GED Study Guide
SCIENCE

What you need to know about the GED® Science Test

1 **You should be familiar with basic science concepts, but you're not expected to have in-depth knowledge of each topic.**
Remember, the science test is not a memorization test! You don't need to know the entire periodic table of elements or the number of bones in the human body.

2 **You'll need to understand science concepts, use logic and reasoning to interpret information, and draw conclusions (which is using your critical thinking skills in science).**
This study guide and the example questions in it will help you get an idea of what's going to be on the test.

3 **You don't need to know everything in this guide!**
If you want to see how close you are to passing, the GED Ready® official practice test is a great way to help you determine if you're ready.

Test Overview

Topics
Reading & Writing in Science
Applying Science Concepts
Applying Mathematical Reasoning in Science

Time (to take the test)
90 minutes
No Breaks

Format
Calculator Allowed
Access to calculator reference sheet
Multiple choice and other question types (fill in the blank, drag and drop, hot spot, and drop down)

What you'll be tested on

The GED test will measure your strength in the skills below. Click on a skill to learn more about it.

Reading and Writing in Science

1 Claims and evidence in science

You'll be presented with science passages and be asked to:

- Find evidence that supports a finding
- Make sense of information that differs between various science sources

Science readings often discuss theories or draw conclusions from evidence that is presented. You should be able to read science passages and identify the evidence that supports the theory, principle, or conclusion that has been drawn.

For example, global climate change is a science topic that is frequently discussed in the news. Articles about this topic generally present evidence as to how humans either *are* or *are not* responsible for the changing climate. It's important for you to be able to read something about climate change and identify the evidence that the authors cite to support their conclusions.

Example Questions

Claims and evidence in science

Two chemists are designing instant hot and cold packs for a sports medicine supply company. Their design uses chemicals that react with water to either heat up or cool down the water inside the packs. They are investigating the reaction of ammonium chloride with water to determine whether it is exothermic or endothermic.

Chemist A read a study done recently by the National Institute for Standards and Testing, which reported that 27.6 kilojoules of energy are absorbed by 100 grams of ammonium chloride when it is mixed with water. Chemist B measured the temperature of the water in which the reaction takes place before and after the reaction. The results are displayed in the table.

Measurement	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Average
water temperature before reaction (°C)	35.4	35.5	33.2	34.7	34.4	34.6
water temperature after reaction (°C)	11.2	12.7	10.9	11.7	12.1	11.7
change in water temperature (°C)	−24.2	−22.8	−22.3	−23.0	−22.3	−22.9

Question:

Does Chemist B's results support or contradict the evidence reported by Chemist A?

You may use the calculator.

(A) Chemist B's results supports Chemist A's data because the reaction gains less energy than the water does.

(B) Chemist B's results contradicts Chemist A's data because it indicates that the reaction gains energy instead of losing it.

(C) Chemist B's results contradicts Chemist A's data because it indicates that the temperature of the reaction should go up rather than down.

(D) Chemist B's results supports Chemist A's data because the lower temperature of the water indicates that energy is absorbed by the reaction.

2 Science vocabulary, terms, and phrases

You'll be shown different science passages and visuals and asked to:

- Understand and explain information from the passages
- Understand symbols, terms, and phrases in science
- Use scientific words to express science information

Science readings often use special vocabulary and include elements such as charts and graphs in addition to standard text. You should be able to read and explain what is discussed in a science passage including the different text and graphic elements that might be included.

You'll see questions that use common science symbols, terms, and phrases, such as degree signs, atomic element symbols, and scientific formulas. You'll also see common scientific words.

For example, a science passage about the causes of earthquakes might include special geology terms or concepts like plate tectonics. It might also include maps showing earthquake activity and charts that describe quake intensity in addition to the text provided. You should be able to take all of these elements and understand and describe the key messages that the passage is trying to communicate.

Another example: in the molecular structure

$CO_2 + H_2O \rightarrow H_2CO_3$

you will not need to know that CO_2 is carbon dioxide or H_2O is water, but you will need to be familiar with the idea that these are representations of two distinct substances, which when combined (+), form a new substance (→) (carbonated water).

A third example: understanding the difference between a theory, a hypothesis, and a scientific law will help you determine when you can draw conclusions and when you will need more information.

Example Questions

Science vocabulary, terms, and phrases

About 2.7 billion years ago, the lower atmosphere had almost no oxygen. It was long before plants existed to produce oxygen. However, in the upper atmosphere, oxygen can be produced when carbon dioxide is split by sunlight into carbon monoxide and oxygen.

Scientists examined 11 ancient micrometeorites, all older than 2.7 billion years old, and discovered that most of them had once been particles of iron mixed with oxygen. In order for that to happen, there had to be almost as much oxygen in the upper atmosphere as there is now. The scientists say that the new information about the upper atmosphere does not change what they know about the lower atmosphere.

Question:

Which statement accurately summarizes the passage?

A. Micrometeorite analysis proves that 2.7 billion years ago, there was no oxygen in the lower atmosphere or the upper atmosphere.

B. Micrometeorite analysis proves that 2.7 billion years ago, there was oxygen in the lower atmosphere but not in the upper atmosphere.

C. Micrometeorite analysis proves that 2.7 billion years ago, there was oxygen in the upper atmosphere but not in the lower atmosphere.

D. Micrometeorite analysis proves that 2.7 billion years ago, there was oxygen in both the lower atmosphere and the upper atmosphere.

Applying Science Concepts

1 Science investigations

You'll be asked to:

- Design a science investigation
- Identify and explain independent and dependent variables
- Identify and improve hypotheses for science investigations
- Identify possible errors in a science investigation and change the design to correct them
- Identify the strengths and weaknesses of different types of science investigations

Key principles of science investigations include using and recording data, developing a hypothesis, setting up experiments, identifying controls and variables, and drawing conclusions. You will be asked to evaluate investigations that may or may not have flaws in one or more of these areas.

You'll also evaluate and improve a hypothesis, or make a prediction about the outcome of a science investigation that can be tested. You will be asked to determine the independent variables (those that can be changed or controlled in a scientific experiment) and dependent variables (things that are changed by the independent variable).

In the passage below, you will see the key principles of science investigations.

The lakes in a town have recently begun developing significant amounts of algae which are preventing people from enjoying recreational activities on them. Environmental scientists are brought in to determine the origin of the algae. They develop a hypothesis that the phosphorus content of the fertilizers used in nearby parks are stimulating excess algae growth. The scientists decide to discontinue the fertilizer at one of the local parks. They then measure and record algae growth for four months at the lake near a park where fertilizer use continues (control group) and the lake near another park where fertilizer has been discontinued (changing the variable of phosphorus fertilizer). After four months, they observe that the algae has markedly decreased at the lake no longer using fertilizer. They conclude that the phosphorus fertilizer was the origin of the excess algae growth and discontinue its use.

In this example, you won't need to know anything about algae growth, lakes, or fertilizer. The question will focus on whether the information presented to you supports the principles of a good science investigation.

Another example:

If calcium supplements are believed to reduce bone thinning, an experiment might be created to give different groups of people differing dosages of calcium over an extended time. The independent variable would be the ingested dosage (including a control group taking no calcium) and the dependent variable would be the resulting bone loss.

If you are conducting this science investigation, you would want different groups of people ingesting different dosage amounts. It would also be critical to have a control group that has not ingested calcium supplements. The results of the control group would be necessary to compare with the groups consuming calcium.

A third example:

Say you purchase two identical raspberry fruit plants. You give one to your neighbor to plant in his backyard and you plant the other in your backyard and at the same time. After a few weeks, you notice that your neighbor's raspberry plant is growing far more raspberries than yours. How would you figure out why your neighbor's plant is producing more fruit?

An insufficient hypothesis would be: If I get lucky, then my plant will grow more raspberries. You cannot test that hypothesis because you can't control "getting lucky."

However, a good hypothesis could be: If I give my plant fertilizer, it will grow as many raspberries as my neighbor's plants. This is a testable hypothesis.

Example Questions

Science investigations

Dissolved carbon dioxide gas (CO_2) creates carbonic acid in ocean water. Rising ocean acidity levels may harm marine life. For example, high acid levels may cause hearing loss. Scientists conducted an investigation to study the effect of increased acidity on fish hearing.

A group of fertilized fish eggs from the same parents were divided into four different aquariums, each with a different pressure of CO_2. One tank contained the normal atmospheric conditions of 390 microatmospheres of CO_2. The other tanks contained 600, 700, and 900 microatmospheres of CO_2, respectively. The same number of eggs was placed into each aquarium. The eggs hatched and the fish lived in these aquariums until testing.

To prepare for the experiment, one fish was placed into an aquarium containing the same CO_2 pressure in which it was raised. The fish's position was recorded every 5 seconds for 2 minutes. Then sounds from a predatory fish were played from an underwater speaker at one end of the aquarium at a volume that was only audible to the fish when swimming near the speaker. The fish's position was again recorded every 5 seconds for 2 minutes. Trials were repeated with fish from each tank.

The study showed that fish raised in elevated CO_2 levels did not avoid the sounds of the predator fish. They spent approximately the same proportion of time at the speaker end of the aquarium before and after the sounds of the predator fish were played. However, the fish from the aquarium with the normal atmospheric CO_2 pressure avoided the speaker end of the aquarium after the predator sounds were played.

Question:

What are the independent and dependent variables in the investigation?

A Independent = CO_2 pressure, Dependent = Position of fish

B Independent = Number of eggs in aquarium, Dependent = CO_2 pressure

C Independent = Position of fish, Dependent = Number of eggs in aquarium

D Independent = Temperature of the water, Dependent = CO_2 pressure

2 Using evidence to draw conclusions or make predictions

You'll be asked to:

- Decide whether conclusions are supported by data
- Make conclusions based on data
- Make predictions based on data

Based on the data presented, sometimes you may need to infer a conclusion or a prediction. The key to drawing valid conclusions is to apply your logic and reasoning skills while using scientific methods.

You might be presented with a series of potential conclusions and asked which conclusion is supported by the evidence.

For example, the city of Palm Springs typically gets very little rain. On average, 10 or fewer days receive rainfall. The average precipitation in April is .08 inches, in May is .06 inches, and in June is .05 inches.

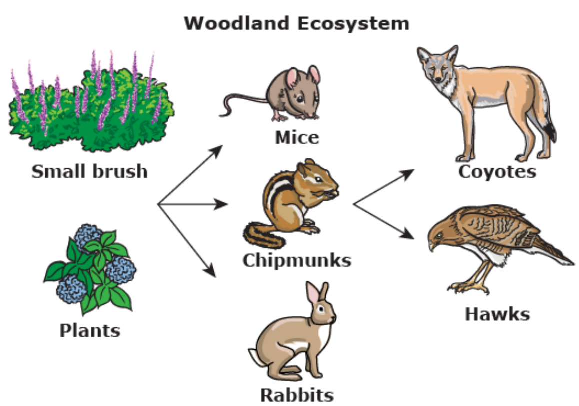
Banana plants thrive in wet climates and require consistent rainfall to bear fruit. They require an average of 4 to 6 inches of water each month.

Based on these data points, you can conclude that banana plantations will not thrive in Palm Springs.

Example Questions

Using evidence to draw conclusions or make predictions

A small woodland ecosystem consists of plants and small brush, rabbits, chipmunks, mice, and hawks.



Question:

Based on this simplified food web, what would most likely happen if a coyote were introduced to the ecosystem?

(A) The hawk population would increase.

(B) The mouse population would increase.

(C) The plant population would decrease.

(D) The rabbit population would decrease.

3 Science theories and processes

You'll be asked to understand and apply science theories and processes.

Scientific theories are explanations of specific phenomena in the natural world. There are many scientific processes to investigate the natural world, including observation and experimentation. All of the methods require posing a question, developing a hypothesis, and collecting data.

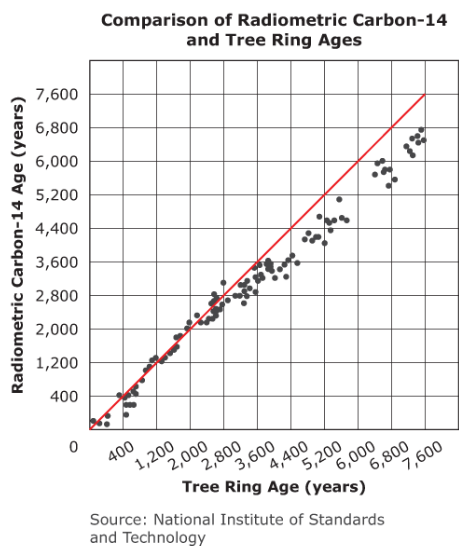
Example Questions

Science theories and processes

Carbon-14 is a radioactive isotope of carbon that decays at a known rate. Plants take in both carbon-14 and carbon-12 for use in photosynthesis. However, when the plant dies, it can no longer take in carbon and over time the radioactive carbon-14 decays while the carbon-12 remains. This process results in the ratio of carbon-14 to carbon-12 decreasing. By measuring the amounts of carbon-12 and carbon-14 in a sample, it is possible to determine the age of the sample. The age of the sample is inversely related to the amount of carbon-14 present in the sample.

Since some tree species live for thousands of years, it is possible to count annual tree rings to determine the accuracy of radiocarbon dating by measuring samples removed from a particular ring in a tree.

In the graph, the dots represent the comparison of one sample measured with both carbon-14 and tree ring dating. The line represents a perfect match between the two measurements.



Question:
While the two age measurements agree for more recent dates, they often do not agree for samples dating back more than 3,000 years. Scientists attribute most of this deviation to changes in carbon-14 production caused by changes in Earth's magnetic field. Which statement correctly analyzes the observed deviation?

A Radiometric carbon- 14 ages are too low, implying that less carbon-14 was present.

B Radiometric carbon-14 ages are too high, implying that less carbon-14 was present.

C Radiometric carbon-14 ages are too low, implying that more carbon-14 was present.

D Radiometric carbon-14 ages are too high, implying that more carbon-14 was present.

Applying Mathematical Reasoning in Science

1 Science formulas and statistics

You'll be asked to:

- Apply science formulas (the science formulas will be provided)
- Use statistics to describe science data

For example, you may be presented with a data set (such as the daily high temperature in Phoenix, Arizona during the month of November). You might be asked to determine the range of high termperatures during the month, the mean high temperature, the median high temperature, or the mode high temperature based on the data set of temperatures.

Example Questions

Science formulas and statistics

A temperature change occurs when ammonium chloride is dissolved in a water solution. The table shows the temperature change over a period of 120 seconds.

Time (seconds)	Temperature (°C)
0	21.1
30	19.4
60	18.8
90	18.3
120	17.7

$$°F = °C \times \frac{9}{5} + 32$$

Question:
What is the appropriate temperature of the solution in degrees Fahrenheit at 60 seconds?

You may use the calculator.

A -24 °F

B -7 °F

C 42 °F

D 66 °F

2 Probability and sampling in science

You'll be asked to:

- Determine the probability or likelihood of something happening
- Use a sample to answer science questions
- Use counting to solve science problems

For example, you may be asked to:

- Predict what may occur by examining a small part of a larger group
- Count how many different ways objects can be ordered or arranged

Example Questions

Probability and sampling in science

A set of parents wants to determine the likelihood of the eye color of their offspring. The parents know that their genes for eye color each have two alleles. The alleles are represented by letters in the form of a genotype.

One parent has a genotype of Bb with brown eye color and the other parent has a genotype of bb with blue eye color. Their offspring will inherit one allele from each parent.

Question:
What are the possible genotypes of their offspring?

A 100% Bb

B 100% bb

C 50% Bb, 50% bb

D 25% Bb, 75% bb

3 Presenting science information using numbers, symbols, and graphics

You'll be asked to:

- Use graphics to display science information
- Use numbers or symbols to display science information
- Explain different ways in which scientific information is presented

For example, you may be presented with a set of data and be asked to place the data in a chart or graph. Or, you may be asked to interpret a graph or chart.

Example Questions

Presenting science information using numbers, symbols, and graphics

A scientist was investigating if differences in the frictional work performed on a model car can change depending on its mass (in grams) and whether the car moves up or down an inclined plane. They decided to measure the amount of frictional force experienced by the model car and the distance it traveled in meters. The scientists were able to evaluate the frictional work using the following data.

	Mass (g)	Distance (m)	Force	Work Done by Friction (J)
car going up the incline	100	39	0.063	2.457
car going down the incline	70	39	0.2309	?

It is known that the relationship between force and distance determines the work done by friction (W_f).

$W_f = fd$

W_f = work done by friction
f = force
d = distance

Question:
How much work done by friction was exerted on the car as it moved down the inclined plane?

You may use a calculator.

(A) 2.457

(B) 9.005

(C) 11.46

(D) 16.16