The Universe: The Vast Frontier

INTRODUCTION TO THE AIMS TEACHING MODULE (ATM) → SECTION 1

INTRODUCING THE UNIVERSE: THE VAST FRONTIER → SECTION 2

PREPARATION FOR VIEWING → SECTION 3

AFTER VIEWING THE PROGRAM → SECTION 4

AIMS Multimedia is a leading producer and distributor of educational programs serving schools and libraries for nearly 40 years. AIMS draws upon the most up-to-date knowledge, existing and emerging technologies, and all of the instructional and pedagogical resources available to develop and distribute educational programs in film, videocassette, laserdisc, CD-ROM and CD-i formats.

Persons or schools interested in obtaining additional copies of this AIMS Teaching Module, please contact:

AIMS Multimedia

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Congratulations!

You have chosen a learning program that will actively motivate your students AND provide you with easily accessible and easily manageable instructional guidelines designed to make your teaching role efficient and rewarding.

The AIMS Teaching Module provides you with a video program keyed to your classroom curriculum, instructions and guidelines for use, plus a comprehensive teaching program containing a wide range of activities and ideas for interaction between all content areas. Our authors, educators, and consultants have written and reviewed the AIMS Teaching Modules to align with the Educate America Act: Goals 2000.

This ATM, with its clear definition of manageability, both in the classroom and beyond, allows you to tailor specific activities to meet all of your classroom needs.

RATIONALE

In today's classrooms, educational pedagogy is often founded on Benjamin S. Bloom's "Six Levels of Cognitive Complexity." The practical application of Bloom's Taxonomy is to evaluate students' thinking skills on these levels, from the simple to the complex: Knowledge (rote memory skills), Comprehension (the ability to relate or retell), Application (the ability to apply knowledge outside its origin), Analysis (relating and differentiating parts of a whole), Synthesis (relating parts to a whole), and Evaluation (making a judgment or formulating an opinion).

The AIMS Teaching Module is designed to facilitate these intellectual capabilities, AND to integrate classroom experiences and assimilation of learning with the students' life experiences, realities, and expectations. AIMS' learner verification studies prove that our AIMS Teaching Modules help students to absorb, retain, and to demonstrate ability to use new knowledge in their world. Our educational materials are written and designed for today's classroom, which incorporates a wide range of intellectual, cultural, physical, and emotional diversities.

ORGANIZATION AND MANAGEMENT

To facilitate ease in classroom manageability, the AIMS Teaching Module is organized in four sections. You are reading Section 1, Introduction to the Aims Teaching Module (ATM).

SECTION 2,
INTRODUCING THIS ATM
will give you the specific information you need to integrate the program into your classroom curriculum.

SECTION 3,
PREPARATION FOR VIEWING
provides suggestions and strategies for motivation, language preparedness, readiness, and focus prior to viewing the program with your students.

SECTION 4,
AFTER VIEWING THE PROGRAM
provides suggestions for additional activities plus an assortment of consumable assessment and extended activities, designed to broaden comprehension of the topic and to make connections to other curriculum content areas.

FEATURES

INTRODUCING EACH ATM

SECTION 2

Your AIMS Teaching Module is designed to accompany a video program written and produced by some of the world's most credible and creative writers and producers of educational programming. To facilitate diversity and flexibility in your classroom, your AIMS Teaching Module features these components:

Themes

The Major Theme tells how this AIMS Teaching Module is keyed into the curriculum. Related Themes offer suggestions for interaction with other curriculum content areas, enabling teachers to use the teaching module to incorporate the topic into a variety of learning areas.

Overview

The Overview provides a synopsis of content covered in the video program. Its purpose is to give you a summary of the subject matter and to enhance your introductory preparation.

Objectives

The ATM learning objectives provide guidelines for teachers to assess what learners can be expected to gain from each program. After completion of the AIMS Teaching Module, your students will be able to demonstrate dynamic and applied comprehension of the topic.

PREPARATION FOR VIEWING

SECTION 3

In preparation for viewing the video program, the AIMS Teaching Module offers activity and/or discussion ideas that you may use in any order or combination.

Introduction To The Program

Introduction to the Program is designed to enable students to recall or relate prior knowledge about the topic and to prepare them for what they are about to learn.

Introduction To Vocabulary

Introduction to Vocabulary is a review of language used in the program: words, phrases, usage. This vocabulary introduction is designed to ensure that all learners, including limited English proficiency learners, will have full understanding of the language usage in the content of the program.

Discussion Ideas

Discussion Ideas are designed to help you assess students' prior knowledge about the topic and to give students a preview of what they will learn. Active discussion stimulates interest in a subject and can motivate even the most reluctant learner. Listening, as well as speaking, is active participation. Encourage your students to participate at the rate they feel comfortable. Model sharing personal experiences when applicable, and model listening to students' ideas and opinions.

Focus

Help learners set a purpose for watching the program with Focus, designed to give students a focal point for comprehension continuity.

Jump Right In

Jump Right In provides abbreviated instructions for quick management of the program.

AFTER VIEWING THE PROGRAM

SECTION 4

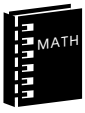
After your students have viewed the program, you may introduce any or all of these activities to interact with other curriculum content areas, provide reinforcement, assess comprehension skills, or provide hands-on and in-depth extended study of the topic.

SUGGESTED ACTIVITIES

The Suggested Activities offer ideas for activities you can direct in the classroom or have your students complete independently, in pairs, or in small work groups after they have viewed the program. To accommodate your range of classroom needs, the activities are organized into skills categories. Their labels will tell you how to identify each activity and help you correlate it into your classroom curriculum. To help you schedule your classroom lesson time, the AIMS hourglass gives you an estimate of the time each activity should require. Some of the activities fall into these categories:

Meeting Individual Needs

These activities are designed to aid in classroom continuity. Reluctant learners and learners acquiring English will benefit from these activities geared to enhance comprehension of language in order to fully grasp content meaning.



Curriculum Connections

Many of the suggested activities are intended to integrate the content of the ATM program into other content areas of the classroom curriculum. These cross-connections turn the classroom teaching experience into a whole learning experience.

Critical Thinking

Critical Thinking activities are designed to stimulate learners' own opinions and ideas. These activities require students to use the thinking process to discern fact from opinion, consider their own problems and formulate possible solutions, draw conclusions, discuss cause and effect, or combine what they already know with what they have learned to make inferences.

Cultural Diversity

Each AIMS Teaching Module has an activity called Cultural Awareness, Cultural Diversity, or Cultural Exchange that encourages students to share their backgrounds, cultures, heritage, or knowledge of other countries, customs, and language.

Hands On

These are experimental or tactile activities that relate directly to the material taught in the program.Your students will have opportunities to make discoveries and formulate ideas on their own, based on what they learn in this unit.

Writing

Every AIMS Teaching Module will contain an activity designed for students to use the writing process to express their ideas about what they have learned. The writing activity may also help them to make the connection between what they are learning in this unit and how it applies to other content areas.

In The Newsroom

Each AIMS Teaching Module contains a newsroom activity designed to help students make the relationship between what they learn in the classroom and how it applies in their world. The purpose of In The Newsroom is to actively involve each class member in a whole learning experience. Each student will have an opportunity to perform all of the tasks involved in production: writing, researching, producing, directing, and interviewing as they create their own classroom news program.

Extended Activities

These activities provide opportunities for students to work separately or together to conduct further research, explore answers to their own questions, or apply what they have learned to other media or content areas.

Link to the World

These activities offer ideas for connecting learners' classroom activities to their community and the rest of the world.

Culminating Activity

To wrap up the unit, AIMS Teaching Modules offer suggestions for ways to reinforce what students have learned and how they can use their new knowledge to enhance their world view.

VOCABULARY

Every ATM contains an activity that reinforces the meaning and usage of the vocabulary words introduced in the program content. Students will either read or find the definition of each vocabulary word, then use the word in a written sentence.

CHECKING COMPREHENSION

Checking Comprehension is designed to help you evaluate how well your students understand, retain, and recall the information presented in the AIMS Teaching Module. Depending on your students' needs, you may direct this activity to the whole group yourself, or you may want to have students work on the activity page independently, in pairs, or in small groups. Students can verify their written answers through discussion or by viewing the video a second time. If you choose, you can reproduce the answers from your Answer Key or write the answer choices in a Word Bank for students to use. Students can use this completed activity as a study guide to prepare for the test.

CONSUMABLE ACTIVITIES

The AIMS Teaching Module provides a selection of consumable activities, designed to specifically reinforce the content of this learning unit. Whenever applicable, they are arranged in order from low to high difficulty level, to allow a seamless facilitation of the learning process. You may choose to have students take these activities home or to work on them in the classroom independently, in pairs or in small groups.

CHECKING VOCABULARY

The Checking Vocabulary activity provides the opportunity for students to assess their knowledge of new vocabulary with this word game or puzzle. The format of this vocabulary activity allows students to use the related words and phrases in a different context.

TEST

The AIMS Teaching Module Test permits you to assess students' understanding of what they have learned. The test is formatted in one of several standard test formats to give your students a range of experiences in test-taking techniques. Be sure to read, or remind students to read, the directions carefully and to read each answer choice before making a selection. Use the Answer Key to check their answers.

ADDITIONAL AIMS MULTIMEDIA PROGRAMS

After you have completed this AIMS Teaching Module you may be interested in more of the programs that AIMS offers. This list includes several related AIMS programs.

ADDITIONAL READING SUGGESTIONS

AIMS offers a carefully researched list of other resources that you and your students may find rewarding.

ANSWER KEY

Reproduces tests and work pages with answers marked.

The Universe: The Vast Frontier

THEMES

The Universe: The Vast Frontier explores the universe from its inception to the current state of scientific exploration. The program begins with a description of the Big Bang theory, and continues with theories describing the formation of galaxies, stars, and nebulae. Students are encouraged to discover the scientific, chemical, and physical components of the matter which comprises the universe.

OVERVIEW

There are no definitive answers about the beginning of the universe, only questions. Many scientists believe that the universe is between 10 and 20 billion years old and that it began as a huge mass of matter crammed into one dense sphere. When this sphere exploded, the universe began to form. While the formation of the universe is still under speculation, scientists have learned many facts about the far reaches of space. The Universe: The Vast Frontier gives students an opportunity to examine these facts, including information about galaxies, stars, planets, and other celestial bodies.

OBJECTIVES

- To examine the origins of the universe, including the Big Bang theory.
- To understand the physical and chemical makeup of stars.
- To compare and contrast the types and ages of stars throughout the universe.
- To study the other elements of the universe, including pulsars, quasars, and nebulae.
- To ponder the existence of undiscovered or unproven phenomena, like black holes.

Use this page for your individual notes about planning and/or effective ways to manage this AIMS Teaching Module in your classroom.

Our AIMS Multimedia Educational Department welcomes your observations and comments. Please feel free to address your correspondence to:

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INTRODUCTION TO THE PROGRAM

The Universe: The Vast Frontier gives students a foundation in the scientific principles of the universe and its composition. The program goes into detail about the types of stars and galaxies in the universe, as well as the mysterious "matter" in-between. At no time since the beginning of space exploration has there been more meaningful activity in the study of the universe, and this program serves as an excellent springboard to get students interested in the study of space.

INTRODUCTION TO VOCABULARY

Write the words "galaxy," "Big Bang" and "Doppler Effect" on the board. Ask students what each word means. How is each word important to understanding the universe? (A galaxy is a grouping of billions of stars. Our galaxy is The Milky Way. The Big Bang is a theory about the origin of the universe. It contends that all of the universe was at one time a dense, hot sphere that exploded. The Doppler Effect is the apparent change in waves as they move closer or further away from the observer. It helps scientists see if an object is moving closer or further away from earth.)

DISCUSSION IDEAS

Bring in a few articles from recent publications to show students the ongoing research being conducted in our own galaxy and beyond. How might this research affect the citizens of Earth? Other than astronomy, what sciences are commonly used to study the universe? (The more we understand about other planets and how they formed, the better we will understand how the Earth is changing. In the future, humans may be forced to work and live in outer space. The more we know about the environment of the universe, the better prepared we will be for this possibility. Physics, chemistry and geology are often used by scientists studying the Earth.)

FOCUS

Studying the stars and the universe can be very exciting. While much of this program deals with the scientific and chemical composition of the universe, it also hints at larger issues. Encourage the class to see the study of space as the study of themselves. Remind them that many astronomers linked the study of the universe with more philosophical questions, such as "Why am I here?"

JUMP RIGHT IN

HOW TO USE THE UNIVERSE: THE VAST FRONTIER AIMS TEACHING MODULE

Preparation

- Read *The Universe: The Vast Frontier* **Themes, Overview,** and **Objectives** to become familiar with program content and expectations.
- Use **Preparation for Viewing** suggestions to introduce the topic to students.

Viewing THE UNIVERSE: THE VAST FRONTIER

- Set up viewing monitor so that all students have a clear view.
- Depending on your classroom size and learning range, you may choose to have students view *The Universe: The Vast Frontier* together or in small groups.
- Some students may benefit from viewing the video more than one time.

After Viewing THE UNIVERSE: THE VAST FRONTIER

- Select **Suggested Activities** that integrate into your classroom curriculum. If applicable, gather materials or resources.
- Choose the best way for students to work on each activity. Some activities work best for the whole group. Other activities are designed for students to work independently, in pairs, or in small groups. Whenever possible, encourage students to share their work with the rest of the group.
- Duplicate the appropriate number of **Vocabulary, Checking Comprehension**, and consumable activity pages for your students.
- You may choose to have students take consumable activities home, or complete them in the classroom, independently, or in groups.
- Administer the Test to assess students' comprehension of what they have learned, and to provide them with practice in test-taking procedures.
- Use the **Culminating Activity** as a forum for students to display, summarize, extend, or share what they have learned with each other, the rest of the school, or a local community organization.

SUGGESTED ACTIVITIES

Writing

60 Minutes

It is widely believed that humans will set foot on Mars within the next 50 years. Ask students to imagine that they are the first people to do so. Have them write a journal entry about their first day on the Red Planet.

Encourage them to describe their emotions and feelings, as well as general observations. Ask them to include a paragraph or two explaining their reasons for being there. Why did the Earth send them to Mars? Encourage students to be as scientific and accurate as they can.

Connection to Social Science

20 Minutes

Who owns space? It may seem like a silly question. However, in years to come, as satellite usage becomes more important to our daily lives, it may not be such a silly question after all. Ask the class to find out about current space laws. Do they exist? Can anyone send a rocket or a satellite into space? Who decides what vessels can go into space? If possible, encourage students to use the internet to find the most up-to-date information available.

Extended Activity

Extended Time

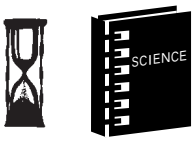
Despite the fact that humans have been looking up at the stars and doing some form of astronomy since the beginning of time, our journeys into space are relatively recent. Ask students to select a major event in recent space exploration history (1950 or later) and write a short paper on its historical significance. Examples can include the first orbit of the Earth, the formation of NASA, the first moon landing, the Space Shuttle program, the recent Mars expeditions, and so on. Remind students to focus on how the event affected, or will affect, future generations.

Critical Thinking

20 Minutes

Modern life increasingly relies on machines and computers to complete tasks, including dangerous tasks like space exploration. Encourage the class to discuss the future of technology in space. Do they think that "manned" space exploration is a thing of the past? Will robots replace people in space? What are the benefits and detriments of sending people into space? Is the risk worth the benefits?

Connection to Science



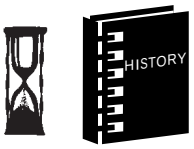
20 Minutes

From the time of Galileo, people have used telescopes to observe the cosmos. There are two major types of telescope: reflecting and refracting. Ask students to find out the differences between the two. Which is more accurate? Why?

(A refracting telescope consists of a long tube with a small eyepiece made from two lenses. At the other end, a convex lens gathers light and sends an image to the eyepiece. The convex lens is known as the objective lens. By adjusting the length between the two ends, the image can be focused.

A reflecting telescope uses a mirror as its objective lens. Reflecting telescopes can be built much larger than refracting telescopes. In addition, reflecting telescopes have greater light-gathering power. For these reasons, a reflecting telescope is more powerful than a reflexive telescope.)

Connection to History



30 Minutes

The sun is one of the most powerful and amazing objects found in nature. For centuries, humans have worshiped the sun and used it in many myths about the formation of the world. What are some early beliefs about the sun? How did these beliefs affect the lives of early people?

(Many ancient civilizations worshiped the sun, including the Egyptians, the Sumerians, the Greeks, the Maya Indians and the Inca Indians. Some early peoples believed that a solar eclipse was the sun god's way of expressing his anger. Many ancient peoples also tried to explain the movement of the sun. The Eskimos believed that the sun traveled on a boat at night, and the Greeks believed that the sun was pulled by a great chariot in the sky.)

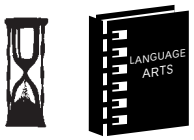
Extended Activity


60 Minutes

Help students locate a book that describes the major constellations. Have them diagram one of the constellations on a piece of paper. Encourage them to find the constellation in the night sky. How does the pattern of stars reflect the constellation's name? Where does the name of the constellation come from?

(Many constellation names come from heroes of Greek mythology.)

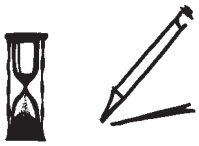
Connection to Language Arts



Extended Time

For years, science fiction has been a very popular genre in motion pictures, television and books. Ask students to locate a book, short story or poem dealing with the universe. Have them present a short report on the work to their classmates. What facts mentioned in the work are realistic or scientifically accurate? What facts are pure fantasy? If the work is several years old, ask students to look for inaccurate facts or theories that have been disproved since the work's publication. Does the work contain any predictions about the future which have proven to be true?

Writing


60 Minutes

Many great scientists have devoted their energies to studying the universe. Their contributions, both great and small, have helped to shape our understanding of the cosmos. Ask students to choose one of the people listed below. Have them write a short paper summarizing the person's contribution to the study of the universe. What specific contributions did the person make? What is the person most remembered for? What other fields or sciences was the person involved in?

Nicolaus Copernicus
Rene Descartes
Pierre Simon de Laplace
Comte de Buffon
Albert Einstein
Harold Urey
Neil A. Armstrong
Alan Shepard
John F. Kennedy

Culminating Activity


60 Minutes

The Big Bang is a prevailing theory about the beginning of the universe, but it is a relatively recent idea. Divide the class into several small groups and have each group research another theory concerning the formation of the universe. Then have each group present their theory to the class. Finally, engage the class in a group discussion about the pros and cons of each theory. Remind them that these are all theories. As of yet, there is no concrete answer.

Name

VOCABULARY

The following terms are from *The Universe: The Vast Frontier* . Fill in the number of each term next to its closest definition.

1. Big Bang
2. chromosphere
3. flares
4. pulsars
5. quasars
6. supernova
7. Doppler effect
8. microwave radiation
9. white dwarf
10. corona

___ objects in space that regularly send out bursts of electromagnetic radiation

___ middle region of the sun's atmosphere

___ outermost layer of the sun's atmosphere

___ extremely bright object that may be a billion times more luminous than the sun

___ theory that the universe began with the explosion of a ball of matter

___ apparent change in waves as they move closer or further away from the observer

___ electromagnetic waves coming from the universe around Earth

___ heavy bursts of energy on the surface of the sun

___ star-like objects that emit immense quantities of light and radio waves

___ a small, white, very dense star that has a low luminosity

Name

CHECKING COMPREHENSION

Read the following sentences and circle the letter of the word that best fills each blank.

Many scientists believe that the universe began between ___1__ years ago. They also believe that ___2__ was the first force formed after the Big Bang. Just one second after the Big Bang, the universe had a temperature of ___3__. The most convincing case that the Big Bang occurred is the___4__ radiation coming to Earth. In our galaxy, there is/are ___5__. Sunspots appear to be related to the activity of ___6__ on the sun. Some stars in the universe have as much as ___7__ the mass of our sun. Stars are formed when ___8__ causes gas, atoms and dust in interstellar matter to be drawn together. A ___9__ is what remains after the explosion of a massive red giant. The only black hole believed to have been identified is __10__.

1. A. 4 and 5 billion
   B. 10 and 20 billion
   C. 10 and 20 trillion
   D. 10 and 100 million

2. A. gravity
   B. magnetism
   C. entropy
   D. heat

3. A. 1 million degrees Celsius
   B. 1 million degrees Kelvin
   C. 1 trillion degrees Kelvin
   D. 100 trillion degrees Kelvin

4. A. ultraviolet
   B. nuclear
   C. Beta
   D. microwave

5. A. only one star, the sun
   B. billions of stars
   C. dozens of stars
   D. less than a dozen known stars

6. A. magnetic fields
   B. radioactive fields
   C. electron fields
   D. surface fields

7. A. 5 times
   B. 10 times
   C. 20 times
   D. 30 times

8. A. heat
   B. gravity
   C. magnetism
   D. radiation

9. A. supernova
   B. flare
   C. neutron star
   D. quasar

10. A. Signus XI
    B. Crab Nebula
    C. Hubble
    D. Tartus IX

Name

HEAVENLY BODIES

Fill in the number of each heavenly body next to the correct group of words below.

1. Supernova
2. Neutron Star
3. Quasars
4. Pulsar
5. Nebulae
6. Red Giant
7. White Dwarf
8. Planet

_____ a dying star whose surface expands and appears brighter

_____ star-like objects that emit immense quantities of light and radio waves

_____ a concentration of interstellar matter

_____ body that revolves around a star, such as the sun

_____ the result of a red giant collapsing and giving off some light for another billion years

_____ an exploding star that flares into an extremely bright object

_____ objects in space that regularly send out bursts of electromagnetic radiation

_____ the mass that remains after the explosion of a supernova

Name

TRUE OR FALSE

Place a T next to statements that are true and an F next to statements that are false.

1. ___ A second after the Big Bang, the universe was about the size of our solar system.
2. ___ The universe stopped expanding 15 billion years after the Big Bang.
3. ___ The Milky Way is an example of an elliptical galaxy.
4. ___ Quasars are much larger than stars.
5. ___ Interstellar matter is called neutron dust.
6. ___ Some sun spots are larger in diameter than the earth.
7. ___ The aurora lights seen in the Northern sky are caused by highly charged atomic particles released by sun flares.
8. ___ A black hole has no density at all.
9. ___ A prominence is a great flame-like cloud that appears to rise from a sunspot.
10. ___ Chinese astronomers documented a supernova in 1054 AD.

Name

SCRAMBLED WORDS

Unscramble the bolded words in the sentences below to learn important facts about the sun.

1. _____ A solar flare occurs when magnetic energy that has built up in the **raols mpeethao** is suddenly released.
2. _____ In about 5 billion years, our sun will gradually expand into a **dre nitga**.
3. _____ The sun's fusion of **ghdrnyoe** into **uhlmei** releases more energy every second than humans have used since the beginning of civilization.
4. _____ The sun's **racono,** or outer atmosphere, can be seen during an eclipse.
5. _____ **Tuspuos** activity fluctuates over an 11-year cycle.
6. _____ The **thonnerr gisthl** are a direct result of activity on the sun.
7. _____ Many people believe that **hotseenegn** in England is an ancient sun calendar.
8. _____ In 1543, **punrocisec** put forth the revolutionary idea that the sun, not the Earth, was the center of the solar system.
9. _____ Plasma continuously ejected into space from a star's surface is known as a **lastelr diwn**.
10. _____ The sun has a **nmea siyetnd** of about 1/4 that of the Earth.

_____

Name

FILL IN THE BLANKS

Use the following words to fill in the blanks below.

Big Bang
Black Hole
corona
diameter
electromagnetic
electrons
irregular
gravity
microwave
quasars

1. A pulsar is an object in space that regularly sends out bursts of _____ radiation.

2. The total estimated _____ of the Milky Way is 120,000 light years.

3. The Magellenic Cloud is the most famous type of _____ . galaxy

4. The sun's outermost layer is known as the _____ .

5. Some known _____ are 100 trillion times brighter than the sun.

6. _____ causes gas, atoms, and dust in interstellar nebulae to form into stars.

7. A neutron star consists entirely of_____ .

8. The _____ took place about 20 billion years ago.

9. The gravity in a _____ is thought to be so great that any light near it would be trapped.

10. The fact that the Earth is being bombarded from space by _____ radiation is thought to be evidence of the Big Bang.

Name

WORD SEARCH

The following words can be found in the maze below. The letters may be arranged horizontally, vertically, diagonally or backward.

Black Hole
Nebula
Red Giant
Sunspot
Flares
Galaxy
Universe
Astronomy
Electron
Pulsar

G F L A R E S R E D F L

A N E S U S P O T G A S

L F X Y M O N O R T S A

X L U A S T R X E R G R

U A G B U G D R E N A E

N B L A C K H O L E L D

I L C E L T R N C B A G

V A R X T A D I T U C I

E H A B L C X R L E A

R T B A L H F Y O A X N

S U N S P O T A N D Y T

E R E G I P U L S A R R

Name

TEST

Circle the phrase which best answers each question.

1. Spiral, irregular, and elliptical are three types of:

   • galaxies.
   • nebulae.
   • quasars.
   • white dwarfs.

2. Concentrations of interstellar matter are called:

   • supernovas.
   • sunspots.
   • galaxies.
   • nebulae.

3. All stars are thought to form from:

   • light disappearing into black holes.
   • gamma rays, x-rays, and visible light.
   • clouds of interstellar matter and gas in nebulae.
   • fusion.

4. The Big Bang is a theory about the:

   • origin of the universe.
   • formation of forces.
   • creation of atomic particles.
   • all of the above.

5. Exploding stars that flare up very brightly are called:

   • nebulae.
   • Neutron stars.
   • black holes.
   • supernovas.

Name

TEST (CONTINUED)

6. The Milky Way is an example of:

   • an elliptical galaxy.
   • a spiral galaxy.
   • an irregular galaxy.
   • a nebulae galaxy.

7. The sun is composed entirely of:

   • photosphere.
   • magnetic fields.
   • chromosphere.
   • gases.

8. Protostars become stars when _____ begins.

   • a new galaxy
   • a new nebula
   • a fission reaction
   • a fusion reaction

9. Massive star remnants left after the explosion of a supernova form a:

   • white dwarf.
   • red giant.
   • galaxy.
   • black hole.

10. When red giants explode, the dense core mass that remains is a:

    • black hole.
    • quasar.
    • neutron star.
    • supernova.

ADDITIONAL AIMS MULTIMEDIA PROGRAMS

You and your students might also enjoy these other AIMS Multimedia programs:

Earth Science Essentials Series

- *Oceans: Charting the Vastness*
- *The Solar System: Our Neighbors in Space*
- *Geology of the Earth: Of Forces, Rocks, & Time*
- *Weather: The Chaos Which Surrounds Us*
- *The History of the Earth: Over the Eons*

ANSWER KEY for page 18

VOCABULARY

The following terms are from *The Universe: The Vast Frontier* . Fill in the number of each term next to its closest definition.

1. Big Bang
2. chromosphere
3. flares
4. pulsars
5. quasars
6. supernova
7. Doppler effect
8. microwave radiation
9. white dwarf
10. corona

4 ___ objects in space that regularly send out bursts of electromagnetic radiation

2 ___ middle region of the sun's atmosphere

10 ___ outermost layer of the sun's atmosphere

6 ___ extremely bright object that may be a billion times more luminous than the sun

1 ___ theory that the universe began with the explosion of a ball of matter

7 ___ apparent change in waves as they move closer or further away from the observer

8 ___ electromagnetic waves coming from the universe around Earth

3 ___ heavy bursts of energy on the surface of the sun

5 ___ star-like objects that emit immense quantities of light and radio waves

9 ___ a small, white, very dense star that has a low luminosity

ANSWER KEY for page 19

CHECKING COMPREHENSION

Read the following sentences and circle the letter of the word that best fills each blank.

Many scientists believe that the universe began between ___1__ years ago. They also believe that ___2__ was the first force formed after the Big Bang. Just one second after the Big Bang, the universe had a temperature of ___3__. The most convincing case that the Big Bang occurred is the___4__ radiation coming to Earth. In our galaxy, there is/are ___5__. Sunspots appear to be related to the activity of ___6__ on the sun. Some stars in the universe have as much as ___7__ the mass of our sun. Stars are formed when ___8__ causes gas, atoms and dust in interstellar matter to be drawn together. A ___9__ is what remains after the explosion of a massive red giant. The only black hole believed to have been identified is __10__.

1. A. 4 and 5 billion
   (B.) 10 and 20 billion
   C. 10 and 20 trillion
   D. 10 and 100 million

2. (A.) gravity
   B. magnetism
   C. entropy
   D. heat

3. A. 1 million degrees Celsius
   B. 1 million degrees Kelvin
   (C.) 1 trillion degrees Kelvin
   D. 100 trillion degrees Kelvin

4. A. ultraviolet
   B. nuclear
   C. Beta
   (D) microwave

5. A. only one star, the sun
   (B.) billions of stars
   C. dozens of stars
   D. less than a dozen known stars

6. (A.) magnetic fields
   B. radioactive fields
   C. electron fields
   D. surface fields

7. A. 5 times
   B. 10 times
   C. 20 times
   (D.) 30 times

8. A. heat
   (B.) gravity
   C. magnetism
   D. radiation

9. A. supernova
   B. flare
   (C.) neutron star
   D. quasar

10. (A.) Signus XI
    B. Crab Nebula
    C. Hubble
    D. Tartus IX

ANSWER KEY for page 20

HEAVENLY BODIES

Fill in the number of each heavenly body next to the correct group of words below.

1. Supernova
2. Neutron Star
3. Quasars
4. Pulsar
5. Nebulae
6. Red Giant
7. White Dwarf
8. Planet

6 a dying star whose surface expands and appears brighter

3 star-like objects that emit immense quantities of light and radio waves

5 a concentration of interstellar matter

8 body that revolves around a star, such as the sun

7 the result of a red giant collapsing and giving off some light for another billion years

1 an exploding star that flares into an extremely bright object

4 objects in space that regularly send out bursts of electromagnetic radiation

2 the mass that remains after the explosion of a supernova

ANSWER KEY for page 21

TRUE OR FALSE

Place a T next to statements that are true and an F next to statements that are false.

1. **T** A second after the Big Bang, the universe was about the size of our solar system.
2. **F** The universe stopped expanding 15 billion years after the Big Bang.
3. **F** The Milky Way is an example of an elliptical galaxy.
4. **T** Quasars are much larger than stars.
5. **F** Interstellar matter is called neutron dust.
6. **T** Some sun spots are larger in diameter than the earth.
7. **T** The aurora lights seen in the Northern sky are caused by highly charged atomic particles released by sun flares.
8. **F** A black hole has no density at all.
9. **T** A prominence is a great flame-like cloud that appears to rise from a sunspot.
10. **T** Chinese astronomers documented a supernova in 1054 AD.

ANSWER KEY for page 22

SCRAMBLED WORDS

Unscramble the bolded words in the sentences below to learn important facts about the sun.

1. **solar atmosphere** — A solar flare occurs when magnetic energy that has built up in the **raols mpeethao** is suddenly released.
2. **red giant** — In about 5 billion years, our sun will gradually expand into a **dre nitga**.
3. **hydrogen, helium** — The sun's fusion of **ghdrnyoe** into **uhlmei** releases more energy every second than humans have used since the beginning of civilization.
4. **corona** — The sun's **racono,** or outer atmosphere, can be seen during an eclipse.
5. **sunspot** — **Tuspuos** activity fluctuates over an 11-year cycle.
6. **northern lights** — The **thonnerr gisthl** are a direct result of activity on the sun.
7. **Stonehenge** — Many people believe that **hotseenegn** in England is an ancient sun calendar.
8. **Copernicus** — In 1543, **punrocisec** put forth the revolutionary idea that the sun, not the Earth, was the center of the solar system.
9. **stellar wind** — Plasma continuously ejected into space from a star's surface is known as a **lastelr diwn**.
10. **mean density** — The sun has a **nmea siyetnd** of about 1/4 that of the Earth.

ANSWER KEY for page 23

FILL IN THE BLANKS

Use the following words to fill in the blanks below.

Big Bang
Black Hole
corona
diameter
electromagnetic
electrons
irregular
gravity
microwave
quasars

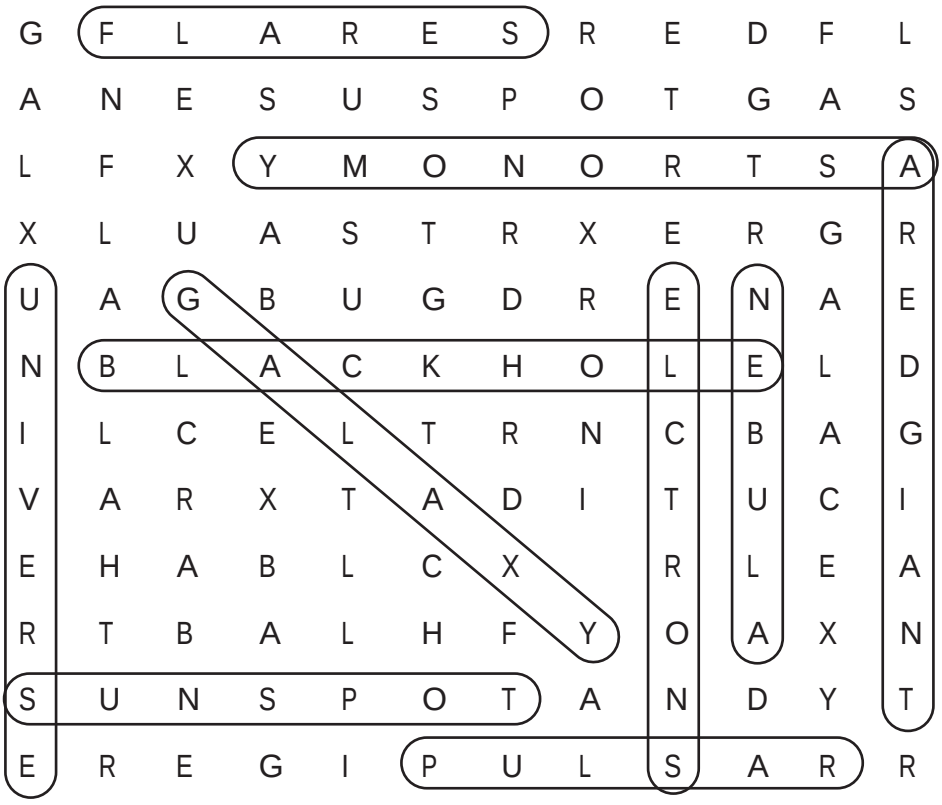
1. A pulsar is an object in space that regularly sends out bursts of **electromagnetic** radiation.
2. The total estimated **diameter** of the Milky Way is 120,000 light years.
3. The Magellenic Cloud is the most famous type of **irregular** . galaxy
4. The sun's outermost layer is known as the **corona** .
5. Some known **quasars** are 100 trillion times brighter than the sun.
6. **Gravity** causes gas, atoms, and dust in interstellar nebulae to form into stars.
7. A neutron star consists entirely of **electrons** .
8. The **Big Bang** took place about 20 billion years ago.
9. The gravity in a **Black Hole** is thought to be so great that any light near it would be trapped.
10. The fact that the Earth is being bombarded from space by **microwave** radiation is thought to be evidence of the Big Bang.

ANSWER KEY for page 24

WORD SEARCH

The following words can be found in the maze below. The letters may be arranged horizontally, vertically, diagonally or backward.

Black Hole
Nebula
Red Giant
Sunspot
Flares
Galaxy
Universe
Astronomy
Electron
Pulsar



ANSWER KEY for page 25

TEST

Circle the phrase which best answers each question.

1. Spiral, irregular, and elliptical are three types of:

   • galaxies.
   • nebulae.
   • quasars.
   • white dwarfs.

2. Concentrations of interstellar matter are called:

   • supernovas.
   • sunspots.
   • galaxies.
   • nebulae.

3. All stars are thought to form from:

   • light disappearing into black holes.
   • gamma rays, x-rays, and visible light.
   • clouds of interstellar matter and gas in nebulae.
   • fusion.

4. The Big Bang is a theory about the:

   • origin of the universe.
   • formation of forces.
   • creation of atomic particles.
   • all of the above.

5. Exploding stars that flare up very brightly are called:

   • nebulae.
   • Neutron stars.
   • black holes.
   • supernovas.

TEST (CONTINUED)

6. The Milky Way is an example of:

   • an elliptical galaxy.
   • a spiral galaxy.
   • an irregular galaxy.
   • a nebulae galaxy.

7. The sun is composed entirely of:

   • photosphere.
   • magnetic fields.
   • chromosphere.
   • gases.

8. Protostars become stars when _____ begins.

   • a new galaxy
   • a new nebula
   • a fission reaction
   • a fusion reaction

9. Massive star remnants left after the explosion of a supernova form a:

   • white dwarf.
   • red giant.
   • galaxy.
   • black hole.

10. When red giants explode, the dense core mass that remains is a:

    • black hole.
    • quasar.
    • neutron star.
    • supernova.