HOW TO MAKE A PARACHUTE 

OBJECTIVE:

Students will learn about air resistance, terminal velocity, and gravity while making and testing a parachute.

MATERIALS:

1. A plastic bag or light material
2. Scissors
3. String
4. A small object to act as the weight, a little action figure would be perfect
5. Teacher notes
6. Student Handout

PROCEDURE:

A. Review Parachute Lesson Notes with students.

B. Handout and review student direction sheet. **Emphasize surface area and air resistance.**

C. Handout data collection work sheet

D. When students are done making their parachutes provide an appropriate place to test their parachutes and make modifications and retest.

CLOSURE:

Wrap up: Have students share results and what best worked in making parachutes and making modifications.

STUDENT HANDOUTS:

1. Student Directions
2. Data sheet and questions

HOW TO MAKE A PARACHUTE LESSON NOTES 

What is gravity?

The force of attraction that moves or tends to move bodies towards the center of a celestial body, such as the earth.

If I drop a heavy stone and a feather from a tall building which will hit the ground first?

Both are being pulled to the ground at the same rate and if there was no air they would hit the ground at the same time. The feather fans out and catches the air as it fall and slows it down, this is called air resistance.

What causes air resistance?

Though we can't see air it is still there. Earth's atmosphere is packed full of gas molecules so if you want to pass through it, walking, driving, or in a parachute, you have to push them out of the way. We rarely notice that unless we are moving at a high speed. Air resistance is a bit like the way water pushes against your body when you're in a swimming pool—except that air is invisible! If you jump off a diving board or do a belly flop, the awkward shape of your body will create a lot of resistance and bring you rapidly to a halt when you crash into the water. But if you make a sharp pointed shape with your arms and dive in gracefully, your body will part the water cleanly and you'll continue to move quickly as you enter it. When you jump or belly flop, your body slows down quickly because the water can't get out of the way fast enough. When you dive, you part the water smoothly in front of you so

your body can glide through it quickly. With parachutes, it's the slowing-down effect that we want.

How does a parachute work?

If you fall from a plane without a parachute, your relatively compact body zooms through the air like a stone; open your parachute and you create more air resistance, drifting to the ground more slowly and safely—much more like a feather. A parachute works by increasing your air resistance as you fall.

What is terminal velocity?

When a force pulls on something, it makes that object move more quickly, causing it to gain speed. In other words, it causes the object to accelerate. Like any other force, gravity makes falling objects accelerate—but only up to a point. If you jump off a skyscraper, your body ought to speed up by 10 meters per second (32ft per second) every single second you're falling. We call that an acceleration of 10 meters per second per second (or 10 meters per second squared, for short, and write it like this: 10m/s/s or 10m/s^2). If you were high enough off the ground, then after about a minute and a half (let's say 100 seconds), you'd theoretically be falling at about 1000 meters or 2200 mph), which is about as fast as the fastest jet fighters have ever flown! In practice, that simply doesn't happen. After about five seconds, you reach a speed where the force of air resistance (pushing you upward) increases so much that it balances the force of gravity (pulling you downward). At that point, there is no net acceleration and you keep on falling at a steady speed called your **terminal velocity**. Unfortunately, the terminal velocity for a falling person (with arms stretched out in the classic freefall position) is about 55 meters per

second or 125 mph, which is still plenty fast enough to kill you-especially if you're falling from a plane!

How much does a parachute slow you down?

Feathers fall more slowly than stones because their terminal velocity is lower. So another way of understanding how a parachute works is to realize that it *dramatically lowers* your terminal velocity by increasing your air resistance as you fall. It does that by opening out behind you and creating a large surface area of material with a huge amount of drag. Parachutes are designed to reduce your terminal velocity by about 90 percent so you hit the ground at a relatively low speed of maybe 5–6meters per second or 12 mph)—ideally, so you can land on your feet and walk away unharmed.

HOW TO MAKE A PARACHUTE DIRECTION SHEET 

OBJECTIVE: Design a parachute that can fall slowly to the ground. A parachute is a large area of material which creates air resistance. The air resistance stops the person parachuting from falling too quickly. The bigger the person or the heavier the object, the larger the surface area of material required.
(Remember what you just learned about gravity and air resistance.)

MATERIALS:

1. A plastic bag or light material
2. Scissors
3. String
4. A small object to act as the weight

DIRECTIONS:

1. Cut out a large square from your plastic bag or material
2. Trim the edges so it looks like an octagon (an eight sided shape).
3. Cut a small whole near the edge of each side.
4. Attach 8 pieces of string of the same length to each of the holes.
5. Tie the pieces of string to the object you are using as a weight.
6. Use a chair or find a high spot to drop your parachute and test how well it worked, remember that you want it to drop as slow as possible.

HOW TO MAKE A PARACHUTE LESSON
STUDENT HANDOUT

PARACHUTE DROP DATA

	HEIGHT OF DROP (METERS)	TIME (SECONDS)
TRIAL 1		
TRIAL 2		
TRIAL 3		
TRIAL 4		

Complete the following steps:

1. Determine a height you will drop your parachute from and keep this height constant for all trials. (The same for all trials)
2. Drop your parachute the same way for all drops.
3. Start the timer consistently during each trial.
4. Test your parachute twice and record your results on Trial 1 and Trial 2.
5. Make modifications on your parachute to try to improve the time. (Your goal is to slow down the time it takes for the object your parachute is holding to hit the ground.
6. Test your parachute a third time and record your results on Trial 3.
7. Make modifications on your parachute to try to improve the time.
8. Test your parachute a fourth time and record your results on Trial 4.

Answer the following questions.

1. What was the fastest time recorded for your parachute drop?_____
2. What was the slowest time recorded for your parachute drop?_____
3. What modifications did you make to slow your parachute time?

   _____
   _____
   _____
   _____
4. Did your modifications slow down the fall of your parachute? What other type of modification could you try to slow your parachute down?

   _____
5. How did air resistance effect the fall of your parachute? _____

SOURCES

http://www.bbc.co.uk/learningzone/clips/parachutes-and-air-resistance

http://www.explainthatstuff.com/how-parachutes-work.html

http://www.sciencekids.co.nz/experiments/freefall.html