



Teacher Notes- “Comets And Asteroids-What They Are, Where They Are, They And Us”

Comets and asteroids are as mysterious as they are beautiful. They capture our imagination with their unbelievable size (did you say a 50-mile-wide flying ice cube?!?!), and terrify us with the thought of what would happen should we (earth) and they meet, which we do with regularity.

This lesson dissects comets and asteroids using 3 criteria: What they are, Where they are, and They and us. It’s all packaged in a note sheet that students fill in as they listen and learn.

	<i>What they are</i>	<i>Where they are</i>	<i>They and us</i>
 <p>Comets</p>	<ul style="list-style-type: none"> A huge ball of mostly _____ Their size ranges between _____ and _____ miles wide. There are _____ in our solar system. 	<ul style="list-style-type: none"> Most comets are found in the _____ Cloud, which is about _____ further out than the earth is from the sun. A few orbit among the 9 _____ A _____ or _____ is what sends some into the inner solar system among the planets. 	<ul style="list-style-type: none"> A comet too close to the sun will begin to die as it sheds small fragments due to _____ passing over it. This is how the _____ forms. If the Earth had passed through this, a phenomenon we call _____ occurs. There are _____ major meteor showers that occur throughout the year.
 <p>Asteroids</p>	<ul style="list-style-type: none"> Asteroids are mostly _____ 	<ul style="list-style-type: none"> Most asteroids hang loosely _____ the sun between _____ and _____ They will never gather into a planet because of Jupiter's _____ A few have been nudged _____ 	<ul style="list-style-type: none"> There are _____ asteroids that cross earth's orbiting plane that are at least 10 meters across or larger. A _____ sized asteroid collides with earth about every _____ year. Asteroid _____, some _____ miles wide, is thought to be what caused the _____ extinction.

Materials per student:

1-Student Note Sheet (see p. 5)

Additional Teacher Materials...

- All optional* {
- PowerPoint-Comets And Asteroids (see page 5)
 - Ice Cubes
 - 1-Roll-Toilet Paper
 - 1-Screwdriver
 - 1-Home-made mini comet (optional)- see Beforehand #3
 - 1-Fan

Beforehand:

- Beginning about a week before these notes, start [reading about comets and asteroids](#). You need to be able to speak knowledgeably and be up to date on the most recent research and discoveries. The day before is too late to begin your research.
- If you’re using PowerPoint, it is set up to look just like the student handout, but it needs pictures of comets and asteroids inserted into it (for copyright reasons we could not include any). *1

Insert the following kinds of pictures on these slides*²: If you're inserting onto slides with student notes and they overlap, then right-click the picture → select "Order" and "Send to Back".

- Slide #1- Leave as-is with the title, or add a stunning comet and asteroid picture to the side/behind
- Slide #2- Close-up of a comet nucleus, without a tail (drawing or photograph)
- Slide #3- The [Oort Cloud](#)
- Slide #4- Comet with a tail
- Slide #5- Close-up of an asteroid
- Slide #6- The [solar system](#) (at least through Jupiter)
- Slide #7- A [crater](#) somewhere on earth (like Barringer)

You'll find more pictures than you can possibly use, so remember that less is more. Too many images would crowd the you're trying to present. Just use 1 or 2 of the best, and keep applying the information on the handout to them.

If you're not using a PowerPoint, look through the appropriate chapter in your book for pictures to refer to.

3. And speaking of picking and choosing, the note sheet that students will be filling out represents the most basic and essential information about comets and asteroids. It was intentionally designed that way for 3 reasons:
 - 1.) It gives a reasonable amount of information that students are expected to be accountable for knowing
 - 2.) Depending on the information you come across in your preparation and are most interested in sharing, plus the student questions you get, there is room for you to expand and elaborate on anything. The idea here is "flexibility".
 - 3.) The amount of information on the sheet will comfortably take you about 45 minutes to share.

So, think of the statements and blanks on the note sheet as discussion starters.

4. Consider making some home-made mini comets to let students see. Put dirt, ammonia (-based household cleaner), and then water in an ice cube tray, freeze it, and you've got mini-comets. They're not perfect (missing are methane, carbon dioxide, and carbon monoxide), but they help.
5. Write yourself notes reminding yourself when to do a demo, change PowerPoint slides, or make a comment.
6. Check a [list of meteor showers](#) so you can pass this

	What they are	Where they are	They and us
Comets	• A large ball of mostly FROZEN WATER • Their size ranges between 1 and 200 miles wide • There are TRILLIONS in our solar system	• Most comets are found in the OORT Cloud, which is about 75,000X further out than the earth is from the sun • A few orbit among the PLANETS • GRAVITATIONAL TUG or COLLISION what sends some into the inner solar system causing the planets	• A comet too close to the sun will begin to die as WIND peeling away it. This is how the TAIL is born. • If the Earth's orbit passes through this, a phenomenon we call METEOR SHOWER occurs. • There are 14 major meteor showers that occur throughout the year.
Asteroids	• A much smaller body of IRON ROCK	• Most asteroids have the ORBIT the sun between MARS and JUPITER • They will never gather into a planet because of Jupiter's GRAVITY • A few have been nudged	• There are 10 MILLION asteroids that cross earth's orbiting zone that are at least 10 meters across or larger. • A FOOTBALL FIELD 1,000 yards wide with only about every 1,000 yards across KT , there are 6 miles wide, is thought to be what caused the DINOSAUR extinction.

info. along to students. Even if there are no major meteor showers happening, you could watch for stray meteors, which are not uncommon. These are more frequent in the morning than evening, and in the early fall than spring.

Procedure:

1. A nice way to welcome students to your room today and get them instantly curious is to have the [Stellarium](#) star program running, with meteors shooting through the sky (press the “9” key to toggle rates).
2. Introduce the lesson:

“Students, we’re going to spend today discussing comets and asteroids. They’re as mysterious and they are beautiful. Using the note sheet you’ve been given, we’ll cover 3 things about each: What they are, Where they are, and They and us.

Now, the information on the sheet represents just the most *basic* and *essential* information about them. There is a lot more besides this that we do know. So here’s what I need you to do- as we talk today, if a question suddenly pops into your head, I want you to raise your hand and ask it. Any question you want. There is lots of room for all kinds of questions, so please ask. I will keep my responses brief so we can answer lots of questions. Let’s begin.

3. Advance to PowerPoint slide #2 and go through the information on the note sheet related to comets using the 3 guiding statements- *What* they are, *Where* they are, and *They and Us*. Encourage students to ask questions, which will give you the opportunity to elaborate.

And don’t just feed them answers- as you lead up to a blank, ask them what goes there.

4. At some point during the 3rd comet column (“They and us”) there are 3 demonstrations you could do:
 - Ice cube: just observe it during column 1 since comets are mostly frozen water. In column 3 drop it on a hard surface and watch it break. Seeing that will make it easier for everyone to understand how the sun could blast off little bits, forming the tail.
 - To demonstrate the cause of meteor showers, pick a student wearing a bright yellow shirt to stand in the middle of the room and be the “sun”. Hand another student volunteer (the “comet”) a screwdriver that has a roll of toilet paper on it, and have them walk around the perimeter of the room leaving a white trail behind them as the roll of t.p. unwinds. A third student, the “earth”, can then orbit the sun on a different path and encounter the comet debris (t.p.) left behind. Ask the class what that would look like on earth as the little bits whiz into our atmosphere going 25,000 mph.

- To help students understand the concept of solar wind, turn a fan on high and ask a student with long hair to stand in front of it. Notice what their hair does. Solar wind is like that- it blows little pieces of the comet off, forming the tail on the side away from the sun.
5. The last comet slide has a little stop sign in the lower-right corner. Its job is to let you know that you're getting ready to transition to asteroids.
6. Move through the notes on asteroids the same way you did with comets.

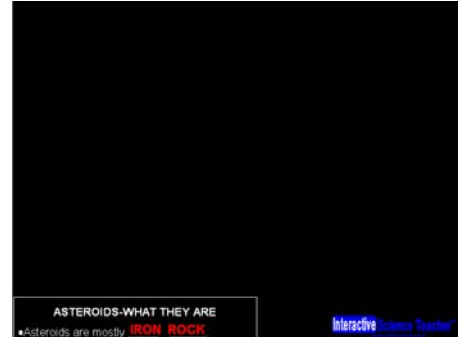
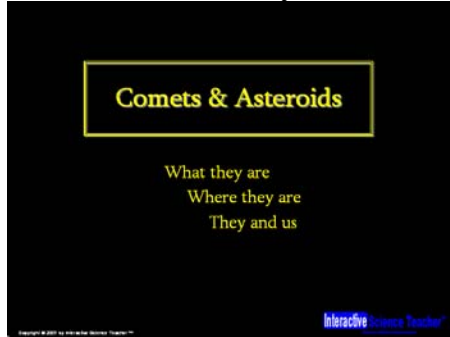


Accessories: Other sub-topics you can add for more length and depth.

- *¹ Good sources of pictures:
<http://en.wikipedia.org/wiki/Comet>
<http://en.wikipedia.org/wiki/Asteroid>
<http://images.google.com/images?hl=en&q=comet&btnG=Search+Images&gbv=2>
<http://images.google.com/images?hl=en&q=asteroid&btnG=Search+Images&gbv=2>
http://antwrp.gsfc.nasa.gov/cgi-bin/apod/apod_search?comet
http://antwrp.gsfc.nasa.gov/cgi-bin/apod/apod_search?asteroid
- *² To insert a picture from the internet, right-click and “Copy” the picture. Come back to PowerPoint and right-click “Paste” it in. Drag a corner out to enlarge it. If it overlaps the student notes, then right-click the picture, select “Order” and “Send to back”.
- Other recommended sites:
<http://www.youtube.com/watch?v=yYgEwXWlUc>
<http://www.jpl.nasa.gov/multimedia/neo/index.cfm>

Come back and visit InteractiveScienceTeacher.com to upgrade this lesson with:

PowerPoint- lead your students through the lesson click-by-click



Student Handout

	What they are	Where they are	They and us
Comets	<ul style="list-style-type: none"> Asgard's of the Their size ranges from They are There are 	<ul style="list-style-type: none"> Asteroids are found in the Cloud, which is the Asteroids like the such a Asteroids are Asteroids are Asteroids are 	<ul style="list-style-type: none"> Asteroids are They are There are Asteroids are Asteroids are Asteroids are
Asteroids	<ul style="list-style-type: none"> Asteroids are Asteroids are Asteroids are Asteroids are 	<ul style="list-style-type: none"> Asteroids are Asteroids are Asteroids are Asteroids are 	<ul style="list-style-type: none"> Asteroids are Asteroids are Asteroids are Asteroids are

QuickNotes

Teacher Quick Notes- "Comets And Asteroids"

Materials:
 1-Student Note Sheet
 PowerPoint-Comets And Asteroids

Procedure:
 1. Introduce the lesson with the PowerPoint slideshow started.
 2. Move through the note sheet deliberately and purposefully. Use your slideshow, the demonstrations, and information you've picked up from your studying to supplement the note sheet.