

# Lesson Plan Template

Candidate: Beth Kostka

Strategy (circle one): *NAL*

Unit Name

Astronomy

Lesson Name

Time Needed (Hours/Days)

Meteorites, Comets & Asteroids

2 class periods

Grade

Subject

Course

6

Earth Space

6th grade Earth Space Science

Essential Question(s)

What should students know when lesson is completed?

How can rocks help us understand our place in the Universe?

Standard

**S6E1. Obtain, evaluate, and communicate information about current scientific views of the universe and how those views evolved.**

e. Ask questions to compare and contrast the characteristics, composition, and location of comets, [asteroids](#), and meteoroids. **THIS LESSON WILL ONLY ADDRESS ASTEROIDS**

Learning Targets:

- I can explain the characteristics, composition, and location of asteroids (S6E1c.)
- I can compare and contrast size/scale of an asteroid to common objects
- I can discuss the effect of asteroid impacts on Earth and the Moon in the past and today

Teacher Lesson Preparation

**Connect to prior Knowledge:**

Prior Knowledge/Skills: Prior the lesson, students will explore the concept of scale with stations (text, videos, websites), as well as the origin of our Universe, the Big Bang Theory, and our solar system including the orbits, location and the characteristics of it's planets (through various labs and personal project). This background information will aid them in this NAL lesson by providing context and content.

**Memory & Learning Connections:**

This lesson is designed to address the three types of memory necessary to learn: Sensory, Permanent, and working memory. Specifically this lesson does this by 1) facilitating connection to past knowledge and building connection to content to come, 2) organizing and teaching students how to collect comparison information (through a graphic organizer that chunks material and incorporates review questions regularly, 3) using memory devices for dual coding (such as visualizations, map analysis, touch, image comparison and analysis, etc.), and 4) incorporating regular review (every 5 minutes) across four questioning types of mastery, understanding, interpersonal, and imagination.

Three types of memory were considered and planned for in this NAL lesson

1. Hook activates sensory memory, providing a visual focus and encouraging access of prior memory. Additional sensory memory activities incorporated into the lesson include a visualization (eyes-closed) of the size of an asteroid and a reading of a first-hand account of a comet crossing the night sky.

2. Permanent memory is invoked through delivery, repetition, and connection. The organizer and slides/notes facilitates chunking content into memorable pieces
3. Working memory is incorporated by application and use of questioning strategies across the 4 learning styles (Mastery, Interpersonal, Understanding, and Synthesis or Self-Expressive. The lesson is planned such that the teacher stops every 5 minutes to poses review questions, rotating through the 4 styles: mastery, understanding, interpersonal, and self-expressive.

**List of Review questions for facilitating working memory:**

**Review (Mastery)-**

- Based on your observations, what does an asteroid look like?
  - Define Asteroid in your own words
  - What are asteroids made of?
  - Where are asteroids found in the solar system?
  - How big are asteroids?
  - Summarize in your own words where do asteroids come from?
  - What were the two most important points to know about Asteroids?
  - Turn your paper over and see how much you can remember about asteroids
- **Interpersonal (feelings)**
    - Discuss how big asteroids are relative to YOU
    - How would you react if you saw an asteroid crater up close?
    - On a map (Moon or Earth) where would you find asteroid craters?
    - How cool would it be to see (to find) an asteroid in the night sky?
    - Which of the three (asteroids, comets and meteoroids) do you feel strongest about and why? (after all three have been discussed)
  - **Understanding (Analysis):**
    - Compare and contrast the size of an asteroid to known items on Earth
    - Are all asteroids the same? Why or why not? Support your answer with evidence
    - Compare and contrast Asteroids to Meteoroids (after discussed meteoroids in next lesson)
    - What effect would an asteroid impact have on Earth versus the Moon? How do you know?
    - How do asteroids move? What evidence do you have for your answer?
    - How are asteroids ancient clues to our solar system?
    - What can scientists learn from asteroids?
  - **Self Expressive (Synthesis):**
    - Imagine you are a scientist on a star ship....
    - Imagine you were tasked to mine an asteroid for metals, how would you do it? What problems do you need to overcome? (Show news article of first landing on asteroid)
    - Read YA Fiction book by Stephen Hawkins...ask students if they would want to switch places with the main character, why or why not?

Gifted Identification: Students are identified as gifted through CSD testing and qualification. I have 24 students identified as gifted in science plus 16 Gifted in Math and/or Gifted in Reading and 1 twice

exceptional (for a total of 41 gifted students in my class). I have asked our CSD gifted coordinator which students are gifted creatively and have not had confirmation yet (I hypothesize 3).

Goals: The goals of the lesson are for students to be able to do the following.

- (Mastery) I can **define and identify** an asteroid.
- (Mastery) I can **locate** where most asteroids are found in our Solar system
- (Understanding) I can **explain** the characteristics and composition of asteroids in relation to their origin
- (Understanding) I can **compare and contrast** size/scale of an asteroid to common objects
- (Interpersonal) I can **discuss** past and/or future ways asteroids affect humans

Pre-assessment:

To pre-assess whether students have met the learning goals prior to this lesson, they were given a google form at the beginning of the Astronomy unit with questions relating to these learning targets. Attached below is the pre-test section assessing CAM (Comets, Asteroids, and Meteoroids).

Misconceptions:

Based on assessment from prior years and from

<https://history.amazingspace.org/resources/explorations/cometmyth/teacher/lessonplan.html> website, I know that students have the following misconceptions about CAM

- **Misconception:** Comets are not a part of the solar system.  
Reality: Comets are part of the solar system. They are believed to originate from one of two locations within the solar system: the Kuiper belt and the Oort Cloud (places researched prior to this lesson)
- **Misconception:** Comets are similar to asteroids.  
Reality: Comets and asteroids have a very different make-up. Asteroids are composed of rocky and metallic material while comets are composed of water ice, dust, and carbon- and silicon-based compounds. There is also a size difference.
- **Misconception:** All comets look the same and don't change their appearance.  
Reality: Comets have a coma and one, two, or three tails when near the Sun, and no coma or tail when far way from the Sun.
- **Misconception:** Pluto is the most-distant and last object in the solar system.  
Reality: Beyond Pluto's orbit is a group of icy objects (comets) located in area known as the Kuiper belt. This is where many short-range comets come from. Further still is a sphere of icy bodies, called the Oort Cloud, from which long-range comets emerge. Short-period comets visit the inner solar system frequently while the long-period comets visit infrequently.
- **Misconception:** There is empty space between the planets.  
Reality: There is gas and dust, also known as the interplanetary medium, between the planets. Comets are responsible for depositing some of the gas and dust found in the inner solar system.

Special Population Consideration: Consider this

A diversity of images are provided in the slides for special populations including female astrophysicist (Lindy Elkins-Tanton) and Minority Students (Japanese and Middle Eastern ). To connect to our technologically savvy gifted students, included is a news article showing a "selfie" taken from a Japanese probe landing on an asteroid (Feb. 25, 2019- <https://www.space.com/hayabusa2-asteroid-landing-photo.html>). Graphic organizers and today's agenda provide structure for twice gifted students and a reflection question (Imagine you were tasked to mine an asteroid for metals, how would you do it? What problems do you need to overcome?) is provided for creatively identified gifted students. As we progress into the lessons on comets and meteoroids, there will be modeling/drawing opportunities for creative students to show their understanding in a different way.

**Activating Strategy (for example: Hook/Mini-Lesson/Warm-Up/Connection to Prior Learning)**

**Engage:** What is it and how do you know? Picture of long narrow asteroid (interstellar from outside our solar system). Have a student record on the board their answers and their evidence in a two column chart. Use this hook to assess what they already know about Comets, Asteroids, Meteors.

(<https://www.news.com.au/technology/science/space/scientists-weigh-in-on-cigarshaped-ufo-believed-to-carry-alien-life/news-story/26ab15fa4da1860da65f08f2b5723d46>). (Aside:In future this could be made into a FQL lesson.)



“Great. You really know a lot about space. Now let’s add-on and build new information onto what you already know.”

**Instructional Sequence and Activities including use of Technology by teacher and by students**

**Day 1**

**Engage:**

- Present the engage image and ask “What is this a picture of? How do you know?” (See above Hook)
- Write down ideas and connections to prior learning as students identify them (see above)
- Encourage use of past unit vocab and content (Solar System, Kuiper Belt, Oort Cloud, Scale, gravity, mineral/rock, Big Bang Theory)
- Say “Great communication of your knowledge from last unit and its connection to this image. “Today we will use that knowledge to learn about asteroids.”

**Explore:**

- Pose the essential question “How can rocks help us understand our place in the Universe?”
- Hand out graphic organizer and ask students why we will use this instead of their notebooks? Discuss how it is important to organize our learning for memory recall and use.
- Students will complete the graphic organizer as you move through the content slides/lecture.

**COMPARING COMETS AND ASTEROIDS**

	COMETS	ASTEROIDS	Meteoride /meteor/meteorite
<b>DEFINITION</b>			
<b>COMPOSITION</b> (What it is made of)			
<b>SIZE</b>			
<b>LOCATION</b> (where do you find them in the solar system?)			
<b>NUMBER</b> (how many are there?)			
<b>OTHER FACTS:</b>			
<b>NAMES OF FAMOUS ONES</b>			

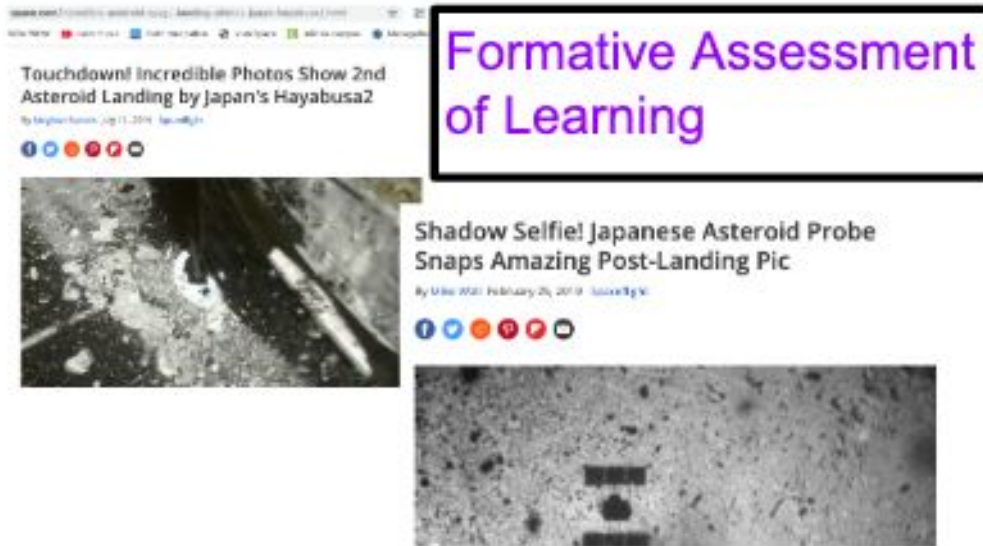
**Explain:**

- Show slides and videos about Asteroids. What is an asteroid? video; slides; As continue through slides ask the formative questions (M,U, IP, Self-E)
  - **see questions listed above and in slides**
- Ponder: Are all asteroids the same? Lead students to discussion of size (scale)
- Visualization (closed eyes) of the size of an asteroid. Compare asteroid to a human
- Ponder: Why do asteroids matter to humans
  - Show craters on moon and consider where they come from and why they are so distinct (no moon atmosphere so no friction and slowing of impact. also no weathering and erosion of impact craters)
  - Show Chicxulub crater and ask what is this (first picture from close up and slowly zoom out) use [Google Earth Technology](#)
  - video and slides of Chicxulub crater and theory of dinosaur extinction
- Reflect on Learning choice (answer one of the following)
  - “Do asteroids matter to humans? Why or Why not?”
  - “Imagine you were tasked to mine an asteroid for metals, how would you do it? What problems do you need to overcome?”
  - “After reading a passage from Lucy and Stephen Hawking’s book “George’s Secret Key to the Universe YA book (p. 208 & 211). “Would you want to sit on an asteroid?”

**DAY 2**

**Elaborate/Apply/Evaluate**

- What did we learn about asteroids yesterday? Let’s fill in Graphic Organizer (GO) -Review
- **Today we will be applying our learning by answering the following question:**



The image shows a screenshot of a news article titled "Touchdown! Incredible Photos Show 2nd Asteroid Landing by Japan's Hayabusa2" by Stephen Lee, dated July 11, 2019. Below the title is a photograph of the Hayabusa2 probe on the surface of an asteroid. To the right of the article is a purple-bordered box with the text "Formative Assessment of Learning". Below the main article is another article snippet titled "Shadow Selfie! Japanese Asteroid Probe Snaps Amazing Post-Landing Pic" by Uta W. February 26, 2019, with a photograph of the probe's shadow on the asteroid surface.

**July 2019 Japanese scientists landed a probe on an asteroid. What kind of things could the probe tell us? Answer this question in full sentences using your knowledge from yesterday**

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See below for Rubric

## Assessment Strategies

### Evidence of Learning

- Students will be able to **define and identify** an asteroid (as compared to a comet and meteor)
- Students will be able to **locate** where most asteroids are found in our Solar system (Asteroid belt between Mars and Jupiter)
- Students will be able to **explain** the characteristics and composition of asteroids in relation to their origin
- Students will be able to **compare and contrast** size/scale of an asteroid to common objects
- Students will be able to **discuss** past and/or future ways asteroids affect humans

**Assessment:** Students will be formatively assessed based on answers to 5 min. pause questions. Specifically, assessment by the teacher occurs with informal questioning using equity sticks (popsicle sticks with students names on it) and questioning slides across the Mastery (M), Understanding (U), Interpersonal (IP) and Self Expressive (SE) areas . If students struggle to answer, I will stop and use a Think/Pair/Share activity with students silently thinking/writing answers for 60 seconds on their own, then sharing answers with a partner for one minute and then discussing as a class. I will do this to determine if students have understood content on the previous slides. The last activity before I move on to Comets and Meteors will be a formative writing assessment where students look at a news headline from this year showing that in July 2019 Japanese scientists landed a probe on an asteroid. They will then answer the question **“What kind of things could the probe tell us and why is it important?”**

### RUBRIC

Considering the learning target is for students to identify the 1) composition, 2) size, 3) shape, 4) Origin, and 5) location of asteroids learning will assessed with these five items in mind.

<b>Mastery</b> (Can teach on own)	<b>Understands</b>	<b>Progressing</b>	<b>Needs Support</b>
<b>Discusses all 5 learning targets</b>	<b>Discusses 4 out of 5 learning targets with some detail</b>	<b>Mentions 2-3 of the learning targets</b>	<b>Mentions 1 of the learning targets</b>

Summative assessment will occur after students receive instruction for asteroids, meteors and comets. The assessment will include multiple choice (Factual) questions and an applied/conceptual task that requires students to write a Claim, Evidence, Reasoning (CER) statement to answer the following question and support it with evidence and reasoning “Which celestial body is more dangerous to humans Asteroids, Comets, or Meteorites?”

### Differentiation

**Scaffolds/ Interventions/Extensions/Enrichment/Adaptations for Special Pops students (acceleration, extension, enrichment, tiered)**

This lesson differentiates by process types of scaffolding (graphic organizer) and product (choice for formative assessment question). In addition, it differentiates by learning profile (across the 6 different ways of thinking) and content through supplemental texts/sources.

Specifically, scaffolds (graphic organizers) are provided to gifted students needing help with **organizational skills**. Gifted students who are quick to grasp content and motivated to complete

assignments have acceleration options of additional/expanded text sources (see materials section). Gifted students who are struggling writers will be provided with sentence starters to aid them in articulating their understanding. Finally, creatively gifted students are planned for by including modeling/drawing options for comparing and contrasting the celestial bodies.

Special populations are planned for through slides including Women and minority astronomers and accomplishments (see slides).

### **Possible acceleration to comets (modified from**

**<https://history.amazingspace.org/resources/explorations/cometmyth/teacher/lessonplan.html>)**

#### 1) Acceleration option #1- Comets

Students follow a webquest to complete the following:

1. Identify a fact associated with comets.
2. Identify a legend associated with comets.
3. Identify a myth associated with comets.
4. Comets are small solar system objects, yet ancient cultures knew about comets. Identify one property of comets that explains why humanity has known of comets for so long.
5. Describe the path of a comet and explain how this affects its reappearance.
6. Short-period comets tend to originate from the Kuiper belt — a region beyond the orbit of Neptune and similar in shape to the Asteroid belt. Long-period comets tend to originate from the Oort Cloud — a spherical region well beyond the orbits of Neptune and Pluto. Based on the reading, explain where each of the following comets is likely to have originated: Hale-Bopp, Swift-Tuttle, Hyakutake, and Halley's comet. Explain your choices.

#### 2) Acceleration option #2- Meteorites

- Students read news articles to answer the question “How are meteorites ancient clues to our solar system?”

<https://www.forbes.com/sites/quora/2016/02/19/why-meteorites-are-an-incredible-window-to-our-universe/#4e2df89c6817>

[https://solarsystem.nasa.gov/asteroids-comets-and-meteors/meteors-and-meteorites/overview/?page=0&per\\_page=40&order=id+asc&search=&condition\\_1=meteor\\_shower%3Abody\\_type](https://solarsystem.nasa.gov/asteroids-comets-and-meteors/meteors-and-meteorites/overview/?page=0&per_page=40&order=id+asc&search=&condition_1=meteor_shower%3Abody_type)

#### **Extension option #1- Asteroids (Extension for more depth)**

- Students research the Oumuamua Interstellar asteroid and share their understanding of this surprising asteroid in a poster. Poster to include: Discovery, Who found it and how, what it is made of (composition), size, location, and origin (with map).

<https://solarsystem.nasa.gov/asteroids-comets-and-meteors/comets/oumuamua/in-depth/>

#### **Extension option #2- Planetary Defense (Extension for more depth and interest)**

Research and create a poster or 5 slide presentation on NASA's Planetary Defense Coordination Office using the website <https://www.nasa.gov/planetarydefense> and

[https://www.youtube.com/watch?v=VYO-mpoC8\\_s](https://www.youtube.com/watch?v=VYO-mpoC8_s)

**Keeping in mind that the learning targets for the end of this unit:**

*After lessons on Asteroids (This lesson), continue to lessons on comets and meteoroids (Future lessons)*

- *(Understanding) I can explain the difference and similarities between meteors, meteoroids, and meteorites*
- *(Understanding) I can identify a property of comets and explain how that property makes comets visible.*

- *(Understanding) I can compare and contrast the characteristics, composition and location of comets, asteroids, and meteoroids.*
- *(Synthesis) I can create a model of interplanetary objects that expresses either scale, location, or characteristics of the objects.*
- *(Interpersonal) I can discuss past and/or future ways interplanetary object impact humans*

## Technology

Technology is incorporated in this lesson in the following ways:

- [google classroom](#) and [google forms](#) for pre-assessment
- [Google Earth](#)- used to zoom in on geologic features of craters making them mystery objects that students need to look at and make scientific observations and inferences
- [Virtual Reality Moon simulation](#) (NASA VR- <https://www.youtube.com/watch?v=6OT186BkPTs> to see moon craters formed by asteroid impacts) Extension
- Videos
- Graphic Organizer available in google classroom and as a hard copy to differentiate for various learning styles

## Materials/Links/Text References/Resources

**Gifted Course Material: Course 2 (Teaching Style 4R's)**

**Slides:** [https://drive.google.com/open?id=1YfgVwf0V5cEn\\_fyjFCgbvaDVO\\_fqR6VA](https://drive.google.com/open?id=1YfgVwf0V5cEn_fyjFCgbvaDVO_fqR6VA)

### Books

Lucy and Stephen Hawking (2007) "George's Secret Key to the Universe" Simon & Schuster Publishers (p. 208 & 211).

### Videos (Asteroids)

<https://www.youtube.com/watch?v=LopiH8cXtkI>

<https://www.youtube.com/watch?v=iy19nHTVLEY>

<https://www.youtube.com/watch?v=CGkjTYqtpco>

### Simulations:

**Comets:** <http://history.amazingspace.org/resources/explorations/cometmyth/home.html>

see also <http://deepimpact.umd.edu/gallery/index.html>

Moon NASA VR- <https://www.youtube.com/watch?v=6OT186BkPTs>

### Struggling/on level material for review (asteroids)

<https://spaceplace.nasa.gov/asteroid/en/>

<https://spaceplace.nasa.gov/asteroid-or-meteor/en/>



## APPENDIX (Attachments)

A quick way recall technique for each style is using the 4 R's (remember, relate, reason, reorganize)

<b>Mastery Questions (REMEMBER)</b> <ul style="list-style-type: none"><li>• Observing</li><li>• Recalling</li><li>• Following Directions</li><li>• Categorizing</li><li>• Sequencing</li><li>• Listing</li><li>• Naming</li><li>• Summarizing</li><li>• Prioritizing</li></ul>	<b>Involvement /InterpersonalQuestions (RELATE)</b> <ul style="list-style-type: none"><li>• Preferring on the basis of personal values</li><li>• Engaging</li><li>• Empathizing</li><li>• Harmonizing</li><li>• Relating interpersonally</li><li>• Achieving Self Awareness</li><li>• Sharing</li><li>• Feelings</li></ul>
<b>Understanding Questions (REASON)</b> <ul style="list-style-type: none"><li>• Analyzing</li><li>• Evaluating</li><li>• Comparing and Contrasting</li><li>• Deducing</li><li>• Inducing</li><li>• Inferring</li><li>• Hypothesizing</li><li>• Explaining and Extrapolating</li></ul>	<b>Synthesis / Self-Expressive Questions (REORGANIZE)</b> <ul style="list-style-type: none"><li>• Creating</li><li>• Innovating</li><li>• Imagining</li><li>• Synthesizing</li><li>• Thinking metaphorically</li><li>• Imaging</li><li>• Symbolizing</li></ul>

### CAM- PreAssessment

Show what you know before we get started on our astronomy unit!

Your email address ([bkostka@csdecatur.net](mailto:bkostka@csdecatur.net)) will be recorded when you submit this form. Not [bkostka](#)?

[Sign out](#)

\* Required

1. First Name \*

2. Last Name \*

3. Period \*

Mark only one oval.

- Period 1  
 Period 2  
 Period 3  
 Period 4  
 Period 5

### Pre-test CAM

4. Our universe is mostly \*

Mark only one oval.

- rocks  
 empty space  
 gases  
 stars

5. Everything everywhere. All the matter and all the light in space and time is called a(n) \_\_\_\_\_.

Mark only one oval.

- galaxy  
 universe  
 planet  
 Earth

6. An enormous rock or boulder that revolves around the Sun, usually between the orbits of Mars and Jupiter is a(n) \_\_\_\_\_.

Mark only one oval.

- comet  
 asteroid  
 planet  
 star

7. A small, frozen mass of ice, dust and gas that travels through the solar system is a(n) \_\_\_\_\_ . Some call them "dirty snowballs". \*

Mark only one oval.

- comet
- asteroid
- planet
- star

8. A star with a group of objects that orbit around it is called a(n) \_\_\_\_\_ . \*

Mark only one oval.

- galaxy
- planet
- universe
- solar system

9. A lump of rock or metal that reaches the surface of Earth after moving through Earth's atmosphere is called a(n) \_\_\_\_\_ . \*

Mark only one oval.

- asteroid
- meteoroid
- meteor
- meteorite

10. A lump of rock or metal that enters the Earth's atmosphere and burns is a(n) \_\_\_\_\_ . \*

Mark only one oval.

- asteroid
- meteoroid
- meteor
- meteorite

11. The asteroid belt is found between which of the following planets in our solar system? \*

Mark only one oval.

- Jupiter and Saturn
- Mars and Jupiter
- Earth and Mars
- Venus and Earth

12. What is the difference between a meteor, meteorite, and meteoroids? \*

Mark only one oval.

- the composition of the rock
- the size of the rock
- where it comes from
- the location it is found

## Assessment Questions (Formative) for Lesson

### Review (Mastery)-

- Based on your observations, what does an asteroid look like?
- Define Asteroid in your own words
- What are asteroids made of?
- Where are asteroids found in the solar system?
- How big are asteroids?
- Summarize in your own words where do asteroids come from?
- What were the two most important points to know about Asteroids?
- Turn your paper over and see how much you can remember about asteroids
- **Interpersonal (feelings)**
  - Discuss how big asteroids are relative to YOU
  - How would you react if you saw an asteroid crater up close?
  - On a map (Moon or Earth) where would you find asteroid craters?
  - How cool would it be to see (to find) an asteroid in the night sky?
  - Which of the three (asteroids, comets and meteoroids) do you feel strongest about and why? (after all three have been discussed)
- **Understanding (Analysis):**
  - Compare and contrast the size of an asteroid to known items on Earth
  - Are all asteroids the same? Why or why not? Support your answer with evidence
  - Compare and contrast Asteroids to Meteoroids (after discussed meteoroids in next lesson)
  - What effect would an asteroid impact have on Earth versus the Moon? How do you know?
  - How do asteroids move? What evidence do you have for your answer?
  - How are asteroids ancient clues to our solar system?
  - What can scientists learn from asteroids?
- **Self Expressive (Synthesis):**
  - Imagine you are a scientist on a star ship....
  - Imagine you were tasked to mine an asteroid for metals, how would you do it? What problems do you need to overcome? (Show news article of first landing on asteroid)
  - Read YA Fiction book by Stephen Hawkins...ask students if they would want to switch places with the main character, why or why not?

## Graphic Organizer Answer Key (Page 1)

### COMPARING COMETS AND ASTEROIDS

	COMETS	ASTEROIDS	Meteoride /meteor/meteorite
<b>DEFINITION</b>	Object that orbits the sun made up of <b>ICE, dust, and rock.</b>	Object that orbits the sun made up chunks of rock and metal	Smallest. Object made of hunk of rock or grain of sand moving in space ( <u>meteoride</u> ), through atmosphere (meteor) or landing on Earth (meteorite)
<b>COMPOSITION</b> (What it is made of)	left overs of early solar system ICE, ROCK, DUST, CARBON	ROCK & METAL 3 types (silica, metals, and carbon-based)	broken bits of asteroids or comets
<b>SIZE</b>	Depends on how close to sun <1mi-15mi Tail= 354 million mi	600 miles (largest=Ceres) to couple meters	dust speck to 1 meter

## Graphic Organizer Answer Key (Page 2)

<b>LOCATION</b> (where do you find them in the solar system?)	orbits the sun anywhere. begins in Oort cloud	orbits the sun. found mostly between mars and jupiter & beyond Neptune. Near Earth < 200	in space, in atmosphere and on Earth
<b>NUMBER</b> (how many are there?)	6339 (2018)	over 1 million	Average 50,000 per year hit Earth (>10g)
<b>OTHER FACTS:</b>	tail created when gets closer to sun and "warms" orbit: <100-100,000 yr	largest asteroids can have its own gravity  impact may have caused dinosaur extinction	
<b>NAMES OF FAMOUS ONES</b>	HALLEY Shoemaker Hyakutake Kohoutek	Ceres Vesta Hygiea Eros The Dinosaur Killer	Willamette Hoba

**New Vocabulary** (taken from <https://history.amazingspace.org/resources/explorations/cometmyth/teacher/lessonplan.html>)

### Asteroid —

A small solar system object composed mostly of rock. Many of these objects orbit the Sun between Mars and Jupiter. Their size can range anywhere from 10 meters in diameter to less than 1,000 kilometers.

### Comet —

A small solar system object consisting of ice and rock. A comet will form a coma and sometimes a visible tail whenever it orbits close to the Sun.

### Coma —

The cloud that forms around a comet's center core

### Meteor —

The flash of light that we see in the night sky caused by the friction of a meteoroid passing through Earth's atmosphere.

### Meteor Shower —

Many and sustained flashes of light that are seen in the night sky as a result of the Earth passing through the former path of a comet. The debris released by the comet causes the meteor shower.

### Meteorite —

Any part of a meteoroid that survives its fall through the atmosphere and lands on the Earth.

### Meteoroid —

An interplanetary chunk of rock and/or metal that is smaller than a kilometer in diameter and most frequently measured in millimeters.

### Comet Nucleus —

The solid rocky part of a comet.

### Comet Tail —

The visible dust an/or gas that flows off of a comet as a result of solar wind. The comet tail has two parts 1) dust tail and 2) gas tail