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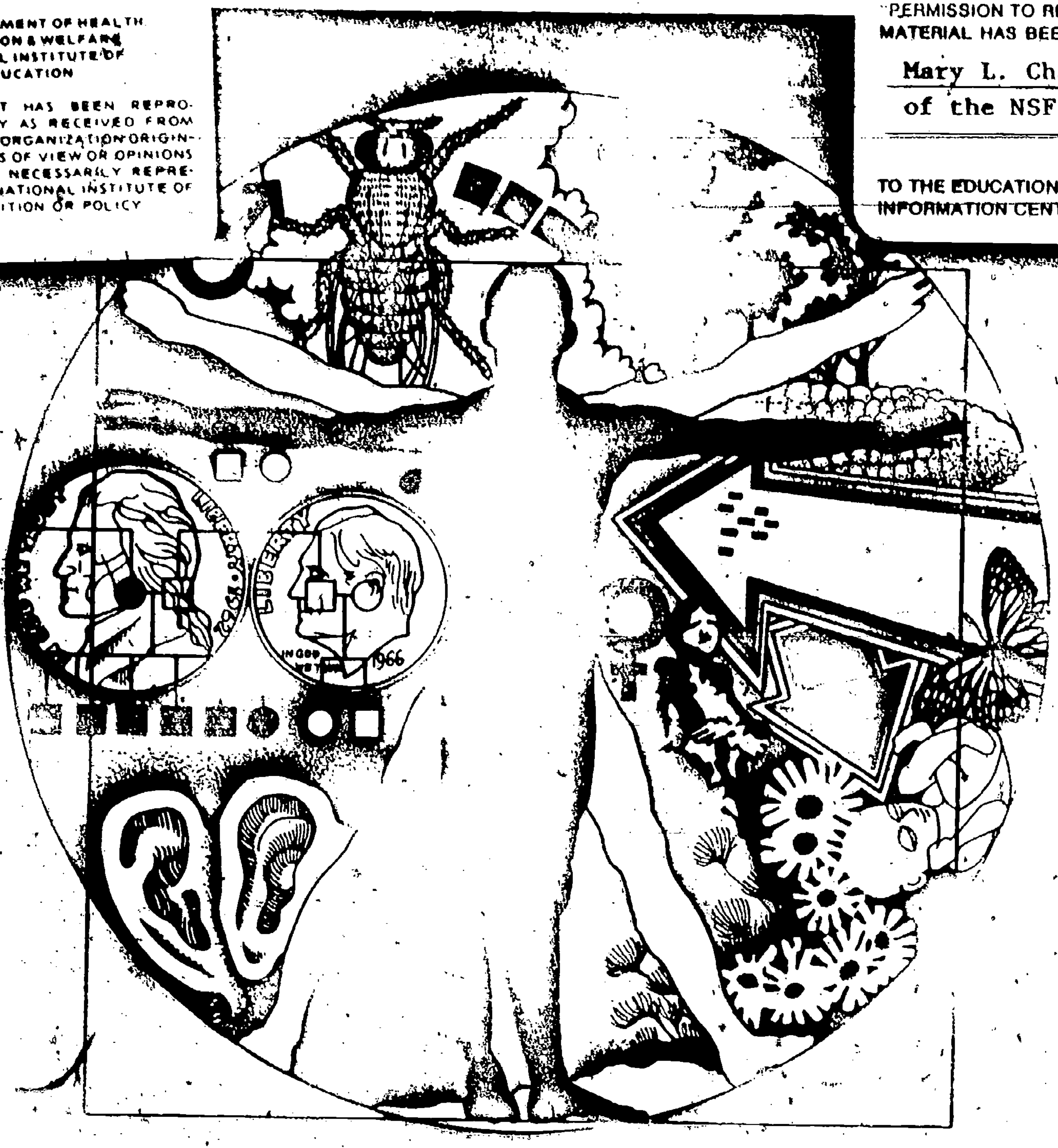
ABSTRACT

This is the teacher's edition of the Record Book for the unit "Why You're You" of the Intermediate Science Curriculum Study (ISCS) for level III students (grade 9). The correct answers to the questions from the text are recorded here. An introductory note to the student explains how to use the book and is followed by the notes to the teacher. Answers are included for the activities and the excursions. A self evaluation section is followed by its answer key. (SA)

Record Book

TEACHER'S EDITION

Why You're You



Probing the Natural World/2

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INTERMEDIATE SCIENCE CURRICULUM STUDY TEACHER'S EDITION

Record Book
Why You're You

Probing the Natural World / Level III

SILVER BURDETT
GENERAL LEARNING CORPORATION
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LEVEL I **Probing the Natural World** / Volume 1 / with Teacher's Edition
Student Record Book / Volume 1 / with Teacher's Edition
Master Set of Equipment / Volume 1
Test Resource Booklet

LEVEL II **Probing the Natural World** / Volume 2 / with Teacher's Edition
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The genesis of some of the ISCS material stems from a summer writing conference in 1964. The participants were:

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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.

Notes to the Teacher

Answers preceded by asterisks indicate that the answers we have supplied are approximate answers. In these cases, other answers may also be accepted. In almost every instance, these variable answers are of a quantitative nature and are based on measurements the students themselves make.

CHECKUP

1. Sperm is the "bit of information" provided by male plants or animals in the formation of offspring.

2. An egg is the "bit of information" provided by female plants or animals in the formation of offspring.

3. The sperm joins with the egg to produce the first cell of the new offspring.

4. Pollen (the sperm) joins the egg, in any of a variety of ways. These 2 cells fuse and the fused cell is the first cell of the new seed.

☐1-1.a. Straight or curly; the curly wings do not lie flat against the body of the fly.

b. Red or brown (Brown is often called "sepia.")

c. Light brown, with darker stripes around lower body

d. Seven, or less, stripes

e. Wing sizes may vary. Most other variations are too small to be readily seen with the hand lens.

☐1-2. Aside from male/female differences, all the flies in any one vial should be alike.

Chapter 1
Red Eyes and Curly Wings

Checkup. Most students should do Excursion 1-1 whether or not they successfully answer the four questions.

Table 1-1. The row of bristles on the male's front leg (the sex comb) is hard to see. However, extra time spent in the identification of the sex differences will pay off for the students. The ability to separate the flies correctly is basic to all the following work in the chapter.

Table 1-1

Male	Female
Definite black tail end	Lighter tail end
Blunt tail end	Pointed tail end
Slightly smaller	Slightly larger
Row of bristles on front leg	No row of bristles on front leg
One point at tip of tail	Two points at tip of tail
Wings smaller	Wings larger

Table 1-2. Be sure that the vials of flies of the two partners are different in the features listed.

Table 1-2

☐**1-4.**

Features	Your Vial #1	Partner's Vial #1
Shape of wings	Straight	Curly
Eye color	Brown	Red

☐**1-5.** Pure strain could be operationally defined as a strain with a feature that has shown no variation over several generations.

1-6. Although the students have inadequate knowledge to predict, it might be interesting to ask some of them why they made the predictions that they did.

☐**1-6.** Answers will vary. Subsequently the student will find that all the offspring will have straight wings and red eyes. However, he cannot be expected to predict this yet.

☐**1-7.** The offspring would be identical to their parents, i.e., they would be pure strain for one or the other feature.

Figure 1-5

Mating: ________ ________ × ________ ________
Sex Feature Sex Feature

Your Name: ____________________

Date: ________ Class Section: ________ Vial #2

FIRST-GENERATION PLANNING CHART	
Event	Date Done or Observed
Vial #1 cleared of adults	Day 1 (e.g., Sept. 15)
Vial #2 prepared	Day 1 (e.g., Sept. 15)
Males & virgin females put in vial #2	Day 2 (e.g., Sept. 16)
Eggs observed	Day 2 (e.g., Sept. 16)
Larvae observed	Day 8 (e.g., Sept. 23)
Parent flies cleared from vial #2	Day 8 (e.g., Sept. 23)
Pupae observed	Day 10 (e.g., Sept. 25)
Adults observed	Day 14 (e.g., Sept. 29)

Table 1-5

Table 1-5. The sample entries in the table are only given as a guide. The actual time for the cycle is greatly dependent on temperature, and may be somewhat shorter or longer than is shown. The important thing is that the student observes the progress daily.

Table 1-6

Eye Color or Wing Shape	Number of Flies

Table 1-6. All the first-generation flies should have red eyes and straight wings. Therefore, Table 1-6 should list *either* red eyes *or* straight wings for the total number of flies.

☐**1-8. Table 1-7**

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

Table 1-7. Whichever feature (red eyes or straight wings) is listed for parents, the same should be listed for the first-generation offspring.

☐**1-9.** All offspring should look like one or the other parent. This answer may or may not agree with 1-6's prediction.

☐**1-10.** All observations should show a consistent pattern, i.e., all first-generation offspring will look like one of the parents.

1-11. Once again, it may be interesting to ask *why* the student made a particular prediction.

☐**1-11.** The predicted answer will vary. Accept any answer.

Table 1-8. The student is instructed to discuss the plan for another generation with you, getting your help, if necessary, and your approval, before beginning the experiment. Be sure that the plan allows for the clearing of vial #2 within 10 hours of the mating time. The timing of the cycle will be temperature-dependent again.

Table 1-8

SECOND-GENERATION PLANNING CHART

Event	Date Done or Observed
Vial #2 cleared of adults	Day 1 (e.g., Sept. 30)
Vial #3 prepared	Day 1 (e.g., Sept. 30)
Males & virgin females put in vial #3	Day 2 (e.g., Oct. 1)
Eggs observed	Day 2 (e.g., Oct. 1)
Larvae observed	Day 8 (e.g., Oct. 7)
Parent flies cleared from vial #3	Day 8 (e.g., Oct. 7)
Pupae observed	Day 10 (e.g., Oct. 9)
Adults observed	Day 14 (e.g., Oct. 13)

☐**1-12.** Answers will vary.

Table 1-9. Parents should be listed as having red eyes and straight wings. The offspring should show an approximate ratio of 3 to 1 for red eyes to brown eyes and for straight wings to curly wings.

Table 1-9

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

☐**1-13.** The 3-to-1 ratio of one type of fly to the other. In terms of the two-bit model, if each parent contributes one bit of information to the offspring, and one bit can mask the other, then the parents must have 2 different kinds of bits for each feature.

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.)

Problem Break 1-1. The student should be able to find the alternative feature to the one he studied (eye color or wing shape). He should also be able to determine an approximate 3-to-1 ratio of the features. From this, the parents can be deduced to be of mixed strain, because each must have been able to contribute a bit for the masked feature. Likewise, the grandparents can be deduced as pure strain in order for them to have identical mixed-strain offspring.

Chapter 2
That's Using the Old Bean

2-1. Be alert for students erroneously stating that the beans differ in sex according to color.

☐**2-1.** Beans may differ in size, weight, color, spottedness, thickness of coat, etc.

☐**2-2.** The brown strain

☐2-3. The white strain

☐2-4. Answers will vary. Accept any answer.

☐2-5. Both brown and white beans

☐2-6. Many more brown than white

Table 2-1. Two beakers of beans should total 225 to 250. At this point the student may not understand ratios, or the rounding-off process, and should do Excursion 2-1.

Table 2-1

SAMPLE COUNT OF SECOND-GENERATION BEANS		
Brown Beans	White Beans	Ratio
174 (approx.)	62 (approx.)	2.8 : 1

2-7. Number of brown beans to number of white beans = 174 to 62
(sample count)
Rough ratio = 2.8 to 1
Rounded-off ratio = 3 to 1

☐2-7. Ratio should be 3 brown to 1 white.

☐2-8. Ratios should be close.

☐2-9. First-generation beans were brown; some second-generation beans were brown and others are white; the ratio of brown to white beans is 3 : 1.

Questions 1, 2, 3, and 4 are not intended to be answered here in the Record Book. They are intended to point out to the student the problems he will be exploring in the remainder of this unit.

Problem Break 2-1. The student cannot see all the kernels of corn on the second-generation ear. From the observable ones, however, typical counts might be these:
Dark kernels = 271
Light kernels = 92
Rough ratio = 2.95 to 1
Rounded-off ratio = 3 to 1

Problem Break 2-1

From the drawings, the student should be able to verify that there are 3 dark kernels to 1 light kernel in the second-generation corn.

Chapter 3 Watch Your Peas and Q's

☐3-1. All peas in package #1 will be smooth and uniformly colored.

☐3-2. No. A pure strain must produce the same type offspring for several generations. There is no way of knowing whether these peas are the result of such generations.

☐ **3-3.** Impossible to predict

☐ **3-4.** They are the same.

☐ **3-5.** Answers will vary, but accept all answers.

3-5. Note that the student should not have been able to make a prediction in question 3-3.

☐ **3-6.** Prediction should include the idea that only smooth peas would result.

☐ **3-7.** So far there is no evidence of any kind that there are anything but smooth type peas in previous generations.

☐ **3-8.** It should be correct.

☐ **3-9.** All are smooth peas.

☐ **3-10.** Pure-strain plants

☐ **3-11.** They would all be smooth.

☐ **3-12.** A pure strain is a strain with a feature that shows no variation over several generations.

☐ **3-13.** All peas will be wrinkled and uniformly colored.

3-13. Also, all are roughly the same size.

☐ **3-14.** These are wrinkled; the previous ones were smooth.

☐ **3-15. and 3-16.** The peas should all be wrinkled. The reason should be that the parent peas were pure strain.

3-15. Note that in order to make this prediction, the assumption that they are pure strain must be made.

☐ **3-17.** Round

☐ **3-18.** Wrinkled

☐ **3-19.** All the peas should look like one of the parents.

☐ **3-20.** They should all look alike, i.e., round (or smooth).

☐ **3-21.** The round (or smooth) parent

☐ **3-22.** There will be smooth and wrinkled peas in a ratio of 3 smooth to 1 wrinkled.

Problem Break 3-1. In the paragraph following the problem break, students are told to try to describe a model for inheritance in their Record Book, if they can. No space has been specifically provided for this, but the few, if any, who try, can write at the bottom of the page.

Problem Break 3-1. Three petri dishes of tobacco seedlings will contain about 45 plants. There should be 30–35 green plants and 10–15 white.

☐3-23. 52 smooth to 17 wrinkled

☐3-24. 3 : 1

☐3-25. Should be the same

☐3-26. Should be the same

☐3-27. a. When two individuals of the same pure strain are crossed, all offspring look like the parents.

b. When two individuals of different pure strains are crossed, the offspring resemble one parent and not the other.

Problem Break 3-1

Students should infer that parents were all alike (all green) and that grandparents were of two different colors (green and white).

Chapter 4 Bits of Information

4-10. In an effort to salvage the one-bit model, students may come up with some novel explanations for the reappearance of white beans. Generally, they will have to make some rather wild assumptions, and the model will become quite complicated. This, of course, is a contradiction of the idea of a model, but the question leads nicely into the following problem break.

☐4-1. Three were smooth (round) and 1 was wrinkled.

☐4-2. Brown

☐4-3. White

☐4-4. Brown

☐4-5. Answers will vary—either brown or white.

☐4-6. Brown

☐4-7. From the brown parent, i.e., parent #1

☐4-8. Because parent #2 had only bits of information for white

☐4-9. Brown

☐4-10. The appearance of white beans cannot be explained by using the one-bit model.

It is impossible to predict the new model suggested by the student. Some may come up with a two-bit model, but not be able to make it work. Accept the student's best effort.

☐ **4-11.** One brown bit and one white bit

☐ **4-12.** The white bit may be defective. Other answers may also be given, e.g., that the white bit was "lost," or that the brown bit overpowers the white bit.

4-12. It is quite probable that many students will not come up with an answer. This is not crucial. The following activity is designed to solve the problem.

☐ **4-13.** Brown

☐ **4-14.** The white bit is masked by the brown bit.

☐ **4-15.** One brown bit and one white bit

☐ **4-16.** Brown

☐ **4-17.** Brown

☐ **4-18.** One brown and one white in each individual

☐ **4-19.** One square from each bag

☐ **4-20.** ✓ Two brown squares

✓ One brown square and one colorless square

✓ Two colorless squares

4-20. It is possible that a more perceptive student may place two check marks next to the middle combination of squares.

Table 4-1

COMBINATIONS OF SQUARES IN SECOND GENERATION

	2 Brown	1 Brown 1 Colorless	2 Colorless
Check marks			
Totals			

Table 4-1. The totals will only approximate 15:30:15. To get closer to a rounded-off 1:2:1 ratio, the student would have to use many more than sixty trials.

Table 4-1 should show totals of approximately 15:30:15.

Table 4-2. Hopefully, the rough ratio will be greater than 2.5 to 1 and less than 3.5 to 1, in order for the rounded-off ratio to be 3 to 1.

Table 4-2

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

When the data is entered into Table 4-2, it should show approximately 45:15, or a rounded-off ratio of 3 to 1.

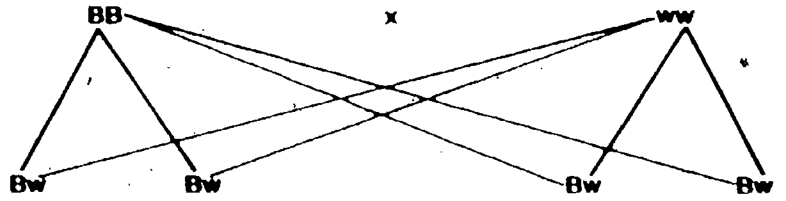
☐4-21. There should be close agreement.

Problem Break 4-2. Note that the student is told to discuss the results with you. You may find that he needs to discuss even more the approach to the problem. Cross #1 should result in all brown beans (Bw). Cross #2 should result in 2 brown and 2 white beans (2 Bw and 2 ww). Cross #3 should result in 4 brown beans (2 BB and 2 Bw).

Problem Break 4-2

The student may use a variety of ways to solve this problem. He may use the brown and clear squares in the paper bags; he may use the diagram method:

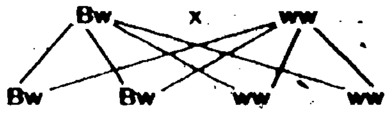
Cross #1



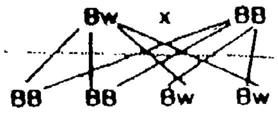
or he may use the "square" method:

	B	B
w	Bw	Bw
w	Bw	Bw

Cross #2



Cross #3



Problem Break 4-3

In all likelihood, the student will find that three-bit or higher models are cumbersome to use and usually fail to explain or predict results,

☐**4-22.** Brown

☐**4-23.** No

☐**4-24.** The resulting offspring will always be brown.

☐**4-25.** Two brown seeds and two white seeds if the brown parent is mixed; all brown seeds if the brown parent is pure.

☐**4-26.** Using a test cross with a pure strain brown parent, the offspring are always brown. Using a pure strain white parent for a testcross, some offspring are white if the brown parent is a mixed strain.

☐**4-27.** The pure-strain parent will have all one kind of offspring. The impure-strain parent will always have two kinds of offspring.

☐**4-28.** When the pure-strain white-bean plant is used, there will be two kinds of offspring. When the pure-strain brown-bean plant is used, all offspring are alike (brown).

4-29. Students should include both ratios in summing up.

☐**4-29.** 1 brown to 1 white with mixed-strain brown parent; 4 brown to 0 white with pure-strain brown parent.

Problem Break 4-4. You should probably accept as an experiment the crossing of several generations of the smooth pea seeds to see if there were any variations, even though the intent of the problem break was to use a test cross.

Problem Break 4-4

Set up a test cross between the smooth peas and some wrinkled peas. If all the offspring are smooth, then the smooth parents were pure strain. If some of the offspring are smooth and some are wrinkled, then the smooth parents were not pure strain.

Chapter 5 Either Heads or Tails

☐5-1. It will taste bitter to those who can taste it. About 30% will taste nothing.

☐5-2. There was no taste.

☐5-3. There should be no "in-between" responses.

☐5-4. Chew a piece of untreated paper.

☐5-5. The "taste" bit appears to mask the nontaste bit.

☐5-6. tt; if a single T bit is present, the person will be a taster.

5-5. The student is referred to statement 4 of the two-bit model at the beginning of this chapter. Actually that statement doesn't tell which bit does the masking. But a look at Figure 5-1 does. The four children of Grandfather and Grandmother Smith being tasters strongly suggests that "taste" is the dominant bit.

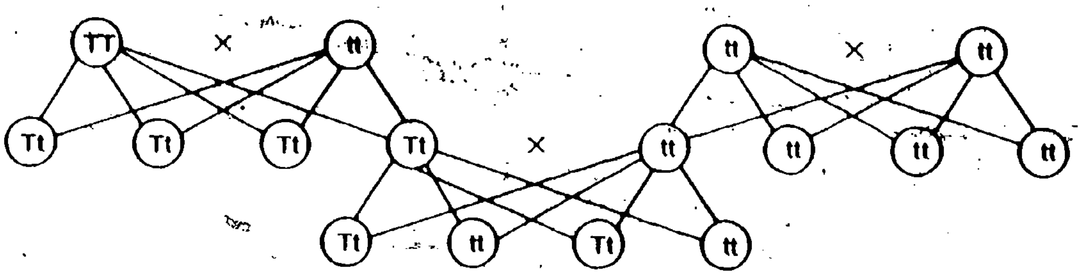


Figure 5-1

☐5-7. TT or Tt

☐5-8. Tt

☐**5-9.** TT or Tt, but more likely TT

☐**5-10.** Parent A is probably not a pure strain because if he were, all the offspring of the mating would probably resemble one or the other parent.

☐**5-11.** Parents A have two different features. They have offspring with 2 different features. It is possible that unattached earlobes is masking attached earlobes.

☐**5-12.** Parent B probably has 2 bits for unattached earlobes. Child B probably has one bit for attached and one bit for unattached earlobes.

☐**5-13.** Since parents B produced all offspring with unattached earlobes, the probability is that the female is pure strain. According to the two-bit model, when two different pure-strain parents mate, all their offspring will resemble one of the parents.

☐**5-14.** Answers will vary.

☐**5-15.** Answers will vary depending on student's observations.

☐**5-16.** Answers will vary depending on student's observations.

☐**5-17.** tt

☐**5-18.** TT

☐**5-19.** Sharon Johnson, Mark's wife, must be tt in order to show the non-tongue-rolling feature. But their children are all tongue-rollers, so they must have a T bit. This could not come from the mother, so the best probability is for Mark to be TT.

☐**5-20.** tt

Problem Break 5-1. The chart, made from their own or generated data, should resemble Figure 5-3 in the text. Be sure that a key to the symbols used is included.

Problem Break 5-1

Family Tree Chart

Problem Break 5-2. The chart should resemble Figure 5-4, but it may not have as many "branches." Encourage students to complete three generations if possible.

Problem Break 5-2

Tongue-Rolling Chart

Table 6-1. Check this table carefully to be sure that the student gets the idea of "reading" the punched card and properly recording the data from it. If the procedure is mastered here, Tables 6-2, 6-3, 6-4, 6-5 and 6-6, which follow, have a much better chance of being done correctly.

Chapter 6
Meet the Ninsect

Ninsect Differences

☐**6-1.** Each ninsect is made up of a different set of features. Thus, according to the two-bit model, each of the two ninsects has a different bit for each feature.

☐**6-2.** Each ninsect must have 2 bits for each feature, making a total of 16 bits.

☐**6-3.** Each parent must pass on 8 bits—one for each feature.

Table 6-1

	Bits of Information				
	Parent (card) #1		Parent (card) #2		
Feature	D or d	Appearance	D or d	Appearance	Appearance of Ninsect Offspring
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. D black ____________________

Table 6-2

	Bits of Information				
	Parent (card) #1		Parent (card) #2		
Feature	D or d	Appearance	D or d	Appearance	Appearance of Ninsect Offspring
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. Chance

☐ 6-6. Four combinations

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

	Bits of Information				
	Parent (card) #1		Parent (card) #2		
Feature	D or d	Appearance	D or d	Appearance	Appearance of Ninsect Offspring
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

	Bits of Information				
	Parent (card) #1		Parent (card) #2		
Feature	D or d	Appearance	D or d	Appearance	Appearance of Ninsect Offspring
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 and 6-8. Check to see that students have determined the noffspring characteristics and not just copied those of the parents.

Tables 6-3, 6-4, 6-5, 6-6. This second group of spaces for the tables is provided so that the student can record the results from Problem Break 6-1, where the ninsect game is played over again.

Problem Break 6-2. Encourage students to review the activities on the two-bit model to try to establish a pattern for predicting. From their past experience, what does it signify if all 4 noffspring
a. show a dominant feature?
b. show a recessive feature?
What significance is there to
a. 3 dominant, 1 recessive?
b. 2 dominant, 2 recessive?

7-1 and 7-2. Failure to answer these questions indicates a need for remedial work with Excursions 7-1 and 7-2.

☐**6-7.** Answers will vary depending on the IBM cards used.

☐**6-8.** The students should find differences in all four, since the chance that two noffspring will ever be alike is rather remote.

Problem Break 6-1

The purpose of these problem breaks is to get the student to report the procedure to get more applied practice in using the two-bit model.

Problem Break 6-2

Consult Figure 6-5 and combine the cards for noffsprings "B," "C," and "D." Record these data in Tables 6-4, 6-5, and 6-6 in your Record Book and complete the right-hand column of each table.

Chapter 7 Problems, Problems, Problems

☐7-1. The student should infer that sometimes masking does not occur; instead, bits of pieces tend to blend.

☐7-2. Apparently the masking of one bit by another is linked to the sex of the individual.

Excursions

Excursion 1-1
More on Offspring

☐1. The sperm is propelled by a whiplike tail.

1. This question may not be answered by the student if the optional activity on frog sperm was not performed.

Excursion 1-2
Writing Operational Definitions

☐1. b, d, e, and f

☐2. The statements as written cannot be measured, and they do not list the things you must do to identify the objects.

☐3.a. Weight is the force measured in newtons when a body hangs vertically from a force measurer.

b. Force is something that causes a change in motion or a change in shape of an object, and it is measured in newtons.

c. Pure strain is a strain that shows no variation over several generations.

Excursion 1-3
Temperature and Life Cycle

☐1. The conclusion should be that the optimum temperature for raising fruit flies is about 80°–85°F.

Excursion 1-4
A Pyramid of Grandparents

☐1. 32

☐2. 62

☐3. 64

☐4. No

☐5. Chance

☐6. About 90 years ago

☐7. None of them

☐8. Chance

☐9. Up

☐10. It is increasing.

☐11. Answers will vary. Accept most of them, since the student can hardly be expected to know about mutations.

☐12. Because there are ever more people producing offspring.

10. There is a tendency for the student to confuse "increase" and "rate of increase." In a series of numbers like 2,4,6,8,10, the numbers are increasing but the rate of increase is constant. In a series like 2,4,16,256, the numbers are increasing and so is the rate of increase.

Problem Break 1

The student should conclude that through interrelationships between pyramids of ancestors, common ancestry can be explained.

Problem Break 1. The student answer might include a diagram that shows how two or more pyramids fit together.

Excursion 2-1
Ratio Simplified

☐1. 2 brown to 1 colorless

☐2. 3 boys to 2 girls (or 1.5 to 1)

☐3. 5 children to 1 adult

☐4. 4 red to 3 yellow to 2 orange to 1 green.

Excursion 4-1
Don't Flip over This

Table 1

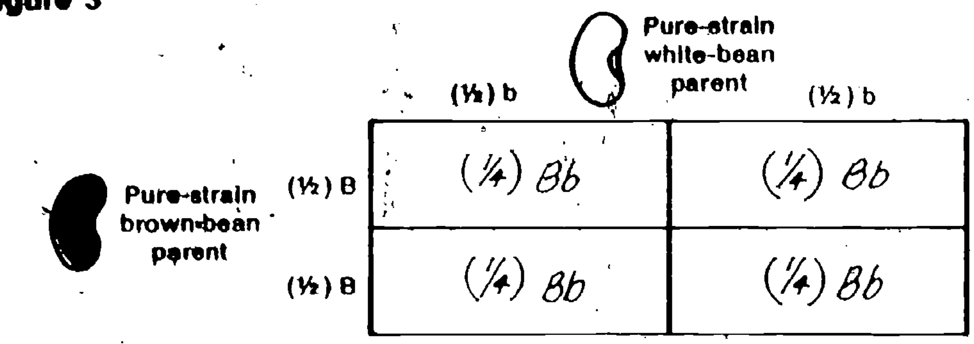
Possible Combinations		Results from 60 Tosses
Nickel	Dime	
Heads	Heads	
Heads	Tails	
Tails	Heads	
Tails	Tails	

Table 1. Check to see that students haven't just filled in "15" for each combination. This would be a highly unlikely result in actual tossing.

Out of 60 tosses, the student should have approximately 15 for each of the four possibilities.

☐**1.** Answers will vary. They should be close, when rounded off, to ¼ for each combination.

Figure 3



	(½) b	(½) b
(½) B	(¼) Bb	(¼) Bb
(½) B	(¼) Bb	(¼) Bb

Figure 3. The four spaces should be filled as follows:
¼ Bb ¼ Bb
¼ Bb ¼ Bb

The student should get ¼ Bb in each of the four squares.

☐**2.** 1 brown to 0 white, i.e., all brown

Figure 4

First-generation offspring

	(½) B	(½) b
First-generation offspring	(¼) BB	(¼) Bb
	(¼) Bb	(¼) bb

Figure 4. The four spaces should be filled as follows:
¼ BB ¼ Bb
¼ Bb ¼ bb

☐3. Three brown to 1 white, or 1 BB (brown) to 2 Bb (brown) to 1 bb (white)

☐4. Brown

☐5. White

☐6. Three brown for every 1 white

Excursion 6-1 A Bit More About Bits

☐1. Two bits are needed for each feature.

☐2. A chromosome, or all the bits from one parent

☐3. A set of features, or the genes from one parent, or the bits of information from one parent

☐4. 8

☐5. 16

☐6. 2

☐7. On the chromosome

☐8. One set comes from one parent, and the other set comes from the other parent.

Problem Break 1

The student is encouraged to read further if he has an interest in hereditary mechanisms.

Problem Break 1. You may want to have the student list the books that he has read.

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	SSYy smooth, yellow	SsYY smooth, yellow	SsYy smooth, yellow
	Sy	SSYy smooth, yellow	SSyy smooth, green	SsYy smooth, yellow	Ssyy smooth, green
	sY	SsYY smooth, yellow	SsYy smooth, yellow	ssYY wrinkled, yellow	ssYy wrinkled, yellow
	sy	SsYy smooth, yellow	Ssyy smooth, green	ssYy wrinkled, yellow	ssyy wrinkled, green

Table 2

Smooth, yellow-seeded plants	9
Smooth, green-seeded plants	3
Wrinkled, yellow-seeded plants	3
Wrinkled, green-seeded plants	1

☐1. 12 to 4, or 3 to 1

☐2. 12 to 4, or 3 to 1

Students may choose any two of the features listed in the excursion. For example, suppose they choose eye color (B,b) and body color (S,s). The first cross will be between BBSS and a bbss, as follows:

	BS	BS
bs	BbSs black, striped	BbSs black, striped
bs	BbSs black, striped	BbSs black, striped

The second cross will be between two of the first-generation BbSs, as shown.

	BS	Bs	bS	bs
BS	BBSS black, striped	BBSs black, striped	BbSS black, striped	BbSs black, striped
Bs	BBSs black, striped	BBss black, plain	BbSs black, striped	Bbss black, plain
bS	BbSS black, striped	BbSs black, striped	bbSS white, striped	bbSs white, striped
bs	BbSs black, striped	Bbss black, plain	bbSs white, striped	bbss white, plain

Excursion 7-1 Red, White, and Pink

☐1. When red and white bits are found together in the same plant, neither one dominates. Instead, there is a blending, or incomplete dominance, resulting in a blended color, pink. Thus, when a pink plant is crossed with a pink plant, 1 red flower (RR), 2 pink flowers (RW), and 1 white flower (WW) result.

	(Pink)	
	R	W
R (Pink)	RR (red)	RW (pink)
W	RW (pink)	WW (white)

1 and 2. It was felt that a capital "W" would be more meaningful to the student for the white bit than a lower-case letter, due to the fact that neither red nor white is completely dominant.

☐2. 2 pink and 2 white flowers result.

	(Pink)	
	R	W
W (White)	RW pink)	WW (white)
W	RW (pink)	WW (white)

Excursion 7-2
Hair Heirs

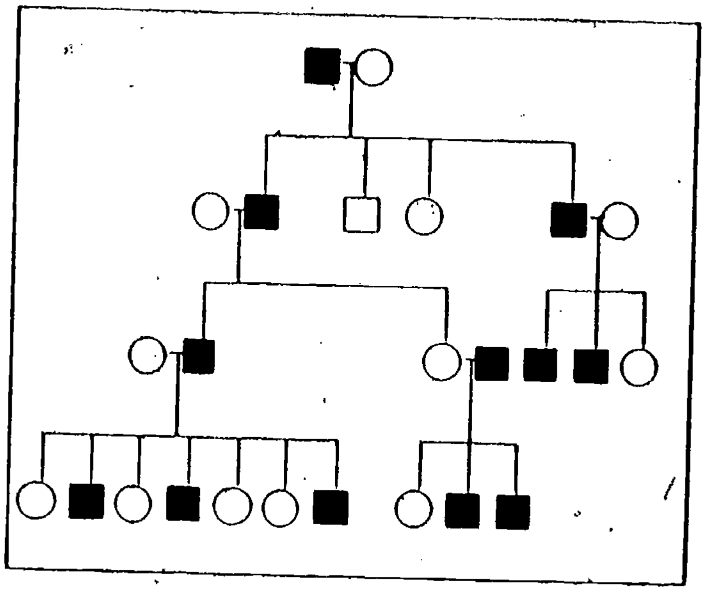
☐1. Because in males, b masks B.

☐2. Because in females, B masks b.

☐3. 3:1

Figure 2. The correct letters for the bits are given to the student at the end of the excursion. You may have to explain why some persons have more than one kind of pairs of bits.

Figure 2



☐4. It must be altered to correlate the feature with the sex of the individual.

Excursion 7-3
Boy or Girl

No responses required for this excursion.

Excursion 7-4
A Royal Problem

☐1. No; the ratios are new.

☐2. Sometimes one bit is masked and sometimes the other seems to be masked.

☐3. 4 male bleeders and 0 female bleeders

☐4. Answers will vary.

☐5. Answers will vary; only a few will guess correctly that bleeding only occurs when a single defective gene is present and that this only occurs when a Y-chromosome is present.

☐6. Students will tend to say "Y," although the X-chromosome is the correct one.

☐7. a. Nonbleeder b. Nonbleeder

c. Nonbleeder d. Bleeder

☐8. The bleeding son received the Y-chromosome from his father, and the defective X^b-chromosome from his mother. This same bleeder's brother received a Y-chromosome from his father but a normal X^N-chromosome from his mother. Thus the first son was a bleeder and the second one was normal.

☐9. Some of the males received a normal X^N-chromosome from their mother.

☐10. No sons could be bleeders, because to be sons they would have to have received the Y-chromosome from their father and a normal gene (either X) from their mother. Daughters would all carry the defective gene, but none would be bleeders. Their sons (grandsons) could be bleeders.

9. There have been *extremely* rare cases of female hemophiliacs reported. For physiological reasons, it is almost impossible for any of these to survive puberty.

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. White (blanched)

☐2. The plants were colorless like those in Problem Break 3-1, but all these plants are white while only a few of the others were white.

☐3. No

☐4. All the seeds were from the same lot. Thus, they were all the same seeds, except that the germinating environment was changed.

☐5. Students will probably predict the restoration of color; however, accept any answer since it is a prediction. Some plants will revert to green in 24 hours, others will remain white for a much longer time.

☐6. The sunlight, or light

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

☐1. Answers will vary.

☐2. Answers will vary

☐3. Both students should have picked up more nonmatching sticks.

☐4. The explanation should indicate that matching sticks are more difficult to see.

☐5. The more nearly alike the moth color and the tree color are, the harder it will be for birds to see them.

☐6. Light-colored moths would be least likely to survive, and dark-colored moths most likely to survive.

☐7. The moth population will become darker in color.

☐8. Protective coloration tends to favor animals whose color tends to blend them into their surroundings. As a result, light-colored moths would be eaten in greater numbers and so there would be less of them available to reproduce. At the same time, dark-colored moths would tend to escape predation and they would successfully reproduce, thus increasing the numbers of dark moths in the population.

Excursion 7-7
Do Blondes Have More Fun?

☐1. Answers will vary.

☐2. Answer should vary with the particular feature mentioned.

☐3. No

☐4. Yes

☐5. Answers will vary, but student should indicate his awareness of what actions he should take to optimize his physical and mental potentials.

☐6. Questions 6 through 10 should lead student to discover that the features developed because of environment are not transmitted by bits of genetic information.

☐7. No

☐8. No

☐9. No

☐10. No

Table 1

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

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.

Notes for the Teacher

The following sets of questions have been designed for self-evaluation by your students. The intent of the self-evaluation questions is to inform the student of his progress. The answers are provided for the students to give them positive reinforcement. For this reason it is important that each student be allowed to answer these questions without feeling the pressures normally associated with testing. We ask that you do not grade the student on any of the chapter self-evaluation questions or in any way make him feel that this is a comparative device.

The student should answer the questions for each chapter as soon as he finishes the chapter. After answering the questions, he should check his answers immediately by referring to the appropriate set of answers in the back of his Student Record Book.

There are some questions that require planning or assistance from the classroom teacher or aide. Instructions for these are listed in color on the pages that follow. You should check this list carefully; noting any item that may require your presence or preparation. Only items which require some planning or assistance are listed.

You should check occasionally to see if your students are completing the progress chart on page 53.

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. You need to prepare (and maintain) a vial of fruit flies for this question. Only a few flies will be needed, but be sure that the vial contains both males and females. Label the vial "Question 1-5." An etherizer and hand lens must also be available. This question calls for a personal check by you.

☐**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?

2-1. Label two vials "2-1A" and "2-1B." In vial 2-1A, place about a dozen brown beans. In vial 2-1B, place 6 white beans and 6 brown beans.

☐**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. ______________________________

____

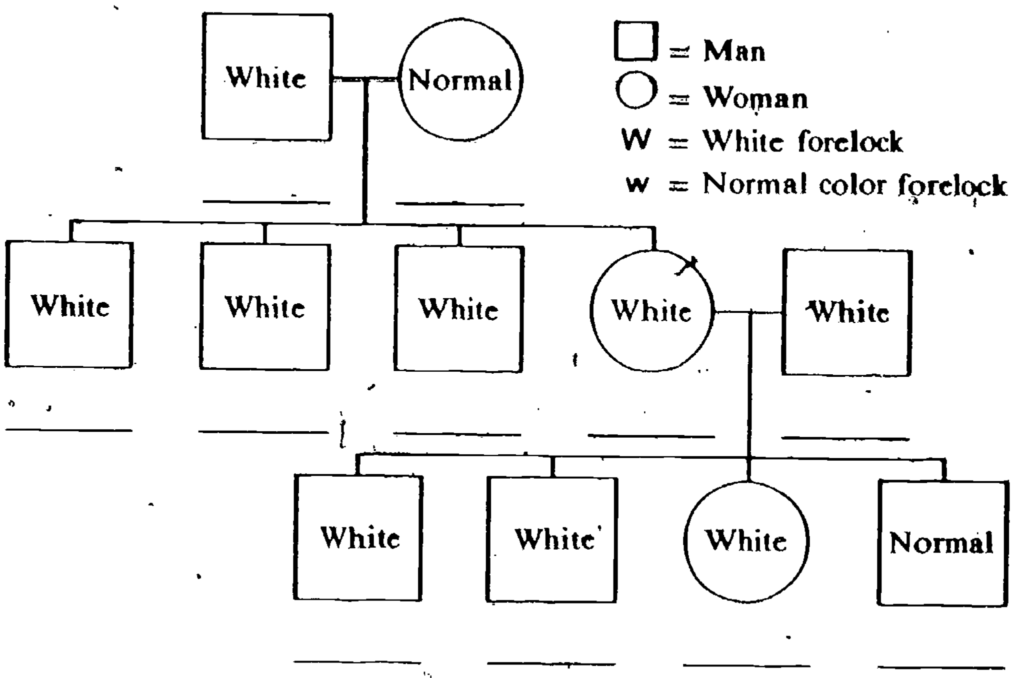
c. Are any of the first-generation offspring from a cross of C and D pure strain for green?

____

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

SELF-EVALUATION 6

☐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.

6-1. You may have to loan a coin for this question.

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

Bits of Information—Iggy Parent B	
1. Pointed ears (T) Round ears (H)	4. Large nose (T) Small nose (H)
2. Straight antennae (T) Straight antennae (H)	5. Thin body (T) Thin body (H)
3. White eyes (T) White eyes (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.

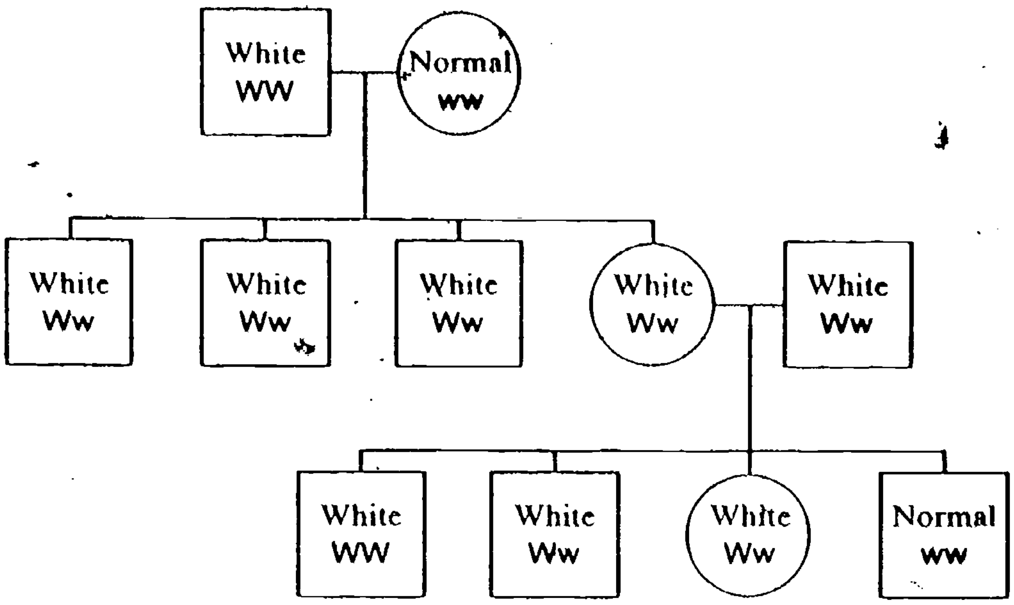
b. None of the plants can be pure strain for yellow.

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