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# 基础科学入门

# Passage to General Science

（美）Globe Fearon Inc. 编

机械工业出版社
China Machine Press

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# 出版说明

人们关于教育是否是一种科学的争论一直都在进行中，但无可质疑的是，教育离不开科学，不仅教育作为一种活动必须符合科学规律，同时人也需要接受科学教育——人必须有追求科学的精神和追求科学的能力。本着这种精神以及满足国内广大师生较高层次的英语学习需要的宗旨，北京华章图文信息有限公司精选并影印出版了多套外国优秀科学教育系列教材，以供各级外语特色学校和双语学校作为选修教材之用，当然也可作为英语爱好者自学的素材。这些原版的科学学习教材创造了一种学科英语的环境，学生不仅能在其中学到学科知识，更锻炼了用英语进行思维、表达的能力，这为他们以后阅读外文专业书刊、成为科学家以及各个领域的专业人才打下良好的基础。

学英语·学科学丛书之一——《基础科学入门》，包括什么是科学、生命科学、物质科学和地球科学4个单元。单元中的每一课都以重点词汇开篇，从细胞到食物链，从物质到能源，从地球到宇宙，涉及一个个具体的研究领域或方向，向学生展示了科学的基本内涵以及各个学科的大致轮廓与基本知识。这本教材的整体设计不仅保证了基本科学知识的系统性、全面性，还从学生的实际接受能力出发，力求简明易懂，让学生不仅爱学科学，还能轻轻松松地学好科学。在这里，科学既包括对学生科学思维的训练、科学认识的提高和科学技能的培养，又包括在科学探索过程中对学生科学探索情感、态度、价值观的熏陶。

《基础科学入门》的显著特点是：

系统性强，涵盖内容广泛，引导学生在学习英语的同时，了解和掌握科学的概貌。所有科学概念都被简明扼要地表达出来，通过清晰的例证、精炼的习题，让学生逐步掌握。

学英语·学科学丛书不仅能使学生在特创的学习环境中了解很多已经被科学家发现或证明了的事实和道理，还能让学生用科学家们探索科学的方法，通过实验、观察和记录来了解我们周围的世界。

让我们跟着科学家的步伐去探索科学的奥秘吧！

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外语编辑部

# Lesson 1 The Scientific Method

***Words to Know***

**scientist** a person who studies nature and the universe
**universe** everything that exists, including stars and planets
**experiments** tests used to find out why something happens
**scientific method** a step-by-step model for solving problems
**observation** paying close attention to something
**hypothesis** a smart guess
**conclusion** a statement about the result of an experiment

universe /'ju:nivə:s/

A **scientist** is someone who studies nature and the universe. The **universe** is everything that exists. You may already be a scientist. You learn how something new tastes if you eat it. You learn how something new feels if you touch it. Everyone who tests new things can be called a scientist.

## A.

Scientists set up **experiments** to test their ideas. Experiments are tests used to find out why something happens. Experiments give scientists new information.

***Reminder***
Write your answers on a separate sheet of paper.

Choose words from the box to complete each sentence. Write the new sentences.

| test | scientist | universe | science |
|---|---|---|---|

1. Science is the study of nature and the _____ through experiments.
2. A scientist might use experiments to _____ an idea.
3. Everyone who tests new things can be called a _____.
4. When you are looking at planets and stars, you are studying _____.

## B.

The **scientific method** is a step-by-step way to solve a problem. Scientists use these steps to do experiments. You can use the scientific method, too. Suppose your dog Prince has stopped eating his dog food. You are worried about him. What could the problem be?

You decide to try an experiment to find out. You will use the steps of the scientific method to find an answer.

## THE SCIENTIFIC METHOD: A PROBLEM WITH PRINCE

**Step 1** **State the Problem**

Why has Prince stopped eating his dog food?

**Step 2** **Gather Information**

You take a good look at the dog. He is lively and happy. His eyes are clear. His coat is shiny. Your **observation** tells you that he is not sick. You decide to watch him at mealtimes. Careful watching gives you a clue.

**Step 3** **Make a Hypothesis (guess)**

Observation tells you that Prince eats a lot of people food. Everybody in your family gives him food. Now you can make a hypothesis. A **hypothesis** is a smart guess about the cause of the problem. You decide that Prince would eat his own food if he didn't eat so much people food.

hypothesis /haiˈpɔθisis/

**Step 4** **Test the Hypothesis**

You try to find out if your hypothesis is true. You talk to your family. They all agree to stop feeding Prince. You watch what happens over the next few days. On the first day, Prince leaves his food bowl alone and waits other food. On the second day, Prince eats half the food in his bowl. On the third day, he eats all the food in his bowl.

**Step 5** **Draw a Conclusion (result)**

Your experiment proves that your hypothesis was correct. A statement about the result of your experiment is your **conclusion**. Why did Prince stop eating his dog food? He was eating too much people food.

Choose the correct word in parentheses to complete each sentence. Write the complete sentence.

1. Observation is a good way to gather (conclusions, information).
2. A good guess about the answer to a problem is called a (hypothesis, statement).
3. A (conclusion, test) is the result of an experiment.

# Lesson 2 Tools of Science

*Words to Know*

**laboratory** the place where a scientist studies and experiments; a *lab*
**microscope** a machine used to study very small things
**telescope** a machine used to study things very far away
**measurement** the size, number, or amount of something
**length** how long something is
**weight** how heavy something is
**volume** amount of space something takes up
**metric system** a system of measurement used by scientists

Scientists must be very exact in their work. Smart guesses are one step in the scientific method. But these smart guesses must be very carefully tested. Scientists need special tools to test carefully.

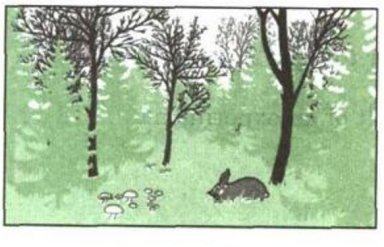
laboratory /lə'bɔrətəri/

**A.** All scientists work in some kind of **laboratory**. A laboratory is also called a lab. A lab is where the scientist studies something. A lab might be a room in a school. It might be a forest.

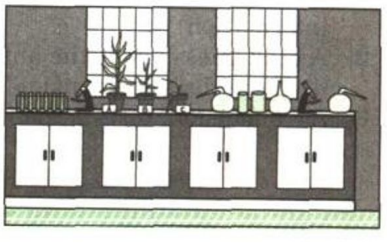
**Reminder**
Safety is very important in a science lab. Your hands and tools must be kept clean. Your eyes must be covered.

Look at the two pictures below. They show different kinds of labs. What might a scientist study in each one? Tell at least two things a scientist might study in each lab. Use words from the box.

| | | |
|---|---|---|
| tree growth | animals | plant growth |
| mushroom types | tiny plants or animals | plant sickness |



Lab 1: A Forest



Lab 2: School Lab Table

**B.** Scientists use special tools in their labs. One very important scientific tool is the **microscope**. A microscope makes tiny things look bigger. A microscope helps scientists see very tiny objects. They can see inside a blood drop. They can study a single hair or a grain of sand.

Another important tool is the **telescope**. This machine is used to study things that are far away. Stars are too far away to study closely. Scientists can see stars, comets, and planets very clearly using telescopes.

Microscope

Telescope

Read the things to study. Which things can best be studied with a microscope? Which can best be studied with a telescope? Write *microscope* or *telescope* next to each thing.

1. planet Mars
2. a drop of water
3. a single hair
4. the Moon
5. a plant leaf
6. the Milky Way

**C.** All scientists measure things. The size or amount of something is its **measurement**. A ruler measures **length**. Length shows how long something is in inches, feet, yards, or meters.

A scale measures **weight**. Weight tells how heavy something is in pounds, ounces, or grams.

Containers of different sizes measure **volume**. Volume is the amount of space something takes up. Volume is measured in cups, quarts, gallons, or liters.

Scientists use the **metric system** of measurement. The *meter* is a metric unit of length. A meter is a little longer than 3 feet. A metric unit of weight is a *gram*. There are about $28\frac{1}{3}$ grams in an ounce. A metric unit of volume is a *liter*. A liter is a little bigger than a quart.

Choose a word to complete each sentence. Write each sentence so it makes sense.

1. A ruler is used to measure _____.
   a. length  b. volume  c. weight
2. Volume is the amount of _____ something takes up.
   a. space  b. height  c. length
3. A meter is a little longer than _____.
   a. 1 foot  b. 2 feet  c. 3 feet

# Lesson 3 Fields of Science

***Words to Know***

**fields** special types of science

**life science** the study of living things

**organisms** living things

**characteristics** the special features that make living things different from one another

**physical science** the study of matter and energy

**matter** the stuff that makes up everything in the universe

**energy** can't be seen or held; makes a thing able to move itself or cause something else to move

**earth science** the study of the Earth, sun, moon, planets, and stars

Science is broken down into different types of study. These are called **fields**. The three fields of science are life science, earth science, and physical science.

organism /'ɔ:gənizəm/

## A.

**Life science** is the study of **organisms**. Organisms are living things. Life scientists study plants, animals, humans, and all other organisms. They study the **characteristics** of living things. Characteristics are the special ways an organism looks and acts. Your own characteristics include your height, your eye color, the shape of your nose, and the sound of your voice.

***Reminder***

Write your sentences on a separate sheet of paper.

Match the word in the first column with its meaning in the second column. Use the word and its meaning in a complete sentence.

| | |
|---|---|
| 1. organisms | a. the study of living things |
| 2. characteristics | b. living things |
| 3. life science | c. special features |

## B.

**Physical science** is the study of matter and energy. **Matter** is the stuff that makes up everything in the universe. Matter comes in many forms. Air is matter. Water is matter. Soil is matter.

**Energy** is something that can't be seen or held. When a thing has energy, it can move itself or cause something else to move. Energy can be taken from one thing and added to another, but it can't be destroyed. There are many forms of energy. Examples of energy are light, electricity, and heat.

Choose the word or words that complete each sentence. Write the new sentences.

1. Physical science is the study of _____.
   a. matter and energy
   b. rocks and weather
   c. plants and animals
2. The stuff that makes up everything in the universe is called _____.
   a. energy b. soil c. matter
3. Two forms of energy are _____.
   a. air and water b. light and heat c. soil and water
4. If a thing has _____, it can make something else move.
   a. light b. energy c. matter

## C.

**Earth science** is the study of the Earth. Earth scientists study rocks, oceans, and weather. They also study the sun, moons, planets, and stars.

The chart below shows some jobs in the three fields of science.

| CAREERS | | |
|---|---|---|
| **Life Science** | **Earth Science** | **Physical Science** |
| farmer | weather forecaster | electrician |
| nurse | sailor | engineer |
| animal trainer | astronaut | chemist |

Read each thing and decide which scientist studies it. Write each word and *life scientist, earth scientist,* or *physical scientist* next to it.

1. light
2. heat
3. fish
4. oceans
5. flowers
6. weather
7. mushrooms
8. matter
9. organisms
10. the Moon

Hint: Put your answers in a chart on your paper.

# Lesson 4 Cells

*Words to Know*

**cells** tiny basic units that make up all living things
**cytoplasm** the watery, inside part of a cell
**cell membrane** the outer covering that holds a cell together
**vacuoles** open spaces in cells; hold food, water, or wastes
**nucleus** the center part of a cell; *nuclei* is the plural form
**chloroplasts** parts of plant cells; use sunlight to make food

How are you and a tree alike? How are you like a bird? What makes you different from a rock? Or from a car? You, trees, and birds are all alive. Rocks and cars are nonliving, or not alive.

**A.** All living things are made of **cells.** These are tiny, watery packages. Your own body has about one hundred trillion cells (100,000,000,000,000). Some living things are made of just one cell. Nonliving things are not made of cells.

Look at the chart below. Read the names of some living things and some nonliving things.

| Living Things | Nonliving Things |
|---|---|
| dog | sand |
| daisy | water |
| flea | TV |
| pine tree | plate |
| mushroom | bottle |
| whale | mountain |

Look at the things in the list below. Place each thing in a chart under the heading *Living Things* or under *Nonliving Things.* You should list 14 living things in the chart.

| | | | | |
|---|---|---|---|---|
| apple | tree | grass | bird | fly |
| kitten | rocks | cow | soil | glass |
| baseball | cat | house | plant | celery |
| CD | sunlight | ocean | spider | tin can |
| worm | mold | magnet | clock | mushroom |

**B.** Cells are very small. But they have even smaller parts. The watery inside part of a cell is called the **cytoplasm**. The outside covering of a cell is called the **cell membrane**. The membrane holds the cell together. Cells also have big open spaces to hold food, water, and wastes. These open spaces are called **vacuoles.**

Near the middle of the cell is the **nucleus**. The nucleus directs what happens in a cell. It makes sure the other parts of the cell do their jobs. Everything there is to know about a living thing is stored in the nuclei of its cells.

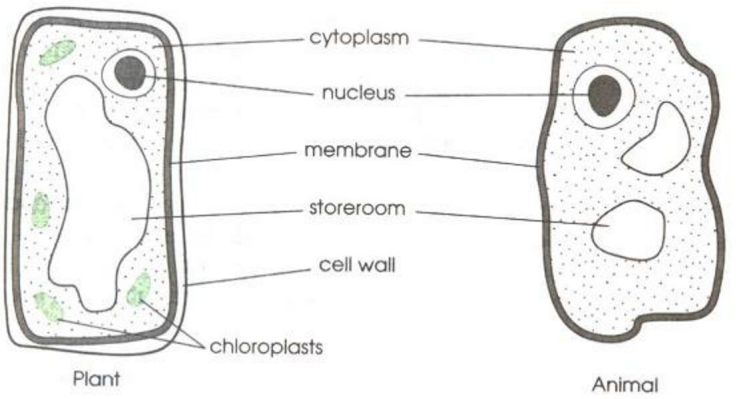
cytoplasm /'saitə,plæzəm/
vacuole /'vækjuəul/
nucleus /'nju:kliəs/
nuclei /'nju:kli,ai/ pl.

Copy each statement. Write the word *True* or *False* after each one.

1. The watery part of a cell is called the membrane.
2. The nucleus makes sure the other parts of the cell do their jobs.
3. A cell's cytoplasm holds the cell together.

**C.** Plant cells are different from animal cells. Plant cells look more square in shape under a microscope. Their outside covering is called a cell wall. They also have parts called **chloroplasts**. Plants use chloroplasts to make their own food from sunlight.

chloroplast /'klɔ:rəu,plæst/




Look at the two kinds of cells above. Answer each question in a complete sentence. Use *animal cell* or *plant cell* in each sentence.

1. Which kind of cell is more round than square?
2. Which kind of cell has chloroplasts?
3. Which kind of cell does not have a cell wall?

Draw a cell diagram and label the parts. Is it a plant or animal?

# Lesson 5 Classification

*Words to Know*

**classification** the scientific way of sorting living things

**kingdoms** five groups of living things; animals, plants, protists, monerans, and fungi

**protist kingdom** group made up of one-celled organisms

**monerans kingdom** group made up of one-celled organisms without nuclei

**bacteria** the most common monerans

**fungi kingdom** group made up of organisms that get their food from rotting plants and animals

**species** the smallest classification of living things within a kingdom

**A.** Scientists use **classification** to sort different kinds of living things. **Kingdoms** are the largest groups of living things. There are five different kingdoms. The two kingdoms you know best are the animal kingdom and the plant kingdom.

Why are plants and animals in two different kingdoms? There is one important difference between them. Plants make their own food. To do this, they use water, a gas in air, sunlight, and the chloroplasts in their cells. Animals must take in food that has been made by plants. They do this by eating plants and other animals. Animals must move around to find food. Plants do not need to find food. Most plants are rooted in the soil.

***Reminder***

Chloroplasts are the parts of plant cells that make food from sunlight.

Draw a chart with two columns. Write *Animal Kingdom* over the first column. Write *Plant Kingdom* over the second column. Look at the words below. Write each word in your chart under the correct kingdom.

| | | | |
|---|---|---|---|
| tigers | fish | trees | daisy flowers |
| spiders | ferns | ladybugs | sharks |

**B.** There are three other kingdoms of life besides plants and animals. The **protist kingdom** is made up of living things that are each just one cell. They have a nucleus inside their one cell. Many protists have both plant and animal characteristics.

Another kingdom of living things is called the **monerans kingdom**. These also are each one cell. Monerans are different from protists. They do not have a nucleus inside. Remember a nucleus is the center part of a cell. Monerans are found everywhere. They are in the air, in water, and all over our bodies. The most common monerans are called **bacteria**.

monerans /'mɔniənz/

bacteria /bæk'tiəriə/

The last kingdom is the **fungi kingdom**. Mushrooms and tree fungus are in the fungi kingdom. Mold that grows on rotting food is in the fungi kingdom. Like plants, fungi grow in one place. But they don't have chloroplasts in their cells. That means they can't make their own food the way plants do. They get their food from the rotting plants and animals they grow on.

fungi /'fʌngai/

**THE FIVE KINGDOMS OF LIFE**

| Kingdom | Description |
|---|---|
| animals | many-celled, must find their food |
| plants | many-celled, make their own food, don't move around |
| protists | one-celled, have nuclei |
| monerans | one-celled, don't have nuclei |
| fungi | many-celled, don't move around, don't make food |

Use words from the chart above to complete the sentences. Write the sentences on your paper.

1. The two kingdoms made up of one-celled living things are _____ and _____.
2. Plants are able to make their own _____.
3. Fungi are like plants in that they are _____ and they don't _____.
4. Animals must _____ their food.

## C.

Kingdoms are the five classifications of all living things. A **species** is a classification within a kingdom. Each kingdom has many species within it. There are species of plants and species of animals. Humans are a species of the animal kingdom. A northern red oak tree is a species of the plant kingdom.

species /'spi:ʃi:z/

Look at the sentences and words in parentheses. Choose the correct word to complete each sentence. Write the complete sentences on your paper.

1. A species is a classification of living things (outside, within) a kingdom.
2. Humans are a (species, class) of the animal kingdom.
3. The five groups of all living things are the (classes, kingdoms).
4. Red oaks and white birch trees are different species in the (fungi, plant) kingdom.

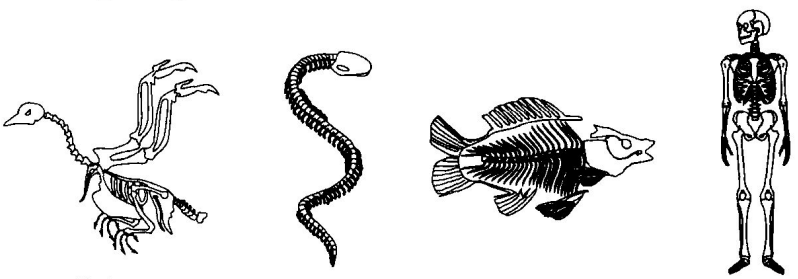
# Lesson 6 Vertebrates and Invertebrates

*Words to Know*

**skeleton** all of the bones in an animal's body
**vertebrates** animals with backbones
**invertebrates** animals without backbones
**arthropods** animals with appendages and outer shells
**appendages** body parts that stick out but have no bones

Feel the bumps down the middle of your back. You are feeling your backbone. Many kinds of animals have backbones. Other kinds of animals don't have backbones.

**A.** Look at the bones of the animals below. These pictures show each animal's skeleton. A **skeleton** is all of the bones of an animal put together. Find the backbone in each skeleton below.



Bird Snake Fish Person

[redacted]

vertebrate /'və:tibrit/

All animals that have backbones are called **vertebrates**. Because you have a backbone, you are a vertebrate. Birds, snakes, and fish are vertebrates, too. Vertebrate animals have bodies made of many different kinds of parts, inside and out.

Copy each statement. Write the word *True* or *False* after each one.

1. All animals have backbones.
2. People and fish are vertebrates.
3. Vertebrates have skeletons and many body parts.

[redacted]

invertebrate /in'və:tibrit/

**B.** Animals that do not have backbones are called **invertebrates**. Invertebrates have simpler bodies than vertebrates.

Sponges are invertebrates. They have been around for more than a billion years. Sponges grow on the ocean floor. Worms are another kind of invertebrate. Both sponges and worms have soft bodies.

Choose the word in parentheses that makes the sentence correct. Rewrite the complete sentences.

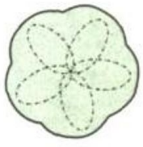
1. Worms are one kind of (vertebrate, invertebrate) animal.
2. Sponges and worm have (soft, hard) bodies.
3. Invertebrates do not have (backbones, body parts).

## C.

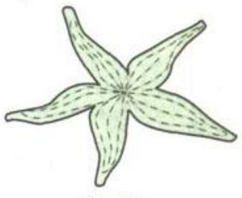
Invertebrates don't have skeletons. Some invertebrates have hard outer shells. Snails and clams are invertebrates with shells. Have you ever seen sand dollars and starfish? Look at the pictures in the margin. They all are invertebrates with hard outer shells.

Snail

Clam



Sand Dollar



Starfish

Choose a correct word to complete each sentence. Rewrite the new sentences.

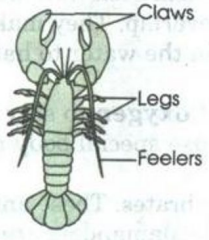
1. Snails are covered by a _____.
   a. skeleton  b. hard shell  c. vertebrate
2. Invertebrates don't have _____.
   a. soft bodies  b. hard shells  c. skeletons
3. Sand dollars are _____.
   a. invertebrates  b. vertebrates  c. fungi

## D.

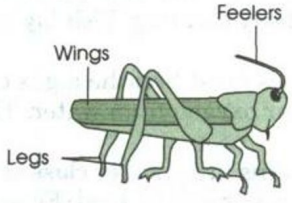
The largest group of invertebrates are the **arthropods**. These are animals with hard outer shells and appendages. **Appendages** are body parts that stick out but have no bones. Wings, legs, arms, and feelers are all appendages. Arthropods have appendages that are jointed. This means the appendages have places to bend. Insects are arthropods. So are lobsters and spiders.

arthropod /'a:θrəpɔd/

appendage /ə'pendidʒ/




Lobster




Grasshopper

Read the statements about each animal. Rewrite only the sentences that are about *arthropods*.

1. A fly is an insect with wings and six jointed legs.
2. A worm has a soft body.
3. A sand crab has a hard shell and ten appendages.
4. A spider has eight jointed legs and many eyes.
5. A clam has a shell but no appendages.