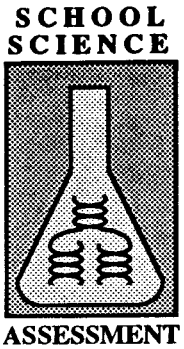


SCIENCE LABORATORY TEST

GENERAL SCIENCE

These tests are being developed through
the University at Buffalo and NORC with support of
the National Science Foundation and
the U.S. Office of Education

Administrator's Manual
for
Science Laboratory Tests
in General Science

This packet of information is intended to accompany the science laboratory tests in general science. The Administrator's Manual consists of the following sections:

1. Introduction
2. Instructions to students
   -Task station schematic
3. Teacher notes for each task including equipment and materials lists
4. Scoring guidelines and criteria
5. Exemplars for the scoring process
6. Student test booklets.

These tests were designed by Diana Anderson, Rodney L. Doran and Carol Lenhardt, State University of New York at Buffalo, Buffalo, NY.

Revised 1993

1. Introduction

The success of an alternative form of assessment depends strongly on the science teacher who administers the tasks. Therefore, a series of guidelines has been prepared, with attention to setting up equipment, administering the tasks, and scoring the students' responses. One teacher can effectively monitor the work of 12 students, with two working on each of the six tasks. The titles of the six tasks in general science are:

A1. Electric Tester
A2. Acid/Base Test
A3. Starch Test
B1. Density
B2. Diffusion
B3. Sugar/Starch Test

The students respond to the tasks in set A or set B. The test booklets contain the questions, necessary diagrams, and spaces for students to write their answers. A total of 30 minutes for student "time on task" is required, 10 minutes per each of 3 stations. With a few minutes of introduction, assignment to task, and collection of booklets, one should schedule a time block of 45 minutes for the testing. The students work at each station for 10 minutes.

The teacher responsibilities begin several weeks before the testing. We have assembled a list of the major tasks and timeline for this completion.

1. Reserve room	4 weeks prior to testing
2. Assign student to testing period (include alternates if part of plan)	4 weeks prior to testing
3. Plan for alternative activities for those <u>not</u> being tested.	4 weeks prior to testing

4.	Locate equipment and material for tasks	2 weeks prior to testing
5.	Assemble, prepare and trial-test equipment	2 weeks prior to testing
6.	Copy student test booklets	1 week prior to testing
7.	Assemble (and try) equipment and materials as needed for first period testing.	Day before testing
8.	Assemble equipment and material for other testing in preparation area.	Day before testing
9.	Check with principal and other teachers for duties on testing day	Day before testing

On the testing day, your responsibilities include the following:

1. Assign each student to appropriate station for the task they will do.
2. Assign alternates to task if some students are absent.
3. Send extra alternates to study hall or other planned space or activity.
4. Make students feel welcome. Begin reading directions.
5. Mark beginning time.
6. Check each station to be sure equipment and material are working correctly.
7. Read the directions for the next section.
8. Answer questions, usually with the comment, "Reread the directions and do the best you can."
9. Collect student booklets and thank them again as they leave.
10. Check stations. Clean up and replenish material for next students.

Once all the tests have been administered, training sessions for the scoring process should be scheduled. A scoring team should consist of experienced teachers. The scoring should not be done just by the teacher of the students being tested. If there are several teachers of science, they could be trained to score a few tasks rather than all six tasks, becoming specialists on those tasks.

The training process should be planned to allow at least five hours. The following outline includes the recommended strategies for developing scorers that can validly and reliably score these tasks.

1. Review the laboratory tasks, including the student test booklets and the equipment/material lists.

2. Discuss the scoring form and criteria sheets and the procedure for using these.
3. Review the exemplars which are scored answers from student test booklets. Discuss the rationale for scoring each exemplar.
4. Score a group of 10 test booklets of the task for which you are being trained.
5. Discuss with the experienced scorer/trainer the scoring of each item on the scoring form. Determine the percent agreement with the trainer.
6. Repeat steps 4 and 5 until the desired level of agreement has been reached (usually 90 %).

2. Instructions to Students

The directions which follow are to be used as oral instructions to students for performance of the general science lab tests. Preliminary instructions include assigning students to stations where test booklets and equipment have been made ready. Step-by-step instructions allow the teacher to lead the student through Part A (Experiment Design) and Part B (Experiment Report) of the six general science tasks.

The format of the directions is in three type styles: normal, italicized, and capitalized. Directions to the teacher appear in normal type. Instructions to be read aloud to the students are italicized. Performance of an action by the teacher (or by the students following an instruction) appears in capitalized print.

normal	Directions to the teacher.
italics	Instructions to be read aloud.
CAPITALS	Actions to be performed by the teacher or the students.

Instructions to Students

As students enter the room, they should be instructed to sit at one of the stations for their assignment (A1, A2, A3, B1, B2, or B3). When the students are seated, let them look around the room, then instruct them to look at the equipment in front of them and find their student booklet.

When the students have settled, the supervising teacher should read the following text. For ease in administration, all sections to be read are printed with italics.

Good morning (afternoon). My name is _____. Today, we are going to perform some science experiments or tasks. A booklet explaining the tasks you are to do should be in front of you. If you cannot find your booklet or you do not have a pencil, please raise your hand.

DISTRIBUTE NEEDED TEST BOOKLETS AND/OR PENCILS

You will keep this booklet for the entire testing session and then hand it in as you leave.

Now that each of you has a test booklet and pencil we are ready to begin. Listen very carefully to the instructions and do your best. Please write your name, your school, your sex and today's date in the space provided on the front page of the booklet.

GIVE THE STUDENTS TIME TO DO THIS

This is a science practical test. The equipment and material that you will need have been set out for you at stations around the room. You will move from station to station until you have performed the three experiments in your set (Set A or Set B). Your booklet will give you directions for each of these three experiments; so carry the booklet with you as you move from station to station. Record the results of your experiments in your booklet.

If you have Booklet A, you will conduct only the experiments marked A1, A2, and A3. If you have Booklet B, you will conduct only those experiments marked B1, B2, and B3. You will have 10 minutes to conduct each experiment with extra time in between to clean up and move from station to station. Do ***not*** *begin any experiment until I tell you to do so. Also, you must stop when I call time.*

Those of you who are at stations A1 and B1, right now, will start at the front of the booklets. The rest of you will need to turn a few pages in your booklet to get to the right experiment. If you are not sure which experiment you are to conduct, look at the card on the table with your materials. It should have A1-B1-A2-B2-A3-or B3 on it. If you are still not sure you are at the right place, raise your hand.

PAUSE AND CHECK TO BE SURE EVERYONE IS AT THE RIGHT STATION.

Check to see that you have all the materials needed for your experiment. Raise your hand if anything is missing.

PAUSE AND CHECK TO BE SURE EVERYONE IS AT THE CORRECT PAGE IN THE BOOKLET AND THAT THEY HAVE ALL THE MATERIALS THEY NEED.

Once you have started your experiment, I cannot help you. I can only assist you right now if you have any materials missing. You will be given 10 minutes to conduct each experiment. After 6 minutes, I will inform you that you have 4 minutes left.

We are now ready to begin the first experiment. Are there any questions? Do your best. You may begin.

AFTER 6 MINUTES, MAKE THIS ANNOUNCEMENT

You have 4 minutes to complete your experiment before cleaning up your station.

WHEN 10 MINUTES HAVE PASSED, GIVE THE FOLLOWING INSTRUCTIONS.

Time is now up. Please close your booklet and stop this experiment. Clean up your station for the next student. Make sure you leave the equipment as you found it. Do **not** *move to the next station until I tell you to.*

GIVE THE STUDENTS TIME TO CLEAN UP. SUPPLY NEW FILTER PAPER, TEST PAPER AND NEW SOLUTIONS NECESSARY FOR NEXT STUDENTS TO CONDUCT EXPERIMENTS, THEN SAY:

You will move two stations to your left. It is essential that you go to the correct station. You may move now. You must do all three experiments from the same set. If you cannot find your new station, please raise your hand.

GIVE THE STUDENTS TIME TO FIND THEIR NEW STATIONS.HELP THOSE STUDENTS WHO INDICATE NEED. A DIAGRAM ON THE BOARD MAY BE HELPFUL.

You should turn to the correct page in your booklet to begin the experiment in front of you. If you are not sure you are on the correct page, please raise your hand.

MONITOR TO MAKE SURE STUDENTS ARE ON CORRECT PAGE.

You may begin work.

AFTER 6 MINUTES, MAKE THIS ANNOUNCEMENT

You have 4 minutes to complete your experiment before cleaning up your station.

WHEN 10 MINUTES HAVE PASSED, GIVE THE FOLLOWING INSTRUCTIONS.

Time is now up. Please close your booklet and stop this experiment. Clean up your station for the next student. Make sure you leave the equipment as you found it. Do **not** *move to the next station until I tell you to.*

GIVE THE STUDENTS TIME TO CLEAN UP. SUPPLY NEW FILTER PAPER, TEST PAPER AND NEW SOLUTIONS NECESSARY FOR NEXT STUDENTS TO CONDUCT EXPERIMENTS, THEN SAY:

You will move two stations to your left. It is essential that you go to the correct station. You may move now. You must do all three experiments from the same set. If you cannot find your new station, please raise your hand.

GIVE THE STUDENTS TIME TO FIND THEIR NEW STATIONS.HELP THOSE STUDENTS WHO INDICATE NEED. A DIAGRAM ON THE BOARD MAY BE HELPFUL.

You should turn to the correct page in your booklet to begin the experiment in front of you. If you are not sure you are on the correct page, please raise your hand.

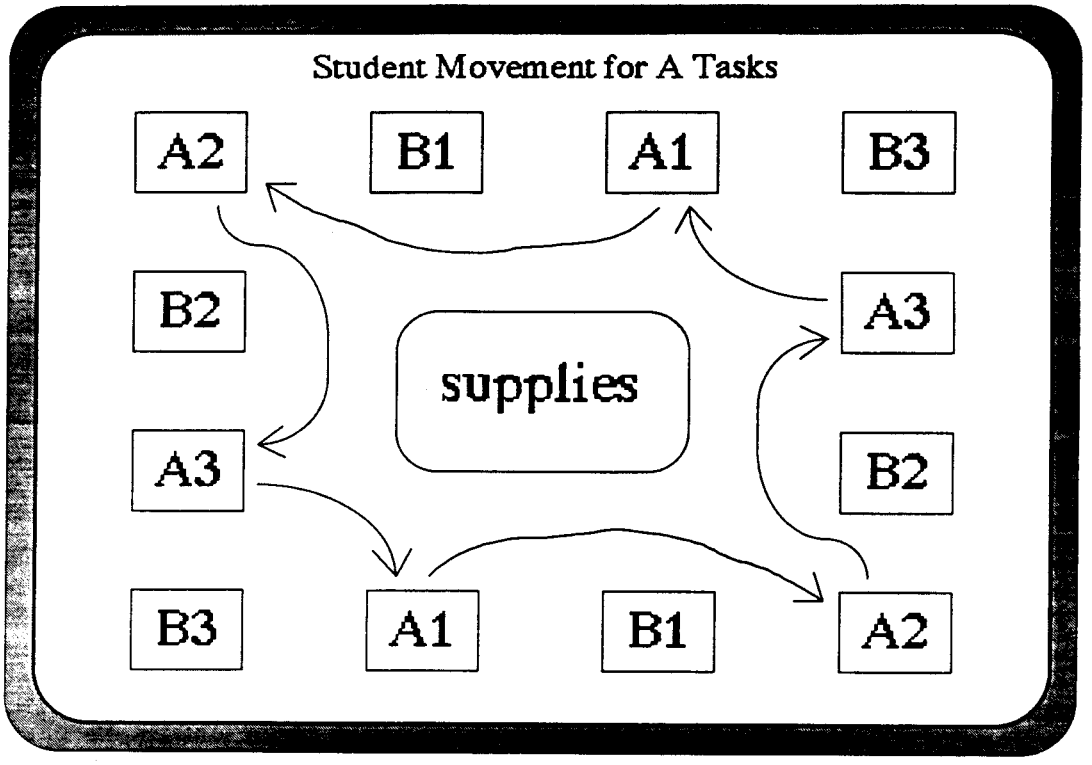
MONITOR TO MAKE SURE STUDENTS ARE ON CORRECT PAGE.

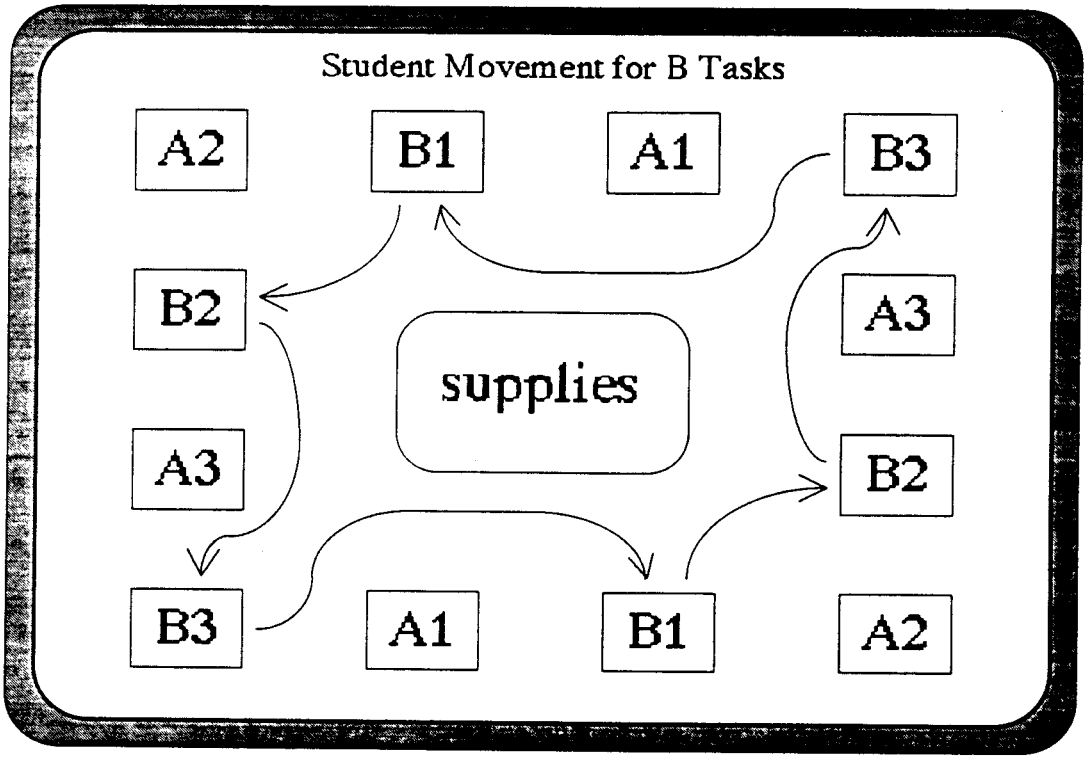
You may begin work.

AFTER THE STUDENTS HAVE COMPLETED THE THREE EXPERIMENTS,GIVE THE FOLLOWING INSTRUCTIONS.

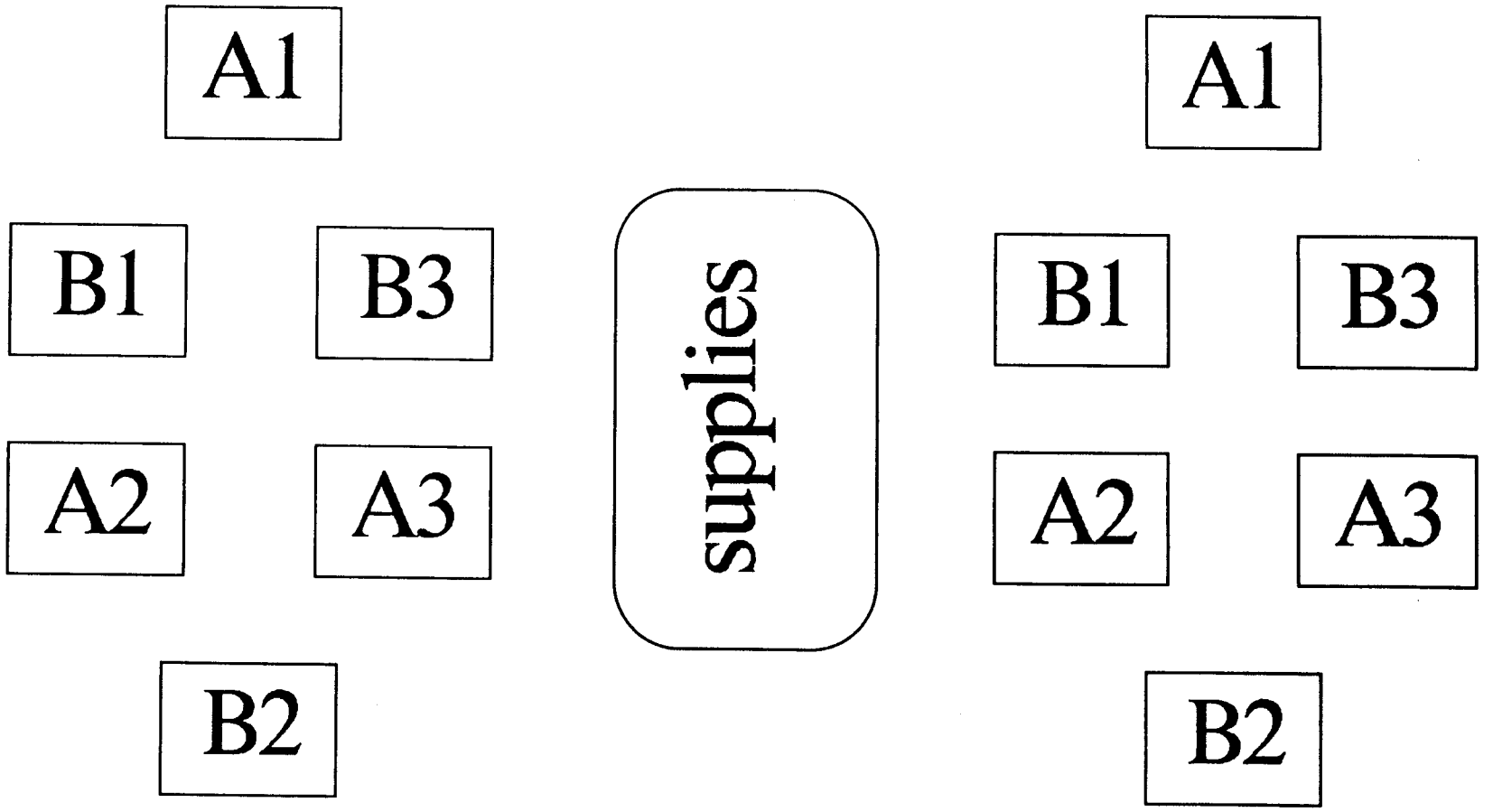
This is the end of the laboratory experiments. Please pass in your booklet and pencils.

Thank you for being so attentive and cooperative during the test. Please wait to be dismissed.


Student Movement for A Tasks
A2
B1
A1
B3
B2
A3
supplies
A3
B2
B3
A1
B1
A2


Student Movement for B Tasks
A2
B1
A1
B3
B2
A3
supplies
A3
B2
B3
A1
B1
A2

Alternative Set-up for Practical Testing for 12 Students



3. Teacher Notes

Teacher Notes provide the information which enables the teacher to gather and prepare materials for set-up of the tasks or stations. Suggestions for performance and calculation of results for each general science task are also given. The sections included are:

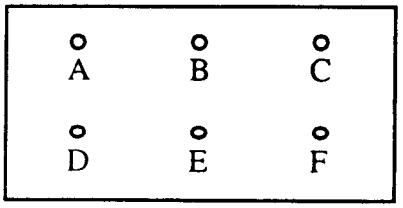
Item and Quantity: Lists the amounts and sizes of all equipment and materials needed for each task.

Comments: Gives suggestions regarding safety considerations specific to each task. In some tasks disposal methods are suggested. Specifies directions for preparation of the needed materials and samples. Provides suggestions aimed at helping the teacher through a "trial run" of the experiment.

EQUIPMENT AND MATERIALS LIST (for one station) LAB TEST - SET A

Experiment	Quantity	Item	Comments
A1	1	Flashlight bulb (1.5 volt)	Bulb must be consistent with bulb holder (e.g., screw versus flange).
	1	Flashlight bulb holder	
	1	"D" battery holder	
	3	3 insulated wires (at least 6 in. long)	Should have clips, or be bare one half-inch on each end.
	1	Circuit card (file folder or back of pad, approx. 10 cm by 14 cm)	Each circuit card will be constructed as follows:

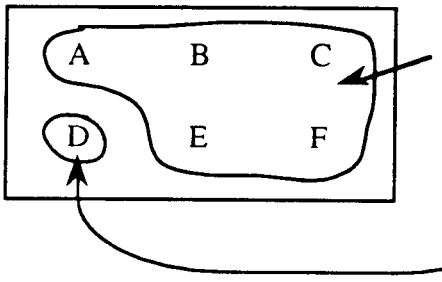
Front View



Foil is taped to the back of bottom card. Front of card has six holes labelled A through F. The entire assembly is taped shut.

Note: tape must <u>not</u> cover the foil exposed through the holes.

Back View



<u>One</u> piece of aluminum foil

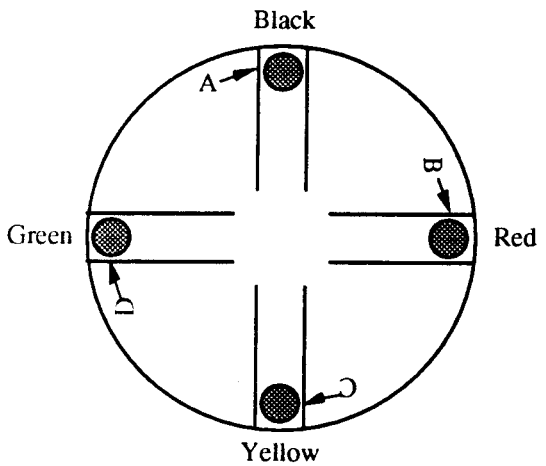
<u>Separate</u> piece of aluminum foil

EQUIPMENT AND MATERIALS LIST (for one station) LAB TEST - SET A (continued)

Experiment	Quantity	Item	Comments
A2	1	Dropper bottles (60 ml) with phenolphthalein	Labelled "Phenolphthalein"
	3	Dropper bottles (60 ml)	Labelled A, B, C. Bottle A contains base (limewater); bottle B contains only water; and bottle C contains acid (1 tsp. citric acid in 50 ml of water).
	1	Vial of blue litmus paper	
	1	Vial of pink litmus paper	
	2	Paper cups	Label: "USED LITMUS PAPER"
	9	Small plastic vials (5 dram)	Sets of three vials (labelled A, B, C).
		Limewater	
		Citric acid	
A3	9	Clear plastic cups (1-2 oz)	Sets of three labelled A, B, C.
	3	Paper cups (16 oz)	Labelled: "Cream Substitute A" (contains 2 tsps. powdered milk and local starch solution). "Cream Substitute B" (contains 2 tsps. powdered milk and local starch solution). "Cream Substitute C" (contains only 2 tsps. powdered milk and 100 ml of water).
	1	Dropper bottle with iodine solution	Labelled: "Iodine" and "Poison"
	9	Plastic coffee stirrers	
		Powdered Milk	
		Starch solution	

EQUIPMENT AND MATERIALS LIST (for one station) LAB TEST - SET B

Experiment	Quantity	Item	Comments
B1	1	50 ml transparent graduated cylinder (with neck collar)	With 1 ml divisions. Place clay at the bottom to prevent breakage if lead weight is accidently dropped.
	1	0-100 gm spring scale	With 1 gm divisions.
	1	Lead sinker - 2 oz. (approx. 60 gm)	Attach about 12 in. of string.
B2	1	Clear plastic cup (4 oz)	With water about 3 cm deep.
	1 per student	Circular filter paper (at least 9 cm in diameter)	Cut paper with four tabs (1 cm x 3 cm) as shown in the illustration. Place a different colored dot 1 cm from the end of each of the four tabs (using three water soluble marker pens: black, yellow, and green; and one non-water soluble marker pen: red.) The distance from the edge of each dot to the end of each tab should be outlined with indelible ink. The beginning position of each dot should be pointed out and labelled "START."
			When the filter paper is placed in the cup, the tabs should just touch the water. The "dots" should not be under the water.



(Paper towels and water should be made available.)

EQUIPMENT AND MATERIALS LIST (for one station) LAB TEST - SET B (continued)

Experiment	Quantity	Item	Comments
B3	1	Dropper bottle (60 ml) with iodine solution.	Labelled: "IODINE" and with appropriate poison warning.
	1	Paper cup	Labelled: "USED TEST TAPE."
	8	Plastic cups (1-2 oz)	2 each, labelled "A," "B," and "C." 1 each, labelled "1" and "2."
	3 per student	Pieces of sugar test tape	Diabetic test tape is not sensitive to table sugar.
	3	Paper cups (approx. 16 oz)	Labelled: "SOLUTION A" - contains only 100 ml of water. "SOLUTION B" - contains 100 ml of starch solution. "SOLUTION C" - contains 100 ml of glucose solution. All containers contain 2 tsp of powdered milk to "mask" the starch solution. Stir well.
		Starch solution	1% commercially prepared solution or 1 teaspoon of corn starch in 100 ml of distilled water.
		Glucose solution	1% commercially prepared solution or 1 teaspoon of glucose in 100 ml of distilled water.
		Powdered milk	May not be needed if sugar and starch solutions are clear.

4. Scoring Guidelines and Criteria

The scoring form which follows allows the scorer to rate any of the six General Science tasks: three test form A and three test form B tasks. The number of items within each task varies from task to task. Each item is identified by a two-digit number separated by a decimal. The first digit to the left of the decimal identifies the task number, the one to the right identifies the item number. Some items have been subdivided so they may also be identified by the letter A, B, C, or D. For example, 2.5B identifies task 2, item 5, part B.

A scoring guide defining specific criteria for each task/item has been prepared to assist the scorer in rating the six tasks. Each task has a total value of ten points. Items within a task may have differing point values, ranging from zero to five points. "No Response" (NR) and "Not Applicable" (NA) are also scoring options.

SCORING FORM — GENERAL SCIENCE LABORATORY TEST

School/Student ID No. _____ Reader ID No. _____

Date _____ Time: _____

Test A

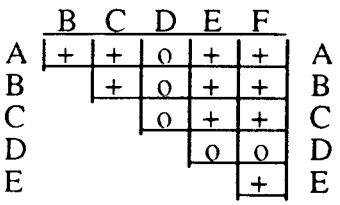
1.1	NR	0	1					NA	3.1	NR	0	1	2			NA
1.2	NR	0	1	2	3	4	5	NA	3.2	NR	0	1	2	3		NA
1.3	NR	0	1	2	3	4		NA	3.3 A	NR	0	1	2	3		NA
2.1	NR	0	1					NA	3.3 B	NR	0	1	2			NA
2.2	NR	0	1					NA								
2.3	NR	0	1	2				NA								
2.4	NR	0	1	2				NA								
2.5 A	NR	0	1	2				NA								
2.5 B	NR	0	1	2				NA								

Test B

1.1	NR	0	1	2	3			NA	3.1	NR	0	1	2			NA
1.2	NR	0	1	2	3	4		NA	3.2 A	NR	0	1				NA
1.3	NR	0	1	2	3			NA	3.2 B	NR	0	1				NA
2.1	NR	0	1					NA	3.2 C	NR	0	1				NA
2.2 A	NR	0	1	2				NA	3.3 A	NR	0	1				NA
2.2 B	NR	0	1	2				NA	3.3 B	NR	0	1				NA
2.2 C	NR	0	1	2				NA								
2.2 D	NR	0	1	2				NA								
2.3	NR	0	1					NA								

GENERAL SCIENCE
SCORING GUIDE - SET 9A

EXPERIMENT 1

Item No.	Answer	Scoring
1	Any evidence of bulb lighting EXCEPT in any Column D or Row D cell.	1 pt for correct answer. 0 pts if all cells marked + or all cells marked 0.
2	The table should be completed as follows: 	5 pts if 13-15 cells correct. (Note: cell B/C may be marked "+" or "0") 4 pts if 10-12 cells correct. 3 pts if 7-9 cells correct. 2 pts if 4-6 cells correct. 1 pt if 1-3 cells correct.
3	Box 2 and Box 6	4 pts for 2 correct answers. 2 pts for 1 correct answer.
		10 points total

GENERAL SCIENCE
SCORING GUIDE - SET 9A

EXPERIMENT 2

Item No.	Answer	Scoring
1	Test tube A - solution turned pink (purple pink).* Test tube B - no change.** Test tube C - no change.**	1 pt if observed changes reported correctly. * = required for point ** = optional for point
2	Test tube A contains a basic solution.	1 pt for correct conclusion.
3	Dip a piece of blue and/or pink litmus paper (blue must be used, pink is optional) into test tube(s) B and/or C. Testing A is not required. Other procedures may be acceptable (e.g., combining equal amounts from vial B (or C) with vial A).	2 pts for complete plan. 1 pt for partial plan.
4	1. Test tube A - pink litmus paper turns blue. 2. Test tube B - no color change with either. 3. Test tube C - blue litmus paper turns pink.	2 pts for listing 2 and 3. 1 pt for listing 2 or 3. (1 is optional.)
5	1. Test tube A - contains a base. Reason: pink litmus turned blue when dipped in it or phenolphthalein turned solution pink. 2. Test tube B - contains water. Reason: no color change with either pink or blue litmus paper. 3. Test tube C - contains an acid. Reason: blue litmus paper turned pink.	<u>Identification:</u> 2 pts for correct identification of 2 and 3 (1 pt each). (1 is optional.) <u>Explanation:</u> 2 pts for correct explanation of 2 and 3 (1 pt each). (1 is optional.)
		10 points total

GENERAL SCIENCE
SCORING GUIDE - SET 9A

EXPERIMENT 3

Item No.	Answer	Scoring
1	Add a few drops of iodine solution to <u>each</u> sample of creamer to test for the presence of starch.	2 pts for complete plan. (A complete plan should have procedure <u>and</u> expected observation, or some indication that change is expected; 1 point given for each element.)
2	Sample A - turns blue-black. Sample B - turns blue-black. Sample C - does <u>not</u> turn blue-black.	3 pts if collor change is correctly reported in all 3 samples (1 pt each). 2 pts if 2 color changes are correctly reported. 1 pt if 1 color change is correctly reported.
3	Sample A - contains starch. Reason: with iodine, it turned blue-black.. Sample B - contains starch. Reason: with iodine, it turned blue-black. Sample C - does <u>not</u> contain starch. Reason: with iodine, it does not turn blue-black.	<u>Identification</u> of sample: 3 pts allowed, 1 pt for each correct identification of A, B, or C. 2 pts for correct identification of 2 samples. 1 pt for correct identification of 1 sample. <u>Explanation</u> of results: 2 pts for correct explanation of 2 or 3 reasons. 1 pt for 1 correct reason.
		10 points total

GENERAL SCIENCE
SCORING GUIDE - SET 9B

EXPERIMENT 1

Item No.	Answer	Scoring
1	Mass of the sinker should be given.	2pts if mass is accurate to within 2 grams. (48-52 g) 1 pt if mass is accurate to within 4 grams. (46-54 g) 1 pt if unit (grams) is given. Note: "2 oz" is an acceptable 3 pt answer, however, all other answers labelled "oz" receive only the point for the label.
2	Answer should include the following elements: A. Some indication of the use of water with the sinker. B. An indication of a change in water level. C. Difference is volume of sinker (3-5 mL). D. Units must be present (mL).	4 pts if all four elements are included. 3 pts for 3 elements present. 2 pts for 2 elements present. 1 pt for 1 element present.
3	Answer should include the following elements: A. Correct use of density foumula (their mass as the numerator, their volume as the denominator). B. Correct calculations (answer should be within +/-0.5 g/mL). C. Correct units given with answer (g/mL).	3 pts if all three elements are included. 2 pts for 2 elements present. 1 pt for 1 element present.
		10 points total

GENERAL SCIENCE
SCORING GUIDE - SET 9B

EXPERIMENT 2

Item No.	Answer	Scoring
1	"Different rate" should be circled.	1 pt for correct answer.
2	A. Black dot separated (changed/turned) into several colors and it moved up the paper. B. Red dot did not change colors and did not move. "Nothing" is acceptable here since no movement or separation is expected. C. Yellow dot did not separate but did move up the paper. D. Green dot separated (changed/turned) into several colors and it moved up the paper.	2 pts for complete description of each dot, including both: 1. color change/separation 2. movement. 1 pt for partial description of each dot. (Total of 8 points possible.)
	(Note: 1. Depending on the ink used, some additional pigments may be present. 2. "Disappear" as an observation does <u>not</u> rate any points.)	
3	The black ink is composed of (is a mixture of) two or more colors (pigments/dyes/chemicals).	1 pt for correct answer.
		10 points total

GENERAL SCIENCE
SCORING GUIDE - SET 9B

EXPERIMENT 3

Item No.	Answer	Scoring
1	Place a piece of test strip into each cup. Put a few drops of iodine solution in each cup. Tests should be done separately, or else use test strips first.	2 pts for complete plan, using both iodine solution and test strip. 1 pt for partial plan.
2	See table below	6 pts possible: 1 pt for each correct observation
3A	Cup C contains sugar.	1 pt for correct identification.
3B	Cup B contains starch.	1 pt for correct identification.
		10 points total

	A	B	C
Iodine solution	N/C*	blue-black	N/C*
Test strip	N/C**	N/C**	green/ darker

* Solution remains yellow-orange-brown in color.
** Test strip remains yellow in color.
Note: If no observations are made in the table in item 2, but correct observations are included in items 3A or 3B, then credit can be given for those observations in item 2.

5. Exemplars for General Science Scoring

This packet is intended as an aid to help the teacher/scorer link the scoring guide with the sometimes unexpected student responses found in the test booklets. Examples of answers to the General Science tasks are presented here.

An attempt has been made to include examples which cover a range of responses and styles; from those that are crisp, clear and detailed, to those that are vague and meager; from those that receive full credit to those that receive none. Comments are included with each page which justify or explain the scoring rationale for each example.

These examples are not intended to illustrate all possible answers. Other responses which are not illustrated here may be equally acceptable for full or partial credit. Some examples illustrate a flexible scoring approach. This means that the task may have been "broadly" scored so that information provided by a student found in an area other than the expected one would still receive full or partial credit as justified by the content of the response. (See Density Task B-1, Example 5, as an illustration.)

EXEMPLARS FOR GENERAL SCIENCE TASK A1:

TESTING FOR ELECTRICITY

GENERAL SCIENCE TASK A1 Testing for Electricity

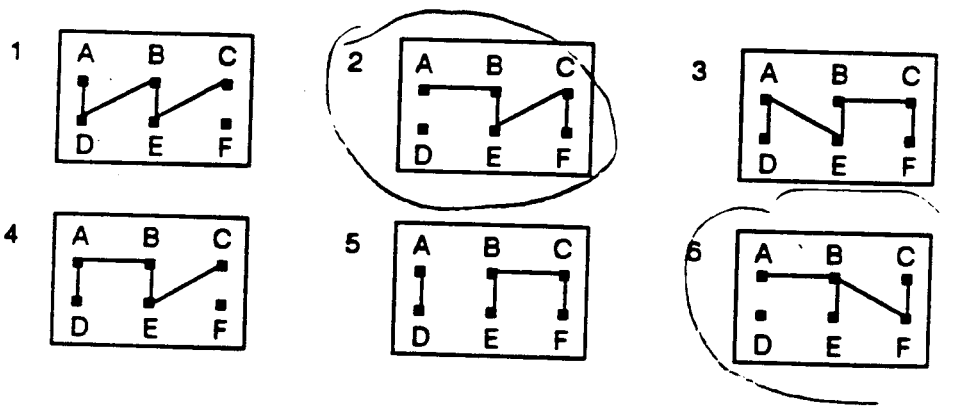
Questions 1, 2 & 3, Example 1 Point Value 1

2. Use this procedure to get results for the other 14 ways of testing between pairs of terminals.

	B	C	D	E	F
A	+	+	−	+	+
B	+	−	+	+	
C	−	+	+		
D	—	—			
E	+				

5

3. On the basis of the above experiment, which two of the following are possible ways the terminals are connected. (Circle two.)



2

2

The student has correctly identified current flow between pairs of terminals with a "+", and no current flow between terminals with a "-". Five points were earned for fifteen correctly identified cells. In question 3, the student has correctly identified circuit boards 2 and 6, earning four points.

Task A1: Testing for Electricity

Questions 1, 2 + 3, Example 2

Point Value

1.

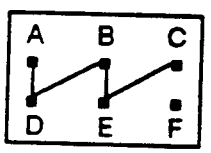
1

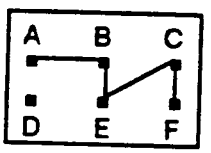
2. Use this procedure to get results for the other 14 ways of testing between pairs of terminals.

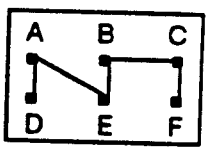
	B	C	D	E	F
A		+			
B	+	+	+	+	
C		+			
D					
E					

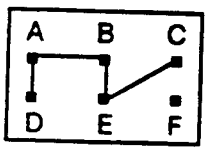
3

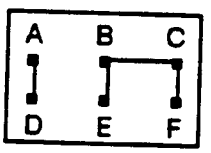
3. On the basis of the above experiment, which two of the following are possible ways the terminals are connected. (Circle two.)

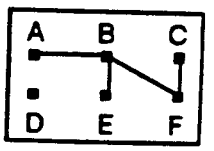
1 

2 

3 

4 

5 

6 

0

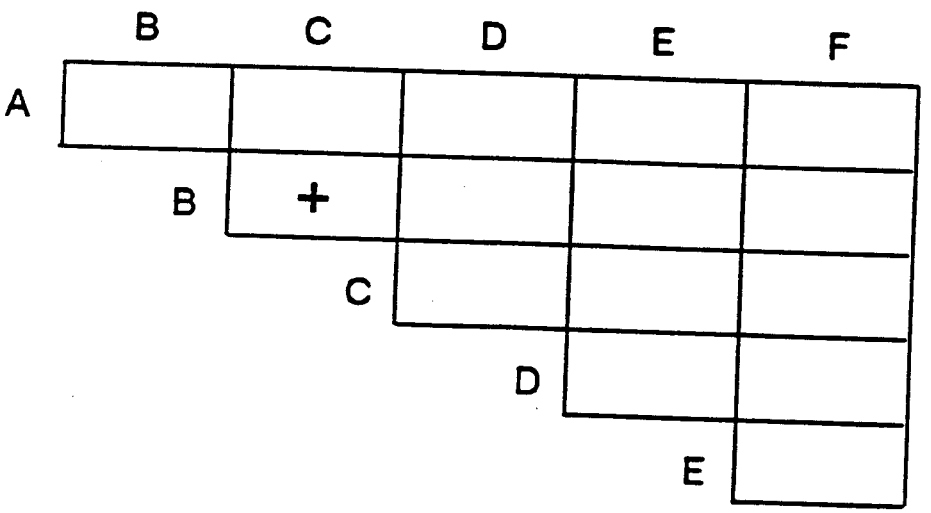
In this example, current flow was indicated with a "+" and the blank areas in the chart were taken as indicating no current flow. This evidence of current flow indicated by the student's responses in the table earned one point for question 1. AC, BC, BE, and BF were correctly identified as cells with current flow; AD, DE, and DF were correctly identified as cells without current flow. Three points were earned for these seven correctly identified cells. No response was indicated for question 3; no points were earned.

Task A1 : Testing for Electricity

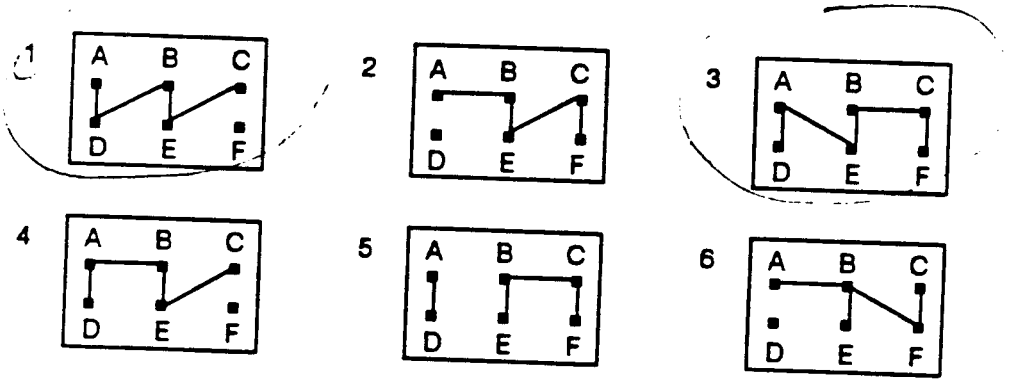
Questions 1, 2 and 3, Example 3 — Point Value

1. 0

2. Use this procedure to get results for the other 14 ways of testing between pairs of terminals. 0



3. On the basis of the above experiment, which two of the following are possible ways the terminals are connected. (Circle two.) 0



In this example, the student has not indicated current flow by a response in the table. No points were earned for questions 1 or 2. The student has incorrectly identified the circuit boards in question 3; no points were earned.

EXEMPLARS FOR GENERAL SCIENCE TASK A2:

ACIDS AND BASES

General Science Task A2: Acids and Bases

Example 1

		Point Value
1.	Add a few drops of the indicator, phenolphthalein, to each vial. What changes do you observe? Record them. A - TURNS PINK w/ 2 DROPS B & C - NO COLOR CHANGE	1
2.	What conclusions can you draw from these changes? A - IS A BASE OR A BASIC SOLUTION B & C - COULD EITHER BE ACIDIC OR NEUTRAL	1
3.	What will you do next? Write down your plan and carry it out. I ALREADY KNOW (A) IS BASIC NOW I WILL USE LITMUS PAPER TO TEST B & C TO SEE IF THEY ARE EITHER ACIDIC OR NEUTRAL	2
4.	What did you observe this time? Record your observations. B - TURNED NO COLOR (NEITHER THE BLUE OR PINK PAPER) C - BLUE TURNED PINK	2
5.	What conclusions can you draw? State your reasons for each one. B - IS NEUTRAL C - IS ACIDIC B - NO COLOR CHANGE ON EITHER THE LITMUS PAPER OR THE PHENOLPHTHALEIN C - BECAUSE TURNED BLUE PAPER RED / RED PAPER STAYED RED & NO REACTION TO THE PHENOLPHTHALEIN	1 1 1 1

Comment:

In items 1 and 2, the student has correctly identified vial A as basic after observing the change which occurred when phenolphthalein was added. One point was given for each of these items. The student's plan in item 3 was considered to be complete since he/she indicated the use of both litmus papers in item 4. This plan was rated two points. Correct observations for a two-point value were given in item 4. The student formed the correct conclusions and linked these conclusions to the observations made previously in the experiment. Item 5 received four points-two for correct identifications and two for the correct reasons.

Task A 2: Acids and Bases

Example 2

Point Value

3. What will you do next? Write down your plan and carry it out.

Dip one of each (red+blue) into each one and record. — 2

4. What did you observe this time? Record your observations.

A= Red turns Blue
B= None
C= Blue turns Red — 2

5. What conclusions can you draw? State your reasons for each one.

A= Basic Solution
B= Water
C= Acidic Solution — 2

The reactions with the litmus paper turn the correct colors to prove the solutions content. — 0

Comment:

The student's briefly outlined plan is complete; two points were given for it in item 3. The observations described in item 4 received the full, two point credit. "None" as an observation in this instance was taken to mean 'no change'. In item 5 the student was given two points for correct conclusions, but none for the reason stated since the conclusions were not linked to previously-made observations.

Task A2: Acids and Bases

Example 3

Point Value

1. Add a few drops of the indicator, phenolphthalein, to each vial. What changes do you observe? Record them.

One vial(A) turned a pink color. The other two did nothing. — 1

2. What conclusions can you draw from these changes?

Vial C is the acidic solution (The blue litmus paper turned pink) Vial A is the basic solution (The pink litmus paper turned blue) Vial B is water (Process of elimination) — 1

3. What will you do next? Write down your plan and carry it out. — NR

4. What did you observe this time? Record your observations. — NR

5. What conclusions can you draw? State your reasons for each one. — 2

2

Comment:

The student correctly described and identified vial A as the basic solution in items 1 and 2. The student did not answer items 3, 4, and 5, but did carry out the experiment using blue litmus paper to identify vial C as the acid. By the process of elimination, vial B was identified as water. No points were given for planning and observing in items 3 and 4. For item 5, two points each were earned for the correct identification and explanation of vial B and vial C written in item 2.

Task A 2: Acids And Bases

Example 4

Point Value

3. What will you do next? Write down your plan and carry it out.

add a bit of A into B and C. — 1

4. What did you observe this time? Record your observations.

B turned red

C stayed cloudy white. — 2

5. What conclusions can you draw? State your reasons for each one.

A is base

B is water

C is acidic — 2

Comment:

The student used an alternate, acceptable partial plan to identify the acid and water. However, he/she gave no indication of volumes to be used and did not justify the plan with reasons or expected results, so this plan was considered incomplete and given only one point. The observations made in item 3 fit the plan, so they received two points. The correct conclusions were drawn in item 5, but since no reasons were stated, only two points were given here.

Task A2: Acids and Bases

Example 5

Point Value

3. **What will you do next? Write down your plan and carry it out.**

Put litmus paper in solution to see what is an acis solution — 1

4. **What did you observe this time? Record your observations.**

That solution C is the acis
Solution A is the basic — 0

5. **What conclusions can you draw? State your reasons for each one.**

That solution A is the basic solution because it turned pink w/ the phenolphthalein & w/ the litmus paper solution B had to be water because it didn't do anything
Solution C had to be the acid. because of the results of the litmus paper — 2 — 1

Comment:

The plan in item 3 is an incomplete, one point plan, because the student does not identify which litmus paper was used, red or blue. Item 4 received no points for observations-the student has written conclusions instead of observations. The student was given tree points for item 5: two points for the correct identification of colution C as the acid, but no point for the reason stated (this student has not described specifically what the "results of the litmus paper" were anywhere in the test booklet).

Task A2: Acids and Bases

Example 6

Point Value

1. Add a few drops of the indicator, phenolphthalein, to each vial. What changes do you observe? Record them.

2 of THem Turned pink.is it and 1 Cloudy — 0

2. What conclusions can you draw from these changes?

2 are Acids and 1 is nit — 0

Comment:

The student's observations recorded in item 1 indicate that an error had been made by the student when the test was performed; no point was given. The conclusion stated in item 2 is incorrect; no credit was given.

Task A2: Acids and Bases

Example 7

Point Value

3. What will you do next? Write down your plan and carry it out.

see if B and C are acids
pour Solution B into a vial and C into a vial and use red litmus paper

4. What did you observe this time? Record your observations.

that solution B is a acid and C is water

5. What conclusions can you draw? State your reasons for each one.

Out of time

NR

Comment:

The plan described in item 3 is incorrect-blue litmus must be used to identify acids. Item 4 was given no points since conclusions, not observations, were made by the student.

EXEMPLARS FOR GENERAL SCIENCE TASK A3:

TESTING FOR STARCH

GENERAL SCIENCE TASK A3 Testing for Starch

Question 1

Example 1

Point Value

1. Using a few drops of iodine solution, how would you find out which sample or samples contain starch? Outline your plan.

Put cream substitute A in A container and B in B container and C in C container. Add a few drops of iodine to each. The ones that turn blue-black contain starch. 2

This is an example of a complete plan. Three elements have been provided by the student: testing each sample, using iodine, and making observations.

Example 2

1. Using a few drops of iodine solution, how would you find out which sample or samples contain starch? Outline your plan.

A- Put each sample in test container
B- Put iodine in each.
C- Record observations. 2

The plan outlined by this student has three elements which make it complete. The student has planned to test each sample with iodine and has also indicated the results that are expected.

Task A3: Testing for Starch

Example 3

Point Value

1. Using a few drops of iodine solution, how would you find out which sample or samples contain starch? Outline your plan.

1) Set up three samples
A
B
C
insert Iodine / 3 drops stirred

1

In this briefly described plan, the student has planned to test three samples with iodine. Although expected results or observations have not been included, the student has provided enough information to earn one point.

Example 4

1. Using a few drops of iodine solution, how would you find out which sample or samples contain starch? Outline your plan.

to test all the things to see which one turns blue-black.

1

One point was earned for this student's plan. "All the things" was taken to mean "three samples", and anticipated results have been stated. Although this plan has not been clearly-written and no use of iodine is mentioned, the student provided enough information and should not be penalized for the language used.

Task A3: Testing for Starch

Example 5

Point Value

1. **Using a few drops of iodine solution, how would you find out which sample or samples contain starch? Outline your plan.** 0

Look at the samples and see what color they turn

The student's plan is vague; he did not explain how he will perform his plan, nor has he specified the use of iodine or anticipated results. No points were earned.

Example 6

1. Using a few drops of iodine solution, how would you find out which sample or samples contain starch? Outline your plan. 0

Sample B in the sample that contains starch, because when the iodine was added the color of the cream turns to a blue-black color.

In this example, the student has stated results and observations instead of a plan; no points were earned.

Example 7

1. Using a few drops of iodine solution, how would you find out which sample or samples contain starch? Outline your plan. 0

Sample A & B Had starch in them But C did not have any starch in it.

This student has stated conclusions rather than a plan; no points were allowed.

Task A3: Testing for Starch

Question 2

Example 1

Point Value

2. Record your observations.

Sample A It turned Brown, almost black. 1

Sample B It turned DARK Brown, almost Black 1

Sample C It turned light Brown 1

The observations recorded by this student are succinct but specific; one point was earned for each correct observation.

Example 2

2. Record your observations.

Sample A is black but didn't reacted the die 1

Sample B the same thing happen with B 1

Sample C reacted the die for a second then turn it yellow. 1
C is the one

This student has made the required observations and attempted to explain the reaction. The answer recorded for Sample B was taken as referring to the answer recorded above it for Sample A. While the language is poor, the observations are essentially correct, so three points were earned.

Task A3: Testing for Starch

Question 2, Example 3

Point Value

2. Record your observations.

Sample A turns brown — 1

Sample B black - blue — 1

Sample C turns it red — 0

The observations recorded here earned two points for samples A and B. A dark color has been taken to indicate positive results, so "brown" is acceptable for sample A. In sample C, "red" cannot be given credit because it is not clear whether this observation was meant to be a positive or negative result, and the student's results/conclusions in question #3 did not further clarify this observation. (See question 3, example #4.)

Example 4

2. Record your observations.

Sample A when I added the Iodine the substance turned a dark blue — 1

Sample B turned To a mustard color — 0

Sample C turned a little darker — 0

The observations recorded in item 2 were acceptable for sample A, but unacceptable for samples B and C. "Mustard color" was interpreted as a negative result. The observation recorded for sample C is too vague. No points were earned for samples B or C.

Task A3: Testing for Starch

Question 3, Example 1

Point Value

3. What are your conclusions? What are the reasons for these conclusions?

Sample A conclusion: That sample A has starch. | 1

Reason: it turned almost black when added with clodine. | 1

Sample B conclusion: B also has starch. | 1

Reason: it turned black when clodine was added. | 1

Sample C conclusion: it don't contain starch. | 1

Reason: it turn a very light brown with clodine in it. | 1

The student has given the correct results and corresponding reasons for samples A, B, and C. A total of six points were earned; one for each correct conclusion and one for each correct reason.

Task A3: Testing for Starch

Question 3, Example 2

Point Value

3. What are your conclusions? What are the reasons for these conclusions?

Sample A conclusion : starch — 1

Reason : the two mixtures were composed of starch — 0

Sample B conclusion : starch — 1

Reason : the two mixtures were composed of starch — 0

Sample C conclusion : no starch — 1

Reason : mixture not composed of starch — 0

The student correctly identified each of the samples containing starch but has stated incorrect reasons in each case. Points were given for identification only.

Task A3: Testing for Starch

Question 3; Example 3 — Point Value

3. What are your conclusions? What are the reasons for these conclusions?

Sample A conclusion: less amount of starch and turned a lighter blue. — 1

Reason: Not enough starch to make it a dark blue — 0

Sample B conclusion: alot of starch present and discoloration occured. — 1

Reason: More starch present in the solution. — 0

Sample C conclusion: no starch present at all in the solution. so there was no discoloration. — 1

Reason: Because there was no starch present. — 0

The student correctly identified each of the samples but has not stated reasons for these conclusions, merely repeated the result in each case. Three points were earned for the identification of samples A, B, and C; no points were earned for reasons.

Task A3: Testing for Starch

Question 3, Example 4

Point Value

3. What are your conclusions? What are the reasons for these conclusions?

Sample A conclusion: Solution turned blue. — 0

Reason: must not be starch. — 0

Sample B conclusion: Solution turned blue, just like A. — 0

Reason: Is not starch — 0

Sample C conclusion: Solution turned a whitish-yellow. — 1

Reason: Is not starch. A+B is a stronger solution than C. O — 1

This student performed the test correctly, as evidenced by the color changes listed for samples A, B, and C. Credit for these observations was earned in preceding question number 2. Full credit was given for sample C although the answers are in the wrong places. No points were earned for samples A and B because the student made incorrect identifications that were listed in the "reason" blank.

Task A3: Testing for Starch

Question 3, Example 5

Point Value

3. What are your conclusions? What are the reasons for these conclusions?

Sample A conclusion: its because of the stuff in the chemicals 0

Reason: because that's the way it was made and what it was made to do. 0

Sample B conclusion: it's the chemical a. that makes it do that when adding 0

Reason: because the adding was made to do that. 0

Sample C conclusion: it's because the cream substitute is what 0

Reason: because it mixed with the iodine it is supposed to turn red. 0

This student does not provide an identification or an explanation for any of the samples. No points were earned.

EXEMPLARS FOR GENERAL SCIENCE TASK B1:

DENSITY

B1: Density

Example 1

		Point Value
1.	What is the mass of the sinker? 47.99g	3
2.	What is the volume of the sinker? 4ml	
	Describe the procedure you used to find the volume of the sinker. (Show all calculations)	4
	Put water in the graduate, set in the sinke & the water rose up 4 ml. and that how much space it took up.	
3.	What is the density of the sinker? (Show all calculations) density = $\frac{\text{mass}}{\text{volume}}$	
	47.99 ÷ 4 = . . . 11.9975	2

Comment:

The student was given full credit for mass with units in item 1 since the rounded mass becomes 48g. (The balance used may have provided this degree of precision.) Full credit was given for item 2. In item 3 the student used the formula and performed the calculations correctly which earned 2 points, but lost a point by not giving units with the answer.

B1: Density

Example 2

		Point Value
1.	What is the mass of the sinker? 49 g	3
2.	What is the volume of the sinker? 4 cm³	4
	Describe the procedure you used to find the volume of the sinker. (Show all calculations) I used the water displacement method, by dipping the weight into 20 cm³ of water and the water rose 4 cm³	
3.	What is the density of the sinker? density = mass / volume (Show all calculations) .081 g/cm3	2

Comment:

The student has correctly determined mass and volume, labeling answers with proper units. Full credit was given for items 1 and 2. In item 3 the student was mathematically accurate and supplied the correct units with the answer. One point was lost in item 3 because the student incorrectly substituted (values were inverted) in the density formula.

General Science Task B1: Finding the Density of a Lead Sinker

Example 3

Point Value

1. What is the mass of the sinker? 60g. — 1

2. What is the volume of the sinker? 4 ml. — 4

   Describe the procedure you used to find the volume of the sinker. (Show all calculations)

   measured water displacement

3. What is the density of the sinker? density = $\frac{\text{mass}}{\text{volume}}$ — 3
   (Show all calculations)

   15 g/ml

Comment:

The mass determined by the student is outside of the acceptable range for accuracy, 46-54g; 1 point was earned for the units given in the answer. The student correctly determined the volume of the sinker without elaborating on procedural steps or calculations. The density of the sinker is correctly calculated based on the student's own data. This example illustrates a very brief but acceptable procedure which earned full credit in items 2 and 3. Full credit was given for the density determined by the student based on his/her data even though the accepted value for lead is nearer to 11.6 g/mL.

B1: Density

Example 4

Point Value

1. What is the mass of the sinker? 2 lbs. — 2

2. What is the volume of the sinker? 24 — by 4 — 3

Describe the procedure you used to find the volume of the sinker. (Show all calculations)

volume: water in the cylinder plus the amount the water goes up to find the volume of the sinker. The volume minus the starting water point.

-19 (5)

3. What is the density of the sinker? density = $\frac{\text{mass}}{\text{volume}}$ — 3

(Show all calculations)

When the sinker was added to the water the level went up 5ml. The sinker with two pounds. The density of the water is. 20lbs / 5ml / 5ml

.4 is the density of the sinker.

Comment:

The student clearly understands the concepts involved in the determination of density. One point was taken off for the inappropriate use of "pounds" as a label for mass in item 1. In item 2, the correct volume has been indicated in the right margin; one point was lost because the units were not present. In item 3, the student has correctly used the formula with his/her measured mass and volume values to accurately calculate density, although with alternate units, lbs/mL. (The student was allowed the point for the label "lbs/mL" in item 3; taking off a point here would constitute "double jeopardy", since a point was already lost for this reason in item 1.)

B1: Density

Example 5

Point Value

1. What is the mass of the sinker? 4 ml — 4

2. What is the volume of the sinker? 50 g. — 3

Describe the procedure you used to find the volume of the sinker. (Show all calculations)

65 with
-61 without
4 mL
weight = 50g

3. What is the density of the sinker? (Show all calculations) $\text{density} = \frac{\text{mass}}{\text{volume}}$

$\text{Density} = \frac{4\,\text{mL}}{50\,\text{g}}$ — 0

Comment:

In this situation it was recognized that the student has correctly done a substantial part of the procedure involved in determining density. Therefore those answers noted in the wrong place do not invalidate the correct procedure for volume and mass indicated by the student under item 2. Full credit was given for items 1 and 2. No points were given in item 3 since the student did not use the formula correctly or perform any calculations and points for units were already given in items 1 and 2.

B1: Density
Example 6

Point Value

1. What is the mass of the sinker? 49.6 grms — 3

2. What is the volume of the sinker? 46 ml

Describe the procedure you used to find the volume of the sinker. (Show all calculations)

The volume was found by putting the sinker into the tube & measuring how much water was taken up by the sinker when in the tube. — 2

3. What is the density of the sinker? density = $\frac{\text{mass}}{\text{volume}}$

(Show all calculations)

V=46 m=49.6 So .46 ÷49.6

10.7grams in density — 0

Comment:

Three points were earned for the correct mass with units provided in item 1. The answer in item 2 is a two point answer: one point for the displacement procedure and one point for the units in the answer. The numerical value for volume is incorrect and the student has not indicated that this volume was determined by difference. In item 3 the student has incorrectly used the formula, performed the calculation, and has provided only partial units in the answer. No points were given.

B1 Density

Example 7

Point Value

1. What is the mass of the sinker? 49g. — 3

2. What is the volume of the sinker? 14cl

Describe the procedure you used to find the volume of the sinker. (Show all calculations)

First weigh the sinker on the scale. = Mass
Second measure the sinker in the beeker with water. = volume — 0

3. What is the density of the sinker? density = $\frac{\text{mass}}{\text{volume}}$

(Show all calculations)

The density of the ~~[illegible]~~ sinker is 3.5 g.

density = $\frac{49g}{14cl}$ — 1

Comment:

In item 1, the mass and units are correct for three points credit. In item 2 the student was too vague in the description of the procedure used, so no points were given for this item. The student correctly substituted his/her values for mass and volume in item 3, earning one point. No points were earned for density value or units.

B1: Density

Example 8

		Point Value
1.	What is the mass of the sinker? 90 ml.	0
2.	What is the volume of the sinker? 42 ml.	
	Describe the procedure you used to find the volume of the sinker. (Show all calculations) I will find the weight of the sinker and put it in the water. I should way to be eight 44. But I then minused to Because of the weight.	2
3.	What is the density of the sinker? density = $\frac{\text{mass}}{\text{volume}}$ (Show all calculations)	NR

Comment:

The mass in item 1 is not within the acceptable range and incorrect units were given; no points were earned. In item 2, the student used an unclear procedure to find volume by water displacement, determining a final volume of 44mL. No initial volume was indicated by the student. The procedure used to determine the volume of the sinker is incorrect. Two points were given for item 2, one for the water displacement method, the other for the correct units.

EXEMPLARS FOR GENERAL SCIENCE TASK B2:

COLOR CHROMATOGRAPHY

General Science Task B2: Color Chromatography

Question #2, Example 1

Point Value

2. Describe what happened to the color of each dot.

Black dot as the coloring moved it also changed from black to a dark red with blue at the center of the paper — 2

Red dot no change — 2

Yellow dot color moved toward center of paper is lighter towards the edge darker towards center — 2

Green dot color moved toward center blue at center green on its outer side — 2

The student correctly described what happened to the black, yellow, and green dots noting movement and/or change/separation. For the red dot, "no change" was acceptable for full credit since no movement or separation was expected.

Task B2: Color Chromatography

Question 2, Example 2

Point Value

2. Describe what happened to the color of each dot.

Black dot first turned purple then blue, moved quickly to the top some green color to — 2

Red dot did not change at all. only faded a little bit right around dot. — 2

Yellow dot did not change color at all faded to top of paper — 2

Green dot faded quickly turned blue at the top of the strip. Some yellow in it. — 2

The student described the red, yellow, and green dots using the word "faded" to mean movement in this example. Alternate descriptors were given full credit as long as the terms clearly described color change or movement.

Task B2: Color Chromatography

Question 2, Example 3

Point Value

2. Describe what happened to the color of each dot.

Black dot remained in it's same place Changed to different colors, first red, then blue — 1

Red dot remains red the entire time — 2

Yellow dot moves upwards but stays yellow — 2

Green dot moves down gets some shades of blue — 2

The student correctly described what happened to the red, yellow, and green dots. (Since no movement or color change is expected for the red dot, the observation made is acceptable.) The student incorrectly described the movement of the black dot, losing one point.

Task B2: Color Chromatography

Question 2, Example 4

Point Value

2. Describe what happened to the color of each dot.

Black dot As the color moved up the tab it changed to different colors. — 2

Red dot the red dot stayed the same. It didn't move — 2

Yellow dot The color moved clear to the top of the tab. — 1

Green dot when the green got to the top it changed to a blue. — 2

The student described both color change and movement for the black, red, and green dots. In the description of the yellow dot, "clear" was taken to mean "all the way", not transparent. The student did not describe any color change here, so one point was lost.

Task B2: Color Chromatography

Question 2, Example 5 Point Value

2. Describe what happened to the color of each dot.

Black dot It turned a different - 2
different blue color and ran

Red dot It stayed the same. 2

Yellow dot It stayed the same. 1

Green dot It ran and it now has 2
a blue color to it

The description given for what happened to the black, red, and green dots all earned full credit here. "It stayed the same", was acceptable for the red dot since no color change or movement was expected. That same description for the yellow dot earned a point only for color change (no color change was expected). However, a point was lost here since no movement was described for this dot as was expected.

Task B2: Color Chromatography

Question 2, Example 6

Point Value

2. Describe what happened to the color of each dot.

Black dot The black dot turn purple — 1

Red dot The Red dot did not turn it Stayed in a neat Complete circle. — 2

Yellow dot The yellow dot turn it didn't stay in a circle — 1

Green dot Green dot Turn a little Blue — 1

In this instance the word "turn" was used by the student to indicate color change. A description of movement was not given for the black or green dots, so one point was lost in each case. "The yellow dot turn" was taken to mean color change which should not have occurred, so one point was lost for this description, but the movement described earned a point.

Task B2: Color Chromatography

Question 2, Example 7

Point Value

2. Describe what happened to the color of each dot.

Black dot came up first and the color runs and it came up first — 1

Red dot was in the water — 0

Yellow dot was a little in the water — 0

Green dot was the same it stayed in the cup — 0

In this example, the student may have performed the procedure incorrectly (tabs may have been set too deeply into the water, so that the dye ran into the water instead of migrating up the tab). One point was given for the movement described for the black dot. The descriptions provided for the red, yellow, and green dots did not earn any credit.

Task B2: Color Chromatography

Question 3, Example 1

Point Value

3. Write an explanation for what happened to the black dot.

Black is a combination of colors, so when its color was spread out toward the paper's center with the help of the water the colors that are contained in black appeared.

1

The student has provided a clear explanation for what occurred with the black dot.

Example 2

3. Write an explanation for what happened to the black dot.

As the black dot became dissolved the different colors within it began to come out separately. The lighter colors went to the top and the darker stayed closer to the bottom.

1

For item 3, "the different colors within it" was interpreted as meaning 'combined colors', so the student received credit for this answer.

Task B2: Color Chromatography

Question 3, Example 3

Point Value

3. Write an explanation for what happened to the black dot. 0

it stayed in it's same spot but changes to all the colors except yellow

No point was given for this item since the answer is an observation, not an explanation.

Example 4

3. Write an explanation for what happened to the black dot. 0

The black dot was the quickest to rise because black is the absorbent color. Black absorbs all lights to change the colors.

The student's explanation was not adequate; no point was earned for it.

EXEMPLARS FOR GENERAL SCIENCE TASK B3:

IDENTIFYING SUGAR AND STARCH

General Science Task B3: Identifying Sugar and Starch

Question 1, Example 1

Point Value

1. Using the information above, what will you do to determine which cup contains starch and which contains sugar? Write out your plan.

First place a test strip in each cup to determine which contains a sugar solution place that cup aside Then put a couple of drops in the other 2 cups to determine which contains a starch solution The one left is neither starch or sugar

2

This is an example of a complete, step by step plan which describes testing for both sugar and starch. The student has stated the use of the test strips for sugar and although he/she has only implied the use of iodine for starch, no credit was lost. Through the process of elimination, the third sample was identified. Full credit was earned for this plan.

Task B3: Identifying Sugar and Starch

Question 1, Example 2 Point Value

1. Using the information above, what will you do to determine which cup contains starch and which contains sugar? Write out your plan.

put each in seperate containers, test with test strips. 1

This student's plan was considered incomplete. The plan minimally described here involves testing for sugar only; no description of a plan to test for starch has been outlined. One point was earned for this partial plan.

Example 3

1. Using the information above, what will you do to determine which cup contains starch and which contains sugar? Write out your plan.

USE THE TEST STRIPS FIRST AND TO CONFIRM WITH THE IODINE 1

This briefly described plan was partially credited with one point since the student did not state the expected observations that were anticipated for either of the tests being performed.

Task B3: Identifying Sugar and Starch:

Question 1, Example 4

Point Value

1. Using the information above, what will you do to determine which cup contains starch and which contains sugar? Write out your plan.

Cup "A" is sugar and
Cup "C" is starch.

0

In this case the student has stated conclusions rather than a plan. No points were earned.

Example 5

1. Using the information above, what will you do to determine which cup contains starch and which contains sugar? Write out your plan.

Dip a paper with iodine into each solution then observe the color to determine what the solution is

0

This student's plan is "fuzzy" at best. Although the student planned to use both the test strips ("paper") and the iodine, the method outlined does not clarify what test is to be accomplished. Use of iodine on the test strip may have caused a false positive test for sugar or starch. This plan earned no points.

Task B 3: Identifying Sugar and Starch

Question 1, Example 6

Point Value

1. Using the information above, what will you do to determine which cup contains starch and which contains sugar? Write out your plan.

(1) 1st I will dip the yellow strip into the cup that boths the cloudious - I dip the paper in solution C - It turned green so the solution C has the sugar

&

(2) I will put the strips in the cups - put a drop of iodine on them and see which has starch.

0

This student has planned to use both the test strips and the iodine in his/her procedure. However, several weaknesses prevented points from being allowed in this case. In the test for sugar, the student's plan involved testing only one, rather than all three of the samples. In addition, the student has inappropriately described results here. The student has also incorrectly used iodine to test for starch by placing the iodine on the test strips instead of directly into the solutions.

Task B3: Identifying Sugar and Starch

Question 1, Example 7

Point Value

1. Using the information above, what will you do to determine which cup contains starch and which contains sugar? Write out your plan.

the starch cup will Be
noticable for the Black strip
will pore 1 p Drop of Iodine
in each cup to see
withe one is starch
and sugar

0

This student's plan did not clearly define which test was being performed with the use of iodine-sugar or starch. This student seems to have merged the two tests into one ("black strip"). This plan earned no credit.

General Science Task B3: Identifying Sugar & Starch

Question 2, Example 1

Point Value

2. Record your observations in the table.

	Cup A	Cup B	Cup C	
iodine	yellow	blue-black	yellow	3
test strips	yellow	yellow	green	3

The student's observations have been fully recorded in this table. Six points were earned here.

Example 2

2. Record your observations in the table.

	Cup A	Cup B	Cup C	
	nothing happened to strip	nothing happened to strip	strip turned green when added	3
	turned yellow when iodine added	turned blue-black when iodine added		3

This table earned six points even though only five observations were recorded here. As stated in this student's plan, a process of elimination was used, so that once the sugar sample was identified, it would be put aside, and the remaining two samples would be tested for starch.

Task B3: Identifying Sugar and Starch

Question 2, Example 3

Point Value

2. Record your observations in the table.

	Cup A	Cup B	Cup C	
(sugar) Paper turned green			X	3
(starch) Iodine turned black		X		3
Neither starch or sugar	X			

This student has identified the tests that were performed and the expected changes in the left column. An "X" identified the samples in which change was observed for either the sugar or the starch test. The columns left blank also earned credit, in this instance for no observed change. Six points were earned.

Question 2, Example 4

2. Record your observations in the table.

	Cup A	Cup B	Cup C	
TAPE	TURNS GREEN	NO CHANGE	NO CHANGE	1
Iodine IN CUP	—	Blue Black	Yellow	3

This student has made incorrect test tape observations for cups A and C-the observations should be reversed. Two points were lost here. This student used the process of elimination to help identify the starch sample, so that when cup A had a positive reaction for sugar, it was not tested for starch; nevertheless, a point was earned. The observations made for cups B and C when tested with iodine are also correct.

Task B3: Identifying Sugar and Starch

Question 2, Example 5

Point Value

2. Record your observations in the table.

	Cup A	Cup B	Cup C	
STRIPS GLUCOSE	NEGATIVE NEUTRAL CUP	NEGATIVE STARCH CUP	POSITIVE GLUCOSE CUP 2%	3
IODINE	NEUTRAL CUP	STARCH CUP	GLUCOSE CUP	1

The student has derived the observations recorded in this table for the sugar test by comparing the sample test strips to the test tape container. For sample C, "2%" would indicate a change in the test tape to green; "negative" for samples A and B was therefore interpreted to mean a yellow test strip or no change. Three points were earned. Additionally, although results were inappropriately recorded here for the starch test, one point was allowed since an observation for sample B was recorded in question 3 which followed.

Task B3: Identifying Sugar and Starch

Question 2 Example 6

Point Value

2. **Record** your observations in the table.

	Cup A	Cup B	Cup C	
Sugar	No reaction	a little color change	changed to green	2
Starch	Changed color to Black	changed to Black	changed to Black	1

The observations made by this student when testing for sugar were allowed for cups A and C. The observation for cup B, "a little color change", was not clearly interpreted, so lost a point. For starch testing, the observation made for cup B was correct, while cups A and C were incorrect. Three points were earned.

Example 7

2. Record your observations in the table.

	Cup A	Cup B	Cup C	
test for Sugar	not Sugar	not Sugar	Sugar	0
test for Starch	not Starch	Starch	not Starch	0

This student has recorded results rather than observations in the data table. No points were earned.

Task B3: Identifying Sugar and Starch

Question 3, Example 1 Point Value

3. On the basis of the information in the table above, answer the following questions.

A. Which sample contains sugar? C 1

What are your reasons for this conclusion? The tape turned green in solution. The tape is an indicator for sugar

B. Which sample contains starch? B 1

What are your reasons for this conclusion? because the contents of the cup turned blue/black in presence of iodine, the starch indicator

The student has correctly identified sample C as the sugar solution and sample B as the starch solution. Two points were earned.

Example 2

3. On the basis of the information in the table above, answer the following questions.

A. Which sample contains sugar? Cup C 1

What are your reasons for this conclusion? the Iodine turned it light Black

B. Which sample contains starch? cup B 1

What are your reasons for this conclusion? Dark Black

The sugar solution and starch solution are correctly identified in this example. Two points were earned. Although the reason stated in 3A does not correlate to the conclusion made, credit was independently earned here based identification.

Task B3: Identifying Sugar and Starch

Question 3, Example 3 — Point Value

3. On the basis of the information in the table above, answer the following questions.

A. Which sample contains sugar? C — 1

What are your reasons for this conclusion? The test tape changed from yellow to green.

B. Which sample contains starch? _____ — 0

What are your reasons for this conclusion? none because neither of the other strips changed from yellow into the blue-black color.

The student earned one point for correctly identifying sample C as the sugar solution.

Example 4

3. On the basis of the information in the table above, answer the following questic..s.

A. Which sample contains sugar? C, & A - — 0

What are your reasons for this conclusion? Because, I put the yellow containers in, and it turned green!

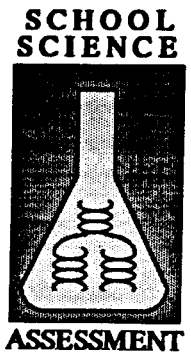
B. Which sample contains starch? B — 1

What are your reasons for this conclusion? Because, when I added the iodine, it turned a blue/black in color!

Sample B was correctly identified as the starch sample; one point was earned. This student has identified both C and A as samples containing sugar. However, the directions at the beginning of task B3 clearly state that one sample "contains neither starch nor sugar". Since all three samples were identified as containing either starch or sugar, no points were allowed for the samples identified in question 3A, even though one of them was

6. Student Test Booklets

Six tasks in general science follow, three tasks in set A and three in set B. Students respond to tasks in set A or set B. The test booklets contain the questions, necessary diagrams, and spaces for students to write their answers. Ten minutes time is required to perform each task, with a total time of 30 minutes required to complete all three tasks. With a few minutes of introduction, assignment to task, and collection of booklets, one should schedule a time block of 45 minutes for the testing.



SCIENCE LABORATORY TEST

GENERAL SCIENCE

FORM A

NAME _____ SEX _____

SCHOOL _____ DATE _____

These tests are being developed through
the University at Buffalo and NORC with support of
the National Science Foundation and
the U.S. Office of Education

GENERAL SCIENCE

Instructions :

This is a science laboratory test. You will be asked to do some science experiments. The materials you need have been set out for you at three stations. You will do the experiments at each of the three stations.

You should visit stations: A1, A2, A3

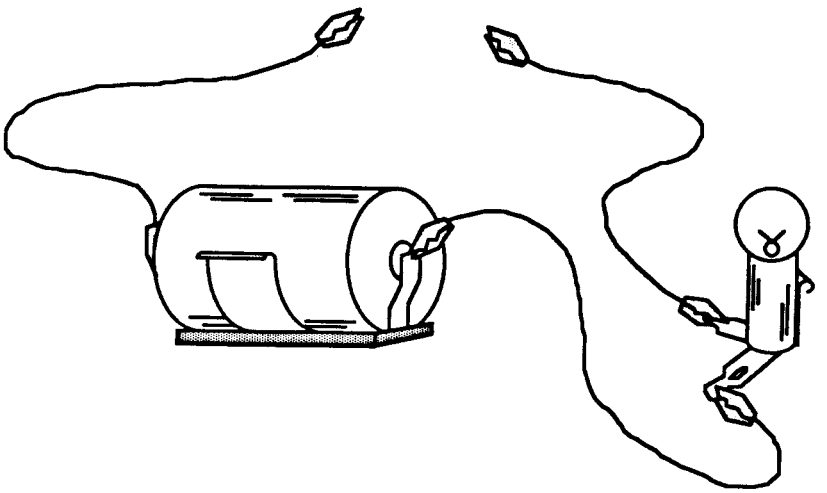
When the supervisor tells you to change stations you should move two stations to your left. You will find a different experiment belonging to Form B at the new station.

This booklet explains what you should do at each station. You should also answer the questions in this booklet.

PLEASE DO NOT TURN THE PAGE UNTIL ASKED TO DO SO.

GENERAL SCIENCE TASK A1

The diagram below represents an electric tester.



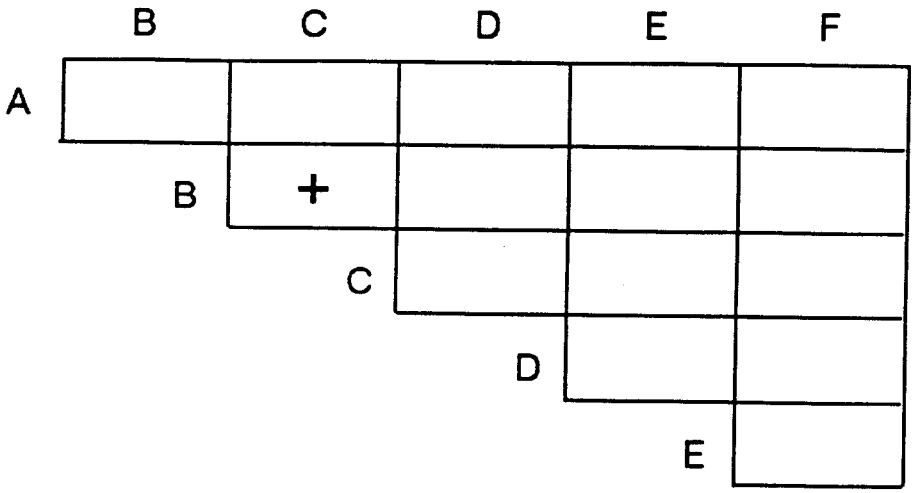
Use the materials given to make an electric tester. Use the tester to check if an electric current flows between all the various pairs of terminals (A to F) on the circuit board.

1. Perform the tests and record the results in the table below. For example, touch terminal B of the circuit board with one wire. At the same time touch terminal C with the other wire. The bulb should light. If the bulb does not light, stop and tell your test administrator. If the bulb lights, you should record this result by marking a plus (+) in the box that is found both in the column of boxes under C and in the row of boxes to the right of B. If the bulb does not light, place a zero in the box.

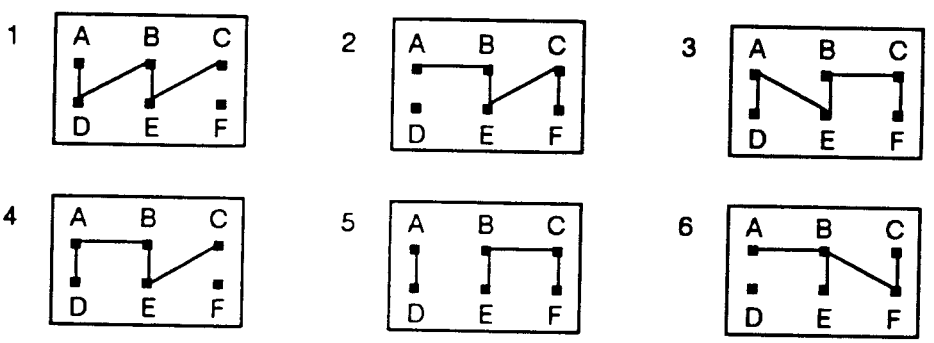
PLEASE CONTINUE TASK A1
ON THE NEXT PAGE

GENERAL SCIENCE TASK A1

2. Use this procedure to get results for the other 14 ways of testing between pairs of terminals.



3. On the basis of the above experiment, which two of the following are possible ways the terminals are connected. (Circle two.)



Wait until you are told to move.

GENERAL SCIENCE TASK A2

Phenolphthalein is a colorless indicator. When a few drops are added to a basic solution, the solution will turn pink.

Litmus paper, another indicator, is used in the identification of acids and bases. Blue litmus paper turns red (pink) when dipped in an acidic solution. Pink litmus paper turns blue when dipped in a basic solution.

Before you are three vials, labelled A, B, and C. One contains a basic solution, another an acidic solution, and a third, water. Use the colorless indicator and litmus paper to determine which vials contain acid, base, or water.

Begin by following the instructions below.

1. Add a few drops of the indicator, phenolphthalein, to each vial. What changes do you observe? Record them.

_____

_____

_____

_____

2. What conclusions can you draw from these changes?

_____

_____

_____

_____

PLEASE CONTINUE TASK A2
ON THE NEXT PAGE

GENERAL SCIENCE TASK A2

3. What will you do next? Write down your plan and carry it out.

4. What did you observe this time? Record your observations.

5. What conclusions can you draw? State your reasons for each one.

Wait until you are told to move.

GENERAL SCIENCE TASK A3

Iodine solution is used to test for the presence of starch. Starch will turn blue-black in the presence of iodine.

1. Using a few drops of iodine solution, how would you find out which sample or samples contain starch? Outline your plan.

<u>CARRY OUT YOUR PLAN.</u>

2. Record your observations.

Sample A

Sample B

Sample C

PLEASE CONTINUE TASK A3
ON THE NEXT PAGE

GENERAL SCIENCE TASK A3

3. What are your conclusions? What are the reasons for these conclusions?

Sample A conclusion : _____

_____

Reason : _____

_____

_____

_____

Sample B conclusion : _____

_____

Reason : _____

_____

_____

_____

Sample C conclusion : _____

_____

Reason : _____

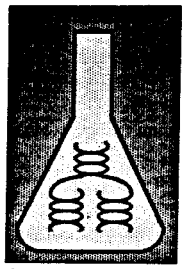
_____

_____

_____

Wait until you are told to move.

SCHOOL SCIENCE



ASSESSMENT

SCIENCE LABORATORY TEST

GENERAL SCIENCE

FORM B

NAME _____ SEX _____

SCHOOL _____ DATE _____

These tests are being developed through
the University at Buffalo and NORC with support of
the National Science Foundation and
the U.S. Office of Education

GENERAL SCIENCE

Instructions :

This is a science laboratory test. You will be asked to do some science experiments. The materials you need have been set out for you at three stations. You will do the experiments at each of the three stations.

You should visit stations: B1, B2, B3

When the supervisor tells you to change stations you should move two stations to your left. You will find a different experiment belonging to Form B at the new station.

This booklet explains what you should do at each station. You should also answer the questions in this booklet.

PLEASE DO NOT TURN THE PAGE UNTIL ASKED TO DO SO.

GENERAL SCIENCE TASK B1

Use the equipment before you to find the mass of the sinker. Then find the volume of the sinker. Lastly, calculate the density of the sinker.

Show all calculations and give the units you used to measure the mass and volume. Also give the units for density.

1. What is the mass of the sinker? _____

2. What is the volume of the sinker? _____

   Describe the procedure you used to find the volume of the sinker. (Show all calculations)

   _____

   _____

   _____

   _____

   _____

   _____

3. What is the density of the sinker? (Show all calculations) $\text{density} = \frac{\text{mass}}{\text{volume}}$

   _____

   _____

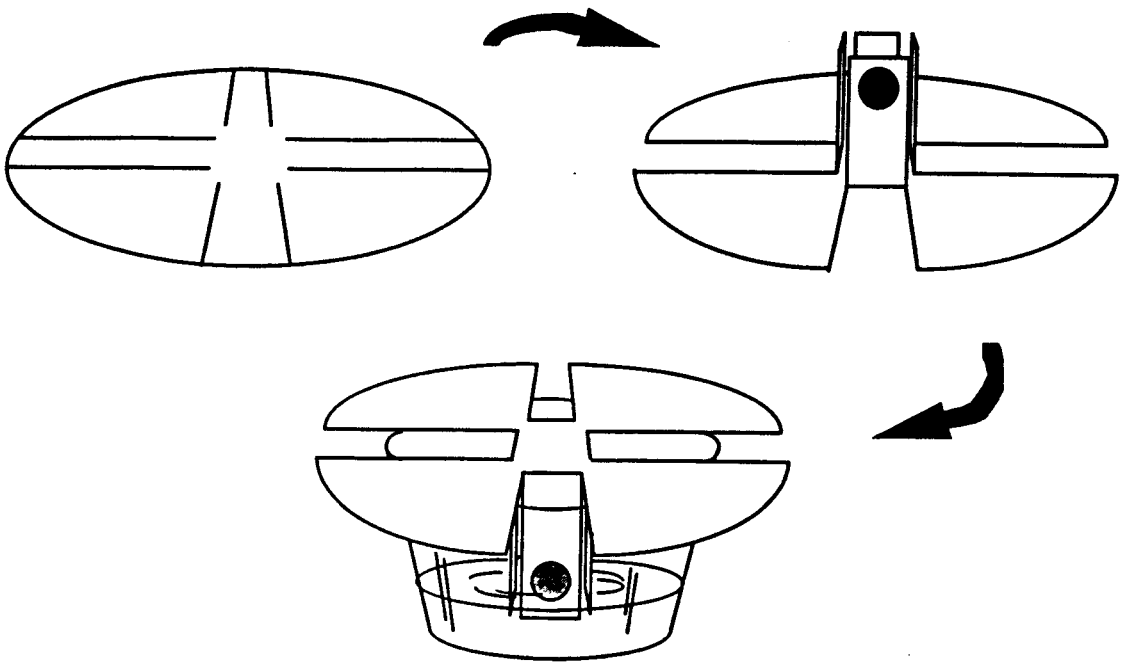
   _____

   _____

   _____

Wait until you are told to move.

GENERAL SCIENCE TASK B2



Before you are a small cup of water and a piece of cut filter paper.

Bend the tabs with colored dots upward as shown in the diagram.

Next, turn the paper upside-down and place the four tabs into the small cup. (Be sure the colored dots are above the water surface.)

DO NOT LIFT THE CUP!

1. By carefully turning the cup around on the table, determine if the coloring from each of the dots moves at the same rate. According to what you observe, circle the correct response below:

SAME RATE OF MOVEMENT	DIFFERENT RATE OF MOVEMENT

When the first color reaches the top of the tab, remove the paper and flatten it out on a paper towel.

PLEASE CONTINUE TASK B2
ON THE NEXT PAGE

GENERAL SCIENCE TASK B2

2. Describe what happened to the color of each dot.

Black dot _____

_____

_____

Red dot _____

_____

_____

Yellow dot _____

_____

_____

Green dot _____

_____

_____

3. Write an explanation for what happened to the black dot.

_____

_____

_____

_____

_____

_____

Wait until you are told to move.

GENERAL SCIENCE TASK B3

Iodine solution is used as an indicator to test for starch. It will turn a starch solution blue-black in color.

The test strips turn from yellow to green in the presence of a certain type of sugar.

Before you are three cups labelled A, B and C. One contains a sugar solution, another a starch solution, and a third contains neither starch nor sugar.

You are to determine the contents of each cup.

1. Using the information above, what will you do to determine which cup contains starch and which contains sugar? Write out your plan.

PLEASE CONTINUE TASK B3
ON THE NEXT PAGE

GENERAL SCIENCE TASK B3

CARRY OUT THE EXPERIMENT.

2. Record your observations in the table.

	Cup A	Cup B	Cup C

3. On the basis of the information in the table above, answer the following questions.

A. Which sample contains sugar? _____

What are your reasons for this conclusion? _____

_____

_____

B. Which sample contains starch? _____

What are your reasons for this conclusion? _____

_____

_____

Wait until you are told to move.