

Station One - Bendable Mirror

1. Observe your face in the Mylar card. Can you see your reflection?
2. What are some properties that make a good mirror?
3. Observe your face again in the card. While observing, hold the card by the edges in one hand, and squeeze the edges outward toward each other. The center will bend toward you in a smooth curve. Describe how the image of your face changed when you made the mirror into a convex shape.
4. Straighten the mirror, then bend the sides of the card inward to make the middle of the card curve inward, or "cave in." Describe how the image of your face changed when you made the mirror into a concave shape.
5. Describe how the image changes if you move the mirror closer or farther away.

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5. Describe how the image changes if you move the mirror closer or farther away.

Station Two - The Bent Ruler

1. Observe the ruler carefully before and after placing it in the glass of water. Draw a before and after water picture in your journal.
2. How does the appearance of the ruler change when you place it in the water?
3. We know that we see an image of an object when light bounces off it, and enters our eyes. Why do you think the ruler appears to be bent when you see it in a clear, curved, water-filled container?

Station Two - The Bent Ruler

1. Observe the ruler carefully before and after placing it in the glass of water. Draw a before and after water picture in your journal.
2. How does the appearance of the ruler change when you place it in the water?
3. We know that we see an image of an object when light bounces off it, and enters our eyes. Why do you think the ruler appears to be bent when you see it in a clear, curved, water-filled container?



Station Three - Copy Cat CD

1. Open a clear plastic CD case and stand it up so that the two sides are at right angles to each other.
2. Place a picture flat on the table to the left of the standing CD case and a blank sheet of paper flat on the table in between the two sides of the CD case. Make your observations from the left side of the setup.
3. Look through the clear plastic of the CD case onto the blank paper on the other side. Draw what you see on the blank paper.
4. How was the reflection different from the picture?
5. Discuss why you can see the reflection of the picture at the same time you see the actual picture.

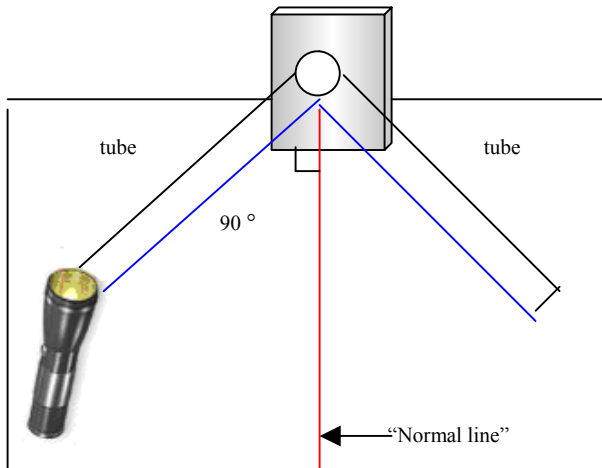


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Station One - Flat Reflections

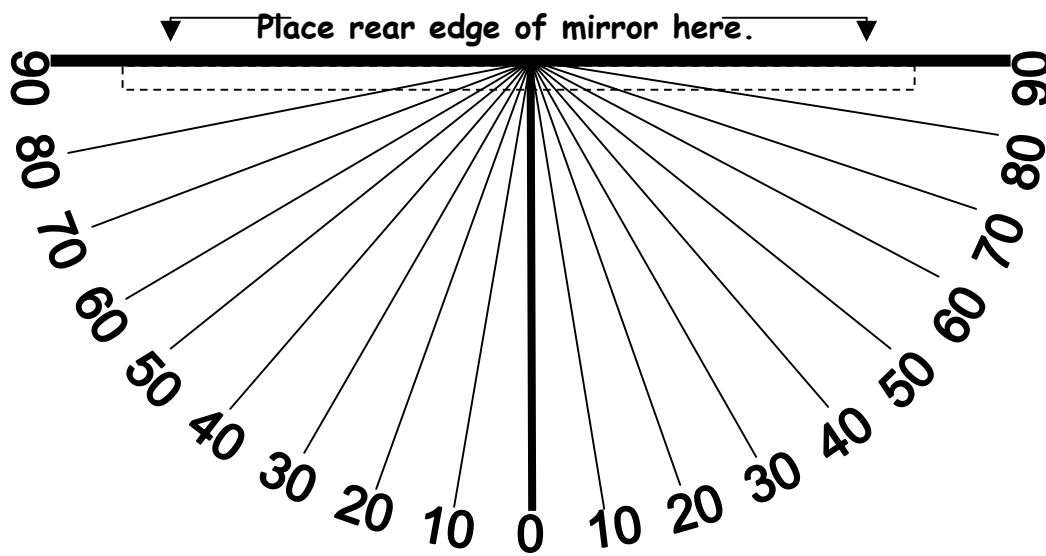
1. Fold the paper hamburger style, and draw a red line down the fold line.
2. Place the mirror at the center of one end of the paper perpendicular to the red centerline.
3. Place one tube on one side of the red line, and shine the flashlight into the end.
4. Determine where to place the second tube on the other side of the red line so light will shine up the first tube, bounce off the mirror, and shine down the second tube. Tape down the tubes in the position that allows light to travel down one tube, bounce off the mirror, and out the other tube.
5. Trace the lines formed by the insides of both tubes with a pencil. Remove the taped tubes. Using a ruler as a straight edge, draw a neat line of color over the pencil lines with a blue marker.



6. Remove the mirror from the chart paper. Refold the chart paper down the red line.
7. What happened to the light beam when it traveled up the first tube?
8. Did the beam of light change direction?
9. What is it called when light bounces off an object?
10. What do you notice about the location of the blue lines?
11. What did you notice about the location of the blue lines when the paper is folded?
12. What is another word for matching?
13. Are any other parts of the diagram congruent?

Station Two - What's the Angle?

1. Place a flat mirror on the back edge of the ray "protractor". The center of the mirror should be placed at the center "normal" line marked zero.
2. Make predictions about the direction of the light ray after it bounces off the mirror, and record in a chart in your journal.
3. Shine a beam at the lines marked 10, 20, 30, 40, 50, 60, 70 and 80 on the right side of the normal line, and record the number of the line on the left side of the reflection on the student data sheet.
4. Placing your finger near the predicted line of the reflected ray on the other side of the "protractor" helps you to see the exact direction of the light ray.



Angle of Light Ray	30°	40°	50°	60°	70°	80°
Angle of Reflected Light Ray						

Station Three - Spoon Images

1. Observe the part of the spoon that you put into your mouth, called the bowl.
2. Position the spoon as if you are going to eat with it.
3. The lower part of the spoon that bulges downward is called the convex side of the spoon. It is the part that is closest to your tongue when you eat with a spoon.
4. The inner part of the spoon curves or "**caves in**" so it can hold food. It is called the **concave** side of the spoon.
5. Hold the spoon vertically in front of your face, with the outer, convex side facing you. Record how your image appears on the spoon.
6. Turn the spoon horizontally, and observe your image. Does it look stretched and distorted?
7. Turn the spoon around to observe the concave side in a vertical position. Record your observations under the concave column.
8. Turn the spoon horizontally, and observe the concave side. Does the image stay the same?

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Station Four - Refraction

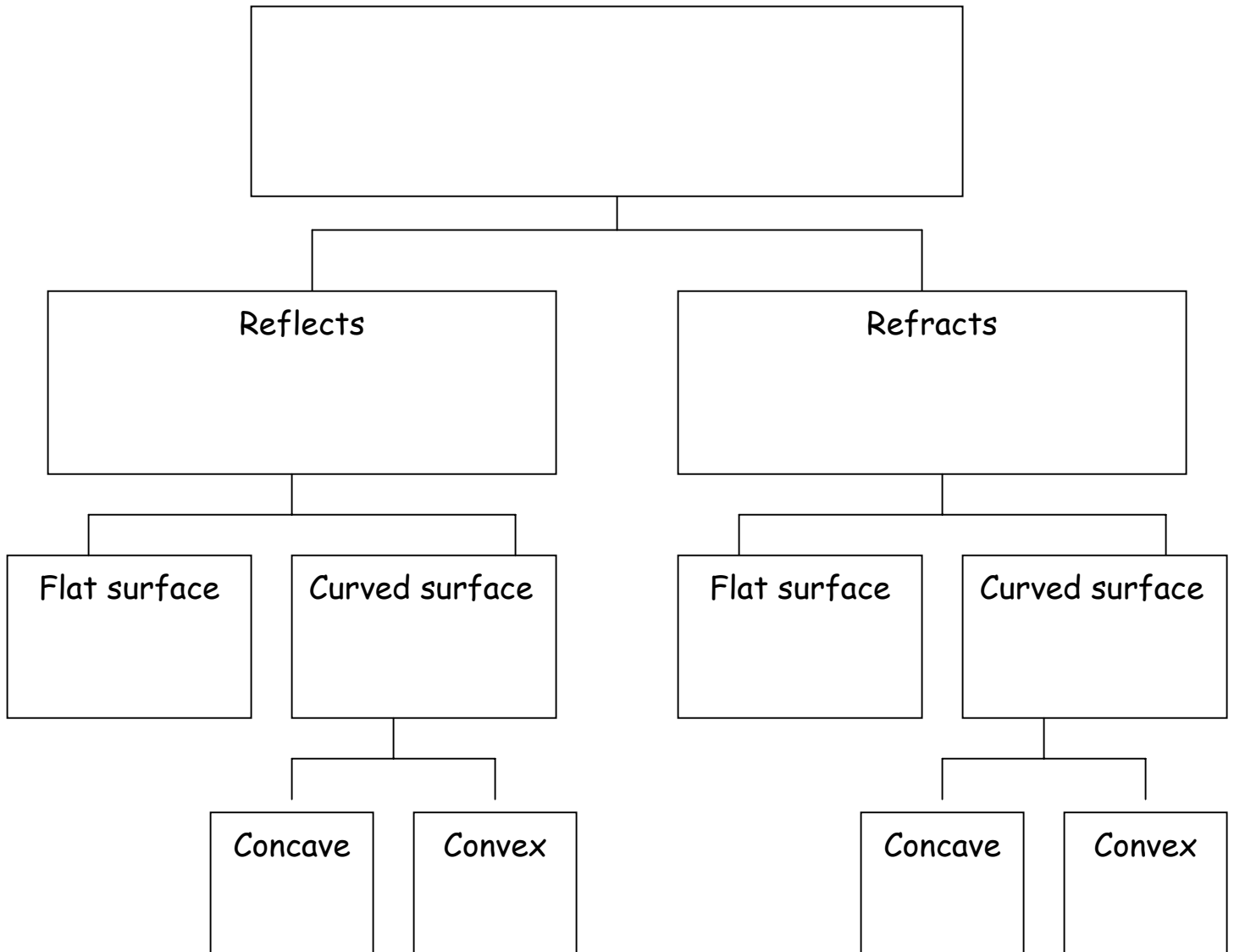
1. Place the slit card in binder clips or holders so that you can stand it up vertically at one end of the black construction paper.
2. Shine the flashlight toward the slit card so that the light rays fall onto the black paper. Record your observation of the light rays in your journal.
3. Place the water-filled jar near the middle of the black construction paper, in line with the slit card. Make a prediction of what will happen when light rays come in contact with the jar. Shine the flashlight toward the slit card, and record your observation of the light rays in your journal.
4. Replace the jar with a convex lens. Follow the same procedure.
5. Replace the convex lens with a concave lens. Follow the same procedure.
6. Organize your data in a chart to summarize your observations.

Station Four - Refraction

1. Place the slit card in binder clips or holders so that you can stand it up vertically at one end of the black construction paper.
2. Shine the flashlight toward the slit card so that the light rays fall onto the black paper. Record your observation of the light rays in your journal.
3. Place the water-filled jar near the middle of the black construction paper, in line with the slit card. Make a prediction of what will happen when light rays come in contact with the jar. Shine the flashlight toward the slit card, and record your observation of the light rays in your journal.
4. Replace the jar with a convex lens. Follow the same procedure.
5. Replace the convex lens with a concave lens. Follow the same procedure.
6. Organize your data in a chart to summarize your observations.

Reflecting on Refraction Assessment

A. Observe the items in the container. Classify each item as an object that is used to reflect or refract light. Then, further classify each example as having a flat or curved surface. Divide the objects with curved surfaces into convex or concave surfaces. Write the name of the items in the appropriate box.



B. Select one object from the "reflects" branch and one item from the "refracts" branch to write about their uses and properties. Describe what the object can be used for and how the properties of each object make it useful for reflecting or refracting light.