

## **Knowledge Domain: Mechanical**

### **Unit: Cleaning**

#### **Skill: Cleaning Lenses**

##### **Items Needed:**

- 1) dirty lens
- 2) soft brush or air blower
- 3) long, thin wooden or bamboo sticks
- 4) high purity cotton
- 5) distilled water
- 6) n-hexane (optional)
- 7) isopropanol (optional)
- 8) dishwashing liquid
- 9) hand soap

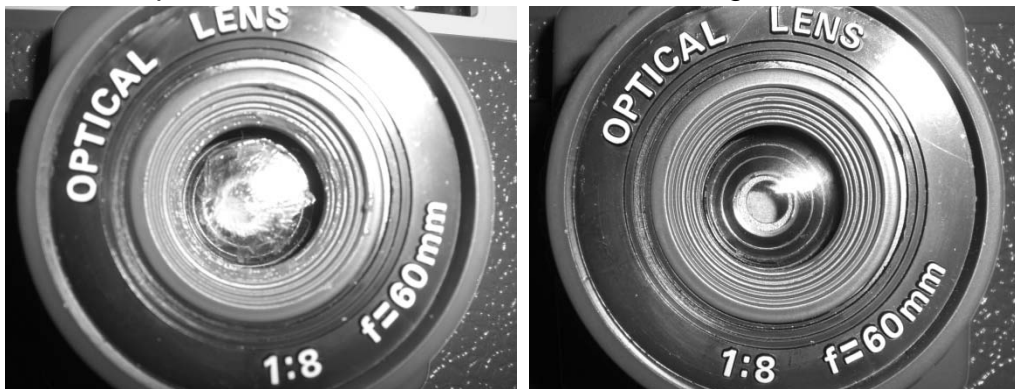
##### **Introduction**

Dirt, dust, and oil collect on a lens with use. Dirt, dust, and oil prevent the lens from working properly.

Cleaning lenses is easy. However, if a lens is cleaned improperly, you can scratch and damage it. A badly scratched lens may need to be replaced.

##### **Example**

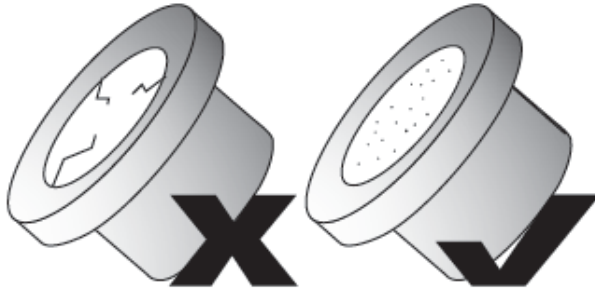
Below is a picture of a lens before and after cleaning.



##### **Identification and Diagnosis**

A clean lens is clear. Look through the lens. Oil or grease on the lens will appear blurry when looking through the lens. You may also see spots or pieces of dirt.

Look for scratches (long lines on the lens). A lens with many scratches may need to be replaced.



For **microscopes**, identify which lens is dirty. Look for decreased sharpness or contrast. Decreased sharpness or contrast may indicate a dirty lens.

To locate the soiled item, look into the lens and:

- Rotate objectives and cameras slightly
- Move the specimen slide slightly
- Move the condenser up and down

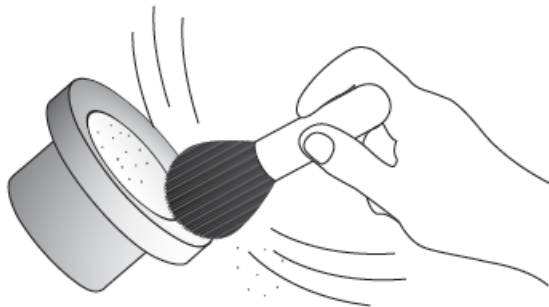
If the dirt moves, you have found the soiled piece. Blurred images may not indicate a dirty lens.

### **Procedure**

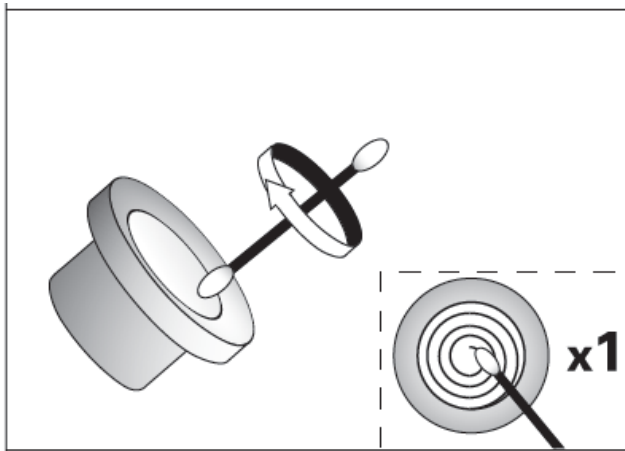
1. Wash your hands using soap.



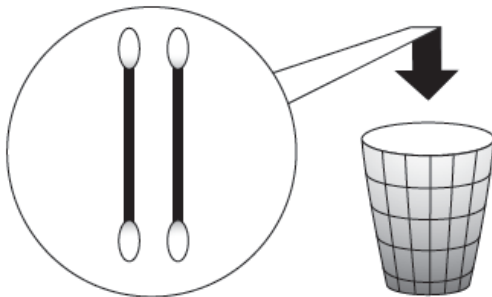
2. Brush off loose dirt or sand with a soft brush or dust blower. If you don't have a soft brush or dust blower, blow gently with your mouth. Oil and other items stuck to the lens will still be present.



3. Prepare a cotton swab
  - Dip a bamboo or wooden stick into the cleaning solution\*
  - Touch the stick to the cotton. Do not squeeze the cotton.
  - Turn the stick to wind up the cotton fibers. Wind until you form an elliptical cotton bud at the tip.
  - Do not touch the tip with your fingers. Your skin has sweat and grease
4. Dip the cotton swab into the cleaning solution\*
5. Shake off excess liquid. Excess liquid may overflow the lens rim. Some solvents will corrode the lens cement.
6. Clean the lens. Move the cotton swab in a spiral motion. Start in the center and move outward.



7. Remove the cotton tip after every stroke. Replace the cotton bud.



8. Repeat until the lens is clean.

#### \* Cleaning Solutions

- **Distilled water** – Removes water-soluble dirt
- **Your breath** - Breathe on the surface of the lens. This will create a layer of moisture
- **Diluted dishwashing liquid** (5-10 drops of dishwashing liquid in 10 ml distilled water) – Removes oils
- **Pure n-hexane, or 85% hexane and 15% isopropanol** – Removes oils

Always try distilled water before other solutions. Use distilled water and very pure solvents to clean the lens. Impure water and impure solvents may leave residue on the lens. Never use acids, acetone, or ammonia.

Wooden or bamboo sticks may be reused. Use separate sticks for water-based and organic solvents.

### **Exercise**

Your instructor will give you a dirty lens. The lens may be from a camera or flashlight or from a piece of medical equipment at your hospital.

Clean the lens. Your instructor must verify your work before you continue.

### **Preventative Maintenance and Calibration**

Avoid touching lenses with your hands. Always cover the lens when the device is not in use. Avoid letting chemicals touch the lens.

Never wipe lenses with dry swabs or tissue – you will scratch the lens. Do not use disposable cotton swabs (e.g. Q-Tips). Disposable cotton swabs may not be clean enough.

Never use lens tissue for cleaning. Use lens tissue for dust-free storage and protection of lenses only. Never use pressurized air. They may leave a residue on the lens.

Do not clean a lens unless it is dirty. Excessive cleaning can damage a lens.

Always calibrate every medical device before returning it to use.