



TEACHER GUIDE

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STUDENT HANDOUTS

- Reading Comprehension

1. <i>An Introduction to the Universe</i>	
2. <i>Measuring Distance in the Universe</i>	
3. <i>Nebulae</i>	
4. <i>Galaxies</i>	
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FREE! **6 Bonus Activities!**

3 EASY STEPS to receive your 6 Bonus Activities!

- Go to our website:
www.classroomcompletepress.com/bonus
- Click on item CC4513 – Galaxies & the Universe
- Enter pass code CC4513D



Black Holes

1. **ANTICIPATION GUIDE:** Fill in the "Before Reading" column of the chart below by circling if you think the statement is **true** or **false**. When you have finished reading the selection, you will fill in the "After Reading" column.

Before Reading	Statement	After Reading
True/False	1. Black holes are not real. They are just found in science fiction stories.	True/False
True/False	2. Black holes can be seen.	True/False
True/False	3. Black holes are empty.	True/False
True/False	4. Astronomers know exactly what is inside a black hole.	True/False
True/False	5. There is only one large black hole in our universe.	True/False

2. Antonyms are two words that have the opposite meaning. Match a word from the left with its antonym on the right.

a	gigantic	_____	empty
b	pull	_____	massive
c	strength	_____	slow
d	full	_____	miniscule
e	visible	_____	push
f	tiny	_____	weakness
g	fast	_____	invisible



Black Holes

There are many things that we can observe in the universe, and some we cannot. Have you ever wondered how we see all of the things we do in the universe? You can see things because light reflects off them and your eye can pick up that image. **Black holes** are invisible! This is because the force of **gravity** from them is so strong that not even light can escape. They just look like a "black hole" when you see them in the universe.



There are lots of holes on Earth. You can dig a hole in a sandbox or get a hole in your sock. Our holes have nothing in them. They are empty. Black holes are different. They have a great deal of **mass** packed into a very small space. This makes the **gravitational force** (pull) extremely strong. You may remember that the bigger the object, the stronger the pull of gravity on it. The reason black holes are called 'holes' is because of how they look to us - like an empty spot in space. They're not empty, we just can't see all of the stuff inside of them. It could be that they are like cracks in the universe. Things might slip into them all of the time.

STOP **MAKE AN INFERENCE: Why do you think black holes are used in science fiction stories so often?**

How do you see a hole in space? Think about the water in your bath draining out of the tub when you pull the plug. If you had any bath toys in the water, what would happen to them? Gravity pulls the water down the drain. The force of the water rushing to the drain pulls the toys along with it. Water is clear, but even if you couldn't see it, you would know the water is leaving the tub because the toys are floating toward the drain. This happens in space. Astronomers can see stars rushing toward an empty, dark space at the **speed of**



Black Holes

1. Complete the Anticipation Guide (page 32) you started before reading. Fill in the "After Reading" column, and see if you changed your mind about any of the statements. Write a brief response to your findings. Did anything surprise you? How can this chart show what you learned from the reading?
2. Put a check mark (✓) next to the answer that is most correct.
- a) Which of the following statements is **NOT** true of black holes?
- A The force of gravity from black holes is very strong.
- B Black holes are invisible.
- C There is very little mass inside black holes.
- D All of the above.
- b) Which word best describes a black hole?
- A empty
- B weak
- C visible
- D packed
- c) How do scientists know where black holes are?
- A They can see them using telescopes.
- B They are always found next to planets.
- C They look at the speed of objects moving around them.
- D They are always found at the center of each galaxy.
- d) Why are black holes invisible?
- A Gravity is too strong for light to escape from them.
- B Other planets and stars block the view of them.
- C We do not have strong enough telescopes to see that far away.
- D They are not real.
- e) Which of the following examples best fits how a black hole works?
- A Waves in the ocean carrying a surfer
- B A vacuum sucking out dirt from a carpet
- C Gravity pulling an apple from a tree
- D A light bulb burning out



Black Holes

3. Answer each question with a complete sentence.

a) Why isn't a black hole actually like a hole at all?

b) How do scientists locate black holes?

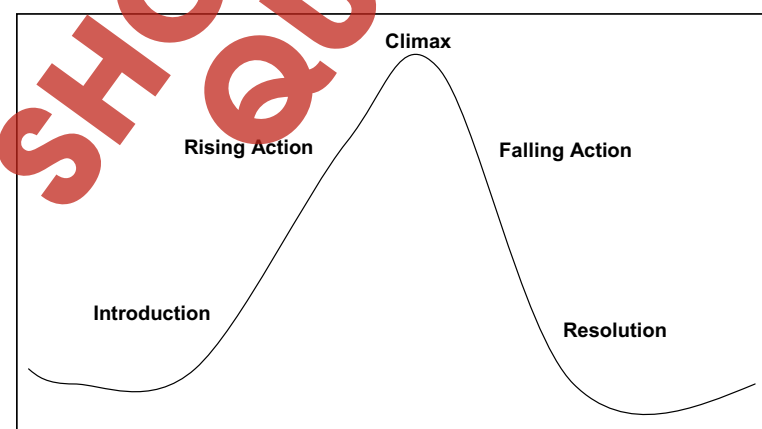
c) What do you think happens to things that get pulled into a black hole?

Research & Extension

Science fiction stories are part of the **fantasy** genre. Setting is the most important element used to tell a science fiction story. These stories are either set off of Earth, or in the future, or both. You are asked to write a short science fiction story that incorporates black holes.

Before you start to write it is important to think about the outline of your story. Writers usually plan or map out where their story is going before they start to write their first draft. Use the planning template provided on the next page to think through the story you want to tell.

This plot arch will remind you of the traditional elements in a narrative story:





Build It!

PINHOLE GALAXIES

You will use what you know to create a presentation on the different types of galaxies: barred, elliptical, spiral and irregular.

You will need:

- black construction paper
- a set of compasses with a sharp point
- a flashlight (an overhead projector may be used instead)
- dark projection area

Steps

- STEP ONE:** Review what you learned about galaxies. Sketch the four different shapes that galaxies can form.
- STEP TWO:** Use a pencil to lightly outline one of the shapes on a piece of black construction paper.
- STEP THREE:** Use the sharp point of a compass to poke holes all over the sketch that you made.
- STEP FOUR:** Test the size of the holes with the flashlight and make any adjustments needed.
- STEP FIVE:** Repeat steps 1-4 for all four galaxies shapes.
- STEP SIX:** Write a brief description of what a galaxy is to present to your class with your pinhole galaxy slides.



Word Search

Find all of the words in the Word Search. Words are written horizontally, vertically, diagonally, and some are even written backwards.

- | | | | |
|--------------------|---------------------|-----------|------------|
| universe | nebula | quasar | light year |
| interstellar space | gravitational force | Milky Way | atoms |
| Big Bang | astronomer | hydrogen | collide |
| galaxy | black hole | gravity | |
| mass | satellite | matter | |
| explosion | theory | compress | |



Comprehension Quiz

Part C

Answer the questions in complete sentences.

- Outline the most commonly-accepted theory of how the universe began. 4
- Give two roles that gravity plays in the universe. 2
- What is the difference between *rotate* and *orbit*? Give an example of an object that does each to show your understanding. 4
- Why can't we see black holes? 3
- Why is it important to study *quasars*? 3

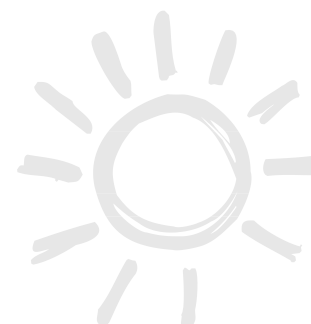
SUBTOTAL: /16

Pleiades Star Cluster and Nebula





Black Holes



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b) How do scientists locate black holes?

c) What do you think happens to things that get pulled into a black hole?

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3.

a) Because it is packed full of material; it's not empty

b) By observing the objects that pass by them

c) Answers will vary

Crossword Puzzle!



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EASY MARKING ANSWER KEY