

1 Learn the Skill

People often use the word *theory* to mean a guess. However, a **scientific theory** is an explanation that is supported by all the available data. A theory often summarizes a hypothesis or hypotheses that are supported by many observations, knowledge, and repeated investigations. To **understand scientific theories**, examine the evidence that supports them.

A scientific theory is not just a statement describing something that happens in the natural world. A theory also contains an explanation of why or how something happens.

2 Practice the Skill

By practicing the skill of understanding scientific theories, you will improve your study and test-taking abilities, especially as they relate to the GED® Science Test. Read the passage below. Then answer the question that follows.

BIG BANG THEORY

a A scientific theory is supported by evidence. For example, the theory that the Big Bang was the start of the universe is supported by Hubble's observation.

b A scientific theory is typically a big idea that can explain a number of related occurrences. Here, the idea of the Big Bang provides a common explanation for several scientific phenomena.

In 1929, astronomer Edwin Hubble observed that the galaxies in the universe around our galaxy, the Milky Way, are speeding away from us. This model of an expanding universe was important in developing the Big Bang theory.

The Big Bang theory states that all the matter and energy that exists was once inside a hot, dense mass just a few millimeters across. About 14 billion years ago, a huge explosion blasted that material outward in all directions. This blast, known as the Big Bang, was the start of the universe as we know it.

Three major pieces of evidence support the Big Bang theory. First, if the universe began with a tiny mass that exploded, the galaxies that formed after that blast would be moving away from each other. This phenomenon appears to exist. Scientists also calculated that, given the way the first atoms formed, 25 percent of the mass in the universe should be helium. They discovered that this circumstance is also true. Finally, in the 1940s, scientists predicted that the Big Bang should have left behind background radiation throughout the universe. Such cosmic background radiation was detected in the 1960s.

1. Based on the Big Bang theory, which statement describes an aspect of the universe?

- A. The Milky Way is the center of the universe.
- B. Galaxies will soon begin to move toward each other.
- C. Galaxies are farther apart now than 50 years ago.
- D. A second Big Bang will occur in a few billion years.

USING LOGIC

Compare the answer choices with what you have learned about the evidence that supports the Big Bang theory. Evaluate which choices are consistent with this evidence and which seem to contradict it.

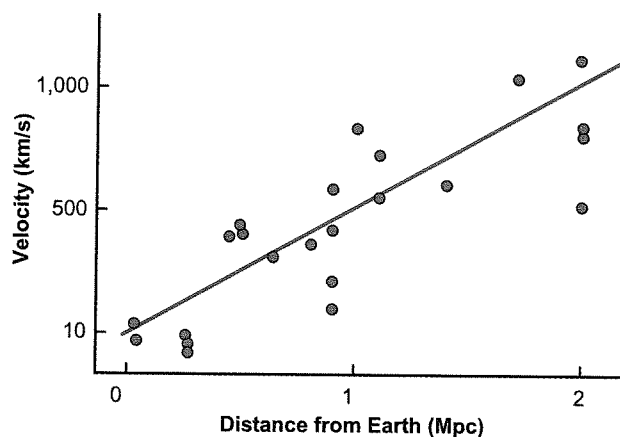
3 Apply the Skill

DIRECTIONS: Study the information and graph, read each question, and choose the **best** answer.

WORK OF EDWIN HUBBLE

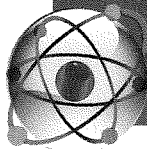
When astronomers looked at distant galaxies 100 years ago, they could not see them in great detail. Still, they could identify the wavelengths of the energy each galaxy emitted. This spectral signature gave astronomers information about the compositions and movements of the galaxies. For example, astronomers determined that if a galaxy were moving toward us, its energy would be shifted toward the blue end of the electromagnetic spectrum. If it were moving away, its energy would be shifted toward the red end. In the 1920s, Edwin Hubble observed that all galaxies seemed to be red-shifted. As a result, he concluded that they were all moving away from Earth.

The graph represents Hubble's findings. It shows the relationship between the distances of other galaxies from ours, in megaparsecs (Mpc), and the velocities at which they move, in kilometers per second (km/s).



2. Which statement expresses the relationship shown by the graph?
- A. All galaxies in the universe move at the same velocity.
 - B. The closer a galaxy is to Earth, the faster it moves.
 - C. The farther away a galaxy is from Earth, the faster it moves.
 - D. The velocity of a galaxy depends on its mass.

3. How does Hubble's observation of red-shifted galaxies support the Big Bang theory?
- A. The Big Bang would have sent the galaxies flying apart from one another.
 - B. The red shift means the galaxies are still hot from the explosion of the Big Bang.
 - C. The observation suggests that the galaxies are about 14 billion years old.
 - D. The red shift proves that the galaxies are all moving toward each other.



1 Learn the Skill

When you **summarize complex material**, you identify and describe its main points. A summary does not contain the exact words of the original material. Instead, you summarize the information using your own words. A summary of complex material provides a simpler, shorter explanation of what the material conveys.

2 Practice the Skill

By practicing the skill of summarizing complex material, you will improve your study and test-taking abilities, especially as they relate to the GED® Science Test. Study the information and illustration below. Then answer the question that follows.

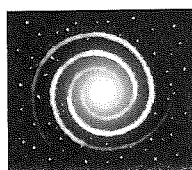
GALAXIES

When looking up at a clear night sky, people on Earth can see thousands of stars. Yet these are only a tiny fraction of the countless stars in the universe. Astronomers have found that the stars in the universe are organized into huge groups called galaxies. Groups of galaxies form clusters, and groups of clusters form superclusters. A typical galaxy, like our Milky Way, has billions of stars, as well as clouds of gas and dust, all held together by gravity. Scientists think many galaxies are surrounded by dark matter, an entity that we cannot see and that is not yet fully understood. The Milky Way is part of a small cluster called the Local Group. The Local Group contains the Milky Way, Andromeda, Messier 33, and about two dozen smaller dwarf galaxies. The largest clusters contain hundreds of galaxies.

a Summarizing means separating the most relevant information (main idea and supporting details) from less relevant information (extra details). This sentence has interesting details that do not belong in a summary.

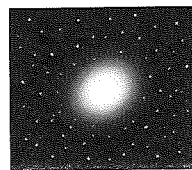
b Visual elements often contain information that would be useful in a summary. The fact that there are three types of galaxies does not appear in the text but could be included in a summary.

THREE TYPES OF GALAXIES



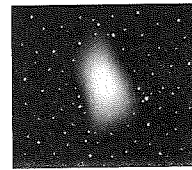
Spiral

Spiral galaxies have a central bulge with curved arms.



Elliptical

Elliptical galaxies have a round or oval shape.



Irregular

Irregular galaxies have shapes that are not symmetrical.

USING LOGIC

The first sentence of a passage may not always contain its main idea. Here, the main idea appears later in the passage. You must carefully read the entire passage to identify the key information.

- Which sentence **best** summarizes the information?
 - Earth is located in the Milky Way galaxy.
 - There are three types of galaxies: spiral, elliptical, and irregular.
 - The universe is organized into three types of galaxies composed of stars, gas, dust, and dark matter.
 - The Local Group contains the Milky Way and several other galaxies of varying sizes.