Exploring the Single-Use Camera

Background Information:

Although quite inexpensive, single-use cameras contain a number of rather sophisticated components. In this laboratory you will investigate the workings of a single-use camera and, in the process, become familiar with elements common to all cameras.

Materials:

1 – used single-use camera
1 – meter stick, metric tape, or ruler
1 – a light bulb (preferably unfrosted) or candle
1 – a file card

The Investigation:

1. (a) Before opening up your camera, draw a sketch of its exterior.
   (b) Label all important components.
   (c) As best as you can, describe the function of these components.

2. (a) Carefully disassemble the camera. Begin by prying off the camera's plastic faceplate. Be careful not to lose any components when you do this!

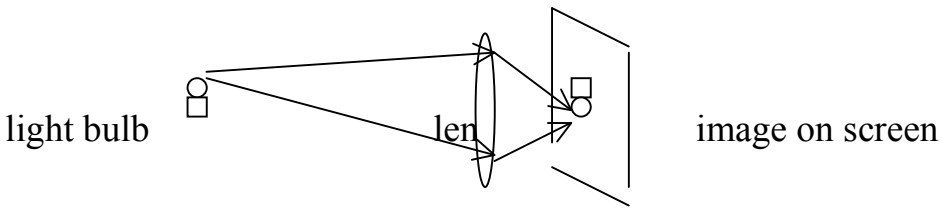
   (b) Once you have removed the faceplate from your camera, examine the camera for lenses. In addition to the principal lens, located in the front of the camera, how many lenses can you find? (Note: It's possible that your camera has only one lens.)

   (c) What do you think the function of each lens is?

   Now describe the nature of your camera's lenses. What shape do they have (you may use sketches)? Are they converging or diverging lenses? You may wish to examine these lenses by looking through and feeling them. What types of images are they capable of forming. For example, are the images right side up (RSU) or upside down (USD); enlarged or reduced in size?

3. (a) Locate and remove the principal camera lens. This lens is located at the front of the camera and is responsible for forming images on film. If this lens is missing, it is possible that this lens fell out of its holder when you opened up the camera.

   (b) Can you form an image of a light bulb or candle flame on a sheet of white paper with the lens? If it's a sunny day, you may wish to try forming an image of an outdoor scene on the paper.



   (c) Describe the image(s) you form. That is, are the images RSU or USD? Are the images enlarged or reduced? real or virtual?

4. Determine the focal length of your lens, preferably in millimeters (mm). To do this, form an image of a distant object on your screen. When the image is as sharp as you can get it, measure the distance between the lens and the screen. This distance is the focal length.

   Focal length = _____mm.

5. Measure the depth of the camera (distance from lens opening to film plane). Depth of camera = _____.

   How does this compare to the focal length of the lens?

6. Try to form an image of a close object on your screen. You may wish to form the image of a light bulb or candle that is less than 50 cm from the lens. At what distance must you place the screen to obtain a clear image of this close object?

7. Based on the image position you found in #6, why can't disposable cameras be used for close-up shots?

8. Measure the diameter of the camera stop's hole (the hole in the front of the camera) in mm. Diameter of hole = d = _____mm.

9. Determine the "f-number" of your camera. The f- number may be found by dividing the focal length of the lens by the diameter of the hole: f-number = focal length/hole diameter (both measured in mm).

   f-number = _____.

   f-numbers often range from 1.8 to 22 on standard 35mm cameras. The f-number relates to the amount of light reaching the film and to the depth of field (near-far range of subjects acceptably in focus). An inexpensive camera, such as the one you are examining today, will generally have a large f-number. This means that they do not admit much light but do form sharp images of objects at a large range of distances.

10. Examine the mechanical components of your camera. What mechanism is used to advance the film (now removed) in your camera? Is there a frame (picture number) indicator? If so, how is it advanced so as to provide the correct frame number?

11. Looking at your system's electrical system, locate the battery, the flash lamp, the capacitor (usually a cylinder about an inch and a half long), and a complicated-looking collection of electronic components. The battery is the source of energy used by the flash lamp. However, the battery's voltage is too low to trigger the lamp. The electronic circuitry you see increases the voltage to the required value. The capacitor then stores electrical energy at a high voltage until the flash button is pushed.

12. You may charge the capacitor by depressing the charging strip on the front of your camera. **This must be done carefully with a pencil eraser or other insulator to avoid shock.** While not dangerous, a shock will certainly startle you and you may find it very unpleasant. You will hear a high-pitched sound while the capacitor is charging.

    The capacitor is charged when the sound stops. **Do not touch any of the contacts on the front of the camera with your hands at this time.**

    You can trigger the flash by discharging the capacitor. To do this, use the tip of a screwdriver or key or a paper clip to simultaneously touch pairs of exposed copper contact points on the front of the camera. Experiment with pairs of these contacts until you get the bulb to fire.

Questions:

1. What are the essential parts of a camera?

2. What is: a) a camera's shutter? B) a camera's diaphragm or iris?

3. What is the function of the shutter and diaphragm?

4. a) Did your single-use camera have an adjustable shutter speed? an adjustable aperture?

   b) How do you suppose a single-use camera compensates for a variety of lighting conditions?

5. a) How are more expensive cameras able to take clear pictures over a wide range of distances, ranging from close-up to infinity?

   b) If a camera is focused for a distance of 20 m, should the lens be moved closer to the film or further from the film to focus on an object 5 m away? Explain why?