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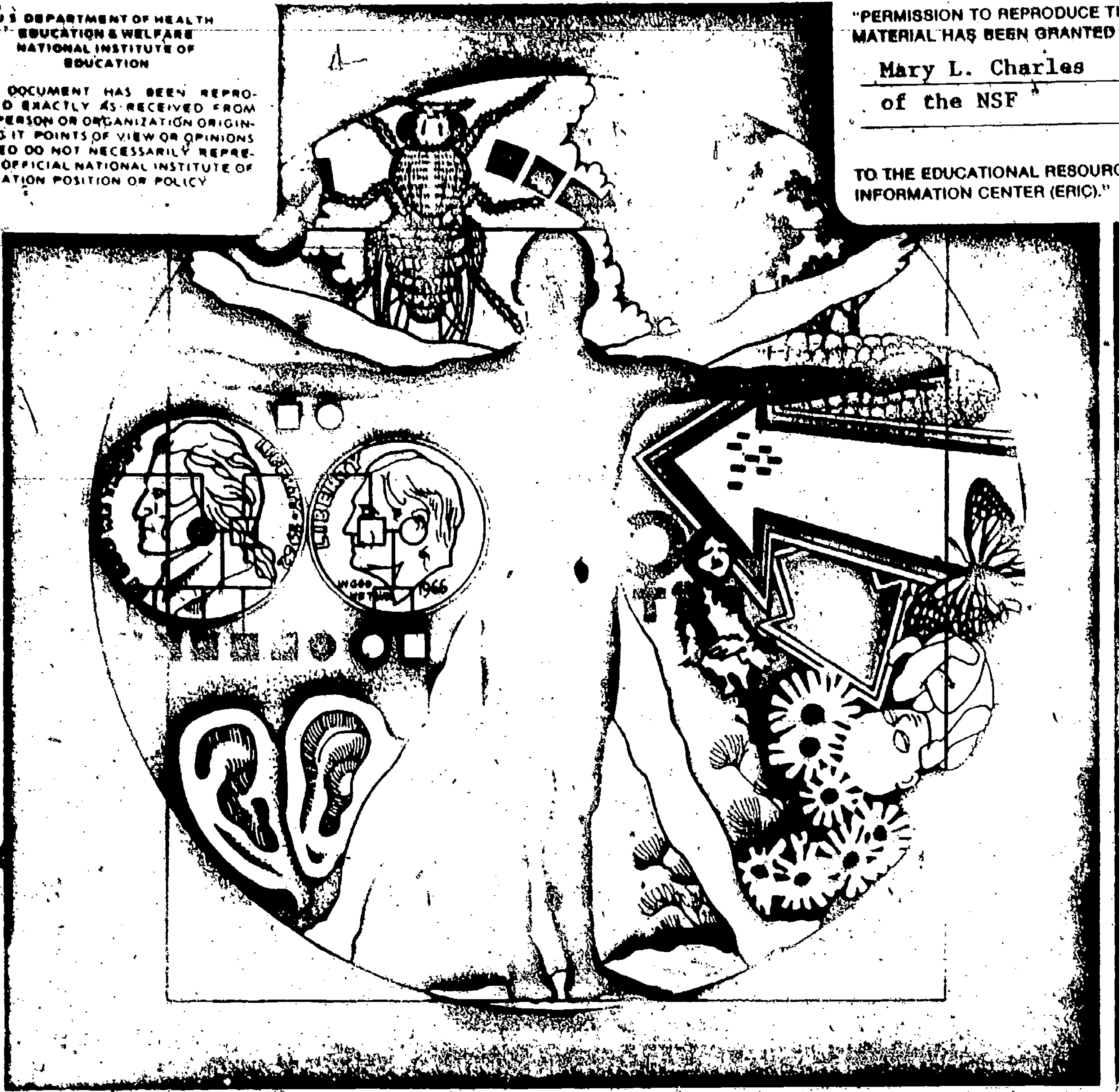
ABSTRACT

This is the student's edition of the Record Book of one of the eight units of the Intermediate Science Curriculum Study (ISCS) for level III students (grade 9). Space is provided for answers to the questions from the text as well as for the "excursions" and the self evaluation. An introductory note to the student explains how to use the book. (SA)

Record Book

Why You're You



Probing the Natural World/3

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INTERMEDIATE SCIENCE CURRICULUM STUDY

Record Book

Why You're You

Probing the Natural World / Level III

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LEVEL I **Probing the Natural World** / Volume 1 / with Teacher's Edition
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MATERIALS DEVELOPMENT CONTRIBUTORS

This list includes writing-conference participants and others who made significant contributions to the materials, including text and art for the experimental editions

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The genesis of some of the ISCS material stems from a summer writing conference in 1964. The participants were:

Frances Abbott, *Miami-Dade Junior College.* Ronald Atwood, *University of Kentucky.* George Assousa, *Carnegie Institute.* Colin H. Barrow, *University of West Indies.* Peggy Bazzel, *F.S.U.* Robert Binger (deceased). Donald Bucklin, *University of Wisconsin.* Martha Duncan Camp, *F.S.U.* Roy Campbell, *Broward County Board of Public Instruction, Fla.* Bruce E. Cleare, *Tallahassee Junior College.* Ann-cile Hall, *Pensacola, Florida.* Charles Holcolmb, *Mississippi State College.* Robert Kemman, *Mt. Prospect, Ill.* Gregory O'Berry, *Coral Gables, Florida,* Elra Palmer, *Baltimore.* James Van Pierce, *Indiana University Southeast.* Guenter Schwarz, *F.S.U.* James E. Smeland, *F.S.U.* C. Richard Tillis, *Pine Jog Nature Center, Florida.* Peggy Wiegand, *Emory University.* Elizabeth Woodward, *Augusta College.* John Woolever, *Sarasota, Florida.*

Foreword

A pupil's experiences between the ages of 11 and 16 probably shape his ultimate view of science and of the natural world. During these years most youngsters become more adept at thinking conceptually. Since concepts are at the heart of science, this is the age at which most students first gain the ability to study science in a really organized way. Here, too, the commitment for or against science as an interest or a vocation is often made.

Paradoxically, the students at this critical age have been the ones least affected by the recent effort to produce new science instructional materials. Despite a number of commendable efforts to improve the situation, the middle years stand today as a comparatively weak link in science education between the rapidly changing elementary curriculum and the recently revitalized high school science courses. This volume and its accompanying materials represent one attempt to provide a sound approach to instruction for this relatively uncharted level.

At the outset the organizers of the ISCS Project decided that it would be shortsighted and unwise to try to fill the gap in middle school science education by simply writing another textbook. We chose instead to challenge some of the most firmly established concepts about how to teach and just what science material can and should be taught to adolescents. The ISCS staff have tended to mistrust what authorities believe about schools, teachers, children, and teaching until we have had the chance to test these assumptions in actual classrooms with real children. As conflicts have arisen, our policy has been to rely more upon what we saw happening in the schools than upon what authorities said could or would happen. It is largely because of this policy that the ISCS materials represent a substantial departure from the norm.

The primary difference between the ISCS program and more conventional approaches is the fact that it allows each student to travel at his own pace, and it permits the scope and sequence of instruction to vary with his interests, abilities, and background. The ISCS writers have systematically tried to give the student more of a role in deciding what he should study next and how soon he should study it. When the materials are used as intended, the ISCS teacher serves more as a "task easer" than a "task master." It is his job to help the student answer the questions that arise from his own study rather than to try to anticipate and package what the student needs to know.

There is nothing radically new in the ISCS approach to instruction. Outstanding teachers from Socrates to Mark Hopkins have stressed the need to personalize education. ISCS has tried to do something more than pay lip service to this goal. ISCS' major contribution has been to design a system whereby an average teacher, operating under normal constraints, in an ordinary classroom with ordinary children, can indeed give maximum attention to each student's progress.

The development of the ISCS material has been a group effort from the outset. It began in 1962, when outstanding educators met to decide what might be done to improve middle-grade science teaching. The recommendations of these conferences were converted into a tentative plan for a set of instructional materials by a small group of Florida State University faculty members. Small-scale writing sessions conducted on the Florida State campus during 1964 and 1965 resulted in pilot curriculum materials that were tested in selected Florida schools during the 1965–66 school year. All this preliminary work was supported by funds generously provided by The Florida State University.

In June of 1966, financial support was provided by the United States Office of Education, and the preliminary effort was formalized into the ISCS Project. Later, the National Science Foundation made several additional grants in support of the ISCS effort.

The first draft of these materials was produced in 1968, during a summer writing conference. The conferees were scientists, science educators, and junior high school teachers drawn from all over the United States. The original materials have been revised three times prior to their publication in this volume. More than 150 writers have contributed to the materials, and more than 180,000 children, in 46 states, have been involved in their field testing.

We sincerely hope that the teachers and students who will use this material will find that the great amount of time, money, and effort that has gone into its development has been worthwhile.

Tallahassee, Florida
February 1972

The Directors
INTERMEDIATE SCIENCE CURRICULUM STUDY

Contents

Notes to the Student

This Record Book is where you should write your answers. Try to fill in the answer to each question as you come to it. If the lines are not long enough for your answers, use the margin, too.

Fill in the blank tables with the data from your experiments. And use the grids to plot your graphs. Naturally, the answers depend on what has come before in the particular chapter or excursion. Do your reading in the textbook and use this book only for writing down your answers.

Chapter 1
Red Eyes and Curly Wings

CHECKUP

1. ______________________________

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2. ______________________________

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3. ______________________________

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4. ______________________________

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☐1-1.a. ______________________________

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b. ______________________________

c. ______________________________

d. ______________________________

e. ______________________________

____

☐1-2. ______________________________

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Table 1-1

Male	Female
Definite black tail end	Lighter tail end
Blunt tail end	Pointed tail end

☐ **1-4.**

Table 1-2

Features	Your Vial # 1	Partner's Vial # 1
Shape of wings		
Eye color		

☐ **1-5.** ______________________________

____

☐ **1-6.** ______________________________

____

____

☐ **1-7.** ______________________________

____

Figure 1-5

Mating: __________ __________ × __________ __________
Sex Feature Sex Feature

Your Name: ______________________________

Date: __________ Class Section: __________ Vial #2

Table 1-5

FIRST-GENERATION PLANNING CHART	
Event	Date Done or Observed
Vial #1 cleared of adults	
Vial #2 prepared	
Males & virgin females put in vial #2	
Eggs observed	
Larvae observed	
Parent flies cleared from vial #2	
Pupae observed	
Adults observed	

Table 1-6

Eye Color or Wing Shape	Number of Flies

☐**1-8. Table 1-7**

	Feature Variation (*State eye-color or wing-shape variation.*)
Parents	
First-generation offspring	

☐**1-9.** ____________________

____

☐1-10. ____________________

____

☐1-11. ____________________

Table 1-8

SECOND-GENERATION PLANNING CHART	
Event	Date Done or Observed
Vial #2 cleared of adults	
Vial #3 prepared	
Males & virgin females put in vial #3	
Eggs observed	
Larvae observed	
Parent flies cleared from vial #3	
Pupae observed	
Adults observed	

☐1-12. ____________________

Table 1-9

	Feature Variation (*State what eye colors and wing shapes you find.*)
Parents	
Second-generation offspring	

☐1-13. ____________________

____

Problem Break 1-1

1. The description of your original flies

2. The results of your crossing experiments

3. Partner's description of his flies

4. Other observations or conclusions

(See teacher note on page 22 of text for suggested reasoning on Problem Break 1-1.)

☐2-1.

☐2-2.

Chapter 2
That's Using the Old Bean

☐2-3. ____________________

☐2-4. ____________________

☐2-5. ____________________

☐2-6. ____________________

Table 2-1

SAMPLE COUNT OF SECOND-GENERATION BEANS		
Brown Beans	White Beans	Ratio

☐2-7. ____________________

☐2-8. ____________________

☐2-9. ____________________

____

____

Problem Break 2-1

Chapter 3
Watch Your Peas and Q's

☐3-1. ____________________

☐3-2. ____________________

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☐ 3-3. ____________________

☐ 3-4. ____________________

☐ 3-5. ____________________

☐ 3-6. ____________________

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☐ 3-7. ____________________

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☒ 3-8. ____________________

☐ 3-9. ____________________

☐ 3-10. ____________________

☐ 3-11. ____________________

☐ 3-12. ____________________

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☐ 3-13. ____________________

☐ 3-14. ____________________

☐ 3-15. and 3-16. ____________________

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☐ 3-17. ____________________

☐ 3-18. ____________________

☐ 3-19. ____________________

☐ 3-20. ____________________

☐ 3-21. ____________________

☐ 3-22. ____________________

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☐3-23. ________________________

☐3-24. ________________________

☐3-25. ________________________

☐3-26. ________________________

☐3-27.a. ________________________

b. ________________________

Problem Break 3-1

Chapter 4
Bits of Information

☐4-1. ________________________

☐4-2. ________________________

☐4-3. ________________________

☐4-4. ________________________

☐4-5. ________________________

☐4-6. ________________________

☐4-7. ________________________

☐4-8. ________________________

☐4-9. ________________________

☐4-10. ________________________

☐ **4-11.** ____________________

☐ **4-12.** ____________________

____

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☐ **4-13.** ____________________

☐ **4-14.** ____________________

☐ **4-15.** ____________________

☐ **4-16.** ____________________

☐ **4-17.** ____________________

☐ **4-18.** ____________________

☐ **4-19.** ____________________

☐ **4-20.** ____ Two brown squares

____ One brown square and one colorless square

____ Two colorless squares

Table 4-1

COMBINATIONS OF SQUARES IN SECOND GENERATION

	2 Brown	1 Brown 1 Colorless	2 Colorless
Check marks			
Totals			

Table 4-2

	Number of Brown-seed Offspring	Number of White-seed Offspring
Total		
Rough ratio	to	
Rounded-off ratio	to	

☐**4-21.** ____

Problem Break 4-2

Problem Break 4-3

☐ 4-22. ______________________________

☐ 4-23. ______________________________

☐ 4-24. ______________________________

☐ 4-25. ______________________________

____

☐ 4-26. ______________________________

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☐ 4-27. ______________________________

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☐ 4-28. ______________________________

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☐ 4-29. ______________________________

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Problem Break 4-4

Chapter 5
Either Heads or Tails

☐5-1.

☐5-2.

☐5-3.

☐5-4.

☐5-5.

☐5-6.

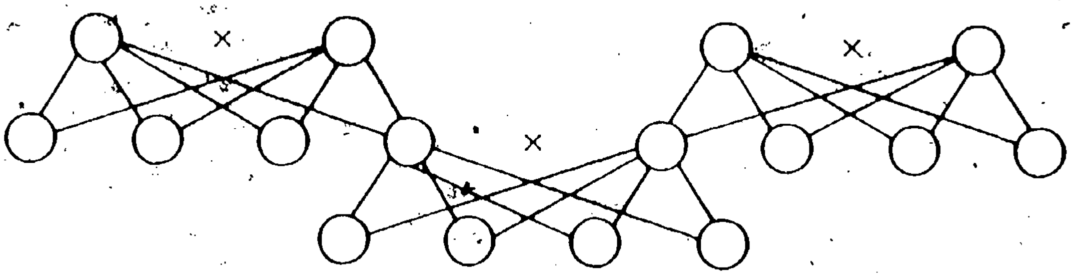

Figure 5-1

☐5-7.

☐5-8.

☐ **5-9.**

☐ **5-10.**

☐ **5-11.**

☐ **5-12.**

☐ **5-13.**

☐ **5-14.**

☐ **5-15.**

☐ **5-16.**

☐ **5-17.**

☐ **5-18.**

☐ **5-19.**

☐ **5-20.**

Problem Break 5-1

Family Tree Chart

Problem Break 5-2

Tongue-Rolling Chart

Chapter 6 Meet the Ninsect

Ninsect Differences

☐ **6-1.** ______________________________

☐ **6-2.** ______________________________

☐ **6-3.** ______________________________

Table 6-1

Feature	Bits of Information				Appearance of Ninsect Offspring
	Parent (card) #1		Parent (card) #2		
	D or d	Appearance	D or d	Appearance	
Eye color [black (D) or white (d)]					
Body color [striped (D) or plain (d)]					
Body shape [chunky (D) or slender (d)]					
Stinger [present (D) or absent (d)]					
Leg length [long (D) or short (d)]					
Antenna [straight (D) or curly (d)]					
Wing pattern [plain (D) or spotted (d)]					
Wing size [large (D) or small (d)]					

☐**6-4.** ______________________________

Table 6-2

Feature	Bits of Information				Appearance of Ninsect Offspring
	Parent (card) #1		Parent (card) #2		
	D or d	Appearance	D or d	Appearance	
Eye color [black (D) or white (d)]					
Body color [striped (D) or plain (d)]					
Body shape [chunky (D) or slender (d)]					
Stinger [present (D) or absent (d)]					
Leg length [long (D) or short (d)]					
Antenna [straight (D) or curly (d)]					
Wing pattern [plain (D) or spotted (d)]					
Wing size [large (D) or small (d)]					

☐ 6-5. ______________________________

☐ 6-6. ______________________________

Table 6-3

Feature	Bits of Information				Appearance of Ninsect Offspring
	Parent (card) #1		Parent (card) #2		
	D or d	Appearance	D or d	Appearance	
Eye color [black (D) or white (d)]					
Body color [striped (D) or plain (d)]					
Body shape [chunky (D) or slender (d)]					
Stinger [present (D) or absent (d)]					
Leg length [long (D) or short (d)]					
Antenna [straight (D) or curly (d)]					
Wing pattern [plain (D) or spotted (d)]					
Wing size [large (D) or small (d)]					

Table 6-4

Feature	Bits of Information				Appearance of Ninsect Offspring
	Parent (card) #1		Parent (card) #2		
	D or d	Appearance	D or d	Appearance	
Eye color [black (D) or white (d)]					
Body color [striped (D) or plain (d)]					
Body shape [chunky (D) or slender (d)]					
Stinger [present (D) or absent (d)]					
Leg length [long (D) or short (d)]					
Antenna [straight (D) or curly (d)]					
Wing pattern [plain (D) or spotted (d)]					
Wing size [large (D) or small (d)]					

Table 6-5

Feature	Bits of Information				Appearance of Ninsect Offspring
	Parent (card) #1		Parent (card) #2		
	D or d	Appearance	D or d	Appearance	
Eye color [black (D) or white (d)]					
Body color [striped (D) or plain (d)]					
Body shape [chunky (D) or slender (d)]					
Stinger [present (D) or absent (d)]					
Leg length [long (D) or short (d)]					
Antenna [straight (D) or curly (d)]					
Wing pattern [plain (D) or spotted (d)]					
Wing size [large (D) or small (d)]					

Table 6-6

Feature	Bits of Information				Appearance of Ninsect Offspring
	Parent (card) #1		Parent (card) #2		
	D or d	Appearance	D or d	Appearance	
Eye color [black (D) or white (d)]					
Body color [striped (D) or plain (d)]					
Body shape [chunky (D) or slender (d)]					
Stinger [present (D) or absent (d)]					
Leg length [long (D) or short (d)]					
Antenna [straight (D) or curly (d)]					
Wing pattern [plain (D) or spotted (d)]					
Wing size [large (D) or small (d)]					

☐6-7. ____________________

☐6-8. ____________________

____

Problem Break 6-1

Problem Break 6-2

Chapter 7 Problems, Problems, Problems

☐7-1. ____________________

____

☐7-2. ____________________

____

30

Excursions

Excursion 1-1
More on Offspring

☐1. ____________________

Excursion 1-2
Writing Operational Definitions

☐1. ____________________

☐2. ____________________

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☐3.a. ____________________

____

b. ____________________

____

c. ____________________

____

Excursion 1-3
Temperature and Life Cycle

☐1. ____________________

____

Excursion 1-4
A Pyramid of Grandparents

☐1. ____________________

☐2. ____________________

☐3. ____________________

☐4. ____________________

☐5. ____________________

☐6. ____________________

☐7. ____________________

☐8. ____________________

☐9. ____________________

☐10. ____________________

☐11. ____________________

____

☐12. ____________________

Problem Break 1

Excursion 2-1
Ratio Simplified

☐1. ____________________

☐2. ____________________

☐3. ____________________

☐4. ____________________

33

Excursion 4-1
Don't Flip over This

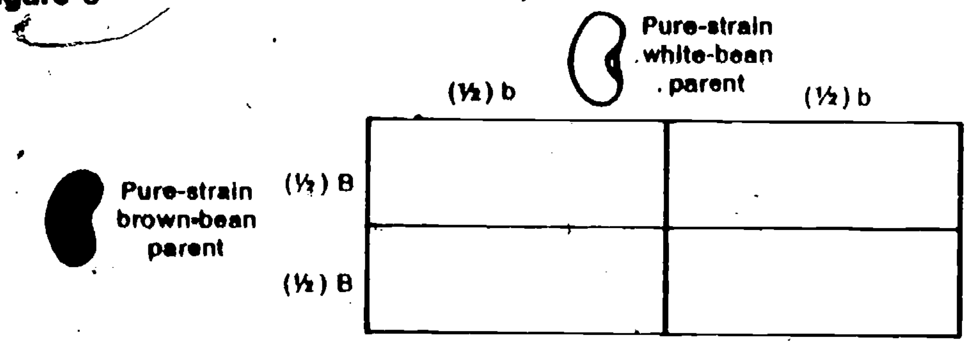
Table 1

Possible Combinations		Results from 60 Tosses
Nickel	Dime	
Heads	Heads	
Heads	Tails	
Tails	Heads	
Tails	Tails	

☐ 1. ____

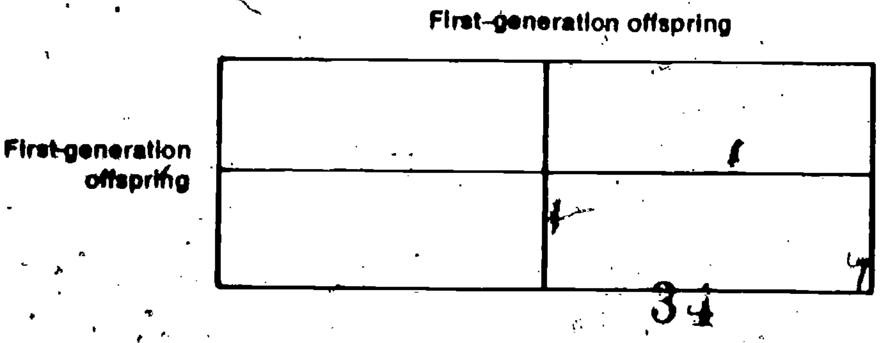
____

Figure 3



☐ 2. ____

Figure 4



☐ 3.

☐ 4.

☐ 5.

☐ 6.

Excursion 6-1
A Bit More About Bits

☐ 1.

☐ 2.

☐ 3.

☐ 4.

☐ 5.

☐ 6.

☐ 7.

☐ 8.

Problem Break 1

Excursion 6-2
Peas Again, But Double Trouble

Table 1

		Possible Bits of Information from Smooth, Yellow Parent (SsYy)			
		SY	Sy	sY	sy
Possible Bits of Information from Smooth, Yellow Parent (SsYy)	SY	SSYY smooth, yellow			
	Sy				Ssyy smooth, green
	sY			ssYY wrinkled, yellow	
	sy	SsYy smooth, yellow			

Table 2

Smooth, yellow-seeded plants	
Smooth, green-seeded plants	
Wrinkled, yellow-seeded plants	
Wrinkled, green-seeded plants	

☐1.

☐2.

	BS	Bs	bS	bs
BS				
Bs				
bS				
bs				

Excursion 7-1 Red, White, and Pink

☐1.

(Pink)

	R	W
R (Pink)		
W		

☐2. ____________________

(Pink)

	R	W
W (White)		
W		

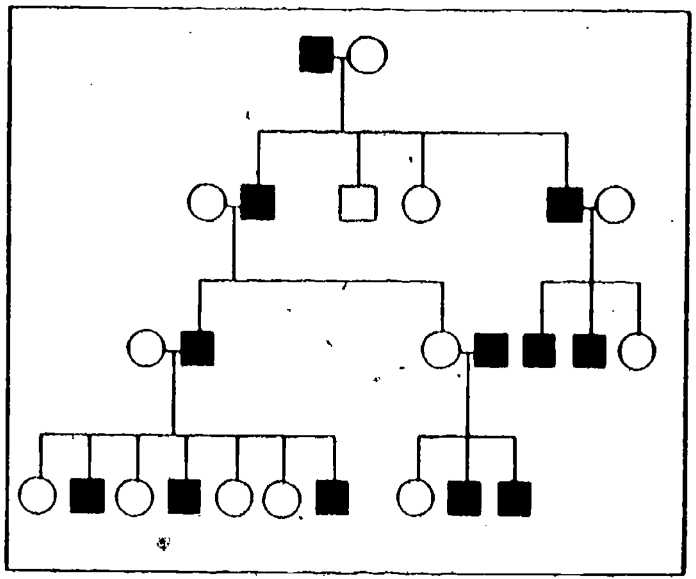
Excursion 7-2
Hair Heirs

☐1. ____________________

☐2. ____________________

☐3. ____________________

Figure 2



☐4. ______________________________

____

Excursion 7-3
Boy or Girl

Excursion 7-4
A Royal Problem

☐1. ______________________________

☐2. ______________________________

____

☐3. ______________________________

☐4. ______________________________

☐5. ______________________________

____

____

☐6. ______________________________

____

☐7. ______________________________

____

☐8. ______________________________

____

____

____

____

☐9. ______________________________

____

☐10. ______________________________

____

____

____

____

Excursion 7-5
I Wonder Where the Color Went?

Remember that this excursion continues for 10 days or more, and all responses may not be made at the same time.

☐1. ______________________________

☐2. ______________________________

____

☐3. ______________________________

☐4. ______________________________

____

☐ 5.

☐ 6.

Excursion 7-6 One, Two, Pick-up Sticks

☐ 1.

☐ 2.

☐ 3.

☐ 4.

☐ 5.

☐ 6.

☐ 7.

☐ 8.

Excursion 7-7

Do Blondes Have More Fun?

☐1.

☐2.

☐3.

☐4.

☐5.

☐6.

☐7.

☐8.

☐9.

☐10.

Table 1

FEATURES	ENVIRONMENTAL FACTORS		
	Sunlight	Exercise	Diet
Skin tanning			
Freckles			
Intelligence			
Hair color			
Weight			
Size of muscles			
Handedness			

How Well Am I Doing?

You probably wonder what you are expected to learn in this science course. You would like to know how well you are doing. This section of the book will help you find out. It contains a Self-Evaluation for each chapter. If you can answer all the questions, you're doing very well.

The Self-Evaluations are for your benefit. Your teacher will not use the results to give you a grade. Instead, you will grade yourself, since you are able to check your own answers as you go along.

Here's how to use the Self-Evaluations. When you finish a chapter, take the Self-Evaluation for that chapter. After answering the questions, turn to the Answer Key that is at the end of this section. The Answer Key will tell you whether your answers were right or wrong.

Some questions can be answered in more than one way. Your answers to these questions may not quite agree with those in the Answer Key. If you miss a question, review the material upon which it was based before going on to the next chapter. Page references are frequently included in the Answer Key to help you review.

On the next to last page of this booklet, there is a grid, which you can use to keep a record of your own progress.

SELF-EVALUATION 1

Part A

You should do this self-evaluation when you have reached page 17, at the point where you are told to go ahead to Chapter 2.

Circle any of the excursions for this chapter that you completed.
1-1; 1-2; 1-3; 1-4

☐**1-1.** Give an operational definition for *pure strain* of an organism.

☐**1-2.** When you cross fruit flies, why is it important to use virgin female flies?

☐**1-3.** How can you distinguish between an overetherized fruit fly and one that is properly etherized?

☐**1-4.** If you were to cross two fruit flies that were both pure strain for brown eyes, what do you predict would be the eye color of

a. the first-generation offspring?____________________

b. the second-generation offspring?____________________

☐1-5. Obtain from your teacher the vial of fruit flies labeled "Question 1-5." Etherize these fruit flies and select one male and one female fly. Have your teacher check whether or not you can identify which is male and which is female.

☐1-6. Give an operational definition of *first-generation offspring.*

☐1-7. One of the main aims of this unit is to develop a model to help explain the patterns that appear in the way features are passed from one generation to the next.

a. What is meant by the term *model?*

b. What are the characteristics of a good model?

Part B

Do not do this self-evaluation until you have completed all of Chapter 1, including all the fruit-fly experiments.

☐1-1. Suppose you crossed fruit flies that were pure strain for black body with flies that were pure strain for striped body. You may assume that the bit for striped body masks the bit for black body.

a. What will be the body color of the first-generation offspring? (Include a ratio in your answer if necessary.)

b. What will be the appearance of the second-generation offspring? (Include a ratio in your answer if necessary.)

☐**1-2.** Suppose you had a vial of red-eyed fruit flies. Describe an experiment that would help you find out if the flies are pure strain for red eyes. (Hint: Red-eye bits mask brown-eye bits.)

____

____

____

☐**1-3.** In fruit flies whenever a white-eyed female is crossed with a red-eyed male, only the female offspring have white eyes. All the male offspring have red eyes.

a. Does the two-bit model account for this? ______________

b. Explain your answer. ______________

____

____

Circle the excursion for this chapter, if you completed it.

2-1

SELF-EVALUATION 2

☐**2-1.** Obtain the two vials labeled "2-1A" and "2-1B" from the supply area.

By looking at the colors of the bean seeds, predict which vial contains the first-generation offspring of a cross between parents each of which was pure strain for a different color.

My prediction is vial number ______________.

Assuming that your prediction is correct, what will be the ratio of the number of bean seeds of one color to the number of seeds of the other color in the second generation?

____

☐**2-2.** Suppose you found there were 829 yellow kernels on an ear of corn and 164 dark-brown kernels.

a. What is the rough ratio of yellow to brown kernels? __________

b. What is the rounded ratio of yellow to brown kernels? __________

☐**2-3.** When pure-strain yellow peas are crossed with pure-strain green peas, the first-generation peas are all yellow.

What will the second generation of peas look like? (Include a ratio in your answer.)

____

____

☐**2-4.** Can you tell if a seed is pure strain for a feature by just looking at the seed?

____

Explain. ________________________________

____

SELF-EVALUATION 3

☐**3-1.** A pure-strain smooth-seed pea plant is crossed with another pure-strain smooth-seed plant.

a. Predict the appearance of the first-generation seeds.

____

b. Predict the appearance of the second-generation seeds. (Include a ratio if necessary.)

____

☐**3-2.** A pure-strain tall pea plant was crossed with a pure-strain dwarf pea plant. All the first-generation pea plants were tall. Predict the appearance of the second-generation offspring. (Include a ratio if necessary.)

____

____

☐**3-3.** Suppose you crossed two tall corn plants of the same strain and found that three fourths of the offspring were tall and one fourth were dwarf.

a. Is this strain of tall corn plants a pure strain? ____________

Explain your answer. ____________________________

____

b. Predict the appearance of the parents of this strain of tall corn plants.

☐**3-4.** A second generation of rose plants contains 82 plants with red roses and 27 plants with white roses.

a. What do you predict was the appearance of the first-generation roses?

b. What do you predict was the appearance of the original parent roses?

SELF-EVALUATION 4

Circle the excursion for this chapter if you completed it.
4-1

☐**4-1.** **a.** What two things does a good model help you do?

b. What is meant by the phrase "the assumptions of a model"?

☐**4-2.** List the four assumptions of the two-bit model.

a.

b.

c.

d.

☐**4-3.** When two pure-strain mice are crossed, half the first generation offspring are males and half are females. In the second generation you again find that half the mice are males and the other half are females.

a. Which of the inheritance models best predicts this inheritance pattern?

b. What evidence do you have that your answer is correct?

☐**4-4.** A male fruit fly with straight wings is crossed with a curly-winged female fruit fly. All the first-generation offspring have straight wings. Three fourths of the second-generation offspring have straight wings, and one-fourth have curly wings.

a. Which inheritance model best explains this inheritance pattern?

b. Does straight wing mask curly wing? ________ What evidence do you have to support your answer?

c. Were the original parents pure strain?

☐**4-5.** Suppose you bought some marigold seeds at the store and wondered whether this variety was a pure strain or not. Describe an experiment that you could do to test whether these flowers are pure strain.

☐ **5-1.** Explain the meaning of the following statements.

a. Curly hair is dominant when crossed with straight hair.

______

______

b. Straight hair is recessive when crossed with curly hair.

______

______

☐ **5-2.** The diagram below represents four pea seeds.

a. When the plant grown from seed A is crossed with the plant from seed B, all the first-generation seeds are yellow. Which feature, yellow or green, is dominant?

______

b. When the plant grown from seed C is crossed with the plant from seed D, some of the first-generation offspring are green and some are yellow. If yellow is the dominant variation, are any of the first-generation offspring pure strain for yellow?

______

Explain your answer. ______

______

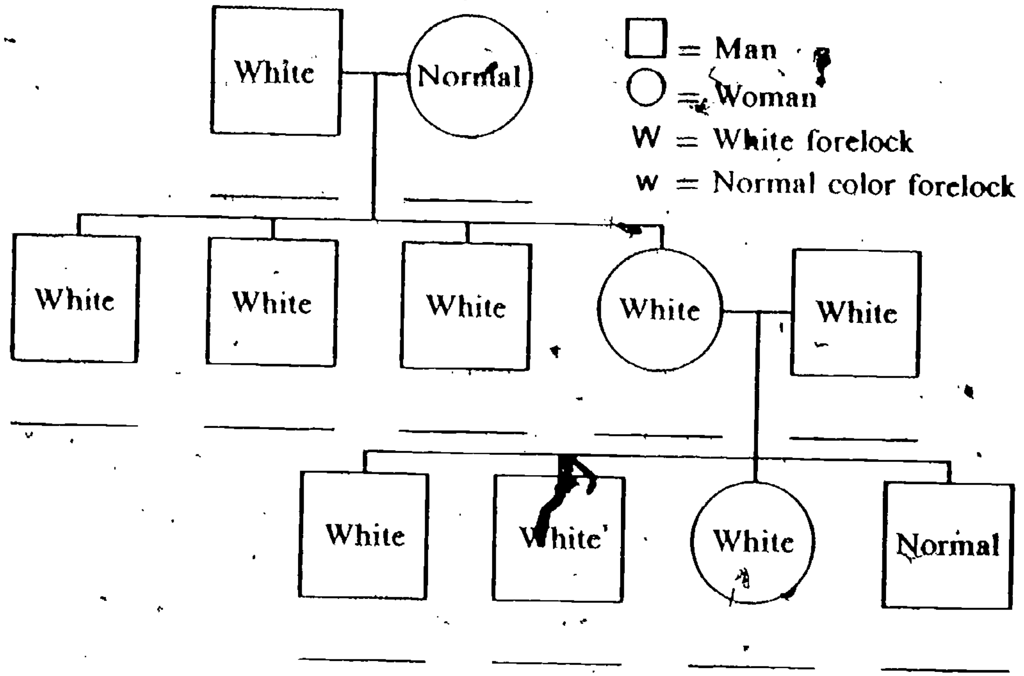
c. Are any of the first-generation offspring from a cross of C and D pure strain for green?

______

Explain your answer. ______

______

☐**5-3.** The family tree below shows which members have white forelocks and which have normal color forelocks. The parents are pure strain for the feature. The hereditary bit for white forelock is dominant. In the space below the symbol for each individual, write the possible pair of bits of information that the individual could have.



☐**5-4.** Bean seeds may have bits for brown color (B) or for white color (b). The following combinations are known.

Bean #1 BB
Bean #2 bB
Bean #3 Bb
Bean #4 bb

a. Which bit is dominant?____________________

b. What is the color of Bean #1?____________________

c. What is the color of Bean #2?____________________

d. What is the color of Bean #3?____________________

e. What is the color of Bean #4?____________________

Have you done the Self-Evaluation Test for Chapter 1, Part B, yet? If you have completed Chapter 1, you should have done the test for Part B by now.

Circle any of the excursions for this chapter that you completed.
6-1; 6-2

☐**6-1.** You are going to have a chance to create an Iggy offspring. The tables below show the bits of heredity information carried by each of the parent Iggys.

Bits of Information—Iggy Parent A

1. Round ears (H)
   Round ears (T)
2. Straight antennae (H)
   Curly antennae (T)
3. Black eyes (H)
   White eyes (T)
4. Large nose (H)
   Small nose (T)
5. Plump body (H)
   Thin body (T)
6. Short legs (H)
   Long legs (T)

Bits of Information—Iggy Parent B

1. Pointed ears (T)
   Round ears (H)
2. Straight antennae (T)
   Straight antennae (H)
3. White eyes (T)
   White eyes (H)
4. Large nose (T)
   Small nose (H)
5. Thin body (T)
   Thin body (H)
6. Long legs (T)
   Long legs (H)

Bits of information are passed on by chance. Flip a coin for each pair of bits to decide whether the heads (H) bit or the tails (T) bit will be passed on to the Iggy offspring. Record the bits that are passed on in the table below.

Feature	Parent A Bit	Parent B Bit	Iggy Offspring Features
1. Ears			
2. Antennae			
3. Eyes			
4. Nose			
5. Body			
6. Legs			

Now complete the Iggy Offspring Features column, making use of the fact that the following bits are dominant.

Pointed ears
Curly antennae
Black eyes
Large nose
Plump body
Short legs

☐6-2. Here is your chance to try some real planned parenthood! Perhaps you didn't really like how your Iggy offspring looked when you used chance in selecting the information bits he got from his parents. You can't get away from chance as determining which bit is passed on, but maybe if you set up properly the bits that you choose from, you can guarantee the kind of offspring you will get.

Let's see if you can figure out how to do it.

First, select what features you want in your new Iggy offspring and write them in the table below.

Features I Want in My Iggy Offspring	Information Bits in My Iggy Offspring	Parent A Bits	Parent B Bits
Ears-			
Antennae-			
Eyes-			
Nose-			
Body-			
Legs-			

Next, by consulting the table showing which bits are dominant, determine what bits your Iggy offspring needs to have to look the way you have decided. Write in the table the bits he could have.

Finally, determine what bits each parent must have so that no matter which bit is passed on, your Iggy offspring gets the bits that he needs.

SELF-EVALUATION 7 Circle any of the excursions for this chapter that you completed.
7-1; 7-2; 7-3; 7-4; 7-5; 7-6; 7-7

☐7-1. Briefly explain by using the two-bit model how features are passed from human parents to their offspring.

☐**7-2. a.** If a red shorthorn bull is bred with a white shorthorn cow, all the offspring are roan (brownish-red) in color. Explain how you might modify the two-bit model to explain this phenomena.

b. If two roan offspring were mated, what do you predict would be the color or colors of the second-generation offspring. (Include numbers if necessary.)

c. Predict what two information bits for color a red shorthorn bull has.

Explain.

☐**7-3.** Now that you have had a chance to expand your two-bit model, try question 1-3 of Part B again: In fruit flies whenever a white-eyed female is crossed with a red-eyed male, only the female offspring have white eyes. All the male offspring have red eyes. Use your expanded two-bit model to explain why this occurs.

SELF-EVALUATION ANSWER KEY

SELF-EVALUATION 1
Part A

1-1. You should have said that a pure strain is one that will produce generation after generation of offspring that are identical in the feature you are observing. Figure 1-3 shows this well.

1-2. If the female has previously mated, the offspring will reflect the characteristics of the previous mating rather than the mating that you planned. This would confuse the experimental results.

1-3. The wings of an overetherized fruit fly are spread, and the wings of a properly etherized one are folded. Check over Figure 1-1 if you had difficulty.

1-4. You should have realized that crossing two identical pure-strain flies will produce generation after generation of flies with the same feature. This was part of your operational definition of pure strain in question 1-1.

1-5. If you had difficulty etherizing the flies, you should review Activities 1-3 to 1-7. If your problem was in separating the male and female flies, take another look at Figure 1-2.

1-6. You should have said that the first-generation offspring are the children of the original parent pair.

1-7. a. You could have defined a model in many different ways. However, your answer should have said that a model is something that is used to explain and predict observations.

b. Good models are usually simple enough to be used to explain the observations made, and they should be able to predict and explain future observations.

SELF-EVALUATION 1
Part B

1-1. a. Your answer should have indicated that all the first-generation offspring will have striped bodies. This is because the striped bit masks the bit for a black body.

b. Three fourths of the second-generation fruit flies will have striped bodies and the other one fourth will have black bodies. If you had problems with this, you should review the ideas of the two-bit model in Chapter 4.

1-2. There are two different experiments that you could perform.

a. You could have mated the red-eyed flies and looked for variations in the eye color in the first- and second-generation offspring. Remember that a pure strain is one that will produce generation after generation of offspring that show no change in the feature. See this in Figure 1-3

b. The other experiment you could have performed would be a test cross between the red-eyed flies and some pure-strain brown-eyed flies. If your flies were pure strain for red eyes, all the first-generation offspring should have red eyes. If you have forgotten how to do a test cross, you should review the section on test crosses near the end of Chapter 4.

1-3. a. You should have indicated that the two-bit model will *not* account for this pattern of inheritance.

b. According to the two-bit model, all the first-generation offspring should have shown one of the features. Since this pattern shows some link between the sex of the fly and the eye color, the two-bit model cannot account for it. This pattern is caused by a "sex-linked feature" and is discussed in **Excursion 7-2**.

SELF-EVALUATION 2

2-1. You should have selected vial 2-1A as the one containing the first-generation offspring of a cross between two different pure-strain parents. The color inherited from one of the parents should completely mask the color from the other parent in the first generation. The beans in vial 2-1B are just a mixture of beans of two different colors.

If you had planted the beans from vial 2-1A to test your prediction, you would have obtained a ratio of 3 brown beans to 1 white bean in this next generation. Look over your data in Figure 2-2 if you got this wrong.

2-2. a. The rough ratio is about 5.055 to 1.

b. The rounded ratio is 5 to 1.

Excursion 2-1 will help straighten you out if you had problems with these calculations.

2-3. You should have predicted a ratio of 3 yellow peas to 1 green pea in the second generation. If you had the colors mixed up, look carefully at the results you recorded in Figure 2-2.

2-4. You should have predicted that you *cannot* tell whether a seed is pure strain just by looking at it. The feature you see may be masking another feature. The brown beans in the first-generation offspring of the cross of pure-strain brown and pure-strain white beans did this. However, as you become more familiar with which feature will mask another, you may be able to make some pretty intelligent guesses as to whether certain features are pure strain or not.

SELF-EVALUATION 3

3-1. You should have predicted for both **a** and **b** that all seeds in both generations will be smooth. This inheritance of identical fetures is part of your definition of a pure strain.

3-2. There will be a ratio of 3 tall pea plants to 1 dwarf pea plant. You should have been able to tell that there would be more of the tall variety, because all the first-generation offspring were tall.

3-3. a. You should have indicated that these are not pure-strain corn plants. If they had been, then all their offspring would have been tall.

b. The parents of the corn plants were pure strain. One was tall and the other was dwarf.

3-4. a. The first-generation roses were all red.

b. One of the parent roses was pure-strain white and the other was pure-strain red.

If you had difficulties with questions 2, 3, or 4, you should go back and review the sections from Activity 3-3 to Problem Break 3-1. You need to understand this well before going on to Chapter 4.

SELF-EVALUATION

4-1. a. You should have indicated that a good model is one that accurately describes your observations and makes accurate predictions.

b. You may have answered this question in many ways. However, you should have indicated that the assumptions are the statements or things that must be true if the model is to work.

4-2. You may have used different words to express your answer but the ideas should be the same.

a. Each individual has two bits of information for each feature, and these bits determine the appearance of the individual.

b. During reproduction, each parent passes on to the offspring one bit of information about each feature.

c. Which of the parent's two bits is passed on to the offspring is determined by chance.

d. One bit of information for a feature may mask the other bit of information for the same feature.

4-3. a. The one-bit model best predicts this pattern of inheritance.

b. The thing that should have convinced you that it was the one-bit model that was correct was the half-and-half split between the features in each generation. If you had problems with this question, you should review the ideas of the one-bit model on page 44.

4-4. a. The two-bit model best describes this pattern.

b. You should have said that straight wing *does* mask curly wing. You can tell this from the fact that all the first-generation offspring have straight wings.

c. Unless the original parents were pure strain, one for straight wing and the other for curly wing, you would not get the three-to-one ratio of features in the second-generation offspring.

4-5. You could have used several different experiments to test this. The best would be to cross the plants and see whether the future generations show any variation in features. A test cross would be difficult to do because you would need to know what features were masked and then obtain a plant that was pure strain for the masked features.

SELF-EVALUATION 5

5-1. a. You should have indicated that the information bit for curly hair *masks* the bit for straight hair when both are present in the same individual.

b. This time the straight hair information bit *is masked* by the bit for curly hair.

If you had problems with this, take a look at the discussion of recessive and dominant bits on page 61.

5-2. a. You should have said that the yellow bit is dominant. You can tell this from the information that all the first-generation offspring are yellow.

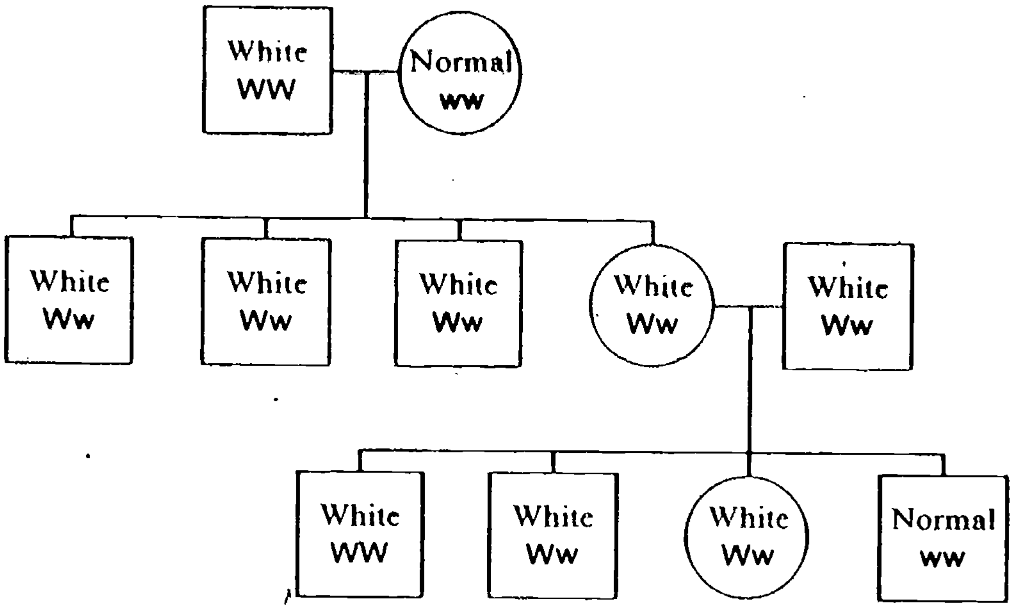
b. None of the plants can be pure strain for yellow.

One of the parents is pure strain for green color (yy) so that any first-generation offspring must have at least one of these bits.

c. Some of the offspring are pure strain for green.

The clue to this is the statement in the question that ". . . some of the seeds of the first-generation offspring are green. . . ." Since green is the recessive bit, the only way you can have green seeds is if the plant is pure strain for green.

5-3. The chart below shows the correct information bits. The strategy for attacking this problem is as follows: One parent is normal so she must be (ww), since normal color is recessive; all the first-generation offspring have white forelocks so they must be mixed (Ww) and the other parent must be (WW). Since a normal child is produced in the second generation, the outside individual (far right on second line) must also be mixed (Ww). The second-generation offspring are the normal combinations of (WW), (Ww), and (ww) that you would expect. If you had problems with this, check over Figure 5-1 again.



5-4. a. You should have recognized that the brown bit is dominant because it is symbolized by a capital letter.

b. Brown

c. Brown

d. Brown

e. White

Review the section on dominant and recessive bits if you had difficulties with this question.

SELF-EVALUATION 6

6-1. You could have many possible answers for this question. One thing to check though is whether you matched up the Iggy offspring features with the bits correctly. Look over the table of dominant features again to make sure that your Iggy offspring features correspond to the bits hat he inherited.

6-2. Once you have written down the bits that the Iggy offspring should have, the rest is easy. Just make each parent pure strain for that feature so that no matter which bit is passed on, the Iggy offspring will have the same set of information bits.

EXAMPLE:

Feature Wanted	Offspring Bits	Parent A	Parent B
Round ears	rr	rr	rr
Curly antennae	Aa	AA	aa

SELF-EVALUATION 7

7-1. Your answer should mention the following points.

a. Each parent has two information bits for each feature and passes one of the two on to the offspring.

b. Which bit is passed on is determined by chance.

c. The offspring receives one bit from each parent and his features are determined by his particular combination of bits.

If you had difficulty with this question, look over **Excursion 7-6** again.

7-2. a. You might have changed your model so that when an individual has one bit for each color, his coat color is a new color. In this case, a bit for red color (R) combines with a bit for white color (W) to produce a roan offspring (RW)

b. From your work with the two-bit model, you should have predicted that one quarter will be white (WW), one half will be roan (WR or RW), and one quarter will be red (RR).

c. A red bull must be pure strain for red. If he had any information bits for white, his color would be roan (RW).

If you had difficulties with this question, check over **Excursion 7-1** again.

7-3. With your expanded two-bit model you should have had no difficulty in predicting that the bit for eye color and the bit for sex are linked and are passed on to the offspring as a single package. See **Excursion 7-2** for an explanation of this.

My Progress

Keep track of your progress in the course by plotting the percent correct for each Self Evaluation as you complete it.

$$\text{Percent correct} = \frac{\text{Number correct}}{\text{Number of questions}} \times 100$$

To find how you are doing, draw lines connecting these points. After you've tested yourself on all chapters, you may want to draw a best-fit line. But in the meantime, unless you always get the same percent correct, your graph will look like a series of mountain peaks.

RECORD OF MY PROGRESS