

THE ASTRONOMY BOOK

Study Guide



INTRODUCTION

Summary

God made us to sense His glory in the heavens. The heavens declare the glory of God (Psalm 19:1). Satan has attempted to get people to believe in astrology and cosmic evolution, both corruptions of genuine astronomy.

Terms to Know and Spell

astrology evolution

Fill in the Blanks

In the sentences below, fill in each blank with a term from the list above. Each term is used once.

1. _____ is the satanic perversion of astronomy.
2. The atheistic perversion of astronomy is called _____.

Discussion Questions

The following approaches may be used for answering the questions below:

- (1) the questions may be answered on a sheet of paper as essay questions;
- (2) if the number of children permits, the children may be organized in discussion groups to discuss answers to the questions;
- (3) if the number of children permits, the parent or teacher may guide a class discussion to answer the questions.

1. How is astrology different from astronomy?
2. How is cosmic evolution different from genuine astronomy?

Activities Together

1. Discuss how looking at the night sky turns your thoughts to the power of God the Creator.
2. Memorize and recite Psalm 19:1.

Projects to Do on Your Own

Memorize Bible verses that tell how God reveals Himself in His creation. Some verses to start with: Psalm 19:1, Romans 1:20, Colossians 1:16–17, Hebrews 1:3.

CHAPTER 1 — WHAT IS ASTRONOMY?

Chapter Summary

Astronomers study the sun, planets, moons, stars, and galaxies. The stars shine by their own light, but planets shine by reflected light. Except for the sun, all stars are far outside the solar system. Stars are grouped into galaxies. Most galaxies have about 100 billion stars. We are in the Milky Way Galaxy.

Terms to Know and Spell

astronomer	galaxies	planets
astronomy	galaxy clusters	solar system
celestial bodies	moons	sun

Fill in the Blanks

In the sentences below, fill in each blank with a term from the list above. Each term is used once.

1. _____ is the branch of science dealing with the sun, the moon, the planets, and the stars.

2. An _____ is a person who has scientific knowledge about the stars and other heavenly bodies.
3. We picture _____ orbiting the sun, and moons orbit planets.
4. Most of the planets have one or more _____ which orbit them.
5. All the objects in the heavens are called _____.
6. The only star in the solar system is the _____.
7. Stars are in groups called _____.
8. The galaxies themselves are in larger groups called _____.
9. The _____ is located in the Milky Way Galaxy. It includes the sun, the moon, and the planets and their moons.

Discussion Questions

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- (1) the questions may be answered on a sheet of paper as essay questions;
 - (2) if the number of children permits, the children may be organized in discussion groups to discuss answers to the questions;
 - (3) if the number of children permits, the parent or teacher may guide a class discussion to answer the questions.
1. What are some differences between planets and stars?
 2. What is the difference between moons and planets?
 3. Since all the objects which astronomers study are so far from us, what do you think would be one of the main limitations of astronomy?
 4. What are some Bible verses that emphasize that God guides our lives?

Activities Together

1. Look up information about the planets. What is the color of each one? The size? How rapidly does each one rotate? What is the length of the year for each one? Which ones have rocky surfaces, and which ones have no known surface?
2. Look up information about the moons of the planets. How many moons does each planet have? What are the names? Hint: the Internet is a good source of information on planets and moons.

Projects to Do on Your Own

1. Choose a moon or a planet, and write a one or two page report on it.

CHAPTER 2 — HOW BIG IS THE UNIVERSE?

Chapter Summary

The universe is extremely vast. The huge size of the universe is consistent with God's huge power in creation. It takes light eight minutes to travel from the sun, and 4-1/2 years to get to the nearest star outside the solar system. A light-year is the distance light travels in one year. The distance to relatively nearby stars is measured by parallax. The most distant galaxies are thought to be some 14 billion light-years away. All heavenly objects are in the one universe in which we live. There are no other universes.

Terms to Know and Spell

Alpha Centauri	Milky Way	quasars
Andromeda galaxy	Neptune	Saturn
Jupiter	parallax	universe
light-year	Pluto	Uranus
Mars	Proxima Centauri	Venus
Mercury		

Fill in the Blanks

In the sentences below, fill in each blank with a term from the list above. Each term is used once.

1. _____ is the planet closest to the sun.
2. _____ is the planet closest to Earth.
3. _____ is nicknamed the “Red Planet.”
4. The biggest planet is _____.
5. If there were a bathtub big enough to hold _____, it would float.
6. The seventh planet going out from the sun is _____.
7. _____ is the eighth planet from the sun.
8. The farthest planet from the sun is _____.
9. The distance light travels in one year is called a _____.
10. The closest star outside the solar system is _____.
11. Proxima Centauri is very near to _____.
12. The closest galaxy outside the Milky Way is _____.
13. Most astronomers estimate that the most distant objects, the _____, are 14 billion light-years away.
14. The _____ includes the entire physical creation.
15. A nearby object has high _____, and a faraway object has low _____. (The same term is used twice.)
16. The number of stars in the _____ is estimated at 200 billion to 300 billion.

Discussion Questions

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 - (2) if the number of children permits, the children may be organized in discussion groups to discuss answers to the questions;
 - (3) if the number of children permits, the parent or teacher may guide a class discussion to answer the questions.
1. Name the closest celestial body to us, the closest planet, the closest star outside the solar system, and the closest galaxy outside the Milky Way.
 2. Discuss from the Bible why it is unlikely that any astronomer will ever see the “edge” of the universe.
 3. Why can there not be other universes?
 4. How is parallax used to measure the distance to stars?
 5. What is a unique feature of each planet? Why do you think God made each planet different from the rest?

Activities Together

1. Visualize the size of the universe with the following experiment. Let one inch be the distance of the earth to the sun. Go outside. In your yard, place a grain of pepper on a piece of paper to represent the earth. One inch away, place a marble to represent the sun. Four feet away, place another pepper grain. This is Pluto, the outermost planet in the solar system. The nearest star outside the solar system will be another marble placed about five miles from where your “earth” is located! Locate a pizza parlor or ice cream shop about five miles from your house, and reflect on the vastness of God’s universe as you enjoy the treats at your destination!
2. In the experiment above, the nearest “star” is about five miles from your house. The true distance in space to the nearest star is 4-1/2 light-years, and the distance to the nearest galaxy outside the Milky Way is about 2 million light-years. How far from your yard would a rock representing the nearest galaxy have to be placed?
3. Learn the order of the planets going out from the sun. To have fun doing this, have a contest. Write a sentence in which each word begins with the initial letter of one of the planets in order. Everyone votes to see which sentence wins.

Projects to Do on Your Own

Build a mobile of the planets and some of the important stars and galaxies. Do not necessarily build your mobile to scale. Besides the sun and the nine planets, here are some suggested stars and galaxies: Alpha Centauri, the Andromeda Galaxy. For stars and planets, use marbles, pith balls, or other round objects. For galaxies, use cotton balls fluffed out to represent the expanse of the galaxy in space.

CHAPTER 3 — THE ORIGIN OF THE UNIVERSE

Chapter Summary

God created the universe during the creation week several thousand years ago. The creation week had six days of work and one day of rest. The universe did not begin in a big bang. There was no big bang. The big bang is a myth. God created the sun, the moon, and the stars on the fourth day of the creation week (Genesis 1:16). In ancient times, and until fairly recently, the planets and moons of the solar system were classed as stars, and are included in the heavenly bodies created on the fourth day.

Bible Verses to Know

Genesis 1:1	Genesis 1:31	Psalms 33:6
Genesis 1:16	Genesis 2:1	Romans 1:20

Fill in the Blanks

In the sentences below, fill in each blank with a verse reference from the list above. Each reference is used once.

1. _____ says that in the beginning, “everything was very good.”
2. Today no one can observe an act of creation anywhere. _____ states that the creation is finished.
3. _____ says that God made the universe to reveal himself and His creative power.
4. _____ states, “In the beginning God created the heaven and the earth.”
5. _____ tells us, “By the word of the Lord were the heavens made.”
6. _____ tells us the God “made the stars.”

Discussion Questions

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- (1) the questions may be answered on a sheet of paper as essay questions;
- (2) if the number of children permits, the children may be organized in discussion groups to discuss answers to the questions;
- (3) if the number of children permits, the parent or teacher may guide a class discussion to answer the questions.

1. Why is “cosmic evolution” a false idea?
2. Explain why cosmic evolution is not the same as true biblical creation.
3. Discuss some Bible verses that clearly state that God created the heavens.
4. Why can we say that planets and moons were created on the fourth day of the creation week?
5. Ancient peoples defined the word “star” differently than the way we do. Does this mean that ancient peoples were primitive, or only that they did some things differently from us?
6. Why does the Bible not mention such a thing as the “solar system”? Does this mean that ancient peoples were primitive and backward? Were ancient peoples in any way held back from understanding the motions of celestial objects in the heavens?
7. Why do we know there was not a big bang?
8. What are some Bible verses that state that the creation is finished, and not evolving?
9. What does Romans 1:20 tell us about why God created the universe?
10. Why do evolutionists want to believe the universe is expanding? Is there conclusive evidence that the universe is expanding at all?

Activities Together

1. Research what the Bible says about when the creation took place. Much of this information is in the genealogies of the Bible, e.g., Genesis chapter 5 and 11.
2. Build a true time-line of history based on the Bible. Get a long roll of paper (used in some fax machines and available at office supply stores). Make a mural by unrolling the paper and writing down the dates for significant events in history. Mount the time-line in a hallway or large room. Suggested events for your time-line mural: Creation of the world, the cosmos, and life; the fall of man; the Flood; the dispersion from Babel; the birth of Abraham; the Exodus; the reign of David; the birth of Christ.

Projects to Do on Your Own

Memorize Genesis chapter 1, the “Creation Chapter.”

CHAPTER 4 — WATCHING THE SKY

Chapter Summary

The moon goes through different shapes called phases as it orbits the earth. One cycle of phases takes one month. Lunar eclipses happen when the earth is between the sun and the moon. Solar eclipses happen when the moon passes between the earth and the sun. We must be very careful when observing solar eclipses. We never look at them directly, but a pinhole camera gives a good image of a solar eclipse. Astronomers have improved their view of the heavens with telescopes. The two main types of telescopes are the refracting type and the reflecting type. Reflecting telescopes are less expensive and more powerful for a given size. The amateur astronomer can get a better view of the planets with a fairly inexpensive reflector.

Terms to Know and Spell

aperture	lunar eclipses	refractor
corona	lunar phases	reflecting telescope
first quarter moon	new moon	solar eclipses
full moon	partial eclipse	sunspots
last quarter moon	pinhole camera	total solar eclipse

Fill in the Blanks

In the sentences below, fill in each blank with a term from the list above. Each term is used once.

1. You can begin your study of astronomy by observing the phases of the moon, or _____.
2. The first phase of the moon is _____, in which the moon is not visible at all.
3. The third lunar phase is _____, when the moon is fully illuminated and looks like a circle.
4. The second phase of the moon is _____.
5. The fourth and last phase of the moon is _____.
6. _____ occur when the moon passes between the sun and the earth.
7. _____ happen when the earth is between the sun and the moon.
8. During a _____, the sun itself looks black.
9. The sun is surrounded by a shining halo of solar gases called the _____, which is not normally visible (except during a total solar eclipse).
10. During a _____ of the sun, the moon does not completely cover the sun.
11. Dark spots called _____ are sometimes visible on the surface of the sun.
12. To view a solar eclipse, you can make a _____.
13. The type of telescope called the _____ has been in use since Galileo's time.
14. The _____ has a design permitting more magnifying power in less space than the refracting type.
15. The opening for light in a telescope is called the _____.

Discussion Questions

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 - (2) if the number of children permits, the children may be organized in discussion groups to discuss answers to the questions;
 - (3) if the number of children permits, the parent or teacher may guide a class discussion to answer the questions.
1. Describe the sequence of lunar phases.
 2. Describe what happens during a total solar eclipse. What is the appearance of the sun during a total solar eclipse?
 3. Describe how to make a pinhole camera.
 4. Describe what happens during a total lunar eclipse. Why does the moon look red during a total lunar eclipse?
 5. How often do total solar eclipses happen in a given locality? partial solar eclipses? lunar eclipses?

6. What are the two types of telescopes? Which kind is most commonly used in astronomy?

Activities Together

1. Purchase a good reflecting telescope, available for \$200-300 from almost any department store.
2. Use your telescope to observe the moon and the planets. Besides “Sky and Telescope,” sky locations of celestial bodies are on the Internet at www.heavens@above.com.
3. Build a pin-hole camera for observing the sun. Follow the directions in *The Astronomy Book*. The pinhole camera is good for observing the sun anytime, not only during eclipses. Children will need adult supervision to protect their eyes. Never, never look directly at the sun, even during an eclipse! Do not look at the sun’s image in a mirror! Do not use even frosted glass, a welder’s filter, or any other darkened glass to view the sun! Seeing the sun directly, even from a mirror or through darkened glass, can blind you *permanently, forever!*

Projects to Do on Your Own

1. Observe the phases of the moon every night for a month (weather permitting). Keep a journal. Enter the time and date of each observation. Make a simple sketch of the appearance of the moon on each night.
2. Each night as you keep your journal, commune with the Creator, who is also the Savior. Is He your personal Savior? Do you know Him in saving faith? How awesome it is to sense God’s care for us under the canopy of the night-time sky!
3. Lunar eclipses are not extremely rare. Observe the first one you have opportunity to see.
4. Get some lunar maps from old issues of *National Geographic*. Have them laminated. They make wonderful wall posters for science!

CHAPTER 5 — WHY DID GOD CREATE THE HEAVENLY BODIES?

Chapter Summary

The Bible is the only trustworthy source for information about why God made the heavenly bodies. We should respect God’s stated reasons for His purposes behind them. Genesis 1:14–18 gives these purposes. The sun and the moon were to define day and night for all life on earth, and all the heavenly bodies including stars are to be tellers of time. Mankind has always observed these purposes. All clocks are ultimately set by the motion of celestial bodies, and all calendar systems have been based on the motion of them. Astrology has attempted to use the stars and constellations to foretell the future. This false purpose for the stars began at Babel, when fallen man began worshiping the heavens.

Terms to Know and Spell

asterisms	Little Dipper	Polaris
Betelgeuse	lunar calendar	solar calendar
Big Dipper	Messier system	solar year
constellation	NGC	universal time
Greenwich Mean Time	Orion	Ursa Major

Fill in the Blanks

In the sentences below, fill in each blank with a term from the list above. Each term is used once.

1. The _____ are certain star patterns which have been recognized by many cultures since around 2500 B.C.

2. _____, the North Star, appears to remain at the same point in the sky with the other stars rotating around it.
3. The moon has always been used for time-telling. It is the basis for the _____.
4. The calendar used in many countries today is the _____.
5. The _____ is officially defined as the time required for the sun to return to the sky position of the previous January 1.
6. All clocks on earth are synchronized with _____.
7. _____ is the same as Greenwich Mean Time.
8. The constellation called “the bear” is also known as _____.
9. You can always find the North Star by following the line from the two end stars of the _____.
10. The constellation _____ is also called “the hunter.”
11. The _____ is not a true constellation, but is an asterism.
12. _____ are familiar star groups which are not defined as constellations.
13. The brightest star in Orion is Alpha-Orionis, but is often called _____.
14. Two common systems for naming stars are the _____ and the NGC system.
15. The term _____ is short for New General Catalog.

Discussion Questions

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- (3) if the number of children permits, the parent or teacher may guide a class discussion to answer the questions.

1. What are some Bible verses that tell us God’s purposes for creating the heavenly bodies?
2. How are the sun and the moon used as the basis for calendar systems?
3. How does modern time-telling fulfill the ancient purposes revealed by God for the heavenly bodies?
4. What are constellations?
5. How are constellations related to astrology?
6. How do astronomers use the constellations?

Activities Together

1. Study our calendar system (the Gregorian calendar). How long has it been used? Who invented it? How is it different from its predecessor, the Julian calendar? Who invented the Julian calendar?
2. Build a clock or a sundial. Model clocks can be purchased at department stores or hobby shops. A sundial, however, is even easier to build, and vividly shows the dependence of time measurement on the position of the sun. For a week (weather permitting), track the position of the sun on your sundial. Then see how accurately you can tell time with your sundial without relying on a clock.

Projects to Do on Your Own

God has a purpose for everything in His creation. The Bible reveals many of these purposes in various Bible verses. Starting with Genesis 1:14–18, make a list of other verses in which God states His purposes.

CHAPTER 6 — SPACE EXPLORATION

Chapter Summary

The first rockets were probably developed for military use by peoples like the Chinese. The first modern rockets were not built until the 20th century by Robert H. Goddard. Rockets for travel in outer space must carry fuel plus oxygen to burn the fuel. The Space Age began in 1957 with the launching of the first artificial satellite Sputnik. Men first landed on the moon in 1969. Since then, the planets have been explored close-up by probes. Voyager 2 was the most remarkable probe. Unmanned landings have been made only on Venus and Mars. NASA is planning future planetary missions.

Terms to Know and Spell

Alan Shepard	Mir	Sputnik
Apollo 8	NASA	Viking mission
Columbia	Neil Armstrong	Voyager 2
John Glenn	Robert H. Goddard	Werner von Braun

Fill in the Blanks

In the sentences below, fill in each blank with a term from the list above. Each term is used once.

1. _____ built the first workable rockets.
2. The U.S. space program and NASA were started in 1958 under the scientific leadership of _____.
3. The first man-made satellite launched into space was _____ in 1957.
4. In 1962, _____ became the first American to orbit the earth.
5. The first American in space (he did not orbit the earth) was _____ in 1961.
6. During the _____ mission, on December 24, 1968, astronauts read from Genesis chapter 1 as the entire world listened in via TV.
7. _____ is short for National Aeronautics and Space Administration.
8. The first man to set foot on the moon was _____.
9. The name of the first space shuttle, launched in 1981, was _____.
10. The Soviets developed a space station named _____.
11. The most famous unmanned mission to date was the journey of the _____ probe through the outer solar system.
12. The first Mars lander, the Viking probe, arrived on Mars July 1, 1976, as part of the _____.

Discussion Questions

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1. Why must rockets carry their own oxygen for space travel?
 2. Describe the history of rocketry.
 3. Outline the high points of the United States space program.

- Describe the journey of the Voyager 2 probe through the solar system.
- The space program has given us lots of new information about the solar system. Describe how this information has strengthened the scientific case for creation.

Activities Together

- Purchase a “bottle-rocket launcher,” available through scientific supply houses, and from some department stores or hobby shops. The typical bottle-rocket launcher uses 2-liter soft drink bottles partly filled with water and pumped up with air to provide the propulsion. Experimenting with such a launcher is an inexpensive and safe way to observe the principles of rocketry.
- Purchase a solid-fuel model rocket kit. These are readily available at most department stores. Depending on the fuel capsule and rocket design, some of these can reach altitudes of nearly 1,000 feet (near the maximum altitude permissible to prevent interference with aircraft)!

Projects to Do on Your Own

Build scale-model rockets. Many are available at hobby shops and department stores. They look really great when carefully painted and put on display in your room.

CHAPTER 7 — A TOUR OF THE SOLAR SYSTEM

Chapter Summary

The earth is not “just another planet.” It is unique in many ways. It is the only known place in the universe with liquid water, a requirement for life. God set the earth apart by creating it on the first day of the creation week (Genesis 1:1), rather than on the fourth day like the other planets. God made the other planets to be time-tellers for life on earth, and to protect the earth from getting too close or too far from the sun. Like the earth, the sun and the moon are each unique in their own special ways. The moon is very unlike the earth and did not evolve from it. Neither did the sun evolve with the rest of the solar system out of a “nebula.” Both the sun and the moon are “young.” None of the planets, not even Mars, is fit for life. Only the earth was created to be inhabited (Isaiah 45:18). None of the planets except earth has ever had its own life.

Terms to Know and Spell

Charon	moon rocks	retrograde
gravitational collapse	nebular hypothesis	solar flare
Great Dark Spot	nuclear fusion	solar prominences
Great Red Spot	planetary rings	solar shrinkage
Hermann von Helmholtz	prograde	Titan
lunar recession		

Fill in the Blanks

In the sentences below, fill in each blank with a term from the list above. Each term is used once.

- Astronomers have found that the moon is moving away from the earth little by little. This is called _____.
- The moon and the earth did not come from the same material. This has been confirmed by _____ brought back to earth.
- A _____ on the sun gives off large amounts of energy. A large flare can disrupt communications satellites on earth.
- Besides solar flares, _____ also dissipate huge amount of energy from the sun.

5. German physicist _____ proposed that the sun is giving off energy as it shrinks in size.
6. The idea that the sun generates its energy by shrinking in size is called _____.
7. _____ is the process of hydrogen atoms fusing together to make helium atoms.
8. Astronomers have carefully measured the _____ for almost 200 years.
9. The false idea that the solar system evolved from a gas cloud is called the _____.
10. Most of the planets have a _____ rotation, with the sun coming up in the east and setting in the west.
11. Venus rotates backwards, or _____.
12. Besides Saturn, Jupiter, Uranus, and Neptune all have _____.
13. One of the largest moons of Saturn is _____.
14. The _____ on Jupiter is actually one of the longest-lasting storms in the entire solar system.
15. A prominent feature of Neptune is the _____, similar to the Great Red Spot on Jupiter.
16. Pluto has a moon of its own called _____.

Discussion Questions

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 - (3) if the number of children permits, the parent or teacher may guide a class discussion to answer the questions.
1. What is God's special purpose for the earth?
 2. Discuss the significance of the fact that in all the universe, only the earth is known to have liquid water.
 3. Discuss some reasons why God created the other planets besides the earth.
 4. What is the purpose which the Bible states for the moon?
 5. What is some evidence that the moon was created recently, and did not evolve from the earth billions of years ago?
 6. What is the purpose which the Bible states for the sun?
 7. What are some facts about the sun that make it different from most other stars?
 8. Describe the idea of gravitational collapse for explaining where the sun gets its heat.
 9. Why do evolutionists prefer the idea that the sun gets its heat exclusively from nuclear fusion?
 10. Compare the evidence that gravitational collapse is happening in the sun, versus the idea that nuclear fusion is responsible for the sun's heat.
 11. What is some scientific evidence that the sun is "young," not billions of years old?
 12. What is the nebular hypothesis? Why is it a false idea?
 13. What is some evidence that Mercury and Venus did not evolve, but were created?
 14. How is Mars similar to the earth? How is it different?
 15. Explain why Mars cannot support life. From the Bible, why would we expect that Mars has never supported life?
 16. Why do evolutionists keep searching for evidence that Mars once supported its own life?

17. Why have evolutionists given up on the idea that Jupiter or Saturn could support life?
18. Explain some evidence that Saturn's moon Titan was created recently, and is not billions of years old.
19. Describe some unique features of Uranus and Neptune.
20. What discovery has shown that Pluto is truly a planet in its own right, and not an escaped moon of Neptune?
21. What do the many unique features of all the planets reveal about the character of God?
22. Why do you think evolutionists are uncomfortable with the idea that planets are all unique and different?

Activities Together

1. Draw planetary art. Have a planetary art contest. Go to encyclopedias or the Internet for realistic views of planetary surfaces and environments, then let your imagination take over from there! Except for Venus and Mars, no man or probe has landed on any planet, so there is a lot of leeway on what the actual ground-surface appearance of the others might be!
2. Have a "space-art" awards ceremony, with prizes on hand for the participants. Some suggestions for prizes: planetary posters (like the one in *The Astronomy Book!*); glow-in-the-dark planet stickers (available at hobby stores); "space food," e.g., popcorn colored orange; Tang, the beverage of astronauts; Milky Way and Mars candy bars, etc. — the sky's the limit!
3. Make a list of evidences that the solar system is "young," not billions of years old. Use the information in this chapter as a starting point.

Projects to Do on Your Own

Assemble a collection of space art and posters. Arrange it in a suitable place — maybe your room! What a neat way to be constantly reminded of our wonderful Creator!

CHAPTER 8 — STARS AND GALAXIES

Chapter Summary

All stars are unique and different. Stars differ in size, color, temperature and other properties. Black holes are defined in such a way that they can never be observed. Science deals with objects and phenomena that we can observe. Therefore, black holes have never been seen and, strictly speaking, are outside the realm of science. The most distant galaxies are thought to be quasars some 14 billion light-years away. When astronomers view distant objects, they are seeing the object as it was in the past. This is called "look-back time." There is evidence that light may have traveled more rapidly in the past (at speeds higher than 186,000 miles per second), making it possible for astronomers to see these distant objects in the few thousand years since the creation week. Thus the look-back time for quasars is no more than a few thousand years.

Terms to Know and Spell

black holes	Large Magellanic Cloud	spectral classes
helium	look-back time	stellar magnitudes
hydrogen	spectral analysis	x-ray sources

Fill in the Blanks

In the sentences below, fill in each blank with a term from the list above. Each term is used once.

1. To know what a star is made of, astronomers use a procedure called _____.

2. Most stars are about 25% _____.
3. The most plentiful element in stars is _____.
4. Astronomers have grouped stars into _____, based on the elements they contain.
5. The Greek astronomer Hipparchus established a system for grouping stars by brightness. Modern astronomers still use this system of _____.
6. A _____ is supposedly a celestial object so massive that nothing can escape from it. No astronomer has ever seen a _____. (Use the same term twice.)
7. Believers in black holes assume that some _____ must be black holes.
8. Since the universe is truly 6000 years old or so, the _____ for even the most distant galaxies is 6000 years or less.
9. The _____ is one of the few objects outside the immediate vicinity of the Milky Way which can be seen without a telescope.

Discussion Questions

The following approaches may be used for answering the questions below:

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- (2) if the number of children permits, the children may be organized in discussion groups to discuss answers to the questions;
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1. How do we know that God considers the earth more important than all the stars?
2. What are stars made of?
3. Describe how astronomers have worked out what stars are made of.
4. Describe some of the differences between stars.
5. What is the definition of a black hole? Has anybody ever seen one? Is it possible for anyone ever to see one?
6. Why do evolutionists believe that black holes must exist?
7. What are the farthest objects we can see without a telescope?
8. The light-year is a unit of distance, not a unit of time. Explain why this is so.
9. What is look-back time? Explain why look-back time extends only thousands of years into the past, not billions.
10. God did not create exploding stars and other catastrophes. What is a possible reason astronomers can see exploding stars billions of light-years away, yet the universe is not billions of years old?

Activities Together

1. Visit an observatory. Look through the powerful telescope to see features of planets you cannot see through an amateur's telescope; e.g., the different sections of Saturn's rings, the various color bands of Jupiter, etc.
2. Visit a planetarium. The typical planetarium show will simulate the appearance of the constellations over the course of a year.

Projects to Do on Your Own

1. Observe the constellations for a month. Keep a journal each night (weather permitting). In your journal, enter the time and date of your viewing, and sketch the main constellations as you see them. Note any parts of the sky obscured by clouds.
2. Purchase a desk-model planetarium. These are available through hobby stores. They are powered by flashlight-size bulbs projecting an image through holes in a plastic dome with the patterns of the major constellations. These are a great aid in learning the constellations!

CHAPTER 9 — COSMIC CATASTROPHES

Chapter Summary

Stars and galaxies show signs of ancient catastrophes. These catastrophes are a product of sin in the physical creation causing decay and destruction everywhere (Romans 8:20-22). Even the sun today is fairly chaotic and self-destructing. However, God has preserved the sun so that it is more stable than most stars, and capable of giving light and heat to life on earth. Most stars are very unstable. Some stars have exploded, forming supernova remnants. All stars are dying. The evolutionary idea of star birth has never been observed.

Terms to Know and Spell

Beta-Pictoris	nova	supernova remnant
Crab Nebula	Ring Nebula	variable stars
nebula	supernova	

Fill in the Blanks

In the sentences below, fill in each blank with a term from the list above. Each term is used once.

1. The _____ is a huge cloud of gases formed by the explosion of a star in the middle of the ring.
2. A _____ is an exploding star.
3. An especially noticeable star explosion is called a _____.
4. The _____ is the remnant of a gigantic supernova explosion visible in A.D. 1054.
5. _____ is Latin for “cloud.”
6. The Crab Nebula, a supernova, is also called a _____.
7. Most stars are unstable and are called _____, because their energy output is always changing.
8. _____ is one of the most publicized cases of a star surrounded by gas and dust.

Discussion Questions

The following approaches may be used for answering the questions below:

- (1) the questions may be answered on a sheet of paper as essay questions;
 - (2) if the number of children permits, the children may be organized in discussion groups to discuss answers to the questions;
 - (3) if the number of children permits, the parent or teacher may guide a class discussion to answer the questions.
1. What are some ways in which sin has caused destruction in the cosmos?
 2. How do we know from the Bible that the effects of sin on the creation extend to the entire universe?

3. How do we know from the Bible that God did not create catastrophes and all the products of destruction? What are some things in the cosmos, that in their present condition, are not like God made them, but were produced by catastrophes.
4. How do O and B stars show that stars were created recently, and are not billions of years old?
5. Compare the stability of the sun with the instability of most other stars.
6. Why do we say that there is no evidence that gas clouds are contracting to form new stars?
7. Which one has really been observed, star birth or star death? Where does the gas and dust surrounding many stars come from?
8. Why is it proper to say that star birth is really a myth?

Activities Together

1. Make a list of things in the universe that are the product of catastrophe.
2. Collect newspaper or magazine articles in which evolutionists claim that the cosmos and stars are evolving. Answer these claims biblically by focusing on catastrophes caused by sin.

Projects to Do on Your Own

Make a list of Bible verses that mention the destructive working of sin in the creation.

CHAPTER 10 — CATASTROPHES IN THE SOLAR SYSTEM

Chapter Summary

The solar system shows many signs of catastrophes which happened to planets and moons in the past. As with the cosmos at large, sin is ultimately responsible for these catastrophes. Planetary moons seem to have exploded to form planetary rings. Jupiter, Saturn, Uranus and Neptune all have rings. A planet may have exploded to form the asteroids. This planet would have been between Mars and Jupiter where the main asteroid belt is today. Comets seem to be asteroids which orbit close to the sun, and many meteors seem to be asteroids which have been knocked out of the asteroid belt. Asteroids, comets and meteors have landed on the earth, causing in the past much destruction and loss of life. Perhaps this explains the ancient fear of unpredictable heavenly events. There is no evidence that a massive asteroid or meteor impact killed all the dinosaurs. The flood of Noah killed many of the dinosaurs. Mars once experienced a flood, which scientists acknowledge, while continuing to deny the reality of Noah's flood on earth.

Terms to Know and Spell

Ahnighito meteorite	Gaspra	Perseids
Apollo asteroids	Halley's comet	Phobos
Arizona Meteor Crater	Hoba meteorite	shepherd moons
asteroid impact	meteor	shooting star
asymmetrical cratering	meteor impact	Sudbury deposits
Chicxulub Crater	Miranda	symmetrical cratering
Chubb Meteor Crater	Olympus Mons	Tunguska event
comets	Oort cloud	Valles Marineris
Deimos		

Fill in the Blanks

In the sentences below, fill in each blank with a term from the list above. Each term is used once.

1. Hypothetical moons that keep planetary rings together are called _____.

2. _____ is a moon of Uranus that seems once to have almost exploded.
3. When asteroids collide, an asteroid knocked out of the asteroid belt may become a _____.
4. There are minor belts of asteroids far outside the main asteroid belt. One of these is the _____.
5. The two moons of Mars, Phobos and _____, seem to be captured asteroids.
6. The Martian moon _____ has been photographed by space probe at close range.
7. An asteroid may collide with a moon or a planet in an event called an _____.
8. Since many meteors seem to be asteroids traveling randomly in space, a _____ is really the same thing as an asteroid impact.
9. One of the few asteroids that has been photographed at close range is the asteroid _____.
10. If craters on a moon or planet were spaced evenly, this would be called _____.
11. All the known moons and planets have more craters in one hemisphere than the other. This is called _____.
12. The _____ on Mars is a canyon twice as deep and ten times as wide as the Grand Canyon.
13. _____ on Mars is the largest known volcano in the solar system.
14. _____ are chunks of rock and ice that develop a tail as they travel near the sun.
15. _____ is a more or less typical comet with an orbit of about 76 years. _____ was last seen in 1986. (Use the same term twice.)
16. Astronomers who believe in evolution have proposed that the solar system is surrounded by a sphere of rock and dust called the _____. No astronomer has ever observed the _____. (Use the same term twice.)
17. As a meteor burns in the earth's atmosphere, it produces a streak of light called a _____.
18. One of the most dependable and noticeable meteor showers is the _____, visible for 2 or 3 weeks around mid-August.
19. One of the largest meteor impact craters on earth is the _____, near Winslow, Arizona.
20. In Canada, there is the _____, with a diameter of about two miles.
21. The _____, in Canada, provide 20% of the world supply of nickel.
22. The _____, in Mexico, was said to be caused by a volcano before it was popular to account for dinosaur extinction by meteor impacts.
23. The largest known meteorite on earth is the 66-ton _____ in Namibia, South Africa.
24. Perhaps the most catastrophic impact event of modern times was the _____ in Siberia in 1908.
25. The _____ is the largest known meteorite in North America, and is the largest to have been placed in a museum.

Discussion Questions

The following approaches may be used for answering the questions below:

- (1) the questions may be answered on a sheet of paper as essay questions;
- (2) if the number of children permits, the children may be organized in discussion groups to discuss answers to the questions;
- (3) if the number of children permits, the parent or teacher may guide a class discussion to answer the questions.

1. What is there about Saturn's rings that shows the rings formed recently, not billions of years ago?

2. Sin has damaged all of the creation. What are some features of the solar system that are different from when God created it, and before sin entered into the creation?
3. How do evolutionists try to account for the false idea that Saturn's rings are billions of years old? What is the biggest problem with the evolutionary explanation?
4. Discuss some evidence that moons may have exploded in the past.
5. Which planets have rings? If the nebular hypothesis were true, why should all the planets have rings?
6. What are asteroids? Where did they come from?
7. What is some evidence that the asteroids formed recently, not billions of years ago?
8. What is asymmetrical cratering? Discuss some examples of it.
9. Discuss how asymmetrical cratering indicates that the asteroids are fragments remaining from an exploded planet.
10. What is some evidence that the asteroids are not remnants left over from a planet that failed to form, as the nebular hypothesis claims.
11. What are some signs that Mars suffered from many catastrophes in the past?
12. Why do many scientists feel comfortable with the idea of a huge flood on Mars, but often continue to deny that Noah's flood ever happened on earth?
13. Sin is the ultimate factor behind all catastrophes. What is a possible physical explanation of the catastrophes which damaged the solar system in the past?
14. What is the evidence, both Biblical and scientific, that the earth was not created molten and hot in the beginning?
15. What is the difference between comets and asteroids? How are comets and asteroids the same?
16. Were there more comets in the past, or has the number of comets in the sky been the same throughout history? If the number of comets was greater in the past, what does this say about the number of meteor impacts and other cosmic catastrophes?
17. What is some evidence that comets are "young," and that they formed recently, not billions of years ago?
18. What is a shooting star? Is a shooting star way out in outer space, or in the earth's atmosphere?
19. Describe some of the largest meteor craters in the world.
20. Why can we say that an asteroid impact did not cause the dinosaurs to become extinct? What is the real reason so many dinosaurs died out? Why do evolutionists like to use the asteroid impact idea to try to explain the death of the dinosaurs?
21. Describe some of the biggest meteorites.
22. What is a possible reason ancient peoples were so much afraid of comets, meteor impacts, and other unpredictable cosmic events?

Activities Together

1. Make a list of features of the solar system that are the result of catastrophes.
2. Make an artificial impact crater. Outdoors, fill a large flat container with sand or loose soil. This is your "impact site." Find a suitable rock to be the "meteor." Drop the "meteor" from a height of several feet and observe the impact crater formed. Try several rocks to get the best impact effect.
3. Another variation: Prepare a layer of thick (not too soupy) plaster of paris on your "impact site."

Form your impact crater, then take away the rock before the plaster of paris hardens. After the “crater” has set, you may paint the plaster to simulate the appearance of a crater on an actual moon or planet.

Projects to Do on Your Own

Research the difference between impact craters and volcanic craters. How can we tell one from the other? Study the Chicxulub Crater. Find out why the evidence indicates it is actually a volcanic crater, and not caused by a meteor or asteroid.

CHAPTER 11 — ARE THERE OTHER PLANETS IN OTHER SOLAR SYSTEMS?

Chapter Summary

Astronomers have not observed other solar systems. Our solar system is unique, as far as we know. Likewise, no life-supporting planets other than earth are known, and extraterrestrial life has never been seen or heard from. The entire topic of extraterrestrial life is a battle ground for spiritual warfare, with Satan attempting to convince mankind that he can find help and spiritual guidance outside of the Redeemer, Jesus Christ. Most UFOs are mistaken cloud formations or other ordinary objects. Some UFOs may in fact be classified military craft not recognized as such by the public.

Terms to Know and Spell

binary star system	exobiology	SETI
double star system	extraterrestrial life	UFOs

Fill in the Blanks

In the sentences below, fill in each blank with a term from the list above. Each term is used once.

1. A _____ is a multiple star system which has two stars.
2. Another term for “double star system” is _____.
3. _____ is life which supposedly lives somewhere besides the earth. Astronomers have found no evidence of _____ anywhere. (Use the same term twice.)
4. Some scientists have coined the term _____, meaning the study of extraterrestrial life.
5. _____ is short for “Search for Extraterrestrial Intelligence.”
6. _____ stands for “Unidentified Flying Object.”

Discussion Questions

The following approaches may be used for answering the questions below:

- (1) the questions may be answered on a sheet of paper as essay questions;
 - (2) if the number of children permits, the children may be organized in discussion groups to discuss answers to the questions;
 - (3) if the number of children permits, the parent or teacher may guide a class discussion to answer the questions.
1. Planets outside the solar system have never been observed. What kinds of observations have some astronomers interpreted to mean that other planets exist?
 2. Why do evolutionists want to find evidence of planets outside the solar system?
 3. Has life been detected in the solar system except on earth?
 4. What does the Bible say about extraterrestrial life?

5. What are UFOs?
6. To whom does the Bible say we are to look for spiritual guidance and intelligence?
7. Why are many evolutionists so keen to find evidence of ET life?
8. How can the search for ET life lead to spiritual deception?
9. How can an obsession with UFOs lead to spiritual deception?
10. Do you think that there could be a tendency by some inventors and technologists to allow the public to believe in UFOs, as an “explanation” for advanced or classified technology being developed? Why or why not?

Activities Together

1. Make a list of Bible verses about the unique life-supporting purpose of the earth.
2. There is the mistake of believing that the Bible is not a universal book, but applies only for the earth itself. Discuss and memorize some Bible verses that emphasize the fact that the Bible is true for every place in the universe. Since the Bible assigns a unique purpose to the earth for life support, what does this say about the possibility of any other part of the universe supporting life?
3. Research this question: How long does military technology or other technology sometimes exist before it is generally known to the public? What might the public think if it got glimpses of the new technology before it was “unveiled”? A couple of examples to help get you started: (1) modern fax machines, developed before the end of World War II, not widely marketed until the 1980s, 35 years later (“Your New World of Tomorrow,” *National Geographic*, October 1945, p. 393); (2) “Stealth” technology, developed in the 1950s if not before, unveiled during the Reagan administration in the 1980s, at least 25 years later (*Skunk Works* by Ben R. Rich and Leo Janos, Little Brown, 1996).

Projects to Do on Your Own

List and memorize Bible verses that warn against following after ideas and things that lead away from the Lord Jesus Christ.

ANSWER KEY

ANSWERS TO INTRODUCTION

Fill in the Blank Questions:

1. astrology 2. cosmic evolution

Suggested Answers to the Discussion Questions

The answers below are condensed. Actual discussion or essay answers may be much longer.

1. How is astrology different from astronomy?

Astronomy is the scientific study of the heavenly bodies. Astrology is the false belief that the stars and heavenly bodies control our lives.

2. How is cosmic evolution different from genuine astronomy?

Cosmic evolution is the belief that the universe developed on its own without God, or that God “used” evolution. This is practical atheism. Astronomy studied biblically sees the power of God in the heavens and credits God himself with all creative power.

CHAPTER 1 ANSWERS**Answers to Fill in the Blank Questions**

- | | | |
|---------------|---------------------|--------------------|
| 1. astronomy | 4. moons | 7. galaxies |
| 2. astronomer | 5. celestial bodies | 8. galaxy clusters |
| 3. planets | 6. sun | 9. solar system |

Suggested Answers to the Discussion Questions

The answers below are condensed. Actual discussion or essay answers may be much longer.

1. What are some differences between planets and stars?

Planets shine by reflected sunlight, but stars produce their own light.

2. What is the difference between moons and planets?

Moons orbit planets, but we picture planets orbiting the sun.

3. Since all the objects which astronomers study are so far from us, what do you think would be one of the main limitations of astronomy?

Scientists can't actually visit the places which astronomy studies. They must decide many questions in astronomy by studying the light we receive from faraway planets and stars on earth. This means there is uncertainty in many astronomical claims, e.g, how far away the stars and galaxies are, what the most distant galaxies are like, what the interior of planets are like, etc. Yet evolutionists base many of their evolutionary beliefs on these uncertainties.

4. What are some Bible verses that emphasize that God guides our lives?

Start with verses listed in this chapter.

CHAPTER 2 ANSWERS**Answers to Fill in the Blank Questions**

- | | | |
|------------|----------------------|----------------------|
| 1. Mercury | 7. Neptune | 12. Andromeda galaxy |
| 2. Venus | 8. Pluto | 13. quasars |
| 3. Mars | 9. light-year | 14. universe |
| 4. Jupiter | 10. Proxima Centauri | 15. parallax |
| 5. Saturn | 11. Alpha Centauri | 16. Milky Way |
| 6. Uranus | | |

Suggested Answers to the Discussion Questions.

The answers below are condensed. Actual discussion or essay answers may be much longer.

1. Name the closest celestial body to us, the closest planet, the closest star outside the solar system, and the closest galaxy outside the Milky Way.

The moon, Venus, Proxima Centauri, Andromeda galaxy.

2. Discuss from the Bible why it is unlikely that any astronomer will ever see the "edge" of the universe.

Jeremiah 31:37 states that God would cast Israel off if man ever completely probed the heavens. By implication, since God will never cast Israel off, astronomers will never see the "edge" of the universe.

3. Why can there not be other universes?

By definition, the universe is all there is. Whatever we can see must be in this universe.

4. How is parallax used to measure the distance to stars?

Like objects on a roadside as we drive by them, stars closer to us appear to move faster, and stars farther away seem to move more slowly. Astronomers can observe this motion telescopically and use it to compute the distance. However, if a star is too far away, it has no apparent motion, like distant mountains seen from the window of a moving car, and the parallax method does not work.

5. What is a unique feature of each planet? Why do you think God made each planet different from the rest?

Mercury, closest to sun; Venus, the hottest surface of all planets; Mars, the “Red” planet; Jupiter, the biggest planet; Saturn, the most prominent rings; Uranus and Neptune, planets seven and eight; Pluto, the most distant planet. God made each planet unique to reveal His ability to create, and His love of individuality.

CHAPTER 3 ANSWERS

Answers to Fill in the Blank Questions

- | | | |
|-----------------|----------------|-----------------|
| 1. Genesis 1:31 | 3. Romans 1:20 | 5. Psalm 33:6 |
| 2. Genesis 2:1 | 4. Genesis 1:1 | 6. Genesis 1:16 |

Suggested Answers to the Discussion Questions

The answers below are condensed. Actual discussion or essay answers may be much longer.

1. Why is “cosmic evolution” a false idea?

No one can observe it now or in the past. The Creator has told us how the cosmos really came to be. He created it. It didn’t evolve.

2. Explain why cosmic evolution is not the same as true biblical creation.

The Bible doesn’t present God as ever having “used” any evolutionary process to create. Biblical creation is the fact that God spoke the universe into existence by His infinitely powerful creative word. Creation was an act, not a process (such as evolution).

3. Discuss some Bible verses that clearly state that God created the heavens.

Genesis 1:1 states that God created the heaven and the earth. The Hebrew for “create” is the word “*bara*,” meaning creation from nothing. Other verses include Exodus 20:9–11.

4. Why can we say that planets and moons were created on the fourth day of the creation week?

Until fairly recently, planets and moons were classed as stars. Only the earth, the sun, and the moon were not stars. As the years passed, the word “star” took on a narrower meaning. Instead of referring to all heavenly bodies outside of the earth, the sun, and the moon, “star” was narrowed to mean only heavenly bodies that shine with their own light. Under the old definition of “star,” planets and moons were included in Genesis 1:16, which says that God “made the stars also.” This was on the fourth day of the creation week.

5. Ancient peoples defined the word “star” differently than the way we do. Does this mean that ancient peoples were primitive, or only that they did some things differently from us?

It only means they were different. Ancient peoples clearly understood that stars (in the modern sense) were not the same as planets. In fact, the bodies we call planets were called “wandering stars,” or simply “wanderers.” The Greek for wanderers was “*planetos*,” from which we get planet. We need to reject the false idea that ancient peoples were “primitive” or less intelligent than we.

6. Why does the Bible not mention such a thing as the “solar system”? Does this mean that ancient peoples were primitive and backward? Were ancient peoples in any way held back from understanding the motions of celestial objects in the heavens?

The biblical focus is on the earth. It is the earth which is emphasized in Genesis chapter 1 as man’s home, it is the earth which God states He made “to be inhabited” (Isaiah 45:18), it is to the earth that Jesus came, and it is to the earth that He will come again. The role of the planets (and stars outside the solar system) is defined completely in terms of support for life on earth. Furthermore, the ancients accomplished all the predictions of modern astronomy without reliance on the concept of the solar system. It is not a concept which is required for observations and predictions in astronomy.

7. Why do we know there was not a big bang?

The big bang would have started the universe in chaos, but the Bible makes it very clear that the universe began in perfection, not chaos.

8. What are some Bible verses that state that the creation is finished, and not evolving?

Genesis 2:1 is one of the most definite statements.

9. What does Romans 1:20 tell us about why God created the universe?

This verse says that God created the universe to reveal himself.

10. Why do evolutionists want to believe the universe is expanding? Is there conclusive evidence that the universe is expanding at all?

If there were a big bang, then the universe must be expanding. But there is no conclusive evidence the universe is really expanding. Evolutionists “need” the universe to expand. Creationists do not. Whether the universe is expanding or not is not a problem for the creationist.

CHAPTER 4 ANSWERS

Answers to Fill in the Blank Questions

- | | | |
|-----------------------|------------------------|--------------------------|
| 1. lunar phases | 6. solar eclipses | 11. sunspots |
| 2. new moon | 7. lunar eclipses | 12. pinhole camera |
| 3. full moon | 8. total solar eclipse | 13. refractor |
| 4. first quarter moon | 9. corona | 14. reflecting telescope |
| 5. last quarter moon | 10. partial eclipse | 15. aperture |

Suggested Answers to the Discussion Questions

The answers below are condensed. Actual discussion or essay answers may be much longer.

1. Describe the sequence of lunar phases.

The first phase is new moon when the moon is not visible. The second phase is first quarter when the moon looks like a semicircle. The third phase is full moon, when the moon is fully illuminated and looks like a full circle. The fourth phase is last quarter, when the moon again looks like a semicircle. The entire phase sequence takes about a month, with about one week between phases.

2. Describe what happens during a total solar eclipse. What is the appearance of the sun during a total solar eclipse?

The moon comes between the sun and the earth. The sun itself is black, and around the black disk of the sun is the corona, a fiery-looking halo of gases surrounding the sun which is not normally visible. The sky on earth takes on a night-time appearance. Birds may even begin to roost and animals act as if darkness is falling.

3. Describe how to make a pinhole camera.

Get a good sized shoe box or other similar container. Put a very small hole (the “pinhole”) in one end, then nearby put a bigger hole for viewing. To use the pinhole camera, look through the viewing hole at the image formed through the pinhole.

4. Describe what happens during a total lunar eclipse. Why does the moon look red during a total lunar eclipse?

The earth comes between the sun and the moon. The moon looks red because the earth’s atmosphere bends sunlight around the curvature of the earth. The color in sunlight which is bent (“refracted”) most effectively is red.

5. How often do total solar eclipses happen in a given locality? partial solar eclipses? lunar eclipses?

Total solar eclipses are rare, happening only once every few centuries in a given place. Partial solar eclipses are much more common, happening every decade or so in a given place. Lunar eclipses happen every few years in a given place.

6. What are the two types of telescopes? Which kind is most commonly used in astronomy?

Refracting telescopes and reflecting telescopes. The reflector is most common in astronomy because it can provide high magnification at low cost.

CHAPTER 5 ANSWERS

Answers to Fill in the Blank Questions

- | | | |
|-------------------|------------------------|--------------------|
| 1. constellation | 6. Greenwich Mean Time | 11. Little Dipper |
| 2. Polaris | 7. universal time | 12. asterisms |
| 3. lunar calendar | 8. Ursa Major | 13. Betelgeuse |
| 4. solar calendar | 9. Big Dipper | 14. Messier system |
| 5. solar year | 10. Orion | |

Suggested Answers to the Discussion Questions

The answers below are condensed. Actual discussion or essay answers may be much longer.

1. What are some Bible verses that tell us God’s purposes for creating the heavenly bodies?

Romans 1:20 tells us that God made all creation to reveal himself and His power, His creative ability, etc.

Genesis 1:14–18 tell us that God made the heavenly bodies to mark time intervals — seasons, days, and years. They are time-tellers. The sun and the moon also provide light for the earth. Extrabiblically, it has been found that planets stabilize the distance of the earth from the sun, and that the stars, sun and moon all provide navigational and migrational cues for life on earth.

2. How are the sun and the moon used as the basis for calendar systems?

The phases of the moon are the basis for the lunar calendar. Each new moon is the beginning of a new month. The solar calendar defines a year as the time required for the sun to assume the same position in the sky as on the previous January 1.

3. How does modern time-telling fulfill the ancient purposes revealed by God for the heavenly bodies?

Ultimately, all clocks and calendars are synchronized with the motions of the heavenly bodies. Each day, the instant of 12 noon “universal time” is observed as the point in time when the sun passes directly overhead in Greenwich, England. Even atomic clocks, supposedly the most accurate clocks

ever built by man, are calibrated with the passage of time as given by the heavenly bodies. Modern man continues to use the heavenly bodies for exactly the same purpose revealed to the ancients in Genesis 1:14–18.

4. What are constellations?

Patterns of stars in the sky, recognizable to many cultures.

5. How are constellations related to astrology?

Nimrod, at Babel, led the people in worshipping the heavenly bodies, including constellations. Eventually this sky-worship grew into the belief that stars, not God, control our lives.

6. How do astronomers use the constellations?

Astronomers have defined 88 constellations as an aid to mapping out regions of the sky, in much the same way as a country is divided into states or provinces.

CHAPTER 6 ANSWERS

Answers to Fill in the Blank Questions

- | | | |
|----------------------|-------------------|--------------------|
| 1. Robert H. Goddard | 5. Alan Shepard | 9. Columbia |
| 2. Werner von Braun | 6. Apollo 8 | 10. Mir |
| 3. Sputnik | 7. NASA | 11. Voyager 2 |
| 4. John Glenn | 8. Neil Armstrong | 12. Viking mission |

Suggested Answers to the Discussion Questions

The answers below are condensed. Actual discussion or essay answers may be much longer.

1. Why must rockets carry their own oxygen for space travel?

There is no air or oxygen in outer space, and rocket fuel must have oxygen to burn.

2. Describe the history of rocketry.

The most ancient rockets we know of were military. Military rockets were used by the ancient Chinese. Goddard built the first workable modern rockets. During World War II, von Braun in Germany developed rocket technology further than ever before, partly based on Goddard's work. After the War, von Braun came to the United States and headed up America's rocket and space program until his death in 1977. Von Braun supervised many firsts in space, such as the first flight of man to the moon in 1969.

3. Outline the high points of the United States space program.

The first American in space (i.e., above the earth's atmosphere) was Alan Shepard in 1961. John Glenn first orbited the earth in 1962. The first moon landing was the Apollo 11 mission in 1969. The first space shuttle, the Columbia, was launched in 1981. The most successful planetary probe was the Voyager 2 mission, 1979–1989. Many recent efforts in space have focused on space station missions, especially with the Russian space station Mir.

4. Describe the journey of the Voyager 2 probe through the solar system.

Voyager 2 saw the planets Jupiter, Saturn, Uranus, and Neptune, and their moons, close-up, for the first time, over the years 1979–1989.

5. The space program has given us lots of new information about the solar system. Describe how this information has strengthened the scientific case for creation.

Much of the new data returned from space has strengthened the ideas that the planets and moons are "young" (not billions of years old), and that each heavenly body was created uniquely ("special creation,"

whereas evolutionism says the whole solar system came from the same cloud or nebula, and thus should show similarities among moons and planets). Evidence of “youth”: Jupiter’s continued heat loss; continued existence of Saturn’s rings, etc. Evidence of uniqueness and “specialness”: Mercury’s unique iron core; Venus’ unusual retrograde rotation, etc.

CHAPTER 7 ANSWERS

Answers to Fill in the Blank Questions

- | | | |
|---------------------------|-----------------------|---------------------|
| 1. lunar recession | 7. nuclear fusion | 12. planetary rings |
| 2. moon rocks | 8. solar shrinkage | 13. Titan |
| 3. solar flare | 9. nebular hypothesis | 14. Great Red Spot |
| 4. solar prominences | 10. prograde | 15. Great Dark Spot |
| 5. Hermann von Helmholtz | 11. retrograde | 16. Charon |
| 6. gravitational collapse | | |

Suggested Answers to the Discussion Questions

The answers below are condensed. Actual discussion or essay answers may be much longer.

1. What is God’s special purpose for the earth?

To support life. He formed it “to be inhabited,” Isaiah 45:18.

2. Discuss the significance of the fact that in all the universe, only the earth is known to have liquid water.

Life requires liquid water, yet only the earth has it. One is led to conclude that the earth must be the only life-supporting planet. (Arguments for other extraterrestrial life-forms based on some other solvent than water do not hold up, because studies of stars and gas clouds in the universe reveal that the elements, and therefore their chemistry, are the same throughout the entire cosmos.)

3. Discuss some reasons why God created the other planets besides the earth.

As time-tellers (Genesis 1:14–18); to provide light on the earth; to stabilize the earth in its distance from the sun. Also, to provide migrational and navigational cues for animals.

4. What is the purpose which the Bible states for the moon?

To give light for the night on earth.

5. What is some evidence that the moon was created recently, and did not evolve from the earth billions of years ago?

Lunar recession. If the moon were really billions of years old, it would be at a completely different distance from the earth (if it were still near the earth at all), due to recession accumulated over the eons.

6. What is the purpose which the Bible states for the sun?

To give light for the day on earth.

7. What are some facts about the sun that make it different from most other stars?

It is more stable than most stars; and it is not part of a close-knit system of stars.

8. Describe the idea of gravitational collapse for explaining where the sun gets its heat.

The sun is a ball of hot gases. The sun’s gravity makes the gases fall to the center of the sun. As the gases fall, they lose energy. This energy is given off by the sun as light and heat for the life on earth.

9. Why do evolutionists prefer the idea that the sun gets its heat exclusively from nuclear fusion?

Because nuclear fusion allows the sun to have a lifetime of a few tens of billions of years, longer than the alleged evolutionary age of the solar system (about 5 billion years). Gravitational collapse would energize the sun for only tens of millions of years, too short for the inflated evolutionary time scale. So evolutionism avoids the reality of gravitational collapse. (Though gravitational collapse could continue for tens of millions of years, it has been happening for only the 6,000 or so years since creation.)

10. Compare the evidence that gravitational collapse is happening in the sun, versus the idea that nuclear fusion is responsible for the sun's heat.

The sun is shrinking, thus verifying gravitational collapse. If nuclear fusion were dominant, the sun should be producing many more "neutrinos" than it is observed to produce. Thus, either nuclear fusion is not happening, or it is not a dominant process.

11. What is some scientific evidence that the sun is "young," not billions of years old?

The time for complete gravitational collapse is tens of millions of years. While much larger than the true biblical chronology, nevertheless this fact completely disproves the evolutionary claim that the sun must be billions of years old.

12. What is the nebular hypothesis? Why is it a false idea?

The nebular hypothesis is the idea that the solar system evolved from a gas cloud. It is false because the Bible presents the creation as originating in perfection at the word of God, and not out of a disorganized, chaotic cloud. Furthermore, no one has ever shown how dust and debris in a cloud can actually come together to form larger bodies and structures.

13. What is some evidence that Mercury and Venus did not evolve, but were created?

Mercury has a uniquely larger iron core, different from all the other planets. Venus has retrograde rotation, very unusual and not like most of the other planets. If all the planets had really evolved out of a nebula, they should all have the same rotation, nearly the same composition, etc. This is not what is observed.

14. How is Mars similar to the earth? How is it different?

Mars is actually more different from the earth than it is similar. The similarities are only superficial. It rotates in 24-1/2 hours, it has four seasons like the earth, and its temperature during its peak summer daytime seems close to that of earth. The differences are more substantial: no liquid water, a very thin atmosphere of mostly carbon dioxide (car exhaust), and a surface of mostly iron oxide (rust) with no soil or nutrients.

15. Explain why Mars cannot support life.

From the Bible, why would we expect that Mars has never supported life? It has no liquid water and a surface without the nutrients required for life. The Bible mentions only the earth as having a life-support purpose (Isaiah 45:18). The planets other than earth have other purposes that do not include supporting life of their own. Thus, Mars has never supported its own life. This conclusion tallies with the absolute failure of secular astronomers to find evidence even of past life on Mars, though several space missions and billions of dollars have been spent in the effort.

16. Why do evolutionists keep searching for evidence that Mars once supported its own life?

Evolutionism needs to find proof that the earth is not unique, but is just another planet among many with evolving life. Finding life on Mars would make the earth seem "less" unique. Evolutionism does not like the uniqueness of the earth because the Bible constantly ties this idea to the reality of special creation by God himself. If God made us, we are answerable to Him. This is the awful conclusion which evolutionists have tried to escape, from Charles Darwin down to evolutionists of the present.

17. Why have evolutionists given up on the idea that Jupiter or Saturn could support life?

Recent data have shown that they are absolutely inhospitable to life.

18. Explain some evidence that Saturn's moon Titan was created recently, and is not billions of years old.

Titan is losing its atmosphere at a high rate. Only if Titan is "young" would the atmosphere still be there. Thus Titan is not billions of years old.

19. Describe some unique features of Uranus and Neptune.

Uranus rotates retrograde, a nearly unique feature. Its axis has a 98° tilt, not $23\text{-}1/2^\circ$ like the earth's axis. This is the highest tilt in the solar system. Uranus and Neptune both have rings, not a unique feature in itself; but the age of the rings seems to be uniquely young.

20. What discovery has shown that Pluto is truly a planet in its own right, and not an escaped moon of Neptune?

Pluto has a moon of its own, Charon. Only planets have moons. (Evolutionists have striven mightily to overcome this conclusion by finding moons that orbit other moons, asteroids that orbit other asteroids, etc. Nevertheless, Pluto remains a thorn in the side of evolutionism.)

21. What do the many unique features of all the planets reveal about the character of God?

God looks at each thing He has created as individual. God loves diversity in that He created each heavenly body different from the others. God expects us to live in conformity to His laws, but He does not expect people to conform to man-made systems or the world system which violate His laws.

22. Why do you think evolutionists are uncomfortable with the idea that planets are all unique and different?

Evolutionism needs to show that all the planets came from the one nebula. Too many differences make it impossible to explain how this could have happened. So textbooks often make it appear that planets are similar by ignoring the differences.

CHAPTER 8 ANSWERS

Answers to Fill in the Blank Questions

- | | | |
|----------------------|-----------------------|---------------------------|
| 1. spectral analysis | 4. spectral classes | 7. x-ray sources |
| 2. helium | 5. stellar magnitudes | 8. look-back time |
| 3. hydrogen | 6. black holes | 9. Large Magellanic Cloud |

Suggested Answers to the Discussion Questions

The answers below are condensed. Actual discussion or essay answers may be much longer.

1. How do we know that God considers the earth more important than all the stars?

He made the earth first of all places on the first day of the creation week (Genesis 1:1); and Genesis chapter 1 tells more about God's creative work on earth than any other place. Only Genesis 1:14–18 (5 verses) concerns all the bodies of outer space.

2. What are stars made of?

Mostly hydrogen and helium, plus a very small percentage of other elements.

3. Describe how astronomers have worked out what stars are made of.

Each element, when heated to a very high temperature, gives off a certain color of light. The colors are called a "spectrum" (plural, spectra). Astronomers can study the spectrum given off by a star to detect the colors given off by each element in the star.

4. Describe some of the differences between stars.

Size, temperature, rotation rate, magnetic field, gravitational field, etc.

5. What is the definition of a black hole? Has anybody ever seen one? Is it possible for anyone ever to see one?

A black hole is supposed to be an object so massive that nothing, not even light, can escape from it. That is why a black hole is supposedly black. No one has ever seen a black hole. Furthermore, it is not even possible to see one. This last fact should make a person suspect that black holes are more of a belief than science, because science is built on observation, and black holes cannot be observed.

6. Why do evolutionists believe that black holes must exist?

They believe that black holes must be the end stage of evolution for certain kinds of stars.

7. What are the farthest objects we can see without a telescope?

Galaxies, such as the Andromeda galaxy.

8. The light-year is a unit of distance, not a unit of time. Explain why this is so.

The light-year is the distance light travels in one year. If the speed of light had been higher in the past, the distance traveled in one year would be greater, and the “light-year” would represent a greater distance than it does today. It is a mistake to think of the light-year as indicating time of travel. It does not follow that because the Andromeda galaxy is some 2 million light-years away, it must be 2 million years old.

9. What is look-back time? Explain why look-back time extends only thousands of years into the past, not billions.

Look-back time is the time it has taken light from a celestial object to reach us. Since light from the sun takes 8 minutes to reach us, we are really seeing the sun as it was 8 minutes ago, so the look-back time for the sun is 8 minutes. Evolutionists often confuse light-years with time, and say, for example, that since Andromeda is 2 million light-years away, it must have a look-back time of 2 million years, and be 2 million years old. This would be true only if the light had really taken 2 million years to reach us. With a higher speed of light in the past, the travel time for the light was less than 2 million years. From the Bible, we know that the age of the universe is thousands of years, and look-back times cannot be higher than this.

10. God did not create exploding stars and other catastrophes. What is a possible reason astronomers can see exploding stars billions of light-years away, yet the universe is not billions of years old?

In the past, the speed of light was higher, so stellar catastrophes became visible to earth in the true (biblical) time frame of the universe, a few thousand years. These catastrophes would be billions of light-years away only in terms of the present-day, slower speed of light, not the ancient higher speed.

CHAPTER 9 ANSWERS

Answers to Fill in the Blank Questions

- | | | |
|----------------|----------------------|-------------------|
| 1. Ring Nebula | 4. Crab Nebula | 7. variable stars |
| 2. nova | 5. nebula | 8. Beta-Pictoris |
| 3. supernova | 6. supernova remnant | |

Suggested Answers to the Discussion Questions

The answers below are condensed. Actual discussion or essay answers may be much longer.

1. What are some ways in which sin has caused destruction in the cosmos?

Stellar explosions, novae, supernovae, etc.

2. How do we know from the Bible that the effects of sin on the creation extend to the entire universe?

Romans 8:20–22 tells us the entire creation is groaning under the effects of sin.

3. How do we know from the Bible that God did not create catastrophes and all the products of destruction? What are some things in the cosmos, that in their present condition, are not like God made them, but were produced by catastrophes.

Genesis 1:31 tells us that after God finished His creation, He pronounced it “very good.” For God to say this means it was perfect. This condition of perfection extended to the cosmos, not just the earth, for Genesis chapter 1 addresses the creation of the entire universe, not just the earth. Sin has produced remnants of destruction, such as supernova remnants, nebulas, gas and dust clouds around stars, etc. Ironically, most of these products of destruction are seen by evolutionists as proof the universe is somehow evolving rather than dying!

4. How do O and B stars show that stars were created recently, and are not billions of years old?

They would burn out in tens of millions of years at the very most, yet they are still shining. They have not had time to burn out!

5. Compare the stability of the sun with the instability of most other stars.

The sun is much more stable than most stars. Most stars are variable, or even explosively unstable.

6. Why do we say that there is no evidence that gas clouds are contracting to form new stars?

Examination of the gas and dust in actual clouds shows that the material in the clouds is always expanding away from the star that produced it, never the reverse. Since no observed clouds show contraction, there is no observational evidence for the idea that new stars are forming. Biblically, Genesis 2:1 says the creation is finished.

7. Which one has really been observed, star birth or star death? Where does the gas and dust surrounding many stars come from?

Only star death by explosions has been observed, never star formation. The debris surrounding many stars is not evidence they are forming, but comes from explosions involved in their own self-destruction.

8. Why is it proper to say that star birth is really a myth?

It has never been observed in any way. It is only a belief without any observational basis.

CHAPTER 10 ANSWERS

Answers to Fill in the Blank Questions

- | | | |
|---------------------|----------------------------|---------------------------|
| 1. shepherd moons | 10. symmetrical cratering | 18. Perseids |
| 2. Miranda | 11. asymmetrical cratering | 19. Arizona Meteor Crater |
| 3. meteor | 12. Valles Marineris | 20. Chubb Meteor Crater |
| 4. Apollo asteroids | 13. Olympus Mons | 21. Sudbury deposits |
| 5. Deimos | 14. comets | 22. Chicxulub Crater |
| 6. Phobos | 15. Halley's comet | 23. Hoba Meteorite |
| 7. asteroid impact | 16. Oort cloud | 24. Tunguska event |
| 8. meteor impact | 17. shooting star | 25. Ahnighito Meteorite |
| 9. Gaspia | | |

Suggested Answers to the Discussion Questions

The answers below are condensed. Actual discussion or essay answers may be much longer.

1. What is there about Saturn's rings that shows the rings formed recently, not billions of years ago?

They are spreading apart at a rate that shows they could not have formed more than a few thousand years ago.

2. Sin has damaged all of the creation. What are some features of the solar system that are different from when God created it, and before sin entered into the creation?

Planetary rings, asteroid belts, comets, meteors, craters on moons and planets, etc.

3. How do evolutionists try to account for the false idea that Saturn's rings are billions of years old? What is the biggest problem with the evolutionary explanation?

The evolutionary explanation is that shepherd moons are holding the rings together. The shepherd moons have not been observed.

4. Discuss some evidence that moons may have exploded in the past.

Several moons have deep canyons or cleavages which make it appear that the moons nearly ruptured. Uranus' moon, Miranda, has extremely deep canyons showing this type of near-destruction.

5. Which planets have rings? If the nebular hypothesis were true, why should all the planets have rings?

Jupiter, Saturn, Uranus and Neptune all have rings. If the nebular hypothesis were true, all the planets should have rings, because rings, in the evolutionary view, are planetary material that failed to coalesce.

6. What are asteroids? Where did they come from?

Chunks of rock mainly between Mars and Jupiter; probably from a planetary explosion between Mars and Jupiter.

7. What is some evidence that the asteroids formed recently, not billions of years ago?

The main asteroid belt is losing asteroids by collisions at a high rate. The asteroid belt would not exist if the solar system were really billions of years old.

8. What is asymmetrical cratering? Discuss some examples of it.

It is uneven cratering on the surface of a moon or planet. Every cratered planetary or moon surface studied to date has asymmetrical cratering, e.g., Mercury, Venus, earth, Mars, earth's moon, Miranda, etc.

9. Discuss how asymmetrical cratering indicates that the asteroids are fragments remaining from an exploded planet.

Asymmetrical cratering is what we would expect to see from the debris of an exploded planet rushing through the solar system. The nebular hypothesis says that planets formed from debris falling in evenly from all directions. This would produce symmetrical cratering, which is what astronomers do not see.

10. What is some evidence that the asteroids are not remnants left over from a planet that failed to form, as the nebular hypothesis claims?

If this were true, there should be many asteroid belts, not just one main one.

11. What are some signs that Mars suffered from many catastrophes in the past?

Olympus Mons, the biggest volcano known in the solar system; the Valles Marineris, ten times wider and twice as deep as the Grand Canyon; and evidence of Martian flooding.

12. Why do many scientists feel comfortable with the idea of a huge flood on Mars, but often continue to deny that Noah's flood ever happened on earth?

The Bible connects the earth's flood with divine judgment for sin; the Bible does not mention the Martian flood.

13. Sin is the ultimate factor behind all catastrophes. What is a possible physical explanation of the catastrophes which damaged the solar system in the past?

Certain processes caused the build-up of heat in moons and planets, causing some to explode, and causing others to release the heat by volcanism, etc.

14. What is the evidence, both biblical and scientific, that the earth was not created molten and hot in the beginning?

Biblically, the earth was made fit for life from the beginning, and could not have been molten. Even interior heat is ruled out, because, volcanos were not part of God's "very good" (i.e., perfect) creation before sin came in. Volcanos cause death, and death was not in the creation before man sinned (Romans 5:12). Scientifically, radiohalos in the rocks show that the earth's interior was cool in the beginning. It got hot because of heat build-up only after God's curse on the ground caused instability and physical destruction.

15. What is the difference between comets and asteroids? How are comets and asteroids the same?

The main difference seems to be that comets orbit close enough to the sun to develop a highly visible tail. In other ways, astronomers believe they are similar, even the same. For instance, they both seem to have a similar rocky core.

16. Were there more comets in the past, or has the number of comets in the sky been the same throughout history? If the number of comets was greater in the past, what does this say about the number of meteor impacts and other cosmic catastrophes?

More comets in the past. The Romans saw many very bright comets each year. This means the number of comets is decreasing, and that the number of impacts and craters formed per year must have been higher in the past.

17. What is some evidence that comets are "young," and that they formed recently, not billions of years ago?

Astronomers believe that comets came from the same planetary explosion that caused the asteroids. Like asteroids, comets are burning out and the number of visible comets is declining. If the universe were really old, comets would have disappeared long before now.

18. What is a shooting star? Is a shooting star way out in outer space, or in the earth's atmosphere?

A "shooting star" is a meteor burning up as it travels throughout the earth's atmosphere. Shooting stars are only visible because they are gaining heat from atmospheric friction as they enter the earth's atmosphere. Thus, they are not way out in outer space.

19. Describe some of the largest meteor craters in the world.

The Arizona Meteor Crater (600 feet deep and a mile wide); the Chubb Crater (now a lake, some two miles wide); and the Sudbury deposits, so large that they are the source of some 20% of the world's nickel.

20. Why can we say that an asteroid impact did not cause the dinosaurs to become extinct? What is the real reason so many dinosaurs died out? Why do evolutionists like to use the asteroid impact idea to try to explain the death of the dinosaurs?

No impact crater large enough to signify global destruction has been found. The Flood explains the climate changes responsible for the eventual death of most dinosaurs. Evolutionists favor the impact idea, and almost any other idea that avoids the necessity for a Flood.

21. Describe some of the biggest meteorites.

The largest is the 66-ton Hoba; the largest in a museum is the 36-ton Ahnighito.

22. What is a possible reason ancient peoples were so much afraid of comets, meteor impacts, and other unpredictable cosmic events?

They were injured and killed by impacts, and these memories persisted into recent centuries.

CHAPTER 11 ANSWERS

Answers to Fill in the Blank Questions

- | | | |
|-----------------------|--------------------------|---------|
| 1. double star system | 3. extraterrestrial life | 5. SETI |
| 2. binary star system | 4. exobiology | 6. UFOs |

Suggested Answers to the Discussion Questions

The answers below are condensed. Actual discussion or essay answers may be much longer.

1. Planets outside the solar system have never been observed. What kinds of observations have some astronomers interpreted to mean that other planets exist?

Stars that wobble due to the attraction of nearby stars; stars surrounded by clouds of dust and gas.

2. Why do evolutionists want to find evidence of planets outside the solar system?

The idea of a single, unique solar system seems to prove “special creation.” Evolution, if it were happening, should be at work everywhere, producing other planets and solar systems besides the one we are in.

3. Has life been detected in the solar system except on earth?

Absolutely not.

4. What does the Bible say about extraterrestrial life?

Absolutely nothing.

5. What are UFOs?

Unidentified Flying Objects.

6. To whom does the Bible say we are to look for spiritual guidance and intelligence?

Jesus.

7. Why are many evolutionists so keen to find evidence of ET life?

They want to believe that life is evolving everywhere. Life on only one planet of the universe seems like “special creation.”

8. How can the search for ET life lead to spiritual deception?

One can be led into the occult; demonic apparitions cannot be ruled out. At the very least, focusing on ET life turns one’s attention away from Jesus, the author of our salvation.

9. How can an obsession with UFOs lead to spiritual deception?

It breeds the idea that “other races” are “out there” to help us, thus turning one’s thoughts away from help in Jesus Christ.

10. Do you think that there could be a tendency by some inventors and technologists to allow the public to believe in UFOs, as an “explanation” for advanced or classified technology being developed? Why or why not?

Possibly. The military needs “cover” for classified technology. What better “cover” than a belief in aliens in UFOs in the public mind? Anyone so conditioned would automatically think “alien UFO” when seeing earth-bound, possibly classified aircraft.