the choice which involves the concept of a chemical reaction.

A: c
B: b
C: c

Performance Check A: A 10 g mass of calcium chloride contains 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.

a. The 10 g mass can be powdered.
b. The 10 g mass can be vaporized.
c. The 10 g mass can be reacted to form a different substance.
d. None of the above are correct.
e. All of the above are correct.

Remediation: (1) Have the student read the last paragraph on page 277. (2) Have him review Chapter 8 and tell you when in that chapter chemical energy was released as heat energy. (3) Have him do Part B of Excursion 19-2.

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09 Core 22

Tells what causes a substance to release its chemical energy.

The student applies the concept that the stored chemical energy of a particular mass of matter can be changed during a chemical reaction.

Student Action: Responding in effect that the chemical energy of a compound is changed when it undergoes a chemical reaction (change).

Performance Check A: ATP is a compound found in your body. It contains a great deal of chemical energy. What causes ATP or any compound to give up its chemical energy?

Remediation: See the Remediation for objective 09-Core-19.

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09 Core 23

Mixes dangerous liquids.

The student chooses to protect his eyes when mixing dangerous liquids.

Regular Supplies: Safety glasses

Special Preparations: The two jars contain substitute solutions – plain water in place of the sulfuric acid and water tinted pink with red food coloring in place of pink Winkler solution. Label the two jars "Sulfuric Acid 09-Core-23" and "Winkler Solution 09-Core-23," respectively, and put them in a box labeled 09-Core-23.

Student Action: Putting on safety glasses before mixing the reactants.

Performance Check A: In the next chapter, you will be using two dangerous liquids – Winkler solution and concentrated sulfuric acid. Assume the two jars found in box 09-Core-23 contain these two liquids. Gather the materials necessary to mix 5 drops of the acid with 10 ml of Winkler solution. Ask your teacher to observe you. Mix the liquids and report your observations.

Remediation: The student may choose to use the glasses for a variety of reasons: you, the administrator, or state laws may require their use, or the student may see a need for them for his own reasons. Remind him of any notices you may have given about wearing safety glasses. Page T 34 of the Teacher's Edition of the text has a list of safety rules that might well be displayed. It could be that the student has forgotten the safety glasses or is careless about wearing them. Point these things out now.

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09 Core 24

States what to do if chemicals are spilled on someone.

The student recalls the procedures to follow when a dangerous or an unknown chemical has been spilled on a person.

Student Action: Stating at least two of the following procedures: (1) rinse the area with plenty of water, (2) call the teacher, and (3) show or tell the teacher what the chemical was, if possible.

Performance Check A: In the next chapter you will be working with Winkler solutions and concentrated sulfuric acid. These are very dangerous chemicals. List three things that should be done if one of these solutions is spilled on someone.

Remediation: Refer the student to the safety notes on pages 4 and 14 of the text and to any special notices that you have placed in the room. Part E of the front matter in the Teacher's Edition of *Probing the Natural World/2* has many notes and suggestions related to safety. Many states require a review of safety procedures with your students. Whether this is a law in your state or not, it is a sensible practice.

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09 Exc 18-1 1

Explains why a battery must be charged.

The student applies the concept of energy input and output to a battery system.

Student Action: Responding that energy must be put into a system before energy can be obtained from it.

Performance Check A: In Excursion 18-1, you were to assemble a lead chemical cell. After it was assembled, it couldn't give off electrical energy to light the bulb. It had to be charged first. Why didn't the system give off energy until it was charged?

Remediation: (1) Have the student review pages 256 through 258. Emphasize the input energy. (2) Have him review Self-Evaluation 18-4. (3) If the student is confused by the Zn-$K_2Cr_2O_7$ system (page 259), remind him that such systems have energy already stored in them and that once they have released all that stored chemical energy as electrical energy, they have to be recharged or replaced.

09

Tells how to determine where zinc goes in a Zn-$K_2Cr_2O_7$ cell.

The student generates a procedure for identifying where the zinc which disappears from the zinc strip in a chemical cell goes.

Student Action: Designing a procedure in Excursion 18-2 and successfully defending or modifying it.

Teacher's Note: Carrying out the procedure successfully is not a criterion for this objective.

See page 562 in the Teacher's Edition of the Level II textbook for help in discussing the student's plans with him.

Performance Check A: 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.

Remediation: (1) Have the student check Table 8-4, page 125, and hypothesize what happens to the solid zinc in the test tube. (2) Have him state what happens to the mass of the solid zinc. (3) Have him do Excursion 8-2 to see that the zinc is in solution after the reaction and this accounts for its disappearing as a solid. (4) Since he can't evaporate the solution because of its corrosive nature, remind him to check other variables in the situation that change, such as color and texture. Let him identify the operant variable.

Exc 18-2 1

Gives examples of specified energy conversions.

The student applies the concept of energy conversion to everyday situations.

Student Action: Stating examples for four of the six conversions in which the specified energy conversion occurs, correctly in at least three of the four cases.

Performance Check A: Below is a list of energy conversions. Choose any 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 sound
2. Electrical to chemical
3. Electrical to mechanical (motion)
4. Chemical to light
5. Chemical to electrical
6. Motion energy to heat

Remediation: (1) Review the excursion. (2) Cite examples of each of the energy conversions on page 277.

O9 Exc 19-1 1

Recognizes whether a reaction is endothermic or exothermic.

The student classifies reactions as being either endothermic or exothermic.

Student Action: Stating that those reactions in which the temperature drops are endothermic and that those in which the temperature rises are exothermic.

A: 1. exothermic, 2. endothermic, 3. endothermic, 4. exothermic
B: 1. endothermic, 2. exothermic, 3. endothermic, 4. exothermic
C: 1. endothermic, 2. exothermic, 3. exothermic, 4. endothermic

O9 Exc 19-2

1

Performance Check A: Kathy 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	KOH	22	28
2	NaCl	24	23
3	$NaNO_3$	23	21
4	LiCl	25	27

Remediation: (1) Have the student reread the top paragraph on page 570 and the last paragraph on page 572. (2) Have him correct his answer and do an alternate performance check for this objective.

O9
Exc
19-2
2

Explains the energy processes involved in dissolving an ionic solid.

The student applies the concepts of opposing energy processes involved in dissolving ionic solids with a corresponding temperature change in the water.

Student Action: Stating that the breaking apart of ions is an endothermic process; that their combining with water molecules is an exothermic process; that if the endothermic process is greater, the solution temperature drops, and that if the exothermic reaction is greater, the temperature rises.

A: 2. The endothermic process is greater.
B: 2. The exothermic process is greater.
C: 2. The endothermic process is greater.

Performance Check A: When a solid like NH_4Cl, which is made up of ions, dissolves in water, two processes occur which involve energy.

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

Remediation: (1) Review Part A of Excursion 19-2. (2) Review pages 267 through 270 and the top of page 273. (3) Have the student explain in his own words the temperature drop on page 270.

Chapters 20 and 21 — Performance Check

Excursions 21-1 and 21-2 — Summary Table

Objective Number	Objective Description
10-Core-1	Selects the correct procedure for preparing glassware for keeping fish
10-Core-2	Describes the procedure for determining the amount of oxygen in a sample
10-Core-3	Tells what information is needed to write an operational definition
10-Core-4	Gives an operational definition for *dissolved oxygen*
10-Core-5	Explains why lids are to be kept on jars when studying ICR's
10-Core-6	Names and explains the function of a sample not subjected to the experimental variable
10-Core-7	States the change with time in reactant-product levels
10-Core-8	Recognizes the nature of solutions
10-Core-9	Uses the relationship between increasing concentration of organisms and reaction rate
10-Core-10	Proposes a reason that fish should be subjected to gradual temperature changes
10-Core-11	Describes the relationship between reaction rates and temperature
10-Core-12	Selects evidences that chemical reactions occur in living things
10-Core-13	States the effect the source has on a chemical substance
10-Core-14	Predicts what will happen to the reactants in a chemical reaction
10-Core-15	States whether reactants can react in other than definite numbers
10-Core-16	Recognizes what happens to particles of reactants in a chemical reaction
10-Core-17	Selects the relationship between experimental results and scientific models or conclusions
10-Core-18	Recognizes the source of the heat that keeps the human body temperature constant

	Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
						√				applies	
										applies	
						√				recalls	
						√				applies	
										generates	
						√				applies	
						√				applies	
						√				applies	
						√				applies	
										generates	
						√				applies	
				Q		√				classifies	
						√				applies	
						√				applies	
						√				applies	
						√				applies	
						√				applies	
						√				generates	

Objective Number	Objective Description
10-Exc 21-1-1	Recognizes burning as a test for oxygen
10-Exc 21-2-1	Plots points, draws a best-fit line, and reads a graph
01-Core-24 thru 28R	(Student's responsibilities)
04-Core-13R	Selects the characteristics of scientific models
04-Core-14R	Recognizes the limitations of model acceptance
04-Core-29R	Explains the relationship between the elements in the reactants and the products
07-Core-8R	States the effect of concentration on reaction rate
07-Core-13R	Explains the effect of temperature increase on reaction rate
09-Core-5R	Tells whether or not new atoms are formed during a chemical reaction
09-Core-6R	Lists observations that indicate a change in the chemical energy of a system
09-Core-23R	Mixes dangerous liquids
09-Core-24R	States what to do if chemicals are spilled on someone

	Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
										applies	
			P		T					applies	
		O				√				chooses	
				Q		√				recalls	
				Q		√				applies	
						√				applies	
				Q		√				applies	
						√				applies	
						√				applies	
						√				applies	
	M	O	P	Q	T	√				chooses	
						√				recalls	

10 Core 1

Selects the correct procedure for preparing glassware for keeping fish.

The student applies the concept of the proper way to clean glassware in which fish are to be put.

Student Action: Selecting the procedure stating that the glassware is washed with tap water and then with distilled water and explaining that the other procedures may leave contamination.

A: Ed
B: Larry
C: Tony

Performance Check A: Preparing for their experiments with ICR's and yeast beasts, three students did the following:

John washed all his glassware with soapy water. He did not rinse them, but he dried them carefully with paper towels.

Sam used the glassware right off the shelf.

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

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

Remediation: Refer the student to the Safety Note on page 285.

10 Core 2

Describes the procedure for determining the amount of oxygen in a sample.

The student applies the procedure that the relative amounts of oxygen in several samples of water are determined by comparing the total number of drops of $Na_2S_2O_3$ used in the Winkler test.

Student Action: Stating that he would keep track of the number of drops of $Na_2S_2O_3$ added to each sample and that the sample which required the most $Na_2S_2O_3$ to remove the color would contain the most dissolved oxygen.

Performance Check A: Suppose you were given three water samples and were asked which sample contained the most dissolved oxygen. You would add Winkler solutions #1 and #2, starch, H_2SO_4, and $Na_2S_2O_3$.

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

Remediation: (1) Have the student turn to Chapters 20 and 21 to find out what data he collected in order to determine the relative amounts of oxygen in different water samples. (2) Have him review Self-Evaluations 20-2, 20-4, and 20-11. (3) should he not be able to revise his response to the check after doing steps (1) and (2), refer him to question 20-12 and the three subsequent paragraphs.

Tells what information is needed to write an operational definition.

10 Core 3

The student recalls the definition of *operational definition.*

Student Action: Stating that it is necessary to know how to detect oxygen to be able to write an operational definition for *oxygen.*

Performance Check A: You have been studying reactions involving oxygen. What would you need to know about a substance like oxygen to write an operational definition for it?

Remediation: Have the student review the first three paragraphs on page 31.

Gives an operational definition for *dissolved oxygen.*

10 Core 4

The student applies the concept of an operational definition and that dissolved oxygen is detected in a solution by the Winkler test.

Student Action: Responding with an operational definition that includes the proper use of the following substances – Winkler solutions #1 and #2, H_2SO_4, starch, and $Na_2S_2O_3$ – to detect dissolved oxygen. The student may include the notion of keeping track of the amount of $Na_2S_2O_3$ used.

Performance Check A: Open your book to Chapter 20 and use it to help you write an operational definition for *dissolved oxygen.*

Remediation: (1) Check the student's knowledge of what an operational definition is. If he is unsure, have him review the first three paragraphs on page 31 and try again. (2) If he still has difficulty, refer him to pages 282 through 285, and explain to him how the Winkler test fits the definition of an operational definition for *dissolved oxygen.* (3) Review with the student his response and the model response to Self-Evaluation 20-2.

Explains why lids are to be kept on jars when studying ICR's.

10 Core 5

The student generates an explanation for putting lids onto the jars in which those reactions were run that used up oxygen (O_2) and released carbon dioxide (CO_2).

Student Action: Stating that the lids were put onto jars to insure that the variables – the amounts of O_2 or CO_2 – were altered only by the reactions in the fish and not by gas transferred into or from the water.

Performance Check A: In Chapters 20 and 21, you studied ICR's and their reaction with oxygen to produce carbon dioxide. In each activity you were told to use jars, and to cap them tightly. Before this you have used beakers. What is there about capping the jars that was important to your activity?

Remediation: (1) Ask the student what it is about O_2 and CO_2 that is being studied in Chapters 20 and 21. (2) Check to see if the student realizes why he was asked questions 20-20 through 20-22. (3) Does he know there are other CO_2 producers in the classroom besides the fish? (4) Check to see if he knows O_2 and CO_2 dissolve into water. (5) Have him review his answer to the performance check and improve it.

---

10 Core 6

Names and explains the function of a sample not subjected to the experimental variable.

The student applies the concepts of what a control is and what it does.

Student Action: Responding with the term *control* and stating, in effect, that a control must be run with an experiment to rule out effects specific to the time of the trial.

Performance Check A: Yesterday, Bob used a procedure identical to that used in jar 2 below. He found that it took 30 drops of $Na_2S_2O_3$ to remove the color from a mixture of 2 drops of H_2O_2, 100 ml of water, Winkler solutions, H_2SO_4, and starch which he had just made. Today, he did the following, using jars 1 and 2.

Jar 1

1. Put in 100 ml water.
2. Added 2 drops H_2O_2.
3. Added 3 ICR's, and capped the jar.
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 8 drops of $Na_2S_2O_3$ to remove color.

Jar 2

1. Put in 100 ml water.
2. Added 2 drops H_2O_2.
3. Added nothing, but capped the jar.
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 22 drops of $Na_2S_2O_3$ to remove color.

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

Remediation: (1) Have the student do the Checkup on page 47 and Excursion 4-1, Part D. (2) Have him check pages 286 and 287 and then explain why the control was necessary. (3) Have him quickly review Activities 6-12 and 6-13, as well as questions 6-21 and 6-22. Then have him recheck his answer to Self-Evaluation 6-12.

---

10 Core

States the change with time in reactant-product levels.

The student applies the concept that the longer an organism is in contact with a given environment, the more reactants it will use up for its survival and the more products will be formed.

7

Student Action: Specifying the sample in which the oxygen level will be lower and the carbon dioxide will be higher and stating that, until the oxygen supply is exhausted, the oxygen level will drop and the carbon dioxide level will rise in a sealed environment in contact with the living (nonphotosynthesizing) organisms.

A: 1. Gary's, 2. Gary's

B: 1. B, 2. B

C: 1. Y, 2. Y

Performance Check A: John and Gary each took a jar into which they put two ICR's with 100 ml of water (H_2O) and 3 drops of hydrogen peroxide (H_2O_2). After ten minutes, John took the ICR's out of his jar. Gary forgot to watch the clock and removed his ICR's from the water after 18 minutes. They tested the water for amounts of oxygen and carbon dioxide.

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

Remediation: (1) Have the student briefly review pages 286 through 291, beginning with Activity 20-7, and then try again to answer the performance check. (2) If the notion of time as a variable bothers the student, have him read the top paragraph on page 95 and identify the variable being controlled by the directions. Then have him show other examples in which time is an important variable.

---

10 Core 8

Recognizes the nature of solutions.

The student applies the concept that solutions are homogeneous mixtures.

Student Action: Responding affirmatively and in effect that if a sample of a solution contains a specific substance, then the rest of the solution also contains the substance because solutions are the same throughout.

Performance Check A: Daisy had a gallon of pond water. She tested a sample of it, using the Winkler test, and found that the water contained oxygen. Daisy said she was not sure if the rest of the water contained oxygen because she had tested only a small sample.

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

Remediation: (1) This point is strongly implied at the bottom of page 74, on all of page 75, and at the top of page 76. (2) After the student has reviewed the pages above, have him review or redo Self-Evaluation 20-3 and Excursion 6-1.

10

Uses the relationship between increasing concentration of organisms and reaction rate.

The student applies the relationship between reaction rates and concentration.

Core 9

Student Action: Stating in effect that the rates at which oxygen is used up and carbon dioxide is produced will increase because in a reaction an increase in the concentration of organisms, like an increase in any other reactant, increases the rate at which the reactants are used up and the products are produced.

Performance Check A: Suppose that the U.S. puts a space station with a staff of four people into orbit around the earth. The next year, the station's staff is increased to six people.

1. What will this increase in concentration of people do to the rate at which oxygen is used up?
2. What will it do to the rate at which carbon dioxide is produced?
3. Why?

Remediation: (1) Have the student review pages 294 through 298 and check his answers to questions 21-2 through 21-5 and 21-7 and Self-Evaluations 20-5 and 21-1. (2) Have the student explain why the two jars were different. (3) Did the student check the "Demonstrated" column for statement 2 on page 303? Have him explain why he did not if he didn't or why he checked it there and missed the idea here.

---

10 Core 10

Proposes a reason that fish should be subjected to gradual temperature changes.

The student generates the concept that many living organisms are sensitive to sudden changes in temperature.

Student Action: Responding that a sudden change in temperature will be harmful to the fish and may cause their death.

Performance Check A: Review Activities 21-8 and 21-9, in which you studied the effect of temperature on the reaction rates in the ICR's. The temperature was dropping slowly throughout the 20 minutes that the ICR's in a jar were in the ice water. Why not chill the distilled water before putting the ICR's into it so that the fish would be in cold water the entire 20 minutes?

Remediation: (1) Remind the student that many chemical reactions occur continually in fish as they do in all living organisms. (See page 304.) (2) A sudden drop in temperature will lower the rate of all of these reactions. (See Chapter 14.) (3) The product of one reaction may be a reactant for a second reaction. (4) With a reduced amount of product from the first reaction, the second reaction might not be able to occur, which can bring the chain of chemical reactions to a halt, causing death.

---

10 Core

Describes the relationship between reaction rates and temperature.

The student applies the concept that reaction rates vary with temperature.

Student Action: Predicting that the animal would have to breathe more often in warmer water and stating that the rates at which it consumes oxygen and produces carbon dioxide (its reactions) are increased.

Performance Check A: In Rainbow Lake, the water temperature in the early spring may be 2°C. In the summer, it warms up to 24°C. **11**

1. What effect, if any, would this warming of the water have on how often frogs must surface to take in new oxygen and release carbon dioxide?
2. Explain your answer in terms of reaction rates.

Remediation: (1) Have the student look over pages 299 through 302. (2) Check his answers to questions 21-16, 21-19, and 21-21 and Self-Evaluations 21-2 and 21-3. Have him explain his answers. (3) This point is summarized in statements 3 and 4 on page 303.

---

10 Core 12

Selects evidences that chemical reactions occur in living things.

The student classifies four effects as evidences that chemical reactions occur in living things.

Student Action: Selecting whichever four of the following appear as evidence that chemical reactions occur in living things: (1) some materials (reactants) are used up, (2) new materials (products) are formed, (3) concentrations are altered, (4) temperatures of living things alter the rate of new material formation, and (5) stomach acid is neutralized in definite quantities, as are other acids.

A, B, and C: e (or a, b, c, and d)

Performance Check A: Select all of the following things which are evidences that chemical reactions take place in living things.

a. Some materials (reactants) are used up.
b. Temperatures of living things alter the rate of new material formation.
c. New materials (products) are formed.
d. Stomach acid is neutralized in definite quantities, as are other acids.
e. All of the above are correct.

Remediation: Have the student review Chapters 17, 20, and 21 and identify activities which illustrate each of the evidences stated above.

---

10 Core 13

States the effect the source has on a chemical substance.

The student applies the concept that the properties of a chemical substance are independent of the source of the compound.

Student Action: Disagreeing with the position that the samples of a substance from living and nonliving sources can be distinguished and stating as a reason that a chemical substance is the same whether it is produced by a living or a nonliving system.

Performance Check A: Two root beer manufacturers put carbon dioxide (CO_2) into their root beer. One company's CO_2 was made by reacting HCl and limestone. The other one claimed that his product was better because the CO_2 was formed by a living system -- yeast and sugar. He further claimed that because his CO_2 came from a living system, it reacted differently and could be identified.

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

Remediation: (1) Check the student's understanding of an operational definition of a chemical substance — it identifies one and only one substance. If necessary, have him review page 31. (2) Check to see if the student realizes that he used the same operational definition for CO_2 in Chapter 3 and in Chapter 20, testing CO_2 from nonliving material in one case and from living material in the other. Help him to see what this means. (3) Take note of the summary for Chapter [illegible]ages 303 through 305, and of Self-Evaluations 21-6 and 21-7.

---

10 Core 14

Predicts what will happen to the reactants in a chemical reaction.

The student applies the concept that the reactants are consumed during a chemical reaction.

Student Action: Predicting that the amount of fuel will decrease because it is a reactant in an ongoing chemical reaction.

Performance Check A: Dr. A.R. Plain said that a chemical reaction between the reactants kerosene and oxygen makes the jets on airplanes work.

1. From what you know about reactants in a reaction, predict what should happen to the amount of kerosene carried by the plane as it flies from Spokane to Atlanta.
2. Why does this happen?

Remediation: (1) Ask the student to review Chapter 7 and explain why one of the reactants was always left over. (2) Have the student explain how method 3 on page 193 acts as a way to find the rate of a reaction, or (3) have him read method 3 on page 193 and then find an example of the use of this method in Chapter 13.

---

10 Core 15

States whether reactants can react in other than definite numbers.

The student applies the concept that when chemicals react, they do so in definite numbers (ratios) and when all the particles have reacted, the reaction stops.

Student Action: Stating that he disagrees with the position that a fixed amount of a reactant will react with varying amounts of another reactant because reactants react in definite numbers (ratios).

Performance Check A: You used $Na_2S_2O_3$ to find out how much oxygen was present in the water. Jake thinks that in different water samples the same amount of oxygen could react differently so that different amounts of $Na_2S_2O_3$ would have been required to remove the color.

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

Remediation: (1) Have the student review pages 241 through 246. (2) Be sure he filled in Table 17-2. (3) Then ask him if he agreed with the position stated. How did he make the predictions in Table 17-2? (4) If you still feel the student needs help, have him review Chapter 7, and Chapter 8, if necessary, where this concept is developed.

---

10 Core 16

Recognizes what happens to particles of reactants in a chemical reaction.

The student applies the concept that in a chemical reaction the particles are recombined in different ways.

Student Action: Citing the lowered oxygen level and the increased carbon dioxide level (a combination of O_2 and C) in the water as evidences of a chemical reaction and stating that if the fish simply absorbed the oxygen, there would be a lowered oxygen level but the carbon dioxide level would remain unchanged.

Performance Check A: You found that your ICR removed oxygen from the water. There are two possible reasons that this happened. Either ICR's only absorb and store oxygen or ICR's involve the oxygen that they absorb in a reaction.

1. State any evidence from the activities that you have done in class that would help you decide which happened.
2. How does the evidence help you choose?

Remediation: (1) Check to see if the student knows how to tell if a chemical reaction has taken place. See Excursion 6-2 on page 113 and method 3 on page 193. (2) If the student has mastered (1), check his responses in Table 21-2. (3) Have him reanswer the performance check.

---

10 Core 17

Selects the relationship between experimental results and scientific models or conclusions.

The student applies the concept that the results of scientific activities support models, but they do not prove them.

Student Action: Selecting the entry which implies that experimental results provide support for models.

A: a
B: b
C: d

Performance Check A: Which of the following is the *best* statement fitting both your model for chemical reactions and the results of your activities with the fish?

a. They *suggest* that reactions take place inside of fish as they do in beakers involving only nonliving systems.

b. They *definitely show* that chemical reactions take place inside the fish as they do in beakers involving nonliving systems.

c. They *prove* that your model must be true.

d. They *establish proof* that chemical reactions do not occur inside of fish as they do in beakers involving only nonliving things.

e. b and c

Remediation: (1) Review the paragraphs following question 6-40. (2) Review "The Model So Far" on pages 104 and 105.

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10 Core 18

Recognizes the source of the heat that keeps the human body temperature constant.

The student generates the concept that heat-releasing chemical reactions occur within the body.

Student Action: Responding that chemical reactions which release heat are the source of the energy that keeps the human body temperature constant.

Performance Check A: John took his temperature and found that it was 37°C. He went outside for four hours. During that time he built a snow fort and had a snowball fight. As soon as he went into the house, he took his temperature again. It was still 37°C. Certain processes convert the energy in food into heat that keeps human body temperature at 37°C. What are these processes called?

Remediation: (1) This problem requires that the student combine the notion that chemical reactions can be heat-releasing (see page 277) and the notion that chemical reactions take place in himself (a living organism). (2) If he is hesitant about the latter, remind him of his intake of O_2 and output of CO_2 and find out how he explains this. (3) Have the student review his response to Self-Evaluation 20-8.

---

10 Exc 21-1 1

Recognizes burning as a test for oxygen.

The student applies the concept that substances burn longest in those containers that have the most oxygen.

Student Action: Responding to the effect that he would invert each container over a burning candle and measure the amount of time it took for each candle to go out. The longer it took, the more oxygen in the container.

Performance Check A: An environmental survey team has four sample jars of equal size filled with air from four cities New York, Indianapolis, Denver, and New Orleans. Suppose there are no Winkler solutions available. How can you find out which jar of air contains the most oxygen?

Remediation: Check the student's response to questions 2, 5, 6, 7, and 13 in the excursion. Have him review the experiment and redo the performance check with his book open.

---

10 Exc 21-2-1

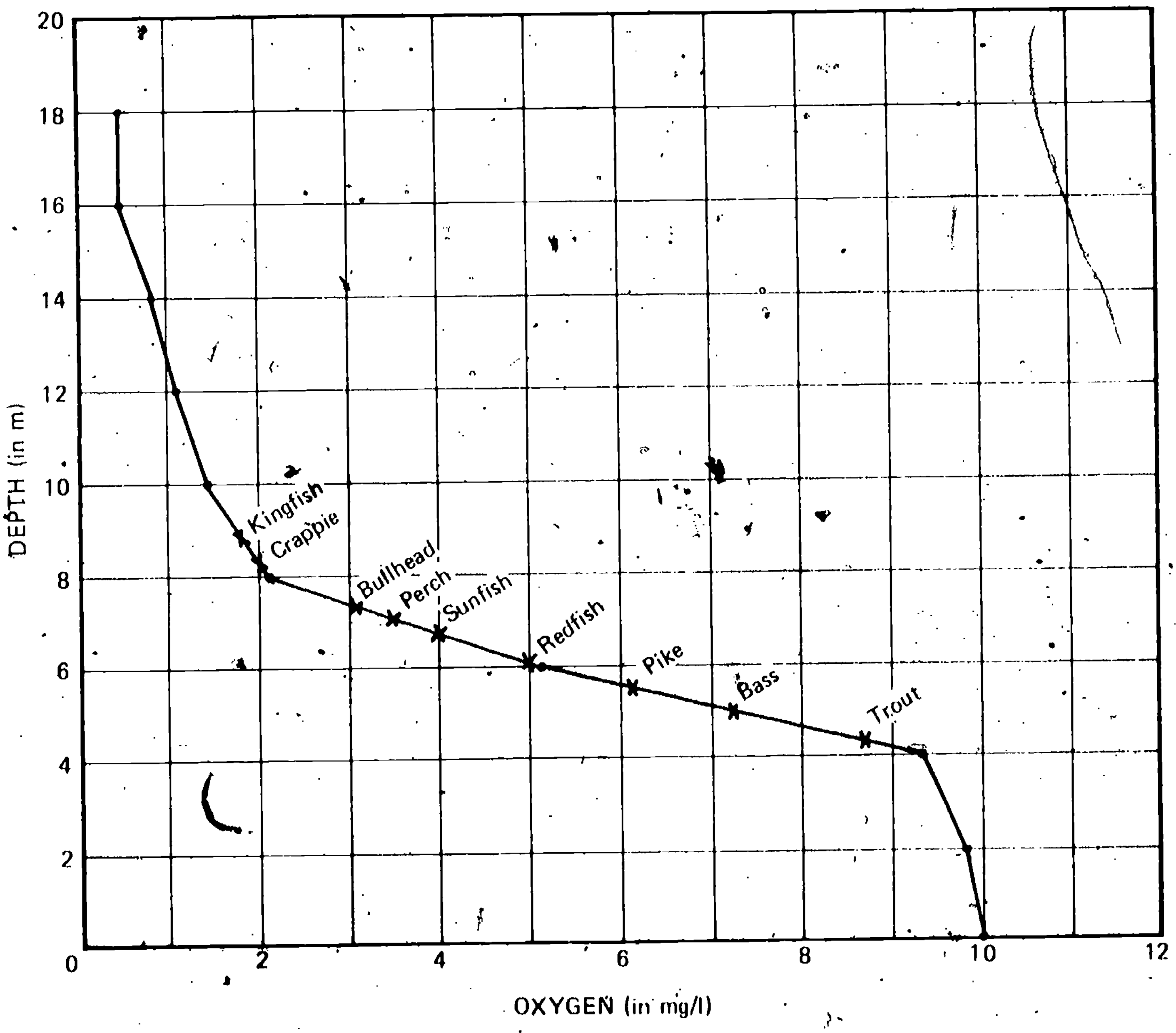
Plots points, draws a best-fit line, and reads a graph.

The student applies the process of plotting data on a prelabeled set of axes, drawing the line of best fit, and reading and interpreting the graph.

Special Preparations: Prepare a labeled grid or duplicate the appropriate labeled grid from the end of Part 2 of the *Performance Assessment Resources*.

Student Action: Plotting the points, drawing a smooth line of best fit, and labeling the lowest levels at which each species of fish can exist, correctly for at least two of the three given species.

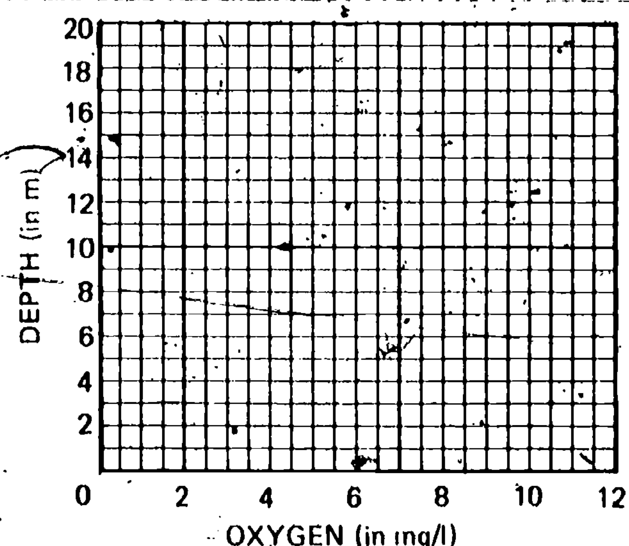
A, B, and **C:**



Performance Check A: Get a piece of graph paper from your teacher, and label it as shown on the grid below. On your grid, graph the data found below about Lake Elba. Then for each kind of fish listed, place an X on the graph at the lowest depth at which it could survive. Beside the X, write the name of the fish.

DISSOLVED OXYGEN IN LAKE ELBA	
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)
Pike	6.2
Sunfish	4.0
Bullhead	3.1



Remediation: (1) Have the student explain the titles and meaning of the data for both tables to be sure he understands the information given him. (2) Have him explain how he plotted the data. If he has problems plotting points or drawing the best-fit line, refer him to Excursion 7-1 on pages 425 through 430. (3) If his trouble is interpolation, have him answer questions 7, 8, and 9 on pages 432 and 433.

Objective Number	Objective Description
11-Core-1	Orders solutions of varying concentrations of glucose
11-Core-2	Orders solutions according to glucose concentration
11-Core-3	Selects the source of an element in a chemical reaction
11-Core-4	Predicts the number of yeast beasts in a drop from the number in a known fraction of a drop
11-Core-5	Tells why reactions occur faster with ground-up yeast
11-Core-6	Recognizes the effect of the conservation of mass on the nature of reactions in living systems
11-Core-7	Recognizes the source of catalysts in the reactions of living organisms
11-Core-8	Recognizes the effect of catalysts in living systems
11-Core-9	Decides whether a living system's catalysts will also work outside of it
11-Core-10	Recognizes whether or not human beings contain catalysts
11-Core-11	Recognizes variables that alter the rate of a reaction in living things
11-Core-12	Recognizes differences in reproduction between living and nonliving systems
11-Core-13	Recognizes the relationship between a catalyst of living materials and heat
11-Core-14	Selects the reaction in which oxygen is a reactant
11-Core-15	Defines *kilocalorie*
11-Core-16	Defines *calorie*
11-Core-17	Recognizes the unit of heat used in measurements in grams and °C
11-Core-18	Calculates the heat energy change in water

Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
M	O	P	Q	T	√				identifies	
M		P	Q	T	√				manipulates	
			Q		√				applies	
			Q						applies	
								√	generates	
							√	√	applies	
									applies	
					√				applies	
									applies	
					√				classifies	
			Q		√				classifies	
					√				applies	
									applies	
			Q						classifies	
					√				recalls	
					√				recalls	
			Q		√				classifies	
M				T	√				applies	

Objective Number	Objective Description
11-Core-19	Explains the meaning of the symbol Δ used before a variable
11-Core-20	Calculates the heat required to produce a temperature change in water
11-Core-21	Recognizes the variables which affect calorimeter calculations
11-Core-22	Recognizes variables which determine the amount of temperature change in matter being
	heated
11-Core-23	Recognizes that chemical energy of food can be converted to other forms
11-Core-24	Recognizes the cause of energy release during a chemical reaction
11-Core-25	Recognizes the form in which energy is stored in food
11-Core-26	Recognizes the chemical nature of human beings and their input and output
11-Exc 22-1-1	States the effect of yeast on dough
11-Exc 23-1-1	Determines how to recognize starch breakdown
11-Exc 24-1-1	Calculates the number of calories lost by water
11-Exc 24-1-2	Expresses the relationship between Calorie and calorie and applies the definition of *calorie*
01-Core-24 thru 28R	(Student's responsibilities)
04-Exc 8-1-1R	Handles a thermometer, using the accepted procedure
07-Core-17R	Gives an operational definition for *catalyst*
09-Core-14R	Explains the difference between input energy and output energy
09-Core-15R	Recognizes where energy is stored in a reaction that releases heat

Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
			Q						classifies	
			Q		√				applies	
			Q						applies	
			Q		√				classifies	
					√				classifies	
					√				applies	
			Q		√				classifies	
			Q		√				classifies	
									applies	
									applies	
			Q						applies	
			Q						applies	
	O				√				chooses	
M	O				√				manipulates	
					√				recalls	
					√				applies	
					√				applies	

Objective Number	Objective Description
10-Core-7R	States the change with time in reactant-product levels
10-Core-12R	Selects evidences that chemical reactions occur in living things
10-Core-18R	Recognizes the source of the heat that keeps the human body temperature constant

	Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
						√				applies	
				Q		√				classifies	
						√				generates	

11 Core 1

Orders solutions of varying concentrations of glucose.

The student identifies the relative concentration of glucose solutions to which Benedict's solution has been added.

Regular Supplies: 5 stoppered test tubes

Special Preparations: Place some of the students' solutions from Activity 22-19 in stoppered test tubes in a box labeled 11-Core-1.

Student Action: Ordering the five solutions from the lightest to the darkest color intensity.

Performance Check A: 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 tubes in order, beginning on the left with the tube with the lowest glucose concentration and ending with the tube of highest glucose concentration. Show your teacher your ordering.

Remediation: (1) Refer the student to questions 22-15 and 22-16 and the preceding sentence on page 319. (2) Check the student's response to Self-Evaluation 22-3 with him to see if ordering the solutions gave him a problem.

11 Core 2

Orders solutions according to glucose concentration.

The student manipulates the given samples, Benedict's solution, and a hot water bath.

Regular Supplies:

glucose	1 dropper with straw
water	4 test tubes
Benedict's solution	1 beaker
test-tube rack	1 alcohol burner and stand

Special Preparations: Label three boxes 11-Core-2A, 11-Core-2B, and 11-Core-2C. In the appropriate box, put four bottles filled and labeled with a number only as indicated in the chart below.

BOX 11-Core-2A	BOX 11-Core-2B	BOX 11-Core-2C	CONTENTS
2	4	3	500 ml distilled water
3	1	4	100 ml 5% stock glucose solution and 400 ml water
4	2	1	250 ml 5% stock glucose solution and 250 ml water
1	3	2	500 ml 5% stock glucose solution

Student Action: Ordering the solutions by concentration of glucose from the least to the most glucose, as shown by the depth of the red color.

A: 2, 3, 4, 1
B: 4, 1, 2, 3
C: 3, 4, 1, 2

Performance Check A: Get 7 drops of each of the four solutions in the bottles in 11-Core-2A. 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.

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.

Remediation: Review the student's procedure and results with him.

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11 Core 3

Selects the source of an element in a chemical reaction.

The student applies the concepts that elements are not created, destroyed, or synthesized in chemical reactions, but are present in reactants, and that food is a reactant for living things.

Student Action: Selecting the option to the effect that carbon is taken in in foods.

A: b
B: a
C: c

Performance Check A: Human beings take in a great deal of oxygen which reacts and is released as carbon dioxide (CO_2). What is the source of the element carbon in the product CO_2?

a. It is created in living things.
b. It is present in our food.
c. It is produced from other elements in our body.
d. It is taken in only as burnt toast.
e. None of these are sources.

Remediation: (1) Have the student review Activity 22-2 through question 22-8. (2) Find out if he knows what elements make up sugars such as glucose and sucrose. If he does not, have him review Chapter 12. (3) Does he recognize sugars (food) as a reactant in living things? If not, have him review page 319. (4) Have him review the accepted responses for Self-Evaluations 22-1 and 22-4b. (5) Have him review his response to the check.

11

Predicts the number of yeast beasts in a drop from the number in a known fraction of a drop.

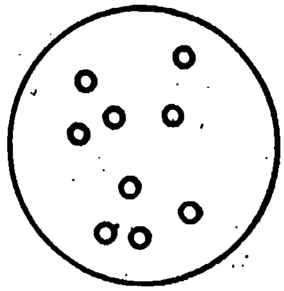
The student applies the assumption that the number of individuals in the source is to the number of individuals in the sample as the size of the source is to the size of the sample.

Core 4

Student Action: Reporting the product of the number of individuals in the sample and the reciprocal of the ratio of the size of the sample to the source.

A: 90
B: 36
C: 45

Performance Check A: Suppose that the figure below shows the number of yeast beasts in 1/10 of a drop of a yeast solution. Calculate the number of drops you would expect to find in the entire drop of yeast solution.



Remediation: (1) Review with the student the procedure he used to answer question 23-5 on page 323. (2) Have him recalculate the response to the performance check.

---

11 Core 5

Tells why reactions occur faster with ground-up yeast.

The student generates an explanation for yeast's acting as a better catalyst when it has been ground.

Student Action: Stating in effect that grinding frees the catalyst and allows the glucose to come into contact with it more easily.

Performance Check A: Grinding the yeast beasts with sand kills the yeast beasts by tearing them apart. Yeast beasts are more effective in speeding up the breakdown of glucose into carbon dioxide and water when they are ground up than when they are whole. Why?

Remediation: (1) Have the student review the paragraph at the bottom of page 328 and the paragraph at the bottom of page 332. (2) Find out if he understands that before grinding, the catalyst is inside the bodies of the yeast and acts only on glucose entering the yeast organism. (3) Have him redo the performance check.

---

11 Core 6

Recognizes the effect of the conservation of mass on the nature of reactions in living systems.

The student applies the concept that the total mass in a reaction is constant and if the mass of living matter increases, the mass of the nonliving matter decreases.

Student Action: Responding negatively and to the effect that the total mass of living and nonliving material is constant and that because some of the glucose is used to increase the mass of the yeast, the mass of the breakdown products is less than the mass of the glucose.

Performance Check A: When yeast acts on glucose, carbon dioxide (CO_2) and water are produced. The yeast organisms get bigger and more numerous. In other words, the mass of the yeast increases. The reaction which takes place is shown below.

glucose + yeast → water + CO_2 + more yeast

1. If 6 grams of glucose were put into the test tube with the yeast, would 6 grams of the CO_2 and water be formed?
2. Explain your answer.

Remediation: (1) Can the student successfully identify yeast as matter and explain why? (2) Does he comprehend that the total mass in a reaction is constant in that the mass of the product equals the mass of the reactants? See pages 74 through 77. (3) Ask the student to tell what X equals in each of the following.

(a) $\underbrace{\text{glucose + yeast}}_{10\text{ g}} \rightarrow \underbrace{\text{water} + CO_2 + \text{more yeast}}_{X\text{ g}}$

(b) $\underbrace{\text{glucose}}_{9\text{ g}} + \underbrace{\text{yeast}}_{1\text{ g}} \rightarrow \underbrace{\text{water} + CO_2}_{X\text{ g}} + \underbrace{\text{more yeast}}_{3\text{ g}}$

---

11 Core 7

Recognizes the source of catalysts in the reactions of living organisms.

The student applies the concept that living organisms supply their own catalysts to reactions.

Student Action: Stating that living organisms supply their own catalysts to reactions.

Performance Check A:

Case 1. Roger wanted to carry out a reaction to break down milk in a test tube. He found that he had to add a catalyst to the test tube.

Case 2. Later Roger wanted his stomach to carry out the same reaction on milk (digest it). Roger didn't have to add a catalyst to the reaction in his stomach.

Explain why Roger had to add a catalyst in the first case, but not the second.

Remediation: (1) Check with the student his answers to questions 23-16 and 23-17 and have him read the paragraph that follows them. (2) Have him reread page 333 and his responses to Self-Evaluation 23-1. (3) Can the student now analyze the difference between the two situations?

---

11 Core

Recognizes the effect of catalysts in living systems.

The student applies the concept that he, like all living things, contains catalysts and that catalysts allow high reaction rates at lower temperatures than are otherwise possible.

Student Action: Stating in effect that the human body, like all living things, contains catalysts which allow high reaction rates at lower temperatures than are otherwise possible.

8

Performance Check A: Steak gravy on the dinner plate doesn't react with oxygen to produce noticeable amounts of carbon dioxide (CO_2), water, and heat at 37°C. Yet the same reaction produces CO_2, water, and noticeable amounts of heat at 37°C in your body. Explain why this occurs.

Remediation: (1) Have the student review pages 221 through 225 and page 336. Have him answer this question: How does the reaction of marshmallows + O_2 take place in the body at body temperature fast enough to release energy useful to the body when they don't react noticeably at body temperature outside the body? (2) If the student is perplexed, refer him to page 333 where the concept is spelled out. (3) Refer him to Self-Evaluation 23-1 and review its acceptable response.

---

11 Core 9

Decides whether a living system's catalysts will also work outside of it.

The student applies the concept that a catalyst which functions in a reaction within an organism will also function outside the organism if the catalyst and all the reactants are present.

Student Action: Stating that he disagrees and that a catalyst which functions in a reaction within an organism will also function outside the organism if it and all the reactants are present.

Performance Check A: A maple tree uses sunshine and catalysts in the following reaction.

carbon dioxide + water → glucose + oxygen

Walter claims that man will never be able to carry out this reaction in a test tube. He says the reaction requires catalysts which are produced in the tree. Therefore, even if the catalysts and the reactants are present, the catalysts will act only in green plants.

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

Remediation: (1) Have the student review Chapter 23 starting with question 23-18 on page 327 and continuing to the end of the chapter. (2) There may be a student to whom the chemical reactions occurring in living things will seem somehow mysteriously different from those in a laboratory. His thinking is reminiscent of the vital force theory. Make clear to him that a chemical reaction is the same wherever it occurs.

---

11 Core

Recognizes whether or not human beings contain catalysts.

The student classifies himself as containing catalysts and that chemical reactions take place at body temperature at faster rates than are possible without catalysts.

Student Action: Stating that he contains catalysts and citing that chemical reactions take place at body temperature at faster rates than are possible without catalysts.

Performance Check A: In a cartoon in Chapter 23, Finny the Fish says she and Yeastie the Beast both contain catalysts, and she asks if you do too. 10

1. Do you contain catalysts?
2. What evidence do you have for your answer? (Hint: Candy and marshmallows release energy inside you at body temperature.)

Remediation: (1) Have the student reread pages 336 and 342. Then ask him why reactions take place inside of living organisms at lower temperatures than those at which they would occur outside the organism? (2) Refer the student to the last paragraph on page 332.

---

11 Core 11

Recognizes variables that alter the rate of a reaction in living things.

The student classifies temperature, concentration, and catalysts as variables which alter the rates of reactions in living things.

Student Action: Listing the terms *temperature, concentration,* and *catalysts.*

Performance Check A: From your study of ICR's and the yeast beasts, name three variables which you think affect reaction rates in living things.

Remediation: (1) Have the student read the last paragraph on page 332 and statements 2 through 4 on page 303. (2) Have the student identify the activities in the text in which these three factors were developed and explain how they show that the factors affect reaction rates in living things. (3) Refer the student to Self-Evaluations 23-2 and 23-5.

---

11 Core 12

Recognizes differences in reproduction between living and nonliving systems.

The student applies the concept that living chemical systems reproduce themselves, whereas nonliving systems do not.

Student Action: Selecting the responses which indicate that the same number of nonliving systems will be present and more living systems will be present after optimal storage and stating that nonliving chemical systems do not reproduce themselves, but living ones do.

Performance Check A:

1. Suppose that you put 3 ISCS batteries (chemical systems) into a cupboard with all the materials needed to make many other batteries, and locked the door. Tomorrow, would the number of ISCS batteries in the cupboard be fewer than 3, exactly 3, or more than 3?
2. Suppose you put 3 yeast beasts (chemical systems) into a cup of warm water and sugar. Would there be fewer than 3, exactly 3, or more than 3 yeast beasts tomorrow?
3. What is the difference between the chemical systems of batteries and yeast beasts which explains your answers to questions 1 and 2?

Remediation: Have the student compare Figure 23-3 and Figure 23-4 on page 324. (1) The best way to show that living things reproduce themselves is to have the student observe the process. If you don't have a microscope, borrow one if possible, and have the student use it to do the activities suggested on page 324. (2) Have the student discuss with you Figures 23-3 and 23-4 and the text of pages 324 and 325. (3) For a summary, have the student review page 333 and the correct response to Self-Evaluation 23-5.

---

11 Core 13

Recognizes the relationship between a catalyst of living materials and heat.

The student applies the concept that most catalysts of living materials are destroyed by heat.

Student Action: Disagreeing and stating that most catalysts of living materials are destroyed by heat.

Performance Check A: Jeff said, "I was warned several times not to overheat the little yeast beasts. But it wasn't the living yeast that increased the rate of the reaction. It was a catalyst inside them. If I had heated the solution more, it wouldn't have hurt the catalyst and the reaction would have gone much faster."

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

Remediation: Have the student do Excursion 15-1, Activities 8 and 9, and the subsequent questions. Then have him reevaluate his response to the performance check.

---

11 Core 14

Selects the reaction in which oxygen is a reactant.

The student classifies burning as a reaction involving oxygen as a reactant.

Student Action: Selecting the reaction which mentions burning.

A: c
B: a
C: b

Performance Check A: Select the letter of the chemical reaction in which oxygen is a reactant.

a. Copper sulfate dissolving
b. Sodium chloride and potassium chloride dissolving in the same test tube
c. A wood splint burning
d. Alcohol boiling

Remediation: (1) If the student selected either of the options mentioning dissolving, have him review from the last paragraph on page 74 through the top of page 76 and Excursion 6-1. Then ask if the process of recombination occurs in the process of dissolving. (2) Also have the student reread page 336.

Defines *kilocalorie.*

11 Core 15

The student recalls the definition that one kilocalorie is the amount of heat necessary to raise the temperature of 1,000 grams (or 1,000 ml or 1 liter) of water 1°C.

Student Action: Stating that one kilocalorie is the amount of heat necessary to raise the temperature of 1,000 grams (or 1,000 ml or 1 liter) of water 1°C.

Performance Check A: What does the heat unit *kilocalorie* mean in terms of water?

Remediation: (1) Check the student's answers to questions 2 and 3 in the Checkup on page 336. (2) Ask him to combine the two questions into one definition for *kilocalorie.* (3) Refer him to Self-Evaluation 23-7.

Defines *calorie.*

11 Core 16

The student recalls the definition that a calorie is the amount of heat needed to increase the temperature of 1 gram (1 ml) of water 1°C.

Student Action: Responding that a calorie is the amount of heat needed to increase the temperature of 1 gram (1 ml) of water 1°C.

Performance Check A: Write a definition for *calorie* in terms of water.

Remediation: (1) Check question 3 of the Checkup on page 336. (2) Have the student review page 595. (3) Refer him to Self-Evaluation 23-6.

Recognizes the unit of heat used in measurements in grams and °C.

11 Core 17

The student classifies the calorie as the unit used to express heat when the measurements are made in grams and °C

Student Action: Selecting the response expressed in calories.

A: b
B: d
C: a

Performance Check A: A 12 gram sample of water is heated so that its temperature is raised 4°C. The change in the water's heat energy would be 12 grams X 4°C = 48. Choose the letter of the entry in the list below that includes the unit of heat in which this problem should be answered.

a. 48 Btu
b. 48 calories
c. 48 newtons
d. 48 meters
e. 48 kilocalories

Remediation: Have the student review page 595 and Figure 1, page 596.

---

11 Core 18

Calculates the heat energy change in water.

The student applies the formula (ΔT X grams of water = calories) for measuring the change in the heat energy of a sample.

Regular Supplies: 1 graduated cylinder, 1 Celsius thermometer, 1 alcohol burner and stand, water

Student Action: Reporting the measurements of water temperatures before and after heating and calculating the calories of heat exchanged within ±10% of the correct value, using the formula ΔT X grams of water = calories.

Performance Check A: Get any equipment you need, and heat 200 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.

Remediation: (1) Check to see if the student knows what measurements to make even if he doesn't know the formula. If so, give him the formula and see if he can do the procedure. (2) If the student doesn't know what measurements to make, have him review pages 338 and 339 and repeat the performance check.

---

11 Core 19

Explains the meaning of the symbol Δ used before a variable.

The student classifies the measurement of Δ variable as the measurement of a change in the variable.

Student Action: Stating that Δ signifies a change in the variable named.

- **A:** Change in height
- **B:** Change in mass
- **C:** Change in length

Performance Check A: If h is the symbol used for height and you were asked to measure Δh, what would you measure?

Remediation: (1) Ask the student what Δ or ΔT means? (2) If he answers correctly, have him reconsider the performance check. (3) If he answers incorrectly, refer the student to page 120 or 595.

---

11 Core

Calculates the heat required to produce a temperature change in water.

The student applies the formula (grams of water X ΔT = calories) for calculating the amount of heat involved in changing the temperature of water.

20

Student Action: Computing the quantity of heat as the product of the appropriate quantities to within ±5%.

A: 1,160 calories (±60 calories)
B: 3,240 calories (±160 calories)
C: 900 calories (±45 calories)

Performance Check A: How many calories of heat energy are needed to heat 20 grams of water from 12°C to 70°C?

Remediation: (1) Have the student do Excursion 24-1. (2) Have him do an alternate performance check.

---

11 Core 21

Recognizes the variables which affect calorimeter calculations.

The student applies the concepts that a calorimeter measures the amount of heat released by a reaction and that the variables which affect the amount of heat captured by the calorimeter are important.

Student Action: Selecting both sources of heat loss listed as options.

A: a, b
B: b, c
C: a, c

Performance Check A: 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?

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

Remediation: (1) Have the student review question 24-5 on page 339. (2) Ask him why a Styrofoam cup was used in Chapter 8 when zinc and copper sulfate were reacted and the change in temperature was measured.

---

11 Core 22

Recognizes variables which determine the amount of temperature change in matter being heated.

The student classifies the amount of matter, the duration of heating, and the amount of heat supplied per time unit as the variables affecting the amount of temperature change of an object being heated.

Student Action: Selecting the amount of matter, the duration of heating, and the amount of heat supplied per time unit.

A: a, b, d
B: b, d, e
C: a, d, e

Performance Check A: Select the variables which affect the amount of temperature change when a steel bar is being heated.

a. The amount of steel being heated
b. The amount of heat supplied per minute
c. The manufacturer of the steel
d. The amount of time the heat is supplied
e. The person heating the steel bar

Remediation: (1) If the student can't handle this, have him do Excursion 24-1 or at least question 5 of that excursion. (2) Have the student explain why it is important to know each of the quantities in question 5 of Excursion 24-1. (3) Have the student identify the factors that appear in the heat formula at the top of page 340 or in the large type on page 595 of Excursion 24-1. If he has a problem doing so, refer him to the paragraph in the middle of page 340.

---

11 Core 23

Recognizes that chemical energy of food can be converted to other forms.

The student classifies chemical energy of food as being converted into electrical, stored chemical, mechanical, or heat energy in the human body.

Student Action: Listing two of the forms of energy – mechanical, stored chemical, heat, and electrical energy – into which the body converts chemical energy.

Performance Check A: You put chemical energy into your body (a system). Your body converts the chemical energy into other forms of energy. List two of these other forms of energy.

Remediation: (1) Have the student try this performance check again with his book open to pages 336 and 342. (2) For each form of energy he lists, have the student state an example of a specific body activity in which that conversion takes place.

---

11 Core 24

Recognizes the cause of energy release during a chemical reaction.

The student applies the concepts that the amount of chemical energy in a material changes during a chemical reaction and that in a reaction the particles of the reactants are recombined.

Student Action: Responding (1) that a chemical reaction would be necessary and (2) that the particles of the reactant are recombined as it gives up its chemical energy.

Performance Check A: The sugar found in milk contains a great deal of chemical energy.

1. What would cause the sugar to give up its chemical energy?
2. What happens to the atoms within the sugar when it gives up its chemical energy?

Remediation: (1) If the student cites a specific reaction such as burning or decomposition by heat, check to see if he comprehends the general concept of reactions. (2) If the student doesn't know the answer to the first question, have him read the paragraphs after question 24-4. (3) If he has problems with the second question, have him review the last paragraph on page 341. (4) Have the student use the model to explain his answers to questions 24-14 and 24-15.

---

11 Core 25

Recognizes the form in which energy is stored in food.

The student classifies chemical energy as the form in which energy is stored in food.

Student Action: Responding "chemical energy."

Performance Check A: Candy contains a lot of energy. In what form is this energy stored?

Remediation: (1) Have the student reread page 342. (2) Check his response to Self-Evaluation 22-1.

---

11 Core 26

Recognizes the chemical nature of human beings and their input and output.

The student classifies human beings as chemical reactors, their input of oxygen, food, water, and so forth as reactants, and their output of perspiration, carbon dioxide, heat, urine, and solid waste as products.

Student Action: Responding affirmatively and naming oxygen, food, and water as reactants and perspiration, urine, carbon dioxide, heat, and solid waste as products. (Any suitable reactants or products may be substituted for those above.)

Performance Check A:

1. Are people HCR's (human chemical reactors)?
2. If so, name three reactants and three products of an HCR. If not, state their source of energy.

Remediation: (1) Review page 342 to establish that humans are HCR's. (2) Check on the student's knowledge of the terms *reactants* and *products*. If he needs help, send him to page 36. (3) If he still does not comprehend HCR's, have him tell how he knows when a chemical reaction has taken place and ask him how one recognizes a new product. (4) Ask him to compare the input of food, oxygen, and water with the output. Are new substances (new combinations) made within the human body? (5) Have him review Self-Evaluation 22-1 and 22-2.

11

States the effect of yeast on dough.

The student applies the concept that the yeast-glucose reaction causes dough to rise as a result of the formation of carbon dioxide.

Exc 22-1 1

Student Action: Responding to the effect that glucose is used by yeast in forming carbon dioxide, the bubbles of which make the dough rise.

Performance Check A: Mother Motley's recipe for rolls includes both yeast and glucose. On the basis of what you learned in Excursion 22-1, state what yeast and glucose do to dough and how they do it.

Remediation: (1) Review questions 9 and 10 on page 590 with the student. (2) Ask him how he knows that glucose and yeast react the same in his bread as in the case given in the performance check. (See page 127, statement 5.)

---

11 Exc 23-1 1

Determines how to recognize starch breakdown.

The student applies the principle that a chemical indicator is affected only by the presence of a specific substance and ceases to be affected when the substance is removed and the fact that iodine is an indicator which is blue-black in the presence of starch.

Student Action: Responding that the blue-black color should fade.

Performance Check A: Turpentine is a substance found in pine sap. Richard wants to determine if turpentine is a catalyst in the breakdown of starch. If it is a catalyst, what visible result should he expect to observe after mixing together the turpentine, starch, and the iodine solution?

Remediation: (1) Does the student know what an indicator is? If not, have him review the second paragraph on page 594 and the paragraph in the middle of page 181. (2) If he doesn't realize that iodine is an indicator for starch, refer him to the paragraph just above question 1 on page 591. (3) Refer him to Self-Evaluation 23-3.

---

11 Exc 24-1 1

Calculates the number of calories lost by water.

The student applies the concept that the number of calories lost by water equals the mass of water in grams times the temperature change in °C.

Student Action: Responding with the correct answer found by using the formula calories lost by water equals the mass of water in grams times temperature change in °C.

- **A:** 450 calories
- **B:** 360 calories
- **C:** 2,100 calories

Performance Check A: Curtis cooled 30 g of water by packing the container in ice. The temperature dropped from 33°C to 18°C. How many calories of heat were lost?

Remediation: (1) Have the student review the bottom of page 595. (2) Then have him work questions 2 and 4 on page 596.

11
EXC
24-1
2

Expresses the relationship between Calorie and calorie and applies the definition of *calorie.*

The student applies the concept that a Calorie is equal to 1,000 calories and that 1 calorie raises the temperature of 1 g of water by 1°C.

Student Action: Reporting the number of grams of water as 1,000 times the number of calories.

- **A:** 101,000 g
- **B:** 266,000 g
- **C:** 93,000 g

Performance Check A: One-half cup of cottage cheese contains about 101 Calories. Suppose this energy were released as heat energy. How many grams of water can this much heat energy raise 1°C?

Remediation: Refer the student to question 3 on page 596 and its solution on page 597.

Summary Table

Objective Number	Objective Description
12-Core-1	Matches related activities with the assumptions of the particle model

	Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
				Q		√				classifies	

12 Core 1

Matches related activities with the assumptions of the particle model.

The student classifies each of the listed activities taken from *Probing the Natural World/2* as most closely related to that assumption of the particle model which it was used to develop, test, or illustrate an application of.

Student Action: Matching related activities with the assumptions of the particle model as shown below, correctly in at least eight of the ten activities assigned.

Assumptions of the Particle Model	**Related Activities Supporting the Particle Model**
All matter is composed of particles.	–This idea is used to explain differences in the reactions of rock and shells with HCl. –This idea is proposed to explain the behavior of water when heated.
There is more than one kind of matter particle.	–HCl reacts differently with zinc (Zn), rock, and shell.
Compounds are combinations of different atoms in definite numbers.	–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. –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.
In chemical reactions, matter particles are not created or destroyed.	–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.
Chemical reactions are rearrangements of matter particles.	–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.

All matter is made up of only 100 or so different kinds of matter particles.	–Four different-colored substances all contained copper. –Egg white, raw meat, and fertilizer all contained nitrogen. –Shell, soda, and chalk all released carbon dioxide when HCl was poured on them. –Four different substances all contained iodine.
When a chemical reaction occurs, different matter particles combine in definite numbers.	–When different quantities of lead nitrate [$Pb(NO_3)_2$] were reacted with an unchanging quantity of potassium iodide (KI), sometimes iodide (I) atoms were left over and sometimes lead (Pb) atoms were left over. –One g of each antacid tablet neutralized about the same amount of stomach acid. –After finding how much sodium hydroxide (NaOH) reacts with 2 ml of citric acid ($C_6H_8O_7$), you successfully predicted how much $C_6H_8O_7$ would react with 1, 4, and 5 ml of NaOH. –If different quantities of zinc (Zn) were reacted with a fixed quantity of copper sulfate ($CuSO_4$), there would be either Zn or $CuSO_4$ left over when the reaction stopped.
Chemical reactions often release heat energy or absorb it.	–Foods burn, and body temperature is often above room temperature. –The amount of reaction between zinc (Zn) and copper sulfate ($CuSO_4$) could be determined by measuring ΔT. –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. –When particles like lead (Pb) and iodide (I) are in solution and combine to form the solid lead iodide (PbI_2), the temperature rises.

Some matter is composed of electrically charged particles called *ions*.	–Solutions of copper sulfate ($CuSO_4$) and cobalt sulfate ($CoSO_4$) let electricity pass through them to light a light bulb. –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.
Neutral molecules contain electrically charged particles.	–A sugar solution wouldn't allow electricity to flow through it to light a bulb, but crystals of sugar were attracted to both positively and negatively charged vinyl strips.
Molecules are made of atoms and can be broken down into atoms or simpler molecules.	–When electricity is passed through water, the elements oxygen and hydrogen are released. –When sucrose is heated, water and carbon are formed. –When sucrose is heated with HCl, fructose and glucose are formed.
Increasing the temperature of reactants increases the rate of a reaction.	–Heated HCl and shell reacted faster than cold HCl and shell. –Zinc (Zn) and HCl produced hydrogen at a faster rate when hot than when cold. –Oxalic acid ($H_2C_2O_4$) and potassium permanganate ($KMnO_4$) turn from purple to a golden color faster when hot than when cold. –A goldfish used up more oxygen in warm water than in cold water. –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.

Increasing the concentration of reactants increases the rate of a reaction.	–One ml of HCl plus 4 ml of water plus 4 pieces of shell produced carbon dioxide more slowly than 3 ml of HCl plus 4 ml of water plus 4 pieces of shell. –Five drops of oxalic acid ($H_2C_2O_4$) plus 5 drops of water plus 10 drops of potassium permanganate ($KMnO_4$) take more time to turn gold color than 10 drops of oxalic acid ($H_2C_2O_4$) plus 0 drops of water plus 10 drops of potassium permanganate ($KMnO_4$). –Two goldfish used up more oxygen than one. –It took more phenol red to get a pink color in water which had contained 2 goldfish than in water which had contained only 1 goldfish.
A catalyst increases the rate of a reaction when it is present in small quantities.	–When a small piece of copper was added to a mixture of potassium iodide (KI) and potassium persulfate ($K_2S_2O_8$) solutions, it took less time for the mixture to turn blue-black than when the copper wasn't present. –When a small amount of iron chloride ($FeCl_3$) powder was added to hydrogen peroxide (H_2O_2), oxygen gas was released more rapidly. –The breakdown of glucose into carbon dioxide and water went faster when the insides of ground-up yeast beasts were added to the reaction.
Because matter is held together by electrical forces, chemical changes may absorb or release electrical energy.	–The zinc (Zn)-potassium dichromate ($K_2Cr_2O_7$) system released electricity, and the $K_2Cr_2O_7$ solution changed color. –The lead (Pb)-sodium sulfate (Na_2SO_4) system absorbed electrical energy and was changed in so doing.

A: 1. c, f; 2. e; 3. b, h; 4. a, i; 5. d, g, j
B: 1. c, e; 2. i; 3. f; 4. a, g, j; 5. b, d, h
C: 1. b, g, j; 2. c, i; 3. e; 4. d, h; 5. a, f
AA: 1. e, i; 2. h; 3. d, g; 4. a, f; 5. b, c, j
BB: 1. a, e; 2. g; 3. d, j; 4. b, h; 5. c, f, i
CC: 1. a, c; 2. j; 3. f; 4. b, e, i; 5. d, g, h

Teacher's Note: This unit is unique; it involves only one chapter and has only one objective written for it. However, the material in this unit encompasses the entire year's work. Therefore, there are six performance checks rather than the usual three. You may wish to assign a student more than one check.

Performance Check A: 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 made up of only 100 or so different kinds of matter particles.

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

3. When a chemical reaction occurs, different matter particles combine in definite numbers.

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. 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.

b. One g of each antacid tablet neutralized about the same amount of stomach acid.

c. Shell, soda, and chalk all released carbon dioxide when HCl was poured on them.

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

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

f. Four different substances all contained iodine.

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

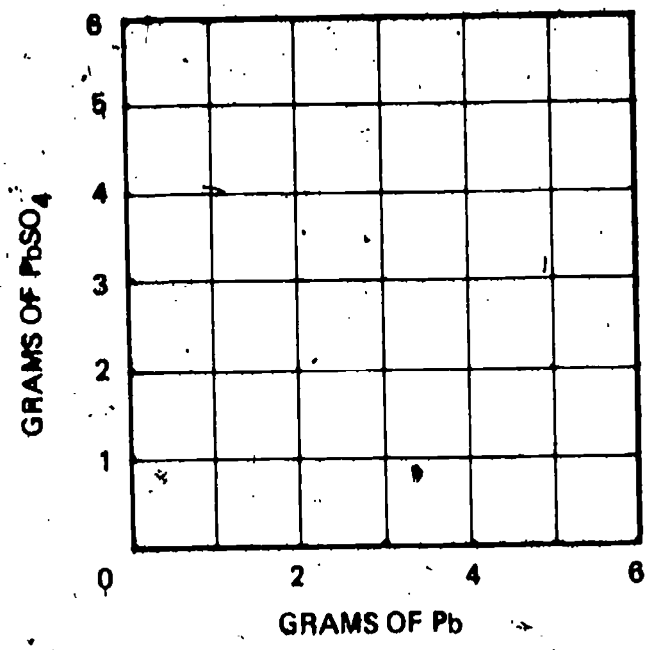
h. If different quantities of zinc (Zn) were reacted with a fixed quantity of copper sulfate ($CuSO_4$), there would be either Zn or $CuSO_4$ left over when the reaction stopped.

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

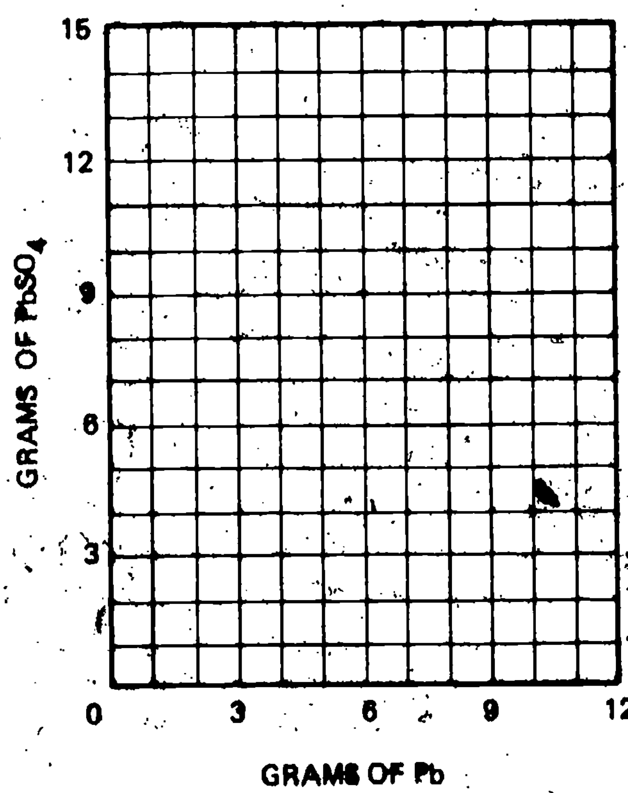
j. When sucrose is heated with HCl, fructose and glucose are formed.

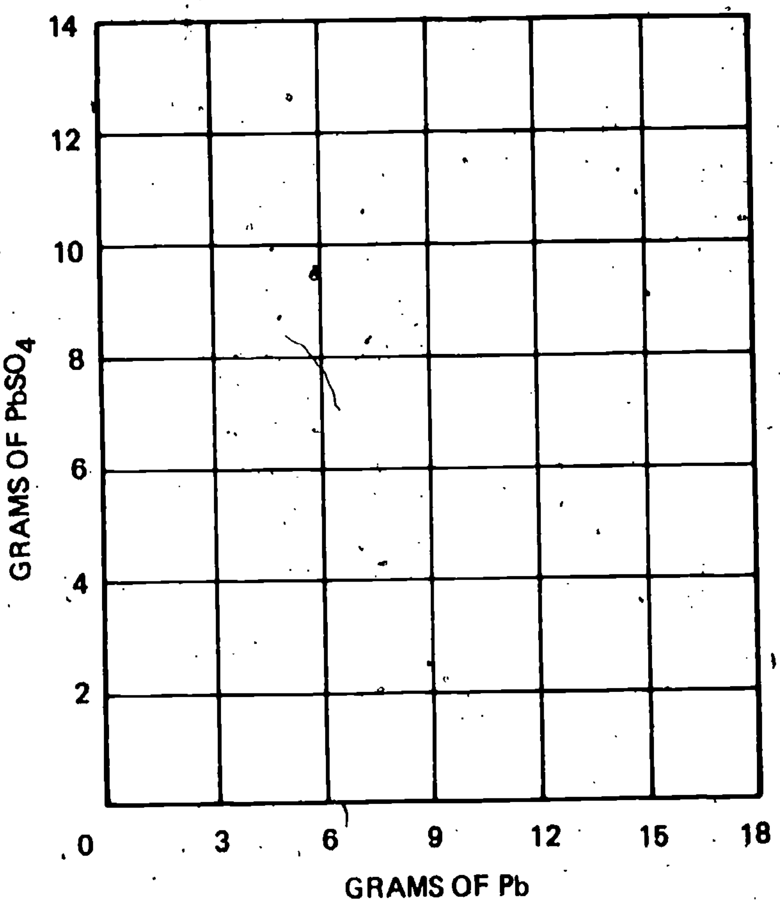
Remediation: These performance checks are probably best used as review activities. For this reason, the students are told to do them with their texts open. If some students still have difficulty, let them work in small groups and perhaps do several different checks together.

04-Core-8A

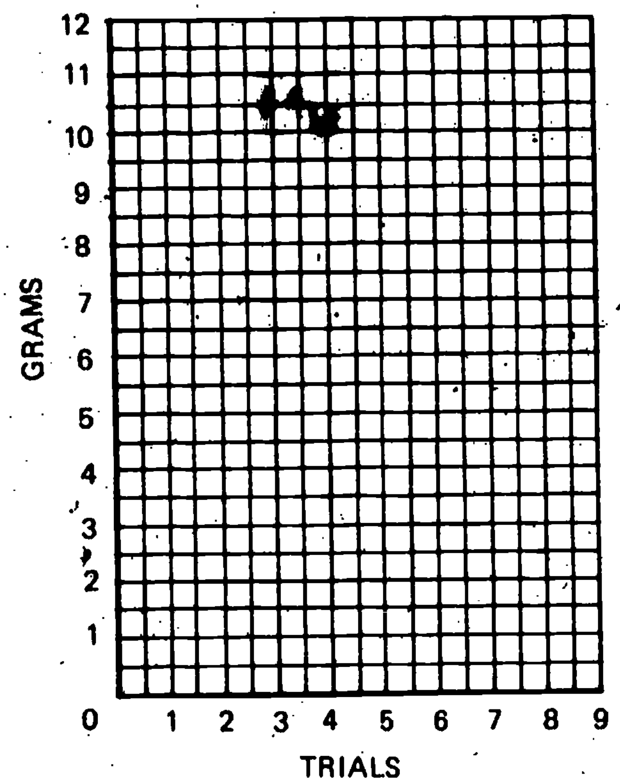


04-Core-8B




14
12
10
8
6
4
2
0
GRAMS OF $PbSO_4$
3
6
9
12
15
18
GRAMS OF Pb

04-Exc 7-1-2 A, B, C



10-Exc 21-2-1 A, B, C