



# The GED Science Test

## *Earth and Space Science*



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California Distance Learning Project  
[www.cdlponline.org](http://www.cdlponline.org)

# GED

## Video Partner



### #24 Passing the GED Science Test

The surest sign that intelligent life exists elsewhere in the universe is that it has never tried to contact us.  
*Calvin and Hobbes, Bill Watterson*

Video 24 Focus: the Earth, its place in our Universe, and how we use the Earth's resources.

#### You Will Learn From Video 24:

- How our Earth is always changing.
- About the rock cycle and the water cycle.
- How the Earth was formed.
- About renewable and non-renewable resources.



#### Words You Need to Know:

While viewing the video, put the letter of the meaning by the correct vocabulary word. Answers are on page 21.

- |                     |  |
|---------------------|--|
| _____ 1. subduction | a. a resource that is inexhaustible                  |
| _____ 2. mantle     | b. a process where one plate is forced under another |
| _____ 3. renewable  | c. the blanket of air surrounding the Earth          |
| _____ 4. atmosphere | d. describes how different types of rocks are formed |
| _____ 5. rock cycle | e. the thickest layer of the Earth                   |



#### Points to Remember:

- You must be able to read and understand graphs and charts.
- You must understand how things in nature are connected either by a food chain, rock cycle, or water cycle. Alter a part of the cycle, and the results can be disastrous.
- The Earth is always changing and always moving. Do not just think of the Earth in local terms, but rather in global or even universal terms.

## Earth and Space Science

Where are we? This is a question you have probably asked before, but a question that usually refers to a specific address or a location within a city or town. For some people, though, this question refers to where we are on earth, or even, where we are in the universe.

When considering time and size, humans are actually quite insignificant. We have only existed for about 5 million years. In comparison, cockroaches have lived for at least 300 million years. In terms of size, think about where you live and work. How far do you travel each day? Now, realize that the earth's diameter (the distance from one side to another) is about 7,900 miles, and its circumference (the distance all around the equator) is over 24,900 miles! To us, the earth is extremely large. In fact, we still have not even explored it in its entirety. Nevertheless, even Earth is insignificant when compared to the Universe. The Universe is so gigantic that its size is still unknown.

To put things into perspective, here are some examples of what we know, or suspect, about our universe.

1. The earth belongs to a solar system containing nine planets and the Sun, and the Earth is considered one of the smaller planets in our solar system. Jupiter, for example, is so much larger than Earth that all of the other planets could fit inside of Jupiter.
2. Our solar system is located on one of the outer arms, called the Orion arm, of the Milky Way Galaxy.
3. There are approximately 200 billion stars within our galaxy, which would suggest approximately that many solar systems.
4. In the Universe, there are thought to be several billion galaxies.



**Milky Way Galaxy**

Why have we not explored the entire universe, yet? Well, if you were to travel the speed of light, which is 186,000 miles per second, it would take you 100,000 years to cross our Milky Way. Just to get to the nearest galaxy would take you another 2 million years! Talk about gigantic! So what fills all of this “space,” and how was our small and seemingly irrelevant planet we live on formed? That is what Earth and Space Science is all about.



**Colliding Galaxies**

Earth and Space Science is actually broken up into several fields of study. Geology deals with the structure and composition of the Earth. Meteorology deals with the Earth's atmosphere, especially concerning weather. Oceanography deals with the Earth's oceans. Paleontology deals with prehistoric life on Earth. Astronomy deals with space.

### Test Your Knowledge:

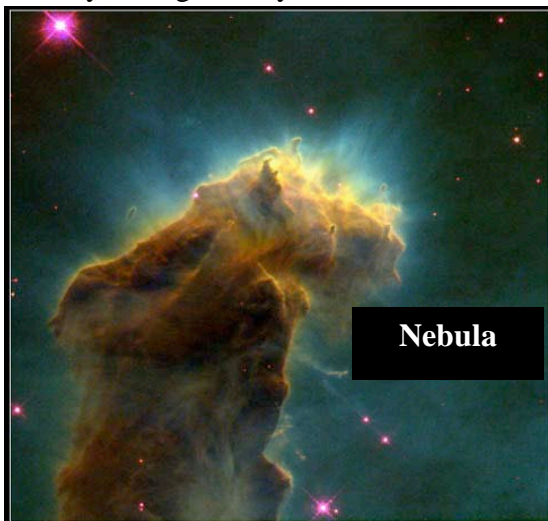
Circle the best answer to the following questions: Answers are on page 21.

- 6) How many miles per second is the speed of light?
  - a) 100,000 miles per second
  - b) 186,000 miles per second
  - c) 2 million miles per second
  - d) the distance that light travels in one year
- 7) What is the largest planet in our solar system?
  - a) Saturn
  - b) Jupiter
  - c) Neptune
  - d) Earth
- 8) Which science deals with the study of outer space?
  - a) Astronomy
  - b) Oceanography
  - c) Paleontology
  - d) Geology

## Earth Science

### How was the Earth formed?

How old is the planet we live on? Scientists believe that the Earth was formed over 4.5 billion years ago. I say "believe," because, of course, there was no one around at the time



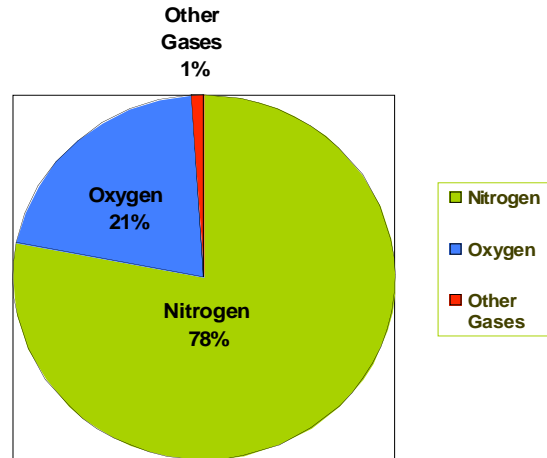
Nebula

the Earth was forming, but scientists do have an idea of how it formed by all of the evidence and observations they have been able to accumulate. In fact, they know much more about the possible creation of the Earth than they do about the creation of the Universe.

The Earth is believed to have formed from the gas and dust left circling the Sun after its own formation, called **nebula**. All of this gas and dust began to cool and condense, finally clustering together into rocks. As the rocks grew, its own gravity

pulled more and more dust and rock particles into it, obviously making it larger, which also increased the strength of its own gravitational pull. These were the beginnings of the planets, including Earth.

Eventually the earth started to heat up and became liquid or **molten**. This molten state allowed the Earth to take its shape and allowed chemical reactions to take place more easily. Later, as it began to cool into the Earth we are more familiar with, the outer “crust” became solid, and an atmosphere formed, but an atmosphere that was quite different than what we have now.



Wow, talk about air pollution! The Earth's atmosphere was believed to contain mostly carbon monoxide, carbon dioxide, methane and water vapor due to the volcanic eruptions. Luckily, oxygen and hydrogen, and hence water, were added from ice-covered comets bombarding the Earth. Yet, it was still not breathable!

Then, about 3-4 billion years ago, life emerged, and it was this early life that changed the composition of Earth's atmosphere to make it more like what we have now, which is 78% nitrogen, 21% oxygen, 0.9% argon, and 0.03% carbon dioxide with very small percentages of other elements. Earth's original atmosphere held very little oxygen compared to today. The earliest and most prosperous life forms are believed to have been cyanobacteria that obtained energy from the Sun and released oxygen into the air, similar to what plants do during photosynthesis.

### Test Your Knowledge:

Circle the best answer to the following questions: Answers are on page 21.

- 9) When do scientists believe life first formed on Earth?
  - a) 5 million years ago
  - b) 300 million years ago
  - c) 3-4 billion years ago
  - d) a billion years ago
- 10) Which element is most common in Earth's present day atmosphere?
  - a) Nitrogen
  - b) Oxygen
  - c) Hydrogen
  - d) Argon



## Present Day Earth

The Earth is always changing. The forces of nature are constantly shaping the Earth's surface in actions that can take place slowly over thousands of years, or swiftly and violently.

To understand more of these changes, you must understand how the Earth is structured.



- Earth's surface consists mainly of oceans, of which there are 5 "world" oceans, the Atlantic, Pacific, Indian, Arctic, and the Southern Ocean. The Pacific Ocean is the Earth's largest ocean.
- Land, which covers about 30% of the earth's surface, is grouped into large continents and small islands. The continents are Asia, North America, South America, Europe, Antarctica, and Australia. These large land masses look motionless; however, they do move and have been moving since their beginning.
- What we call "land" is actually the visible parts of the **crust** of the Earth. It is, in actuality, considerably thin, only a few miles thick, especially compared with the overall diameter of the Earth. The crust itself does not have a major influence on the Earth, however its movement does. The crust can be separated into various parts, called tectonic plates, each being able to move individually. When two plates grind against each other, often, an earthquake is produced.
- Underneath the crust is the **mantle**. The mantle is the thickest part of the Earth's interior, about 1,800 miles thick, and can reach temperatures up to 5400°F.
- The **core** is the center of the Earth. The core is a dense ball of iron and nickel and actually is broken up into 2 parts, an inner and an outer layer. The outer layer is mainly melted (molten) iron and nickel; however, the inner layer, even though it reaches 6700°F, remains solid due to the extremely high pressure.
- The 2 layers of the core are what scientists believe creates Earth's magnetic field. The molten outer core spins along with Earth's rotation, but the solid inner core stays motionless; this "friction" creates a magnetic field.

The core is also important because it supplies us with an internal energy. The core's intense temperatures, sometimes reaching 13,000°F, radiate through the mantle toward the crust. This radiation is called **convection current**, as currents of heat flow through the Earth's mantle. These currents cool as they close in on the surface of the earth, resulting in a horizontal direction of movement along the bottom of the crust. When they cool even more, they descend again toward the core. There the temperature increases, and the currents rise again. The process is repeated constantly. Sometimes when the

convection current reaches a thin part of the crust, it forms a volcano, and, occasionally, the molten lava from the mantle will spew out.

**Mt St. Helens, Washington State**  
Courtesy of US Geological Survey  
1980



### **Test Your Knowledge:**

Circle the best answer to question #11: Answers are on page 21.

11) About what percentage of the Earth's surface is covered by water?

- a) 30%
- b) 50%
- c) 70%
- d) 80%

For Questions #12-14, fill in the blanks with the appropriate word. Answers are on page 21.

12) The \_\_\_\_\_ Ocean is the Earth's largest ocean.

13) The \_\_\_\_\_ is the thinnest layer of the Earth.

14) The thickest layer of the Earth is the \_\_\_\_\_.

### **Earthquakes**

Besides volcanoes, convection currents also produce another potential natural disaster, earthquakes. Earthquakes are produced when the Earth suddenly releases strain energy in the Earth's crust. This strain energy comes from the energy produced by convection currents, which causes various parts of the crust to move. These parts, called tectonic plates, occasionally move against each other, resulting in waves of shaking, moving outward from the earthquake source, or epicenter. These plates "float" above the molten mantle, and do move slowly about 1-10 centimeters per year. These plates not only move horizontally but also vertically, as they are often pushed together, causing one plate to

sink into the hotter mantle. This process is called subduction. Earthquakes happen suddenly and release enormous amounts of pressure. Have you ever experienced an earthquake? Earthquakes also occur daily around the world, however many are too small to be felt. Nevertheless, some are so huge they can cause devastation for hundreds of miles.

Do you know where the largest recorded earthquake occurred? Many people would guess California, Japan or Alaska. The correct answer is Chile, South America in 1960, an earthquake measuring 9.5. Numerous cities in Chile were devastated. The earthquake also created a deadly tsunami, sometimes incorrectly called a “tidal wave,” over 30 feet tall, destroying entire towns and villages. The tsunami even carried itself far away to Hawaii where 61 people were killed due to its powerful effects, and to Japan where hundreds more were killed.

### **Can Earthquakes Be Predicted?**

Nobody can predict earthquakes. There is not enough data, and there are too many variables to account for. Even though researchers around the world are trying to find the key to predicting earthquakes, no one method has succeeded. One of the most popular methods was using animals to predict a coming earthquake. Many people have documented animals behaving strangely right before one hits. Believers say that they can feel the small warning vibrations before a massive wave occurs. Some scientists were even using hamsters, and yet none of the methods has proven reliable.

For more information on earthquakes you may want to visit the following websites:

<http://www.crustal.ucsb.edu/ics/understanding/> and

<http://whyfiles.org/094quake/6.html>

**Mexico City Earthquake, 1985.**  
**Wreckage of a twenty-one story,**  
**steel-constructed building.**  
Courtesy of US Geological survey.



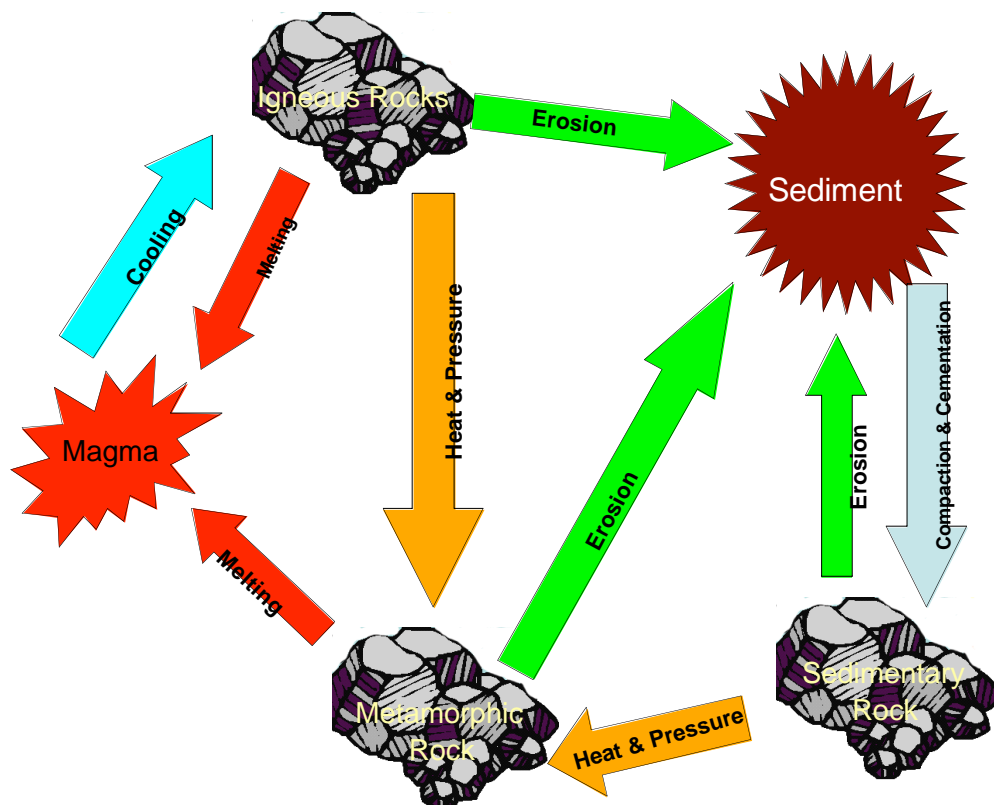
### **Rocks**

Earth scientists gather much of their data and information from studying rocks because those rocks can tell us a story of how the Earth was formed and when. Geologists also use this information to help predict when volcanoes will explode, where deposits of fossil fuels such as oil or coal can be found, and to hopefully give us better warning signs for earthquakes. These rocks can also tell us how certain natural wonders, such as the Grand Canyon, were formed, as well as contain clues, such as fossils, which give us a better idea of how life evolved on Earth! Possibly, even more important than what has already happened here on Earth, is what will happen in the future. By studying the past history of Earth, geologists gain valuable insight on Earth's future.



## The Rock Cycle

Geologists must understand the rock cycle when studying the Earth. The rock cycle explains how different types of rock forming the Earth's crust had emerged. Starting with the extremely hot liquid rock within the mantle, called **magma**, this rock will slowly rise to the surface of the Earth's crust. As it rises, it will cool. Once magma cools, sometimes oozing forth out of a volcano, it will condense into a solid called igneous rock. The second leg of this cycle has igneous rock, such as granite, eroding due to the weather, water, etc. This erosion will cause pieces of rock to fall from the igneous rock. These pieces, often just tiny grains, are called sediment. Wind, water and ice carry sediment into an area called a deposit. This sediment, once enough pressure is applied, will then form sedimentary rock, for example, limestone or even coal. Sedimentary rock can undergo changes in its structure due to earthquakes, heat, and also pressure. These forces will cause sedimentary rock to create crystals, thus turning into metamorphic rock. Examples of metamorphic rock would be slate and marble. Metamorphic rock is often pushed under the crust due to subduction, becoming hotter and hotter, finally liquefying into magma. Nonetheless, the cycle is not a perfect circle, as each rock form can turn into another. You must understand though, that all rock forms are all connected, and the rock cycle never stops! For a better understanding see the diagram below.



## The Rock Cycle

## The Atmosphere of Earth

Now that you understand how the Earth was formed and how it is structured, let us discuss its **atmosphere**, or the envelope of air surrounding the Earth. Since our atmosphere reaches nearly 350 miles from the surface of the Earth, we only seem to pay attention to what we can see from the surface. Fortunately, by using sensitive instruments orbiting in space, we are able to get a better idea of how our entire atmosphere functions.

The atmosphere performs 3 crucial roles enabling life to exist on Earth.

1. It provides us with the necessary gases, oxygen, nitrogen, and carbon dioxide, allowing life forms to breathe.
2. It gives us weather that controls temperatures by blocking much of the Sun's heat and allowing heat collected by the Earth to escape at night.
3. It also blocks ultra-violet light, and for anyone who has received a bad sunburn, you would know why this is beneficial to life on Earth. Fortunately, the ozone layer around the Earth blocks up to 99% of the UV light. To put things into perspective, it is the remaining 1% of UV light that causes sunburns and skin cancer. Imagine what life would be like if the ozone layer were diminished and unable to block 99% of those rays!

One can describe the Earth's atmosphere as a blanket of air enveloping the planet, and that blanket can be divided into 4 separate layers, each with different characteristics, especially concerning density and temperature.



### Troposphere

The lower atmosphere is called the troposphere, and it starts at the Earth's surface and extends 5 to 9 miles up. This region holds what we call the weather and is the densest of all layers in that it contains over half of all the atmosphere's gases. As you rise in elevation in the troposphere, the temperature will drop significantly.

### Stratosphere

The stratosphere starts just above the troposphere and extends to 31 miles up. Compared to the troposphere, this part of the atmosphere is drier and less dense. Unlike the troposphere, the temperature in this region actually remains constant as you increase in elevation due to the absorption of ultraviolet radiation. The stratosphere also contains the ozone layer.

## Mesosphere

The mesosphere starts just above the stratosphere and extends to 53 miles up. In this region, the temperatures fall as low as -135°F as you increase in altitude.

The stratosphere and the mesosphere are called the middle atmosphere by scientists.

## Thermosphere

The thermosphere starts just above the mesosphere and extends to 372 miles high. The temperatures go up as you increase in altitude due to the Sun's energy. Temperatures in this region can go as high as 3140°F. This layer is known as the upper atmosphere.

### Test Your Knowledge:

Circle the best answer to the following questions: Answers are on page 21.

15) Which layer of the atmosphere can reach the highest temperatures?

- a) Troposphere
- b) Mesosphere
- c) Stratosphere
- d) Thermosphere

16) What percentage of ultraviolet (UV) light does the ozone layer block?

- a) 99%
- b) 90%
- c) 10%
- d) 1%

Now that you have a better understanding of the Rock Cycle and the Earth's atmosphere, another cycle will be introduced to you. This cycle describes the close relationship the Earth's land, oceans, and air have with one another.

## The Water Cycle

Are you thirsty right now? Where does your water come from? Thinking "locally," and not "globally," you might answer by saying the faucet, a bottle in the refrigerator, or the water purification plant down the way. But where did they get it?

Did you know that 71% of the Earth is covered by water, yet can you drink it all? The answer is obvious if you've ever tasted the ocean, for oceans make up the majority of the Earth's surface. In fact, fresh water covers less than a 1/10 of a percent of the Earth. So how does fresh water become "fresh"?

The answer to this can be seen in the water cycle. The water cycle explains how water can be transported to different areas around the globe. Since, most water can be found in the oceans, we will begin there.

1. **Evaporation** - The sun's heat causes water from the oceans to evaporate as a gas into the air. The salt is left behind.
2. **Condensation** - As the water vapor rises, it begins to cool and condense, forming water droplets. These water droplets often travel together in the form of clouds that rotate around the Earth.
3. **Precipitation** - Winds push these clouds over land, and eventually the clouds will drop their excess moisture in the form of rain or snow.
4. **Runoff** - Due to gravity, water will always seek the lowest spot it can find. If water cannot seep into the ground, or **infiltrate**, it will run down the mountainsides in streams, often collecting into lakes and ponds, or merging with larger rivers. Rivers, streams, and infiltrated ground water will eventually end up running back into the oceans, thus completing the cycle.

Understanding the water cycle gives us better insight into the importance of protecting the Earth's environment. Like the video says, "land and air pollution are the major sources of ocean pollution." Why should we care? Well, a major portion of our food supply originates in the oceans.

Pay attention to the news and the Internet, for they will give you the latest findings on the effects of pollution and the current state of the Earth. For example, one story that has raised a lot of eyebrows has to do with farm-raised salmon. Our government has declared that farm-raised salmon can be potentially bad for your health if eaten often. Researchers have discovered that the ground-up fish product, which is used to feed farm-raised salmon, often contains chemicals from land pollution. In other words, the fish we use to



feed the salmon are living in polluted environments. Thus, if we eat the salmon we are eating the pollution too! Currently, researchers are still collecting data on the long-term health risks associated with eating farm-raised salmon. Also, there is a movement to force all fish vendors, grocery stores, and restaurants to state where they caught the fish. This is just one example demonstrating how we are affected either directly or indirectly by pollution.



## Resources

The Earth's environment is crucial to our way of life. The more we damage the environment, the worse our quality of life becomes. Have you ever visited a city whose air was filled with smog? It can make for a beautiful sunset, but think about what you are breathing in. Have you ever swum in a pond, lake, or ocean and later developed a strange itch? We need to pay strict attention to our environment, especially when it comes to using the Earth's resources. Not all of the Earth's resources are **renewable**, or have an unlimited supply. This means that many of the Earth's resources we use will run out eventually.

### Test Your Knowledge:

Circle the best answer to the following questions: Answers are on page 21.

17) What part of the water cycle leaves salt behind in the oceans?

- a) Evaporation
- b) Condensation
- c) Precipitation
- d) Runoff

18) What percentage of the earth's water is considered "fresh" water?

- a) 71%
- b) 80%
- c) 90%
- d) 1/10%

## Space Science



### Astronomy

"Space, the final frontier": a phrase you might have remembered from a popular 70s TV show, and even though space is considered the final frontier, the study of space is one of the oldest sciences. For thousands of years, humans have looked up into the night sky in order to contemplate the mysteries of the Universe. How large

is the Universe? Is it growing, shrinking, or remaining constant? What is the Sun made of? Do the stars revolve around the Earth? How were stars formed? What is a black hole? Some of these have already been answered, and yet some remain mysteries.

The 20<sup>th</sup> and 21<sup>st</sup> centuries have shown a significant leap forward into solving some of these mysteries even though others have sprung up in their place. In fact, the study of space does not consist of just astronomers, but rather scientists from all different fields of science and mathematics.



Why is Earth so unique? As far as we know, Earth is the only planet supporting life in the entire universe. There are several key ingredients that have allowed life to flourish on Earth. Can you imagine what would happen if any of those “ingredients” suddenly changed. How cold would the Earth be if its orbit started to draw away from the warmth of the Sun? What if we were drawing closer to the Sun? What would happen to the ocean if the Moon pulled away or came closer? What if our ozone layer dissipated, letting in dangerous ultra-violet light? As you can see, everything is in balance. Let’s hope it stays that way.

Earth’s neighborhood, the solar system, consists of nine planets, several moons, thousands of asteroids, a few comets, and the Sun. They all move due to the gravitational pull of heavenly bodies, in other words anything in outer space that has weight. And, of course, the larger the body, the stronger the pull it will exert. Thus, moons circle the planets, and planets circle the sun. The following are some other objects that can be found in space.



**Comets** are small bodies orbiting the Sun in a predictable way, and are made up of a solid core of dust particles and frozen gas. They are one of the most spectacular sights you could see, even without the aid of a telescope, because as they draw closer to the Sun, their dust particles and frozen gas vaporize, forming large tails thousands of miles long.

The most famous of these comets is Halley’s Comet, which last passed Earth in 1986. Alas, we will not be able to see it again until 2061.

**Asteroids** are very similar to comets but are more like large rocks. They are found primarily between Mars and Jupiter in a field called the “asteroid belt.” They typically will stay in that large belt, but if you have seen any apocalyptic movie, you will have discovered that some asteroids follow their own circulation around the Sun and do occasionally cross the paths of planets and moons. Earth, in fact, has been hit numerous



times before. Luckily, our dense atmosphere causes the breakup of any small asteroid, and it can be seen at night as a bright flame in the sky raining down onto earth.

These are called **meteors**. On a rare occasion, a larger “meteor” will not burn up entirely, but instead it will crash into the Earth. When this occurs, they are called **meteorites**, and it is hypothesized that it was a large meteorite that caused the extinction of the dinosaurs. Without an atmosphere, asteroids have a much greater impact. Looking at the moon, you should be able to see

many impact craters asteroids have made.

### Test Your Knowledge:

Fill in the blanks with the appropriate word. Answers are on page 21.

19. \_\_\_\_\_ are composed of dust and frozen gases.
20. \_\_\_\_\_ burn up before they hit the Earth's surface.
21. Most asteroids are found between the two planets, \_\_\_\_\_ and \_\_\_\_\_.

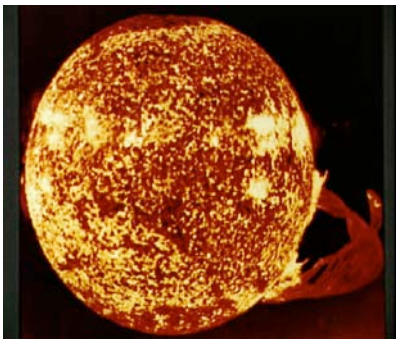
## The Stars

If you have ever enjoyed a nice sunny day, you would appreciate how incredibly valuable our Sun is to us. Of course, the Sun does so much more than granting us a comfortable living temperature, its energy is also used by all green plants during photosynthesis.

The sobering news is that our Sun is not going to live forever. All stars have a set lifespan and will eventually explode into one of the most fantastic structures to have ever been seen. Luckily, stars often live for many billions of years, and our Sun still has many more left.

A star's most useful resource is its energy, yet, too much will cause an inhospitable environment; for example, the planet Mercury is only about 30 million miles away from the Sun and has a high temperature of 472°F, hot enough to melt lead. Its orbit is so close to the Sun, it only takes 88 days to complete a full cycle. So Mercury's year lasts only about 3 months! Too little of the Sun's energy will also create a planet without a possibility for life; for instance, all planets from Jupiter on are much too frozen. Pluto, usually the farthest planet from the Sun, gets as cold as -356°F. In truth, scientists believe that besides Earth, only Mars has a chance of having once supported primitive life, as evidenced by the possible presence of frozen water on Mars.

### The Birth of a Star



**The Sun**  
Courtesy of  
NASA

How is a star born? Gases, most likely from the deaths of past stars, are collected, and as they pool into a cloud, their weight creates gravity, thus pulling in even more gas. As its own gravitational pull grows stronger, the gases contract, or draw in. Think about what keeps you held down on the ground, it is the Earth's gravity. As all of its gases pack tighter and tighter, its temperature begins to rise, finally reaching a few million degrees. Now, it is this extremely high temperature

that allows a star to act as its own energy source. This is because the heat will transform hydrogen atoms into helium atoms by nuclear reactions. These nuclear reactions, similar to nuclear bombs exploding, produce the energy we need on Earth. As long as the star still has hydrogen left, it will keep producing this energy.

### Star Types

The universe is filled with billions of stars, and they do come in different types and sizes. 90% of the stars in the universe are **dwarf stars**, which are young stars. They can be described as follows:

- Yellow Dwarf – our Sun
- Red Dwarf – the most common type of star, cooler than our Sun

Some stars are older and are considered **Giant or Super Giant Stars**

- Red Giant – These stars are about 20 times larger than our Sun and red in color.
- Blue Giant – hotter and larger than Red Giants
- Super Giant – The largest of all stars, when these stars die, they form supernovas and leave black holes.

Eventually all stars will die out and form either of the following:

- White Dwarf – a small, dense star about the size of the Earth, but much heavier
- Neutron Star – a very small star, only about 5 miles across, composed of tightly-packed neutrons
- Pulsar – a neutron star that is spinning, releasing pulses of light energy
- Black Hole – a large area in space that is so dense that its own gravitational pull is so strong, light cannot escape it. It is believed that when giant stars eventually die, they explode, or **supernova**, then leave an area called a black hole.

### Test Your Knowledge:

Circle the best answer to the following questions: Answers are on page 21.

22. A Giant star that suddenly explodes is called a

- a. black hole.
- b. pulsar.
- c. supernova.
- d. red dwarf.

23. These stars are the largest and hottest:

- a. red giants
- b. super giants
- c. red dwarfs
- d. pulsars

24. These are the smallest of stars, only about 5 miles across:

- a. white dwarfs
- b. black holes
- c. red dwarfs
- d. neutron stars

With today's technology we are further expanding our knowledge of space. We are not only sending out remote spacecraft to the farthest reaches of our solar system, but the Hubble telescope is allowing us to see objects in space that we could never have seen on the surface of Earth before. The Hubble telescope floats above us in orbit with Earth, and in 2004, scientists discovered a galaxy 13 billion light years away, for now, the most distant known object from Earth.

Of course, science is not just about observation but also relies on actual collecting. In 2004, NASA sent two "robot geologists," called the Spirit and Opportunity Rovers, to explore the surface of Mars, collecting valuable data for the first time. Will they find evidence of life on Mars?

**Mars viewed by the  
Hubble Telescope.  
Courtesy of NASA**

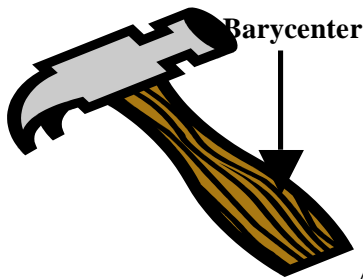


## GED Practice Exercises

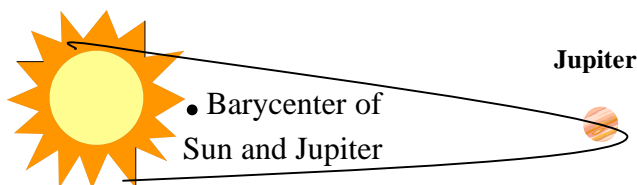
Read the following passage, and then answer questions 1-3 to the best of your ability.  
Answers are on page 21.

Why have we not explored other solar systems even, remotely, through a telescope? Planets in other solar systems are too small and too far away to be seen using a telescope. However, scientists have “discovered” other planets in a rather ingenious way.

First of all, it is not entirely true that a planet revolves around a star like our Sun, while the star remains stationary. It is more correct to say they revolve around a center of mass between the two, called a “barycenter.” A barycenter is the point at which two bodies will rotate around and is determined by each body’s mass or weight. The heavier the object is compared to the other, the closer the barycenter will be to it. Take a hammer, for instance. The head of a hammer often weighs more than the entire handle. The point of balance should not be in the center, but rather closer to the head of the hammer, where most of its weight is found.



A ruler, on the other hand would have a barycenter right in the middle. Scientists do the same with planets and their corresponding suns. For example, Jupiter and the Sun revolve around a center of gravity located just outside of the Sun. See the diagram below.



As planets orbit around a star, the star will wobble because it, too, will slightly move around its “barycenter.” Scientists can view this wobble using telescopes, thus proving the existence of other planets outside of our solar system.



Circle the best answer to the following questions: Answers are on page 21.

1. A barycenter is
  - 1) the center of gravity between a star and a planet.
  - 2) the center of mass inside of a planet.
  - 3) the center of mass inside of a star.
  - 4) the wobbling motion seen in distant stars.
  - 5) the telescope used by astronomers to see distant stars
  
2. Why does a star “wobble”?
  - 1) It is off balance.
  - 2) It is becoming a Red Giant.
  - 3) The gravitational pull from orbiting planets causes it to move slightly.
  - 4) It is an optical illusion.
  - 5) Major explosions occurring on the star’s surface causes it to wobble.
  
3. The center of gravity of a hammer can be found near the
  - 1) head of the hammer.
  - 2) exact center of the hammer.
  - 3) the end of the handle.
  - 4) The outside surface of the handle.
  - 5) The outside surface of the head.

Read the following passage, and then answer questions 4-7 to the best of your ability.

The **Richter Scale** was created to describe the magnitude, or the amount of energy released, of an earthquake.

The scale reads as follows:

**M=1 to 3:** recorded on local seismographs, but generally not felt

**M=3 to 4:** often felt, but no obvious damage

**M=5:** felt widely, slight damage near the epicenter

**M=6:** damage to poorly constructed buildings and other structures within a few miles of the epicenter; some possible injuries

**M=7:** "major" earthquake causes serious damage and injuries up to 60 miles away (recent Taiwan, Turkey, Japan, and California earthquakes).

**M=8:** "great" earthquake, great destruction, loss of life over several hundred miles (1906 San Francisco)

**M=9:** rare great earthquake, major damage over a large region extending to 1000 miles; extensive loss of life. The largest recorded earthquake was 9.5 in Chile in 1960. The largest in the US was in Alaska in 1964, which measured 9.2.

The Richter Scale is based on logarithms, so an increase of "one" is actually 10 times as powerful. An earthquake of 8 is ten times greater than an earthquake of 7.

Circle the best answer to the following questions: Answers are on page 21.

4. What magnitude was the recent earthquake in Taiwan?

- 1) 5
- 2) 6
- 3) 7
- 4) 8
- 5) 9

5. How many times larger would a 9.5 earthquake be compared to 8.5 earthquake?
- 1) Twice as large
  - 2) 5 times as large
  - 3) 10 times as large
  - 4) 100 times as large
  - 5) 1000 times as large
6. Where was the largest earthquake in the US?
- 1) California
  - 2) Alaska
  - 3) Hawaii
  - 4) Oregon
  - 5) Washington
7. What was the magnitude of the largest earthquake in US history?
- 1) 9
  - 2) 7.2
  - 3) 8.2
  - 4) 9.2
  - 5) 10

## Answers & Explanations

Page 1: Words You Need to Know

1. b
2. e
3. a
4. c
5. d

Pages 3-16: Test Your Knowledge

6. b
7. b
8. a
9. c
10. a
11. c
12. Pacific
13. Crust
14. Mantle
15. d
16. a
17. a
18. d
19. Comets
20. Meteors
21. Mars and Jupiter
22. c
23. b
24. d

Pages 17-20: GED Practice Exercises

1. 1
2. 3
3. 1
4. 3
5. 3
6. 2
7. 4