

Topic: Clean Rooms

Teacher Information

Time Allowance

50 min.

Background

A clean room creates a barricade that keeps out dirt and dust. It provides a safe environment for working on flight hardware while keeping Earth's contaminants away.

Materials

Large cardboard box (a copy paper box will work)

Black construction paper, a black cloth, or black spray paint

Erasers with chalk dust

Flashlight

Clear packing tape

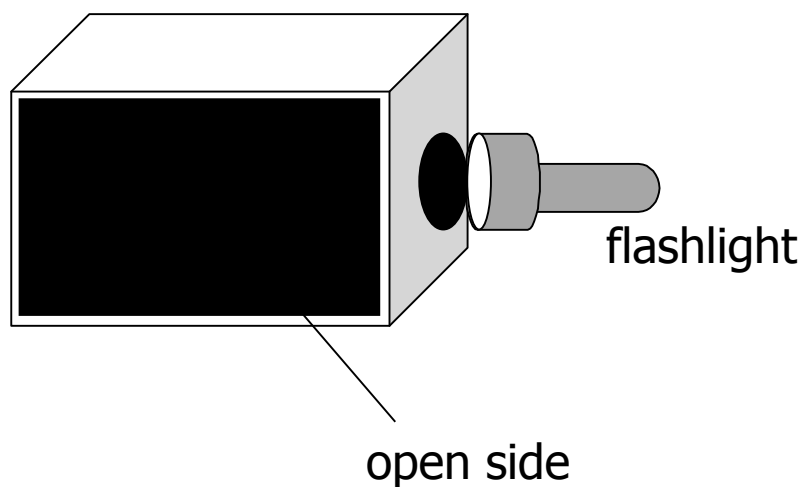
Small pieces of black construction paper

Magnifying glass

Stopwatch or clock with second hand

Preparation

Build the "dust box" before teaching this lesson. To construct the "dust box," remove the lid from the box. Cover the inside of the box with black construction paper or cloth, or spray paint the inside black. Then, cut a hole in one end of the box that will allow the light-end of a flashlight to fit through it.



How Clean is Your Room?

Student Activity

Electronic equipment must be tested prior to being sent as part of the payload on a mission.

Background Information

NASA has to overcome many challenges when sending astronauts into space. One of these obstacles is dust. While dust can be a menace here on Earth, in the microgravity environment of space, it can be extremely harmful. In the presence of Earth's gravity, dust settles onto the ground and flat surfaces. This makes cleanup fairly easy. In space, dust continually floats around. This makes it easily inhaled by astronauts. It also makes its way into equipment and can cause malfunctions.

So, how does NASA fight dust? It uses clean rooms. These facilities are large rooms that are kept extremely clean. Workers wear special suits, and high-quality ventilation removes dust and debris. These rooms are used to assemble flight hardware to prevent the accumulation of dust in the Space Shuttle and the Space Station.

These special rooms even have their own rating system to distinguish their amount of cleanliness. For example, many of the Clean Work Areas (CWAs) are known as 100K Work Areas. This means that this work area has no more than 100,000 particles of 0.5 microns in size or larger. This may sound like a lot, but many of these rooms are so large that that equals less than 1 particle of dust per cubic foot of space.

In this lesson, will observe that many particles of dust are too small to see with the naked eye. Even though a room may seem clean, it's not nearly as clean as a NASA clean room!

Procedures:

1. Place the "dust box" on the table in front of you.
2. Place it on its side so that the top of the open box is facing your partner.
3. Hit the erasers with chalk dust together inside of the box, then start the timer on the stopwatch.
4. When you and your partner do not see any more dust floating in the box, stop the timer.
5. Record the time in the proper place on the data log, then following the remaining instructions below.
6. Now turn on the flashlight and shine it into the hole on the side of the box.
7. What do you see? Record you answer on the data log.

How Clean is Your Room?

Data Log

Time on stopwatch when all dust had cleared: _____

What did you see when you shined the flashlight through the hole?

Procedure

You are going to be looking for dust particles in your classroom and school area. Choose three different areas to test, and use the procedure below for each area.

- 1 Cut a piece of tape approximately 2 inches long.
- 2 Carefully fold over a corner of the tape. This will make tape removal easier.
- 3 Place the tape sticky-side down in the test area. Gently rub your finger over the tape to ensure particle pickup.
- 4 Carefully remove the tape.
- 5 Place the tape sticky-side up on the black construction paper. Can you see dust particles on the tape?
- 6 Use the magnifying glass to examine the dust particles more carefully.

Location	Approximate # of particles

Answer the following questions on a separate piece of paper.

- 1 Why did you choose to test these areas?
- 2 Do any of the samples have too many particles to count?
- 3 Is there any difference between the particle samples? Are there more particles on one sample than another? Are the particles all the same size and color?
- 4 How would these dust particles behave in a microgravity environment? How would this affect the astronauts?