

LEARN ENGLISH FOR SCIENCE 1

A.R.BOLITHO & P.L.SANDLER



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A.R.Bolitho and P.L.Sandler



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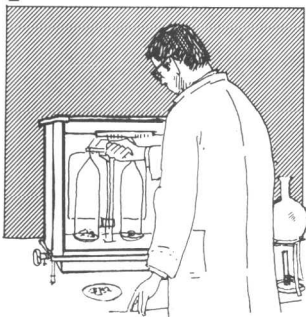
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UNIT 1 How do scientists work?

1 We can all observe simple scientific facts about the colour of the sky, the temperature, or the depth of a river at different times of the year. The scientist's task is to ask questions about these observed facts and to find answers to these questions. He usually bases theories on his observations and then tests his theories by practical experiment. He often uses special apparatus to help him to make observations and to carry out his experiments.

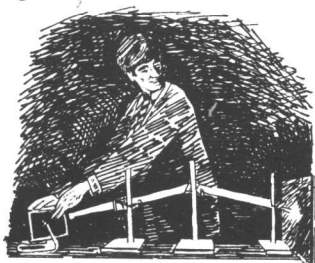
Look at these pictures of scientists at work in their laboratories:

2



This man is a chemist. He is using a balance to weigh some copper sulphate crystals. Beside him is the apparatus which is used to make the crystals. Copper sulphate (CuSO_4) is composed of three elements – copper, sulphur and oxygen. It is a compound. Compounds are substances which consist of two or more elements. Chemists not only analyse compounds but also combine elements to form compounds.

3



This man is a physicist. He wants to find out something about the colours in the spectrum. He is using lenses and a prism to produce these colours from a beam of white light. Physicists study not only light but also sound, heat and electricity.

4



This woman is a biologist. She is using a microscope to examine a blood sample. She wants to find out the number of red blood cells in the sample. She can only see these cells through a microscope because they are so small. A microscope is an instrument which magnifies very small objects. A biologist studies all forms of life and often needs the help of a microscope. Some living things consist of only one cell.

WORDS

WORD STUDY

observe (1): When we observe the moon through a telescope, we look at it closely and try to find things out about it.

depth (1): The depth of a river is greater in the middle than near the sides. A bad swimmer should never go out of his depth.

bases on (1): builds on. Darwin's Theory of Evolution was based on observations of animals in many parts of the world.

theories (1): ideas which explain, or try to explain, facts or events.

apparatus (1): Remember that this word is uncountable and has no plural. Lenses and prisms are pieces of apparatus.

consist of (2): are made up of. Water consists of hydrogen and oxygen.

analyse (2): If a chemist analyses a compound, he breaks it down; he finds out which elements it consists of.

spectrum (3): the different colours which light consists of.

examine (4): look at very closely and carefully.

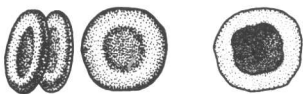
sample (4): a small amount of a substance, usually taken for testing.

cells (4): the smallest living units. All living things consist of cells. The smallest living things consist of only one cell. They are single-celled.

magnifies (4): Microscopes and telescopes are instruments which magnify. They make things seem bigger.

WORDS IN COMBINATION

Look at these examples



These cells are found in blood. They are *blood cells*.



These crystals consist of copper sulphate. They are *copper sulphate crystals*.

1. Now complete these sentences in the same way

a)



This assistant works in a laboratory.
He is . . .

b)



Joe studies physics.
He is . . .

c)

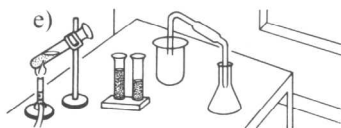


Mrs Evans teaches biology.
She is . . .

d)



This is a sample of rock.
It is . . .



This laboratory is used for chemistry.
It is . . .

WORD BUILDING

2. Fill in the missing word in each pair. The first one has been done for you.

The scientist

His science

a) a biologist

biology

b) a physicist

. . .

c) . . .

chemistry

d) a mathematician

. . .

e) a geologist

. . .

f) a technologist

. . .

g) . . .

botany

h) . . .

zoology

QUESTIONS AND ANSWERS

1. Answer these questions

a) What does a scientist usually base his theories on?

- b) How does a scientist test his theories?
- c) What does a scientist often use instruments for?
- d) What does a scientist often use apparatus for?
- e) What does copper sulphate consist of?
- f) What sort of substance is copper sulphate?
- g) How many elements does water consist of?
- h) What do physicists study?

2. *Here are some answers. Make a question for each one, using the words in brackets.*

- a) To weigh some copper sulphate crystals. (What . . . for?)
- b) To make the crystals. (What . . . for?)
- c) To produce the colours in the spectrum. (What . . . for?)
- d) To examine a blood sample. (What . . . for?)
- e) There are copper sulphate crystals on the balance. (What sort of . . .?)
- f) Water is a compound. (What sort of . . . ?)
- g) Oxygen is an element. (What sort of . . . ?)
- h) She is looking at blood cells. (What sort of . . . ?)

SENTENCES

PRESENT TENSES

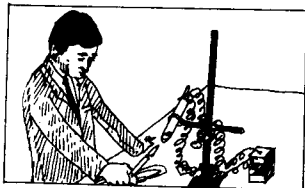
Look at this example

Peter/biologist/laboratory → Peter is a biologist. He *works* in a laboratory.

1. *Now make similar pairs of sentences from each group of words below*

- a) Marie/chemist/chemistry laboratory
- b) Frank/geologist/university
- c) Tom/mathematician/with numbers
- d) Mr Clark/technologist/with computers
- e) Mrs Evans/biology teacher/school
- f) John and Ann/laboratory assistants/with apparatus
- g) Rita and David/botany students/with plants

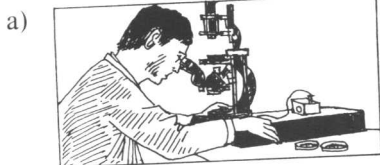
Look at the picture and the example



chemist/do/experiment →

This man is a chemist. He *is doing* an experiment.

2. Now make similar pairs of sentences for each picture



biologist/look through/
microscope



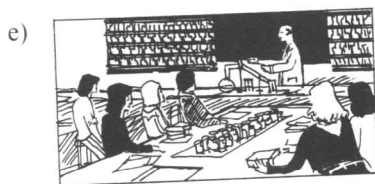
laboratory assistant/wash/
apparatus



biologist/test/blood sample



geologist/analyse/rock sample



students/observe/experiment



mathematician/use/computer

3. Now answer these questions

- What does Tom work with?
- Where does Mrs Evans work?
- Where does Frank work?
- What is the laboratory assistant in the picture doing?
- What is the geologist in the picture doing?
- What is the biologist in picture (c) doing?

THE PASSIVE

Look at the verb in this example

Copper sulphate *is composed* of three elements.

4. Use verbs in the same passive form to complete these sentences

- Water (compose) of hydrogen and oxygen.

- b) Microscopes (use) to see very small things.
- c) Chemical substances (weigh) on a balance.
- d) Theories (often test) by experiment.
- e) A spectrum of light (produce) by using a prism.
- f) Apparatus (usually wash) by laboratory assistants.

CONNECTIVES

Look at this example

Physicists study both light and sound.

→Physicists study *not only* light *but also* sound.

5. *Now rewrite these sentences in the same way*

- a) Biologists study both plants and animals.
- b) Chemists study both elements and compounds.
- c) Scientists work both in laboratories and outside.

Look at this example

Chemists analyse compounds. They also combine elements to form compounds.

→Chemists *not only* analyse compounds *but also* combine elements to form compounds.

6. *Now rewrite these sentences in the same way*

- a) Scientists form theories. They also test them by experiment.
- b) Laboratory assistants look after apparatus. They also help with experiments.
- c) Students observe experiments. They also do them.
- d) Geologists collect rock samples. They also analyse them.
- e) Botanists collect plants. They also study them.
- f) Zoologists observe animals. They also try to find out more about them.

GUIDED WRITING

Look at this example

Biologist/microscope/see/very small objects.

→A biologist *uses* a microscope *to see* very small objects.

7. *Now build more sentences with use in the same way*

- a) Chemist/balance/weigh/substances
- b) Physicist/prism and lenses/produce/spectrum

- c) Mathematician/computer/make/difficult calculations
- d) Chemist/special apparatus/produce/hydrogen
- e) Scientists/special instruments/make/observations
- f) We/ruler/measure/straight lines
- g) We/thermometer/measure/temperature
- h) Scientists/grammes and kilogrammes/measure/weight
- i) We/telescopes/observe/moon and stars

NUMBERS AND MEASUREMENTS

SIMPLE ARITHMETIC

Look at the way we say these examples

$4 + 4 = 8$	four and four is eight
$9 - 2 = 7$	nine minus two is seven
$5 \times 5 = 25$	five times five is twenty-five
$8 \div 4 = 2$	or five multiplied by five is twenty-five
	eight divided by four is two

1. *Now read these aloud*

- a) $12 + 7 = 19$ b) $15 \div 3 = 5$ c) $6 \times 2 = 12$ d) $23 - 6 = 17$
 e) $9 - 3 = 6$ f) $6 + 3 = 9$ g) $28 \div 4 = 7$ h) $8 \times 9 = 72$
 i) $3 \times 8 = 24$ j) $12 - 4 = 8$

WEIGHTS

Scientists all over the world use a decimal system of weights.

1,000 milligrammes (mg)	= 1 gramme (g)
1,000 g	= 1 kilogramme (kg)
1,000 kg	= 1 tonne

Scientists use a balance to weigh things. Look back at the picture of the chemist in the laboratory. What is he weighing? How much do the crystals weigh?

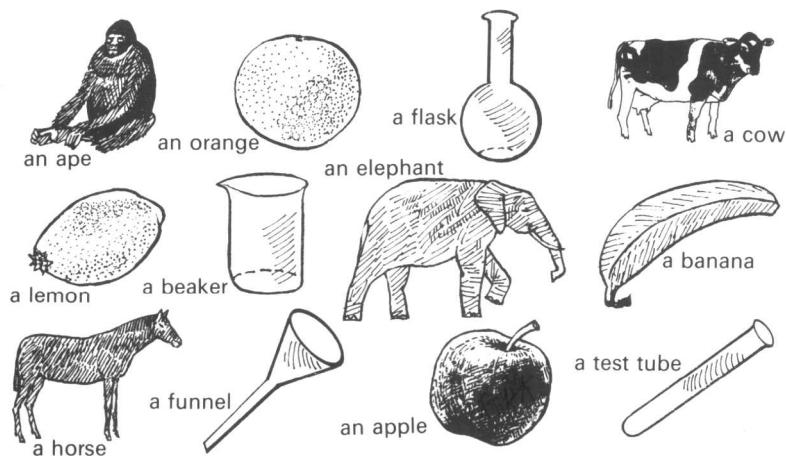
They weigh 85 grammes.

How much do you weigh? How much does a loaf of bread weigh?

How much does your English book weigh? Ask some of your classmates how much they weigh.

UNIT 2 Classification

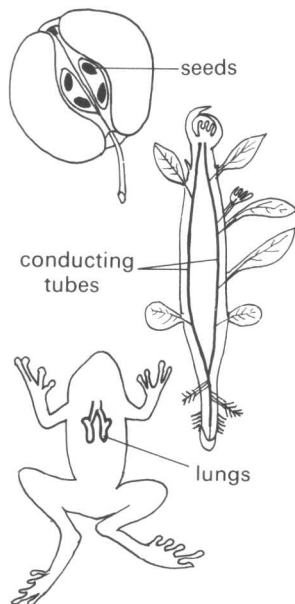
1 Look at these twelve pictures:



Put them into three groups of four, according to common features. Give reasons for your grouping.

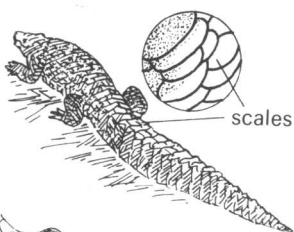
2 Some sort of class word (e.g. *fruits*, *animals*, *pieces of apparatus*) is needed for each group. Here are some class words which are used for living things, or organisms:

Flowering plants. The common features of flowering plants are flat green leaves, flowers, seeds in fruits and conducting tubes.



Amphibians are animals which live both on land and in water. They usually have a moist skin. Most full-grown amphibians have lungs.

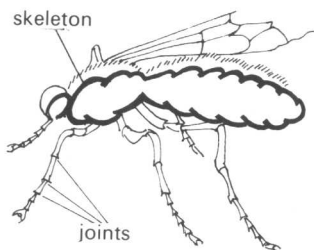
Reptiles are animals with a naturally dry skin. They are covered with scales and are cold-blooded.



Mammals have an unchanging body temperature and hair on their bodies. The females give milk to their young.

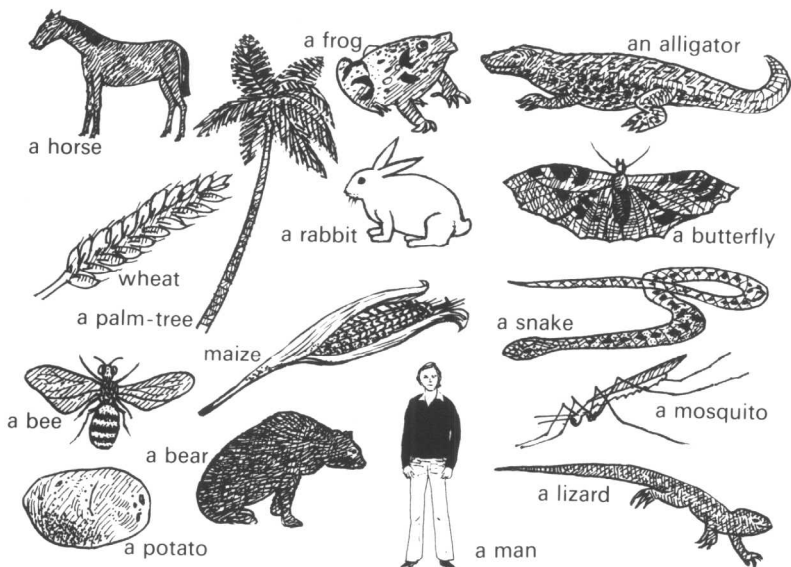


Insects are small animals which have no backbones. They have skeletons on the outside of their bodies, and three pairs of jointed legs.



Now look at these pictures and classify each organism according to the common features. Use a question and answer in each case, for example:

What sort of organism is a horse? It is a mammal.



3 You have now made a simple classification of a small number of organisms. Yet biologists have calculated that there are about two million kinds of organisms alive today. And new kinds are discovered every day. That is why a complete and accurate system of classification is needed. To build up this system, biologists have not only studied the differences between animals but also their common features.

WORDS

WORD STUDY

common (1): (i) Oxygen is the common element in carbon dioxide (CO_2) and copper sulphate (CuSO_4); it is the only element which is found in both compounds. (ii) The palm tree is very common in hot countries – there are a lot of palm trees in hot countries.

features (1): Long hair is a feature which is common to most mammals in cold countries.

organism (1): any living thing, plant or animal. Rocks are not organisms; they are inorganic.

moist (2): wet to the touch. Lick your lips! Now touch them! They are moist.

jointed (2): connected. Your joints are the points in your body where two bones are connected, e.g. the knee.

have calculated (3): have found out by using facts which they know; calculations are made in numbers.

accurate (3): A scientist's balance must be accurate – it must give the exact weight of a substance.

WORDS IN COMBINATION

Look at this example

A reptile is an animal with cold blood.

It is a *cold-blooded* animal.

1. Now rewrite these sentences in the same way

- A mammal is an animal with warm blood.
- A bear is an animal with long hair.
- A rabbit is an animal with long ears.
- An insect is an organism with six legs.
- A triangle is a figure with three sides.
- A reptile is an animal with a dry skin.
- An amoeba is an organism with a single cell.



WORD BUILDING

Many adjectives (and adverbs) can be made negative by the addition of a prefix. The most common negative prefixes are *in-* and *un-*.

Look at these examples

Palm trees are *not common* in England.

→ Palm trees are *uncommon* in England.

The results of the experiment were *not accurate*.

→ The results of the experiment were *inaccurate*.

2. *Now rewrite the sentences below in the same way. Use the correct negative prefix in each case.*

- a) It is *not natural* for animals to live in zoos.
- b) Tom was *not able* to complete his experiment as his instruments were *not accurate* and his calculations *not correct*.
- c) Metals are *not organic*.
- d) The exact number of organisms in the world is *not known* and *not calculable*.
- e) Our information about the moon is still *not complete*.
- f) The colour of that flower is *not usual*.
- g) The two parts of this circle are *not equal*.



QUESTIONS AND ANSWERS

Look at these examples

What has a horse in common with a bear? They are both mammals.
In what way is a horse different from a bear? A horse is usually short-haired whereas a bear is usually long-haired.

1. *Answer these questions in the same way*

- a) What has a bee in common with a mosquito?
- b) In what way are bananas different from oranges?
- c) What has a palm tree in common with wheat?
- d) In what way is an alligator different from a frog?
- e) In what way is an insect different from a mammal?
- f) What has a snake in common with a lizard?

2. *Make questions for these answers*

- a) They are both cold-blooded.
- b) A fish is cold-blooded whereas a mammal is warm-blooded.

- c) Horses have small ears whereas elephants are big-eared.
- d) They are both amphibians.
- e) Butterflies are often brightly coloured whereas mosquitoes are not.
- f) They are both pieces of apparatus which are found in a chemistry laboratory.

SENTENCES

THE PRESENT PERFECT

Look at this sentence

Biologists *have calculated* that there are about two million kinds of organisms alive today.

Notice the form of the verb and notice that the sentence does not tell us *when* biologists made these calculations. It is not important to know.

1. *Now use the correct forms of the verbs in this list to complete the sentences below*

calculate discover find out base decrease .

- a) Chemists in America . . . an important new carbon compound.
- b) Since the 18th century, biologists . . . their classification of living things on the Linnaean system.*
- c) No one . . . ever . . . the exact number of organisms in the world.
- d) The numbers of wild elephants in India and Africa . . . very sharply since the beginning of this century.
- e) Since the invention of the microscope, scientists . . . much more about single-celled organisms.

*The system of classification which was developed by the Swede Linnaeus (1707–78). He used Latin names; e.g. 'Homo sapiens' for man.

Now here are three exercises which you can do with friends.

Look at the example

A: Name three animals.

B: A cat, a cow and an elephant.

A: What *have* you *just done*?

B: I *have just named* three animals.

2. *Now base dialogues, in the same way, on these orders*

- a) Name three elements.
- b) Name three flowering plants.

- c) Multiply ten by five.
- d) Divide ten by five.
- e) Name a cold-blooded animal.
- f) Name an animal which gives milk to its young.

3. Now repeat exercise 2 with three students in a group. Follow this example

- A: Name three animals.
 B: A frog, an alligator and a horse.
 C: What has he just done?
 A: He has just named three animals.

4. Here is a dialogue to practise

A:	Have you ever	seen	a bear? a toad? a rabbit? an alligator?
		milke	a cow?
		killed	a mosquito? a bee?
		caught	a butterfly?
		climbed	a palm tree?
		ridden	a horse?

- B: Yes, I have
 Yes, I have seen a lot of them.
 Yes, I have often killed one, etc.
 (No, I haven't)
- A: When did you see it?
 When did you last kill one? etc.
- B: Last year/week.
 Five years ago.
 In 1973.
 Yesterday, etc.
- A: Where did you see it?/kill it?/ride it? etc.
- B: In a zoo.
 By the river.
 In the mountains, etc.