Reading Science A - The Physics of Mirrors from Properties of Visible Light

1. Light acts in a way that is easy to predict. We can also predict what will happen when light hits a reflective surface. The light ray traveling toward the mirror is called the incident ray. The light ray traveling away from the mirror is called the reflected ray. Imagine a line coming out perpendicular to the mirror. The angle of incidence is the angle between the incident light beam and this line. The angle of incidence is exactly equal to the angle of reflection. You see an image if your eye is in the path of the reflected light beam.Multiple mirrors at an angle to each show multiple images. Many flat surfaces are reflective such as mirrors, ponds, or glass doors. They all obey the law of reflection. So do curved surfaces, although the effects can be more interesting.

2. Two different curved surfaces are easy to analyze. Convex mirrors show squashed images. Standing in front of a convex mirror will make you look short and wide. It does not matter where the object is. The image will always be right side up and smaller. In contrast, concave surfaces stretch images. Standing in front of a concave mirror will make you look very tall and thin. The location of the object determines whether an image is right-side up or upside down. The object location also determines if it is larger or smaller than the object. Funhouse mirrors at carnivals often have a wavy surface. They are a mix of concave and convex sections. However, carnivals are not the only places where curved reflective surfaces are used.

3. Satellite dishes are seen in many places. The dishes have a concave reflective surface. It focuses the signal at a single point in front of the dish. A receiver is placed at this focal point. The receiver collects the signal and sends it through a cable to the television;

however, very large round surfaces do not focus on a single point. Therefore, very large dishes have a parabolic shape. Radio telescopes also have concave reflecting surfaces. Radio telescopes are used to track satellites and other spacecraft.

4. If (or when) you drive a car, you will use of another curved reflective surface. The side-view mirrors in most cars are convex reflective surfaces. The field of view is the area that light is collected from. It determines what you will see. The field of view is wider for a convex mirror than for a flat mirror. A convex mirror allows the driver to see more of the road behind the vehicle. Many of these mirrors are labeled, “Warning! Objects in mirror are closer than they appear!” The image you see in the mirror is smaller than the actual object behind you. To your brain, smaller usually means farther away; however, drivers get used to this fairly quickly. Looking directly out the window allows a driver to judge distances more accurately before changing lanes, for example.

5. There are reflections and mirrors in many pieces of artwork. Two famous drawings by M.C. Escher use mirror surfaces. A Hand with Reflecting Sphere shows the artist holding a reflective sphere in his hand. His 1956 Print Gallery also models curved mirrored surfaces. Anish Kapoor is a modern sculptor. He uses both concave and convex surfaces. Cloud Gate reflects the Chicago skyline and the sky on its concave upper surface. Nature photographers such as David Muench often use reflections from natural surfaces such as rivers and lakes. One example is his 2009 Canyon Reflection photograph. In it, the flat Rio Grande River reflects the reddish cliffs of a canyon in Big Bend National Park.

6. A mirror can be made of many things. They can be natural or man-made. They can be rigid or flexible. As long as it is smooth, the mirror will obey the law of reflection. Reflective surfaces are used in many ways from fun, to safety, to art. Experiment with different mirrors as you come across them in your daily life!

QUESTION 1

The ray of light traveling towards the mirror is called the _____ ray.

- (●) incident ✓
- ( ) accidental
- ( ) normal
- ( ) reflected

Grading

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QUESTION 2

A sculpture named Sky Mirror in New York City reflects skyscrapers upside down and smaller than they are in real life. What type of reflective surface does this sculpture most likely have?

- ( ) Convex
- (●) Concave ✓
- ( ) Flat
- ( ) Wavy

Grading

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QUESTION 3

What type of mirror could have resulted in the image of the giraffe above?

- (●) Convex ✓
- ( ) Concave
- ( ) Flat
- ( ) Wavy

Grading

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QUESTION 4

Side-view mirrors in many cars are convex. What is one advantage of convex mirrors for this

use?

- ○ Convex mirrors are more sturdy than flat mirrors.
- ○ Convex mirrors show the image at the actual size of the object.
- ○ Convex mirrors have a very narrow field of view.
- ◉ Convex mirrors always show the image right side up. ✓

Grading

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QUESTION 5

The rearview mirror in most cars is flat. What driving situation is it most useful for?

- [x] Judging actual distance of traffic behind you
- [ ] Making sure no small child is sitting behind your car when you back up
- [ ] Seeing a car in your blind spot
- [ ] Putting on makeup while driving

Grading

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QUESTION 6

Which of the following natural surfaces would make a good mirror?

- [ ] A fast-moving river
- [ ] A blade of grass
- [x] A still lake
- [ ] The ocean during a storm

Grading

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