

Mystery Card 3

Task Information

Grade: 4th Grade

Content:

Physical Science

- **IIC2.2** Electricity can flow from one object to another, through materials and through space.
- **IID-3** When energy interacts with objects the properties of the object may be changed. Electricity may cause a wire to become warm and glow.

Format: Manipulative

Purpose:

To determine the student's knowledge of electrical conductors and circuits.

Skills:

Primary: Interpreting data, Generalizing/Inferring
Secondary: Observing, Recording data

Time: 10 minutes

Materials:

Teacher

- 4" X 6" index cards
- heavy duty foil
- hole punch
- masking tape
- permanent black marker
- heavy duty, clear packing tape

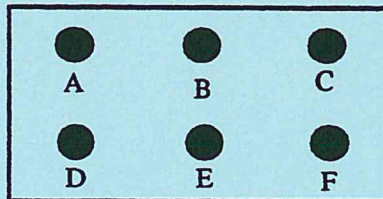
Per Student

- 1 D-cell battery
- 1 battery holder
- 3 - 6" wires with alligator clips
- 1 flashlight bulb (1 or 1.5 volts)
- 1 bulb holder
- 1 circuit card

Preparation:

- The circuit card can be made by taping aluminum foil (heavy duty) between two 4" X 6" or 5" X 8" index cards. You can use old folders or poster board too. It is better to use colored index cards rather than white because they are not as see through.
- Punch holes for the terminals and label on one of the index cards. A standard size hole punch is large enough.

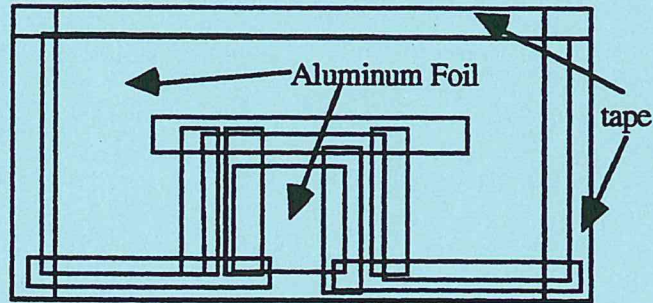
Index card #1



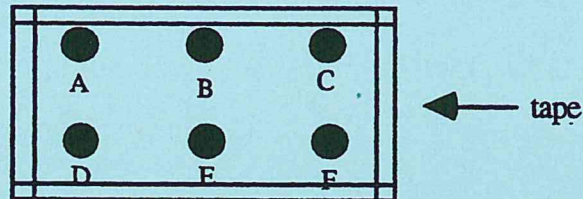
- Cut a piece of aluminum foil large enough to fit over the top of the six terminals. Heavy duty aluminum foil works the best.

- Cut out the bottom middle of the aluminum foil so that terminal "E" is not connected to the other terminals.
- Tape the foil securely to the index card.
- It is important to put foil over all of the terminals because it is visible in each of the holes
- Be sure that you do not put tape over the top of the terminals or the test card will not work properly.

Index card #2



- Tape the two index cards together on all four sides so that it cannot be taken apart easily. Clear packing tape works well for this.



- Connect wires, bulb, and battery to form an electrical tester. (See diagram on student task sheet)
- Be sure that all the electrical testers and mystery cards are in good working condition before students begin the task. It may be necessary to use two (2) batteries for the light bulbs to light sufficiently.

Extensions and Modifications:

Mystery Card 1 and Mystery Card 2

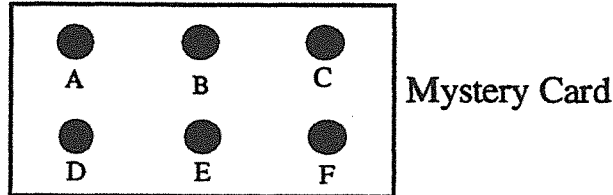
Have students create their own mystery cards.

Mystery Card 3

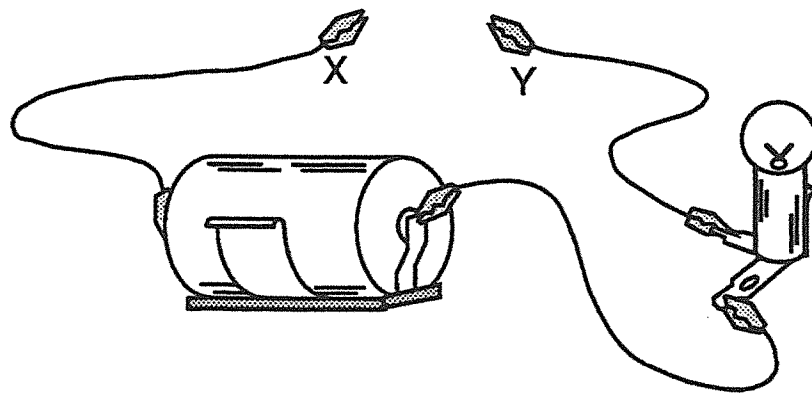
Task: At this station, you will be using an electrical tester to determine where electricity flows between circles on a mystery card.

Materials

- 1 electrical tester
- 1 mystery card



The diagram below represents an electrical tester.



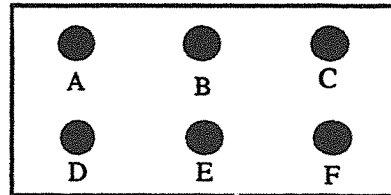
Directions

1. Look at the electrical tester in front of you and make sure that it looks like the electrical tester shown in the diagram above.
2. Touch the free ends of the wire clips together to see if your bulb will light up. If it doesn't, please raise your hand to let the teacher know right away.
3. Touch circle A on the mystery card with one wire clip. **AT THE SAME TIME**, touch circle B with the other wire clip. If the bulb lights, put a check in the **YES** column in the chart on page two. If the bulb does not light, put a check in the **NO** column in the chart.
4. Do the same for all of the other pairs of circles on the mystery card. Be sure to record **all** of your results in the table.

Please Continue on the Next Page

		Bulb Lights	
Touching		YES	NO
A	→ B		
A	→ C		
A	→ D		
A	→ E		
A	→ F		
B	→ C		
B	→ D		
B	→ E		
B	→ F		
C	→ D		
C	→ E		
C	→ F		
D	→ E		
D	→ F		
E	→ F		

5. On the basis of your findings, draw a diagram which shows a possible way the circles on your card could be connected with wires. Use lines to show where the electricity travels.

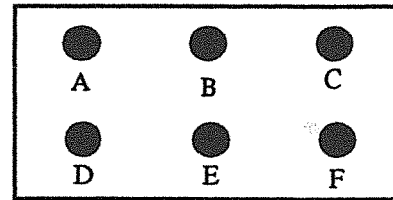


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6. Suppose your data table for a mystery card looked like the one below. Use the data in table #2 to draw a diagram showing the possible ways the circles could be connected.

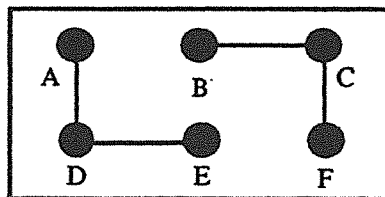
Data Table - Card #2

Touching	YES	NO
A → B		✓
A → C		✓
A → D	✓	
A → E	✓	
A → F		✓
B → C	✓	
B → D		✓
B → E		✓
B → F	✓	
C → D		✓
C → E		✓
C → F	✓	
D → E	✓	
D → F		✓
E → F		✓



Card #2

7. Could the following circuit diagram be in card #2?



Circle your answer below.

YES

NO

8. Explain how you used the data table to answer questions #6 and #7.

Mystery Card 3 - Scoring Rubric

Maximum score - 5 points

4. Data Table

1 point total

Standard: The student tests the circles on the mystery card and correctly indicates which connections made the bulb light or not light.

Criteria:

- 1 point if the whole data table is filled in.

*** Credit should be given even if some check marks are incorrect.

*** No credit is given if the table is incomplete.

Example of completed data table

Touching	YES	NO
A → B	√	
A → C	√	
A → D	√	
A → E		√
A → F	√	
B → C	√	
B → D	√	
B → E		√
B → F	√	
C → D	√	
C → E		√
C → F	√	
D → E		√
D → F	√	
E → F		√

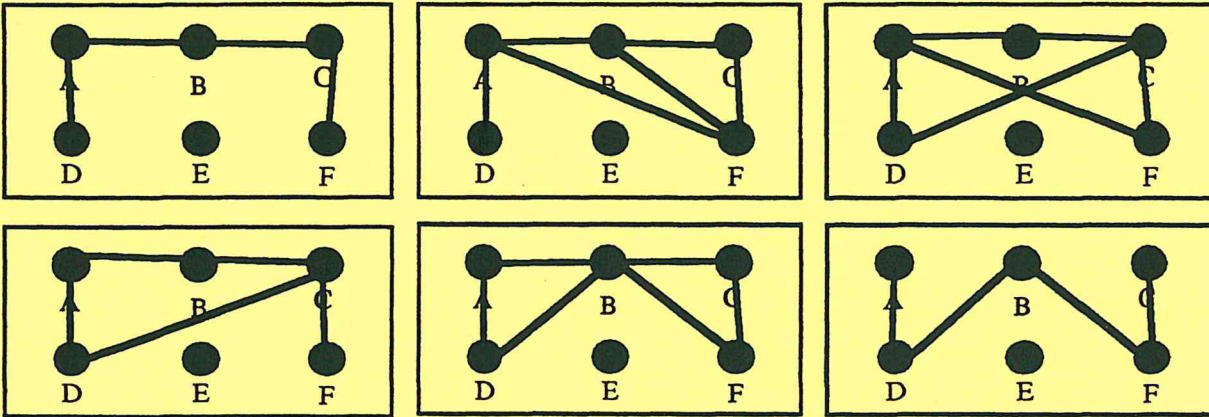
5. Diagram

1 point total

Standard: The student makes a valid drawing based on his/her data from question #4.

Criteria:

- 1 point for a drawing that correlates correctly to the student's data table.
- *** The student still receives 1 point if their drawing correlates with their data table even if the data in their table is incorrect
- *** Some example drawings are shown on the next page. Obviously there are others. The rater will have to be sure that the student data table and drawings correlate with one another.



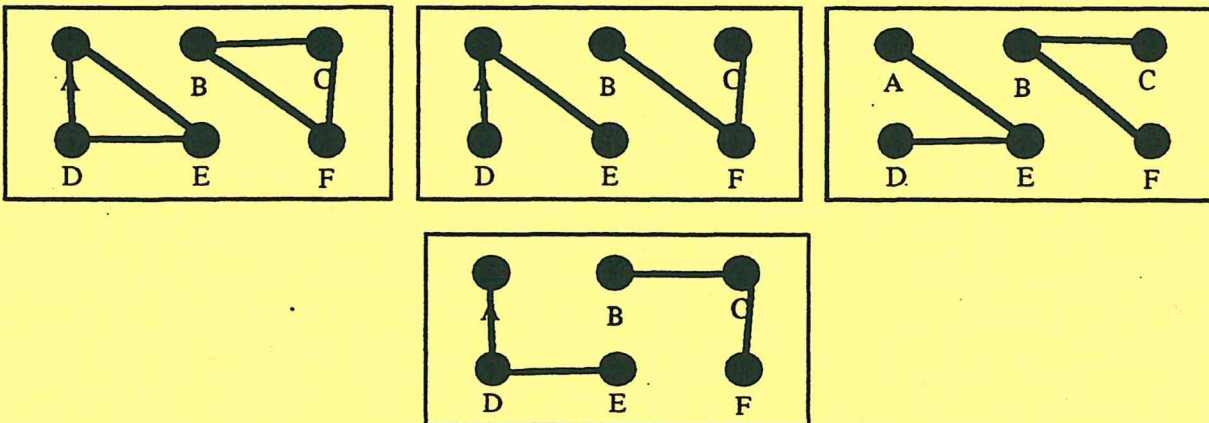
6. Using given data table to draw a diagram for card #2

1 point total

Standard: The student makes a valid drawing based on the data in the table for card 2.

Criteria:

- 1 point for a drawing that correlates correctly with the data in the table for card 2.
- *** Some example drawings are shown below. Obviously there are others. The rater will have to be sure that the data table and the drawings correlate with one another.



7. Circuit diagram for card #2

1 point total

Standard: The student will decide whether or not the given drawing could be possible for mystery card 2.

Criteria:

- 1 point for a correct answer - YES

8. Explain use of given data table to answer questions # 6 & 7

1 point total

Standard: The student explains how the chart helped them to make their drawings.

Criteria:

- 1 point for a reasonable explanation telling that the student looked at the entries in the data table to draw the diagram.
- Even if the student's drawing is incorrect, he/she may still be able to explain the use of the data table.

Highest possible score - 5 points

Student ID _____

Scoring Form - Mystery Card 3

Male / Female (circle one)

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

- | | | |
|---|---|---|
| 4. Data Table | 0 | 1 |
| 5. Diagram | 0 | 1 |
| 6. Using given data table to draw a diagram for card #2 | 0 | 1 |
| 7. Circuit diagram for card #2 | 0 | 1 |
| 8. Explain use of given data table to answer questions #6 & 7 | 0 | 1 |

Total Score _____
Total possible score - 5 points

Student ID _____

Scoring Form - Mystery Card 3

Male / Female (circle one)

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

- | | | |
|---|---|---|
| 4. Data Table | 0 | 1 |
| 5. Diagram | 0 | 1 |
| 6. Using given data table to draw a diagram for card #2 | 0 | 1 |
| 7. Circuit diagram for card #2 | 0 | 1 |
| 8. Explain use of given data table to answer questions #6 & 7 | 0 | 1 |

Total Score _____
Total possible score - 5 points

#1 Student ID 4B - DE - 14
Male / (Female) (circle one)

Scoring Form - Mystery Card 3

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

- | | | |
|---|-----|-----|
| 4. Data Table | 0 | (1) |
| 5. Diagram | 0 | (1) |
| 6. Using given data table to draw a diagram for card #2 | (0) | 1 |
| 7. Circuit diagram for card #2 | (0) | 1 |
| 8. Explain use of given data table to answer questions #6 & 7 | 0 | (1) |

Total Score 3pts
Total possible score - 5 points

#2 Student ID 4B - DE - 4
Male / (Female) (circle one)

Scoring Form - Mystery Card 3

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

- | | | |
|---|-----|-----|
| 4. Data Table | 0 | (1) |
| 5. Diagram | (0) | 1 |
| 6. Using given data table to draw a diagram for card #2 | 0 | (1) |
| 7. Circuit diagram for card #2 | 0 | (1) |
| 8. Explain use of given data table to answer questions #6 & 7 | 0 | (1) |

Total Score 4pts
Total possible score - 5 points

#3 Student ID 4B-DE-3

Scoring Form - Mystery Card 3

Male / Female (circle one)

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

- | | | |
|---|---|----------|
| 4. Data Table | 0 | <u>1</u> |
| 5. Diagram | 0 | <u>1</u> |
| 6. Using given data table to draw a diagram for card #2 | 0 | <u>1</u> |
| 7. Circuit diagram for card #2 | 0 | <u>1</u> |
| 8. Explain use of given data table to answer questions #6 & 7 | 0 | <u>1</u> |

Total Score 5pts
Total possible score - 5 points

Student ID _____

Scoring Form - Mystery Card 3

Male / Female (circle one)

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

- | | | |
|---|---|---|
| 4. Data Table | 0 | 1 |
| 5. Diagram | 0 | 1 |
| 6. Using given data table to draw a diagram for card #2 | 0 | 1 |
| 7. Circuit diagram for card #2 | 0 | 1 |
| 8. Explain use of given data table to answer questions #6 & 7 | 0 | 1 |

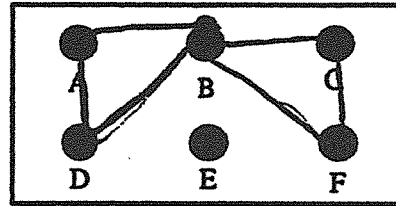
Total Score _____
Total possible score - 5 points

4B-DE-14

#1

Touching		Bulb Lights	
		YES	NO
A	→ B	✓	
A	→ C	✓	
A	→ D	✓	
A	→ E		✓
A	→ F	✓	
B	→ C	✓	
B	→ D	✓	
B	→ E		✓
B	→ F	✓	
C	→ D	✓	
C	→ E		✓
C	→ F	✓	
D	→ E		✓
D	→ F	✓	
E	→ F		✓

5. On the basis of your findings, draw a diagram which shows a possible way the circles on your card could be connected with wires. Use lines to show where the electricity travels.

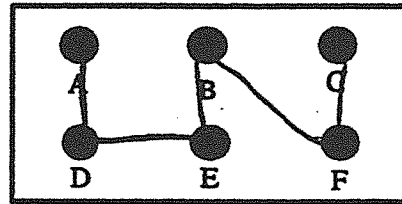


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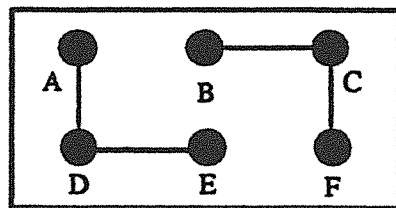
6. Suppose your data table for a mystery card looked like the one below. Use the data in table 2 to draw a diagram showing the possible ways the circles could be connected. #1

Data Table - Card #2

Touching		YES	NO
A	→ B		✓
A	→ C		✓
A	→ D	✓	
A	→ E	✓	
A	→ F		✓
B	→ C	✓	
B	→ D		✓
B	→ E		✓
B	→ F	✓	
C	→ D		✓
C	→ E		✓
C	→ F	✓	
D	→ E	✓	
D	→ F		✓
E	→ F		✓



7. Could the following circuit diagram be in card #2?



Circle your answer below.

YES

NO

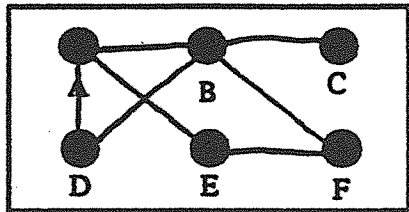
8. Explain how you used your observation to determine your answer to questions #6 and #7.

#6 I connected the ones that lit. #7
 It couldn't because A has to be able to
 light with B.

4B-DE-4
#2

Touching		Bulb Lights		
		YES	NO	
A	→	B	✓	
A	→	C	✓	
A	→	D	✓	
A	→	E		✓
A	→	F	✓	
B	→	C	✓	
B	→	D	✓	
B	→	E		✓
B	→	F	✓	
C	→	D	✓	
C	→	E		✓
C	→	F		✓
D	→	E		✓
D	→	F		✓
E	→	F		✓

5. On the basis of your findings, draw a diagram which shows a possible way the circles on your card could be connected with wires. Use lines to show where the electricity travels.



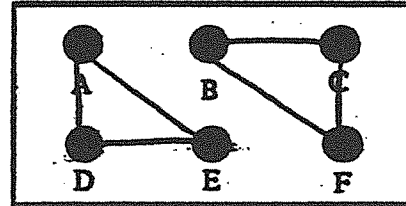
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data in table 2 to draw a diagram showing the possible ways the circles could be connected.

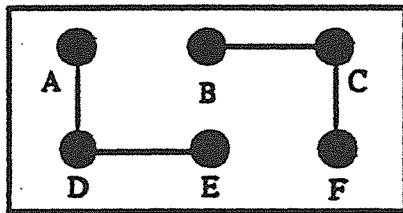
#2

Data Table - Card #2

Touching		YES	NO
A	→	B	✓
A	→	C	✓
A	→	D	✓
A	→	E	✓
A	→	F	✓
B	→	C	✓
B	→	D	✓
B	→	E	✓
B	→	F	✓
C	→	D	✓
C	→	E	✓
C	→	F	✓
D	→	E	✓
D	→	F	✓
E	→	F	✓



7. Could the following circuit diagram be in card #2?



Circle your answer below.

YES NO

8. Explain how you used your observation to determine your answer to questions #6 and #7.

⑥ I looked down the column "Yes" and when I came to a ✓ I looked across the line in the column

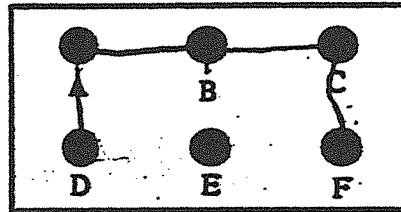
NYS Alternative Assessment in Science Project
NSF Grant #MDR-9154506

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The State Education Department
Albany, New York 12234

⑦ I looked what the results were and marked on the box what I looked on mine. I see if it could have been what mine box like.

Touching		Bulb Lights		
		YES	NO	
A	→	B	✓	
A	→	C	✓	
A	→	D	✓	
A	→	E		✓
A	→	F	✓	
B	→	C	✓	
B	→	D	✓	
B	→	E		✓
B	→	F	✓	
C	→	D	✓	
C	→	E		✓
C	→	F	✓	
D	→	E		✓
D	→	F	✓	
E	→	F		✓

5. On the basis of your findings, draw a diagram which shows a possible way the circles on your card could be connected with wires. Use lines to show where the electricity travels.



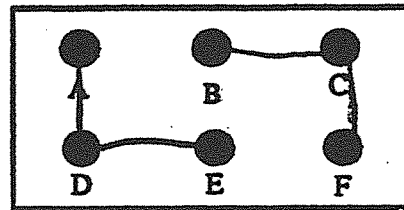
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6. Suppose your data table for a mystery card looked like the one below. Use the data in table 2 to draw a diagram showing the possible ways the circles could be connected.

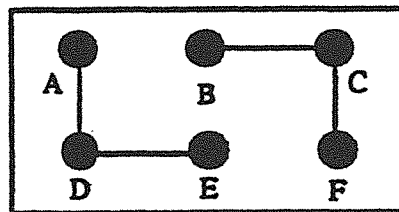
#3

Data Table - Card #2

Touching		YES	NO
A	→ B		✓
A	→ C		✓
A	→ D	✓	
A	→ E	✓	
A	→ F		✓
B	→ C	✓	
B	→ D		✓
B	→ E		✓
B	→ F	✓	
C	→ D		✓
C	→ E		✓
C	→ F	✓	
D	→ E	✓	
D	→ F		✓
E	→ F		✓



7. Could the following circuit diagram be in card #2?



Circle your answer below.

YES

NO

8. Explain how you used your observation to determine your answer to questions #6 and #7.

Because I looked on my diagram and looked
on Data Table to see if it is open or closed