TEACHER'S GUIDE

TECH bytes EXPLORING SPACE

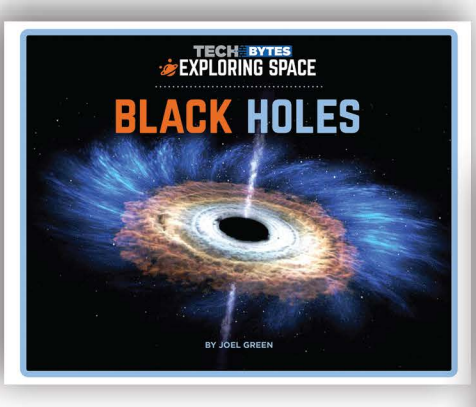
COLLECTION DESCRIPTION

The books in the Tech Bytes series explore some of the most fascinating innovations and inventions of our time. Readers will learn about how these great ideas began, how they were developed, and how they have become a part of our lives.

CURRICULUM CONNECTIONS

- Technology
- Science
- Innovation

GRADES: 4-6



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Teacher's Notes

In these teacher's notes, you will find resources to support students as they engage with each text. Each title in the Tech Bytes: Exploring Space series is rich with detailed information that helps students learn about how technology has allowed us to explore outer space. These teacher's notes will help you provide students with opportunities to organize their thinking as they read each text so that they are able to absorb and discuss what they've learned. Resources include:

1. **Graphic Organizer and Reading Response:** Helps students identify and absorb key information as they read and reflect on what they learned.
2. **Text Features Hunt:** Helps students locate text features used in each book and identify how it supports their understanding of the information presented.
3. **Comprehension Check/Quiz (for each title):** Helps students and teachers assess what has been learned. Questions can be used as discussion questions, a mini-quiz, or to further guide reading/re-reading of the text. (Answer key can be found on pages 23-24.)
4. **Vocabulary Practice/Quiz (for each title):** Supports students' understanding of the scientific terminology discussed in each title. Each quiz focuses on 10-15 key vocabulary words from its corresponding title. This resource can be used as a practice worksheet or mini-assessment. (Answer key can be found on pages 23-24.)

Titles in Tech Bytes Classroom Library Collection

1. Black Holes
2. Satellites
3. The International Space Station
4. Life on Mars
5. Space Junk
6. Visiting Space

Graphic Organizer & Reading Response

Name: _____

Date: _____

Title and author:

Before Reading: What do you already know about topic?

During Reading: What did you learn about this topic?

Chapter 1	
Chapter 2	
Chapter 3	
Chapter 4	

After Reading: What was the most interesting thing you learned?

What vocabulary words did you learn?

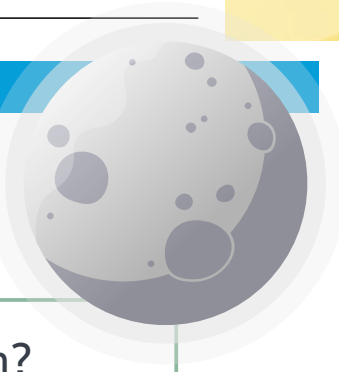
Word	Meaning

I wonder... What questions do you still have about this topic?

TEXT FEATURES HUNT

Name: _____

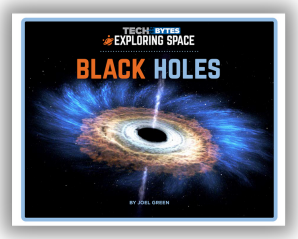
Date: _____



Locate text features used in each book and identify how they support the information presented.

Text Feature	Page #	What does it help you learn?
Title		
Table of Contents		
Heading		
Sub-Heading		
Bold Text		
Italics Text		
Photograph		
Caption		
Map		
Text Box/Sidebar		
Glossary		
Index		

Name: _____ Date: _____



Black Holes

Answer the following questions about **Black Holes** by Joel Green.

1. How did scientists capture the first picture of a black hole?
   a. With a rover
   b. On a manned space mission
   c. Through a massive telescope
   d. By drone

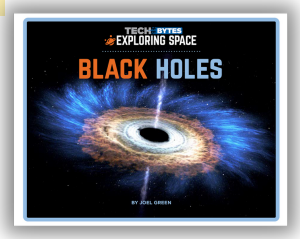
2. What causes gravity to get stronger?
   a. Objects being close together with more mass
   b. Objects being far away with less mass
   c. Objects being close together with less mass
   d. Objects being far away with more mass

3. The cores of stars are extremely dense, which means they are _____.
   a. bright
   b. light
   c. heavy
   d. strong

4. Why are black holes dark?
   a. Stars cannot enter them
   b. They don't have enough gravity to pull in light
   c. They have no sun
   d. The pull of gravity is so strong light cannot escape

5. What happens to something that is pulled inside a black hole?
   a. It enters another galaxy
   b. It is gone forever
   c. It changes color
   d. Its mass increases

Name: _____ Date: _____



Black Holes

Answer the following questions about **Black Holes** by Joel Green.

6 What do telescopes use to focus light so we can see distant objects?

a. Mirrors
b. Microscopes
c. Cameras
d. Lasers

7 Infrared, ultraviolet, and x-ray are all forms of:

a. Telescopes
b. Rovers
c. Light
d. Sound

8 When was the first picture of a black hole presented?

a. 1967
b. 1980
c. 2008
d. 2019

9 Scientists are planning for the first manned mission into a black hole.

True

False

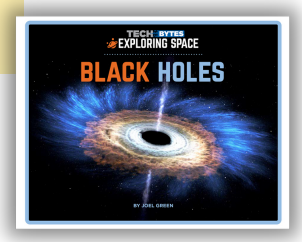
10 Short answer: What kinds of tools have scientists used to study space and black holes?

_____

_____

_____

Name: _____ Date: _____



Black Holes

Choose the correct vocabulary word for each definition.

appertures	asteroids	astrophysics	atmosphere	clarity
dense	gravity	mass	obscured	orbiting
phenomenon	physicist	radiation	rovers	theory

Word	Definition
	An action or event.
	The amount of matter in an object.
	The force that pulls things with mass towards each other.
	Openings that allow or limit light to enter instruments like telescopes.
	Vehicles that explore other planets
	Light that carries energy out of particles
	Having high mass in a small space
	The study of the universe and stars and planets
	Moving around something in a continuous loop
	Clear or transparent to the eye
	Concealed or hard to see
	A set of mathematical rules that are consistent with all facts and evidence
	A scientist who studies matter and energy
	Large and small rocky space objects that revolve around the Sun
	The mixture of gases and particles surrounding a planet

Name: _____ Date: _____

The International Space Station

Answer the following questions about **The International Space Station** by Joyce Markovics.

1. Who owns the International Space Station?
   a. U.S.A
   b. Japan
   c. Russia
   d. It is shared by many countries

2. How long is the average stay on the ISS?
   a. 5 days
   b. 2 weeks
   c. 3 months
   d. 6 months

3. What are the station's solar arrays used for?
   a. To even out the weight of the station
   b. To help it float without tipping over
   c. To harness the Sun's energy to make power
   d. To shade the station from the Sun

4. What functions do robots have on the ISS?
   a. Making repairs
   b. Making food
   c. Monitoring system controls
   d. Steering the station in the right direction

5. What are the 2020 astronauts testing in space?
   a. The effects of mental health in confined spaces over time
   b. The effects of microgravity on living things
   c. The safety of new space helmets
   d. Debris in the atmosphere

Name: _____ Date: _____

The International Space Station

Answer the following questions about **The International Space Station** by Joyce Markovics.

6 Why do astronauts need to exercise in space?
a. To study how the heart works in microgravity
b. Space food is high in fat and carbohydrates
c. Microgravity causes loss of bone and muscle mass
d. Exercise is good for their mental health

7 What is a spacewalk?
a. Astronauts leave the space station to complete repairs
b. Astronauts leave the space station to free float in space
c. Astronauts float through all wings of the space station for exercise
d. All the above

8 8. What will happen when the ISS is decommissioned?
a. It will go into a museum
b. It will be kept at the Kennedy Space Center for future use
c. It will be sunk into the Pacific Ocean
d. It will burn up in the atmosphere

9 Parachutes help the space capsule land safely on Earth.

True

False

10 Short answer: What kind of work do astronauts do on the International Space Station?

_____

_____

_____

Name: _____ Date: _____

The International Space Station

Choose the correct vocabulary word for each definition.

astronauts	automated	botany	component	decommissioning
dissipate	engineering	helipad	mimic	propulsion
radiation	resistance	thermal	truss	zero gravity

Word	Definition
	To scatter or disperse
	People who travel to space
	The slowing or stopping effect of one thing on another
	To copy
	A takeoff and landing area for helicopters
	A kind of powerful energy made from high-energy particles
	Triangular-shaped structural frame
	The science of plants
	Removing from active service
	The state when there is no apparent gravity
	Made to hold in heat
	Operated by equipment that works with little human control
	The science of building machines or structures
	The act of driving or pushing forward
	A part of a mechanical system

Name: _____ Date: _____

Life on Mars

Answer the following questions about **Life on Mars** by Joyce Markovics.

1. What questions are NASA scientists hoping the Mars rover, Perseverance, can answer?
   a. How far is Mars from Earth?
   b. Was there ever life on Mars and could humans ever live there?
   c. Do aliens exist?
   d. Can a drone survive in Mars' atmosphere?

2. What is the atmosphere on Mars like?
   a. Wet and cold
   b. Wet and hot
   c. Dry and hot
   d. Dry and cold

3. Mars red color comes from what mineral?
   a. iron
   b. sulfur
   c. calcium
   d. copper

4. What did the Martian meteorite lead scientists to believe?
   a. There might have been life on Mars
   b. Mars might have had water
   c. An asteroid may have caused its climate to change
   d. All the above

5. What is one of the main things the Curiosity rover is helping scientists measure?
   a. Temperature
   b. Soil
   c. Radiation
   d. Water-levels

Name: _____ Date: _____

Life on Mars

Answer the following questions about **Life on Mars** by Joyce Markovics.

6 What is the Perseverance rover taking samples of?
a. rocks
b. ice
c. raindrops
d. solar power

7 If humans travelled to Mars, what would be the greatest risk to their health?
a. Potential alien life
b. Radiation
c. Comets
d. Loss of gravity

8 When does SpaceX hope to put people on Mars?
a. 2050s
b. 2030s
c. 2080s
d. 3000s

9 Mars is larger than Earth.

True

False

10 Short answer: What kinds of tools have scientists used to study space and black holes?

_____

_____

_____

Name: _____ Date: _____

Life on Mars

Choose the correct vocabulary word for each definition.

asteroids	astronomer	climate change	colonizing	core samples
evaporates	geologist	lunar	molecules	probe
radar	radiation	satellite	sediment	terrain

Word	Definition
	A scientist who studies outer space
	Type of ground or land surface
	A scientist who studies Earth's rocks and soil
	The warming of Earth's air and oceans due to environmental changes
	A spacecraft that studies space and sends information back to earth
	Powerful energy made from high-energy particles
	A tool that can find the location of any object by sending out radio waves
	Relating to the moon
	Tiny parts made from atoms that make up everything
	Turns from a liquid to a gas
	Settling or establishing control over
	A spacecraft sent into outer space to gather and send back information
	Tube-shaped sections of naturally occurring substances such as rocks or ice
	Large and small rocky space objects that revolve around the Sun
	The mixture of gases and particles surrounding a planet

Name: _____ Date: _____

Satellites

Answer the following questions about **Satellites** by Joyce Markovics.

1. What does the GOES-18 satellite monitor?
   a. Heat given off by the Sun
   b. Temperature of deep space
   c. Weather hazards on Earth
   d. Radiation levels

2. What does the GOES-18 satellite help scientists predict?
   a. Long-term weather
   b. Short-term weather
   c. Space weather
   d. All the above

3. What is a radio wave?
   a. A form of light that can travel far without being blocked by solid objects
   b. An antenna that collects information
   c. A GPS tracker
   d. A panel with solar cells

4. Which nation launched the first artificial satellite called Sputnik 1?
   a. U.S.A
   b. Russia
   c. Japan
   d. Canada

5. Neil Armstrong was the first astronaut to _____.
   a. Travel to space
   b. Walk on the Moon
   c. Live in space for more than 2 days
   d. Orbit Earth

Name: _____ Date: _____

Satellites

Answer the following questions about **Satellites** by Joyce Markovics.

6 Why is it important to have satellites take pictures of the same locations over time?

a. To investigate how weather patterns develop and study climate change
b. As maintenance to make sure the satellites still work
c. To justify the cost of satellites
d. To share pictures with the public

7 What is the biggest and most powerful space telescope ever built?

a. Hubble Space Telescope
b. Aqua Telescope
c. TIROS 1 Telescope
d. James Webb Space Telescope

8 What do the Starlink satellites intend to provide?

a. High-resolution images of space
b. International communication channels
c. Information about the movement of stars
d. High-speed internet services

9 Satellites can block our view of the stars from Earth.

True

False

10 Short answer: Share 3 ways scientists use satellites in space?

_____

_____

_____

Name: _____ Date: _____

Satellites

Choose the correct vocabulary word for each definition.

activist	altitude	antennas	climate change	constellation
deforestation	equator	generate	gravitational	lunar
Mach 1	power grids	resolution	Soviet	thermometer

Word	Definition
	An instrument that shows the temperature of something
	The imaginary line around the middle of Earth
	The speed of sound
	The warming of Earth's air and oceans due to environmental changes
	A person who fights for a cause
	The process of clearing forests
	Rods, wires, or other devices used to transit or receive radio or TV signals
	Relating to the moon
	To produce
	Interconnected network that delivers electricity from power companies to people
	The height of something
	Instrument that shows the temperature of something
	Concerning a former country that was centered around Russia
	A group of stars or other objects in the night sky
	The degree of detail in an image

Name: _____ Date: _____

Space Junk

Answer the following questions about **Space Junk** by Joyce Markovics.

1. What is space junk or space debris?
   a. Litter from the ocean that gets pulled to the sky during the water cycle
   b. Pollutants from the Earth's atmosphere that enter space
   c. Pollutants, such as fuel, that enter the atmosphere during space missions
   d. Rockets and other objects humans have placed in space and no longer use

2. Where do scientists try to steer space junk to fall?
   a. Remote areas of the ocean
   b. Other nearby planets
   c. Into black holes
   d. Remote, open fields on land

3. Why do things burn up in Earth's atmosphere?
   a. Objects repeatedly move through burning stars as the fall to Earth
   b. Objects fall at a superfast speed causing the air around them to heat up
   c. Mission control workers can identify and zap falling objects with lasers
   d. Objects in space are cold and Earth's atmosphere is hot

4. What can the dust in our galaxy and around other stars teach us?
   a. How polluted the solar system is
   b. Where the dust came from
   c. How different planets and stars were formed
   d. How to clean up space

5. What sports item was left on the Moon from the Apollo 11?
   a. Golf ball
   b. Baseball bat
   c. Tennis racket
   d. All the above

Name: _____ Date: _____

Space Junk

Answer the following questions about **Space Junk** by Joyce Markovics.

6 What is the danger of space junk?
a. It can fall to a populated area of Earth and injure humans
b. It can hit spacecrafts and harm astronauts as they move through outer space
c. It can damage operating satellites and telescopes
d. All the above

7 Where is the "Spacecraft Cemetery" located?
a. In the ocean near New Zealand
b. In a museum at the Kennedy Space Center
c. In crater on Mars
d. In a remote area of Russia

8 What does the Kessler Effect predict could happen to space junk?
a. Collisions of space junk could light up the sky preventing us from seeing the night sky
b. Repeated collisions could cause dangerous explosions in the sky
c. One collision could cause a chain reaction and make Earth's orbit unsuable
d. Collisions of space junk could raise the temperature in outer space

9 There is an international law that requires countries to clean up their space junk.

True

False

10 Short answer: What are some ways scientists are trying to solve the problem of space junk?

_____

_____

_____

Name: _____ Date: _____

Space Junk

Choose the correct vocabulary word for each definition.

aerospace	deployed	colonel	decommissioning	antennas
exoplanets	Mach	gravity	habitable	fragmentation
meteor	telescope	probability	remnants	oceanographer

Word	Definition
	The remains of something
	A chunk of rock or metal that falls from space and burns up in Earth's atmosphere
	A measurement that relates to the speed of sound
	The science of jet flight and space travel
	The force that pulls things with mass toward Earth, the Sun, or any other bodies in space
	Sent to an area for a specific purpose
	Rods, wires, or other devices used to transit or receive radio or TV signals
	An army officer of high rank
	Livable or capable of being inhabited
	The likelihood of something happening
	A tool for making things that are far away appear bigger and brighter
	A scientist who studies the ocean
	Removing from active service
	Planets that orbit stars outside the solar system
	The process of breaking or being broken into small parts

Name: _____ Date: _____

Visiting Space

Answer the following questions about **Visiting Space** by Joyce Markovics.

1. When did the James Webb Space Telescope launch into space?
   a. 2012
   b. 2000
   c. 2022
   d. 2002

2. The Big Bang Theory says that the universe was once _____.
   a. the size of a tiny dot made by a pencil tip
   b. 400 times larger than it is now
   c. shaped like a watermelon
   d. inhabited on all planets

3. How did World War II help space travel?
   a. It did not help space travel, it delayed it.
   b. People started building rockets for war
   c. Countries were trading materials for weapons
   d. People were upset by the war and wanted to leave Earth

4. Why was Sputnik 1 a monumental achievement?
   a. It was the first potato in space
   b. It took the first pictures of Mars
   c. It was the first satellite to land on the Moon
   d. It was the first human-made object placed in orbit around Earth

5. What two countries were involved in the space race?
   a. United States and Japan
   b. United States and Soviet Union
   c. Japan and Soviet Union
   d. None of the above

Name: _____ Date: _____

Visiting Space

Answer the following questions about **Visiting Space** by Joyce Markovics.

6 What is the first country to send a human to space?
a. Soviet Union
b. United Kingdom
c. United States
d. Japan

7 What did Project Gemini help the U.S. accomplish?
a. Put an astronaut into orbit
b. Practice going on a spacewalk
c. Study astronauts' mental health in space
d. All the above

8 What did Neil Armstrong and Buzz Aldrin do?
a. Flew the first spacecraft in Earth's orbit
b. Flew the first spacecraft around the Moon
c. The first humans to land on the Moon
d. Orbited the sun

9 Companies are planning to build space hotels where people can stay after they reach space.

True

False

10 Short answer: Share some ideas scientists have for future space exploration.

_____

_____

_____

Name: _____ Date: _____

Visiting Space

Choose the correct vocabulary word for each definition.

accelerate	antennas	black holes	axis	astronomer
climate change	comets	interplanetaryc hostility		descent
pressurized	propelled	velocity	transmitter	

Word	Definition
	Rods, wires, or other devices used to transit or receive radio or TV signals
	Unfriendliness
	The rate of speed at which something happens
	The warming of the Earth's air and oceans due to environmental changes
	Objects in space consisting of ice and dust
	Occurring between the planets or between a planet and the Sun
	Equipment that is used for sending signals or messages
	Made to keep air in a sealed environment
	A straight central part in a structure to which other parts are connected
	Regions of space having a gravitational fieldc so intense that no matter or light can escape
	Moved or pushed forward
	The act of moving downward
	A scientist who studies outer space
	To speed up

Answer Key

Black Holes **Comprehension Questions:** 1. c, 2. a, 3. c, 4. d, 5. b, 6. c, 7. c, 8. d, 9. False, 10. Possible responses may include: "*Scientists have used telescopes, rockets, and rovers.*"

Black Holes **Vocabulary Quiz:** 1. Phenomenon, 2. Mass, 3. Gravity, 4. Apertures, 5. Rovers, 6. Radiation, 7. Dense, 8. Astrophysics, 9. Orbiting, 10. Clarity, 11. Obscured, 12. Theory, 13. Physicist, 14. Asteroids, 15. Atmosphere

International Space Station **Comprehension Questions:** 1. d, 2. d, 3. c, 4. a, 5. b, 6. c, 7. d, 8. c, 9. True, 10. Possible responses may include: "*Study the effects of microgravity on living things, grow plants, find systems to remove heat from spacesuits, analyze living tissue, make repairs and maintain upkeep of the space station.*"

International Space Station **Vocabulary Quiz:** 1. Dissipate, 2. Astronauts, 3. Resistance, 4. Mimic, 5. Helipad, 6. Radiation, 7. Truss, 8. Botany, 9. Decommissioning, 10. Zero Gravity, 11. Thermal, 12. Automated, 13. Engineering, 14. Propulsion, 15. Component

Life on Mars **Comprehension Questions:** 1. b, 2. d, 3. c, 4. d, 5. c, 6. a, 7. b, 8. b, 9. False, 10. Possible responses may include: "*It would take 5-10 months to travel there. Scientists would need to build a vehicle that could safely transport people and have enough fuel. There is extreme heat when speeding through Mars's atmosphere. There is less gravity on Mars. Mars is extremely cold. Being far away and in a small, spacecraft can cause stress and anxiety. Humans would be exposed to radiation from the Sun. Scientists need to create oxygen so humans can breathe on Mars.*"

Life on Mars **Vocabulary Quiz:** 1. Astronomer, 2. Terrain, 3. Geologist, 4. Climate change, 5. Probe, 6. Radiation, 7. Radar, 8. Lunar, 9. Molecules, 10. Evaporates, 11. Colonizing, 12. Satellite, 13. Core samples, 14. Asteroids, 15. Atmosphere

Satellites **Comprehension Questions:** 1. c, 2. d, 3. a, 4. b, 5. b, 6. a, 7. d, 8. d, 9. True, 10. Possible responses may include: "*To observe earth, predict weather, communication, transmit tv and cell-phone signal, GPS, discover how planets, stars, and galaxies form, take pictures of planets, stars, and black holes.*"

Satellites **Vocabulary Quiz** 1. Thermometer, 2. Equator, 3. Mach 1, 4. Climate change, 5. Activist, 6. Deforestation, 7. Antennas, 8. Lunar, 9. Generate, 10. Power Grids, 11. Altitude, 12. Thermometer, 13. Soviet, 14. Constellation, 15. Resolution

Answer Key

Space Junk Comprehension Questions: 1. d, 2. a, 3. b, 4. c, 5. a, 6. d, 7. a, 8. c, 9. False, 10. Possible responses may include: *"Not creating anymore debris until the problem has a solution. Technology like a harpoon and net to guide junk back to Earth's atmosphere, converting trash into gases that astronauts can use, spacecrafts with magnets that capture and remove multiple satellites from orbit at a time."*

***Space Junk* Vocabulary Quiz:** 1. Remnants, 2. Meteor, 3. Mach, 4. Aerospace, 5. Gravity, 6. Deployed, 7. Antennas, 8. Colonel, 9. Habitable, 10. Probability, 11. Oceanographer, 12. Telescope, 13. Decommissioning, 14. Exoplanets, 15. Fragmentation

***Visiting Space* Comprehension Questions:** 1. c, 2. a, 3. b, 4. d, 5. b, 6. d, 7. d, 8. c, 9. True, 10. Possible responses may include: "*Send astronauts back to the moon and build a base camp. Send rovers to the moon to explore craters. Building the largest rocket ever that will create places for astronauts to live and work on their trip to the moon. Investigating other stars. Use space technology to monitor the Earth to track climate change.*"

***Visiting Space* Vocabulary Quiz:** 1. Antennas, 2. Hostility, 3. Velocity, 4. Climate Change, 5. Comets, 6. Interplanetary, 7. Transmitter, 8. Pressurized, 9. Axis, 10. Black Holes, 11. Propelled, 12. Descent, 13. Astronomer, 14. Accelerate

ABOUT THE SERIES

Technology has allowed people to explore space – from building and launching spacecraft to walking on the moon and finding black holes! Tech Bytes: Exploring Space takes readers on an exciting out-of-this-world voyage and uncovers cutting-edge technology. This series supports STEM and NGSS standards. Each book contains fact boxes, sidebars, a glossary, an index, and places to go for more information.

INTEREST LEVEL: Grade 4-6 **PAGES:** 48 **SIZE:** 9" X 7"
F & P: W, X | **AR**: 6.5-6.9
Available in Hardcover, Paperback, and Ebook.

SUGGESTED TITLES

Interested in learning more about technology?
Check out our *Tech Bytes: High-Tech* series to discover more examples of innovation in the world.