

Exercise 1

Draw lines joining the labels with the correct part of the diagram.

anode

food in

ion-exchange membrane

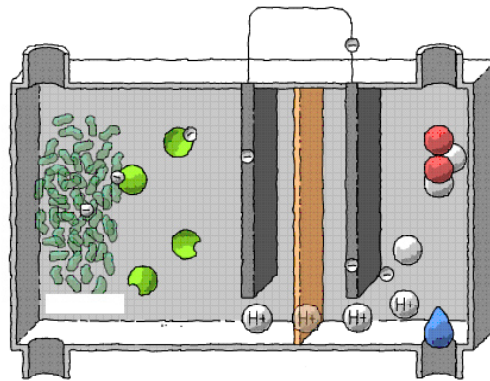
bacteria

electricity

mediator

oxygen in

electrons



carbon dioxide out

cathode

water out

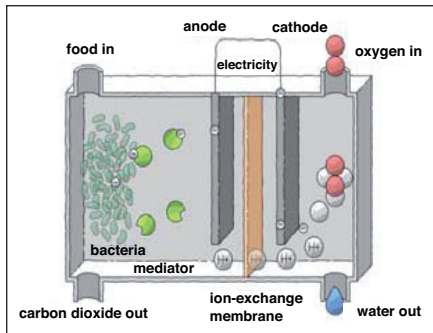
Exercise 2

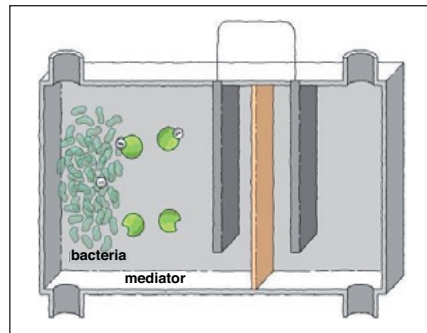
Match the first part of each sentence with the correct ending.

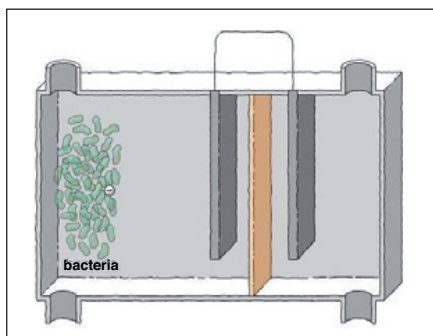
1. Scientists have been working out how	a) electricity that we can use.
2. Whenever bacteria break down food,	b) the electricity will keep flowing.
3. But a special chemical called a mediator can enter the bacteria	c) they can be released to travel around a circuit
4. Once the electrons are outside the bacteria,	d) to make electricity using a 'bug battery'.
5. This flow of electrons is	e) electrons inside the bacteria are released.
6. All we need do now is keep feeding the bacteria and	f) steal some electrons and then exit again

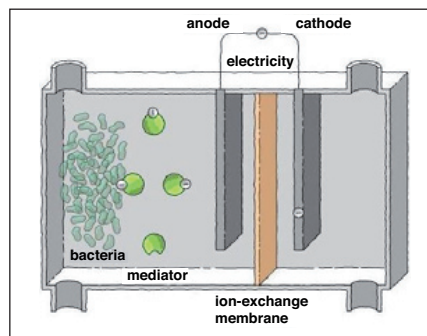
Exercise 3

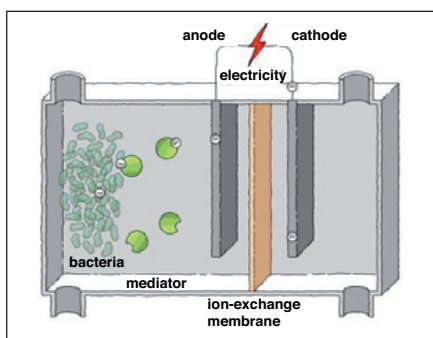
Write the number of the correct completed sentence above (1-6) next to each picture.

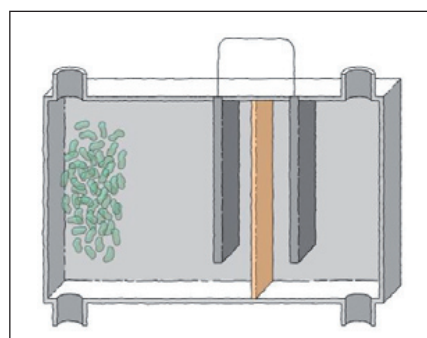












Objectives

Science

Students learn how scientists can make electricity by feeding bacteria in a 'bug battery'.

Language

Skills: Speaking, listening, reading

Grammar: Present simple tense

Vocabulary: Nouns: *electricity, bug, battery, bacteria, electrons, mediator, circuit, anode, cathode, ion-exchange membrane, oxygen, carbon dioxide*

Verbs: *break down, release, enter, steal, exit, travel around, flow*

Activities

Activities	Language skills
Students label a diagram to show how bug batteries work	Speaking; reading; vocabulary
They watch the animation and check if they labelled the diagram correctly	Listening; reading; vocabulary
They use the diagram to describe how a bug battery works	Speaking; vocabulary; present simple tense
They do a matching activity to make sentences about the process	Reading; vocabulary; present simple tense
They match the sentences with a jumbled set of pictures showing the process	Reading; vocabulary
(Groups only) They give an oral commentary on the animation	Speaking; vocabulary; present simple tense

Procedure

With the whole class

(Typical situation: whole class watching the presentation and animation on an interactive whiteboard or projector.)

- 1 [Slide 1] Introduce the topic. Ask the class to say what they know about bug batteries and how they work, but do not go into detail. Introduce some key vocabulary (see above). Then ask students to work in pairs and do exercise 1 on the worksheet: they label a diagram of a bug battery. Monitor and help, but do not give students the answers.
- 2 [Slides 2 and 3] Play the animation. Ask the class to listen carefully and check whether they labelled the diagram correctly. Afterwards, check the correct labelling with the whole class. (See answer key.)
- 3 Ask students to work in pairs using the diagram to describe how a bug battery works.
- 4 [Slide 4] Students continue to work in pairs and do exercise 2 on the worksheet: they match the first part of each sentence with the correct ending. Monitor and help. Check answers with the whole class. (See answer key.) Ask questions to check if the students have understood the whole process.

5 Students work individually and do exercise 3 on the worksheet: they write the number of the correct sentence next to each picture. When they have finished, play the animation once more so that students can check their answers in pairs. Then check answers with the whole class (see answer key): ask individuals to read out the sentences.

With groups (one group studies bug batteries and then presents it to the class)

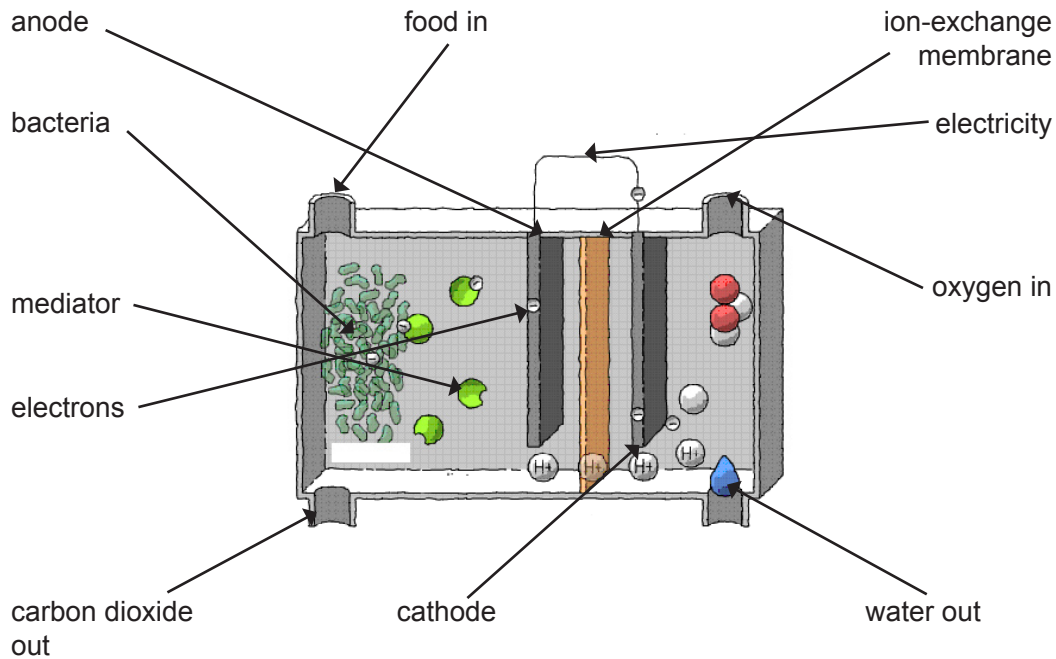
(Typical situation: students arranged in groups around computers eg, in a language lab)

- 1 [Slide 1] Ask the students to work in pairs and do exercise 1 on the worksheet: they label a diagram of a bug battery. Monitor and help, but do not give students the answers.
- 2 [Slides 2 and 3] Students play the animation and check whether they labelled the diagram correctly. (They can also use the answer key.) In their group, ask students to use the diagram to describe how a bug battery works.
- 3 [Slide 4] Students do exercise 2 on the worksheet: they match the first part of each sentence with the correct ending. Monitor and help. They can use the answer key to check their answers.
- 4 Students do exercise 3 on the worksheet: they write the number of the correct sentence next to each picture. When they have finished, they can play the animation once more to check their answers and then use the answer key.
- 5 [Slide 5] The group gets ready to give an oral commentary on the animation: they may like to rehearse it once or twice. Play the animation without sound; students give the commentary.

Bug batteries

Worksheet answer key

Exercise 1



Exercise 2

1	d
2	e
3	f
4	c
5	a
6	b

1. Scientists have been working out how to make electricity using a 'bug battery'.
2. Whenever bacteria break down food, electrons inside the bacteria are released.
3. But a special chemical called a mediator can enter the bacteria, steal some electrons and then exit again.
4. Once the electrons are outside the bacteria they can be released to travel around a circuit.
5. This flow of electrons is electricity that we can use.
6. All we need do now is keep feeding the bacteria and the electricity will keep flowing.

Exercise 3

6	3
2	4
5	1