Unit 2

Science: Now and the future

- **Topics** Eco-living; satellite technology; solar cars; desalination; hydroponics and aquaponics; saving the tiger
- **Use of English** Defining and non-defining relative clauses; linking adverbials

Lessons 1–2 **Eco-living**

- What do you know about living in a more environmentally-friendly way? What changes can we make to our homes? What about our cities? How can we change cities so they do less damage to the environment?

Listening strategy

When we do a listening activity, we should:

- first identify what we need to listen for – read the question or look at the gaps
- listen and pay attention to relevant information-bearing words. If we want to know a number or a date, we listen specifically for that. Listen and check – once we have completed any comprehension questions, we should listen again to confirm our answers.

Listening

1 Before you listen, check these words in your dictionary. Write them in your vocabulary table.

eco-friendly sustainable clean energy innovation
carbon footprint carbon-neutral fossil fuels
reduce recycle waste renewable energy

2 33 You are going to listen to a talk about Masdar City. Why would this be a nice place for people to walk? Give two reasons.

3 Complete this summary of the text, using the words in the box. Then listen again and check.

research	six	eco-friendly	clean	desert	traditional		
2008	45	17	artificial	2010	university	carbon	natural

Masdar City is located in the desert [1], 17 [2] kilometres from Abu Dhabi. Work started on the city in 2008 [3]. The first six [4] buildings were completed by 2010 [5]. The city is designed to be carbon [6]-neutral and to only use clean [7] energy. The streets are kept cool by a 45 [8]-metre wind tower. This is a traditional [9] design. There are large windows to use more natural [10] light and there are no cars in the city.

There is a university [11] in Masdar which carries out important research [12] and development into eco-friendly [13] living.

Listening and speaking

4 34 **Listen to this conversation. Match the underlined phrases with items a, b and c.**

A: I've just read a really interesting article about Rashed Al Nuaimi. Do you know about his work?[1] He …

B: Yes, I do! Oh, sorry …

A: Sorry, I was just going to say, he's done so much to raise awareness about environmental issues and sustainability, hasn't he?[2]

B: Yes, he has. He encourages an eco-friendly way of life and he follows the same lifestyle himself. I think that's really important.[3]

A: So do I. He's a very inspiring man.

_____ a question tag

_____ b opinion

_____ c question

c question

a question tag

b opinion

Speaking tip

Speakers can signal when they finish speaking in different ways. The tone of voice may indicate that a person has finished speaking. Alternatively, questions or question tags may be used, or one speaker may give a conclusive opinion.

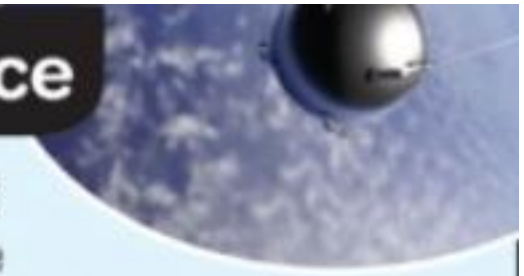
5 Read the conversation again.
What happens when B starts speaking?

6 Practise the conversation in pairs.
Take turns to play each role.

7 21st **Work in pairs. Think about how environmentally-friendly your home or school is. What about your town or city? Try to find the answers to the following questions. Prepare a presentation for somebody who is new to your area, explaining how buildings can be made more eco-friendly and why this is necessary.**

- Why is it important to think about the environment when we plan new homes?
- Are older homes less environmentally friendly or do traditional building techniques use less energy?
- What new developments have been made in your country in the design of new buildings?

Satellites in Space



The first satellite, Sputnik 1, was launched into space by the Soviet Space Programme in 1957. It was a small, round, metal object with four radio antennae. Sputnik 1 orbited Earth for three months before it broke up in space. Since then, as science and technology have developed, many countries have launched satellites into space. Today, satellites are used for a wide range of things, including mapmaking, telecommunications, global positioning systems (GPS) and environmental information collection.

In 2015, the Mohammed bin Rashid Space Centre (MBRSC) was founded by Sheikh Mohammed bin Rashid in Dubai to support science and technology in the Emirates. The centre, and its 68 engineers, aim to create a new space industry in the Emirates. Its projects include the Emirates Mars Mission and the development of satellite technology. Dubai and Abu Dhabi have each launched two satellites into space and the MBRSC is preparing to launch a fifth satellite, KhalifaSat, in 2018.

The first Emirati satellite, DubaiSat-1, was developed and built with colleagues in South Korea. It was launched from Kazakhstan in 2009 on a Russian rocket. Since its launch, DubaiSat-1 has been sending photos and images back to Earth with information on the effects of extreme weather conditions, for example the effects of floods in Pakistan.

In 2013, Dubai's second satellite, DubaiSat-2 was sent into space from Russia. Its improved technology mean that the photos it sends back are clearer and better quality than those sent by DubaiSat-1. The satellite provides high-definition television broadcasts to countries across the Middle East, Asia and Africa.

The third Dubai satellite, KhalifaSat will be the first Emirati satellite to be built by Emirati engineers alone. It will orbit the Earth an average of four times a day and it will travel at 7.5 kilometres a second. During its orbit, it will send information to Earth. KhalifaSat will have improved technologies and more satellite positioning techniques to allow better photography and GPS systems. The launch of KhalifaSat will be an important day in the history of Emirati engineering and space technology.

Lessons 3–4 Satellites

- Which country launched the first satellite into space? How many satellites are there in space today? What is the largest satellite in space at the moment?

1- Soviet Union
2- over 2,200 but the exact number is impossible to know.
3- The International Space Station

Reading

1 21st **Read the first paragraph of this text. What kind of text do you think it is? How do you know?**

- a novel
- an information text
- a magazine interview

2 Answer these questions.

1 Name two things that satellites are used for.

2 Why did Sheikh Mohammed bin Rashid create the Mohammed bin Rashid Space Centre?

3 Which country helped the Emirates build their first satellite DubaiSat-1?

4 When will the Emirates launch KhalifaSat into space?

1- any two of: mapmaking, television and telephone communication systems, global positioning systems (GPS) and information collection.

2- to support science and technology in the Emirates.

3- South Korea

4- 2018

3 **Read the article again. Work out the answer to these questions.**

1 How do we know that it isn't possible to launch a rocket from the Emirates yet?
2 How do we know that scientists aren't building KhalifaSat with colleagues from other countries?
3 How do we know that KhalifaSat will be able to do more things than DubaiSat-1 and DubaiSat-2?

Did you know?

Kazakhstan is on the border with Russia and is the ninth largest country in the world.

Reading strategy

Sometimes when we read a text we can work out information that is not specifically stated. Look at this sentence:

Omar has just set his alarm clock.

We can work out from this that Omar is probably about to go to bed.

Satellites in Space

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3 **Read the article again. Work out the answer to these questions.**

1 How do we know that it isn't possible to launch a rocket from the Emirates yet?
2 How do we know that scientists aren't building KhalifaSat with colleagues from other countries?
3 How do we know that KhalifaSat will be able to do more things than DubaiSat-1 and DubaiSat-2?

1- because DubaiSat-1 was launched in Kazakhstan and DubaiSat-2 was launched from Russia.
2- Because KhalifaSat will be the first Emirati satellite to be build only by Emirati engineers.
3- Because it will have better technologies.

Vocabulary

4 **Match the words from the text to their meaning.**

1	navigation	e	a communication using telephone, cable or digital technology
2	high-definition	d	b navigation based on data from a satellite in space
3	global positioning systems	b	c long metal wires which send and receive information
4	telecommunications	a	d a lot of detail in a photo, or television or film image
5	antennae	c	e the process of planning and following a route

Language focus

5 Read the article again. Find and underline three examples of the zero article.

Language tip

Look at this sentence:

Satellites are used for mapmaking, telecommunications, global positioning systems (GPS) and environmental information collection.

Notice that there are no articles (*the, an, a*). We call this the **zero article**. Here are some instances when we use the zero article:

with non-specific things:
Satellites (in general) *are used for a wide range of things.*

with plural nouns and uncountable nouns:
My mother never eats cheese.

with countries, towns, streets, places, languages, months, days, single mountains, forms of transport:
Have you been to Australia or New Zealand?
I live in Market Street in the middle of Leicester.
George has climbed Mount Everest, Mont Blanc and Mount Kilimanjaro.
I never travel by bus, I prefer using taxis.

Writing

6 Make some notes of the key points in each paragraph of the text in Activity 1. Use your notes to write a summary of 50 to 100 words.

Writing tip

When writing a summary, remember it is a shorter version of a text. Write the key facts and the most important information. Do not write your opinion.

Did you know?

Space debris is the name for the bits of old satellites that have broken up in space. There are more than 500 000 pieces of space debris, currently orbiting Earth at speeds of 17 500 mph.

Lessons 5–6 **Solar cars**

- Are there lots of cars where you live? What effect do they have on the environment? Do you think it is expensive to use a car? What do you know about new developments in transport?

Reading

1 **Read the text. What advantages do organic solar cells have?**

Solar power — the future

Scientists around the world are doing their best to ensure that they will work differently too. Cars which use more sustainable energy are gradually replacing traditional petrol or diesel-powered cars. These are electric cars, which use electric energy stored in rechargeable batteries, or hybrids, which use a combination of petrol or diesel with an electric motor.

However, there's an alternative which is even more appealing from an environmental point of view. Solar energy — using the heat of the sun — is already used to heat buildings and provide electricity. Researchers are now trying to apply this technology to vehicles.

A solar vehicle is an electric vehicle which takes all, or most, of its power from solar energy. The car has photovoltaic (PV) cells in solar panels, which are made of silicon. These convert the sun's energy into electrical energy. For instance, Ford are designing a car with a solar panel system on the roof, which will soon be able to draw the same amount of power as a four-hour charge from a battery.

Other options include replacing a car's sunroof with a panel which has organic solar cells within it. This is a clever idea and may mean that existing cars can convert to solar energy.

Organic solar cells don't work quite as well as silicon cells, but they have the advantage of being more flexible. They are also transparent, so you can see through them.

Some scientists are also doing research into solar paint. It's possible that cars could be painted with material which converts solar energy into electrical energy.

The Abu Dhabi Solar Challenge, part of Abu Dhabi Sustainability Week, aims to promote research in this area of technology. This is a race of 1200 kilometres over four days. Teams from universities around the world take part, and they have to design, build and drive solar-powered cars. The first challenge was held in 2015 and the team from the UAE, whose name was Yas, came second.

2 Read the text again. Choose the correct word.

1 Cars in the future **will** / **won't** look the same as cars now.
2 There are **more** / **fewer** cars using sustainable energy now.
3 Solar energy to **power cars** / **heat buildings** has been used for a long time.
4 Photovoltaic panels convert the sun's energy into **heat** / **electrical energy**.
5 It **might** / **won't** be possible to convert existing cars to solar energy.
6 Organic cells are **more** / **less** effective than silicon cells.
7 It takes **a week** / **less than a week** to complete the Abu Dhabi Solar Challenge.
8 The people who race in the challenge **buy** / **build** the cars.

Language tip

Remember, *more* can be an adjective (*more cars*) or an adverb (*more flexible*). *Less* is an adverb (*less effective*) and also an adjective with uncountable nouns (*less waste*). *Fewer* is an adjective with countable nouns (*fewer cars*).

Vocabulary

3 **Read the text again. Match the words to the meanings.**

1	rechargeable	c
2	hybrid	h
3	solar energy	a
4	transparent	f
5	silicon	d
6	sunroof	b
7	flexible	e
8	solar challenge	g

a energy from the sun
b a section of a car roof which you can remove to let light in
c describing a battery that can be refilled with electric power
d a chemical element, found in rocks and sand, and used in making glass and transistors
e describing something that can move and bend
f describing something you can see through
g a competition to design and build devices powered by solar energy
h describing something which is made by combining two or more different things

Use of English

4 **Rewrite the sentences using the relative pronoun in brackets.**

1 That's my brother. His name is Hassan. (whose)
That's my brother, whose name is Hassan.
2 He met my cousin. This cousin works in the cafe. (who)
3 That's the train station. They filmed a movie there. (where)
4 The team from New York came third. Their name was Sun Racer. (whose)
5 Sven Morgan built the best car. He is from Sweden. (who)

1- That's my brother, whose name is Hassan.
2- He met my cousin who works in the café.
3- That's the train station where they filmed a movie.
4- The team from New York, whose name was Sun Racer, came third.
5- Sven Morgan, who is from Sweden, built the best car.

Use of English: Defining and non-defining relative clauses

There are two kinds of relative clauses. **Defining relative clauses** give essential information about a subject. **Non-defining relative clauses** give extra information about a subject.

We can use defining and non-defining relative clauses with different pronouns:

who to talk about people

where to talk about places

which or *that* to talk about things

whose to give more information about a person or group of people. It replaces the possessive pronouns *his / her / their.*

Defining relative clauses:

I met a woman. Her name was Sarah. > I met a woman ***whose*** *name was Sarah.*

This is the place. The race started here. > This is the place ***where*** *the race started.*

Non-defining relative clauses:

The team from Belgium won the race. Their name was Special Red. > The team from Belgium, ***whose*** *name was Special Red, won the race.*

The winning car was from Canada. It had six wheels. > The winning car, ***which*** *had six wheels, was from Canada.*

We demonstrate that the information is extra — and therefore non-defining — by using commas.

Speaking

5 21st Work in groups. Do some research into the World Solar Challenge in Australia. Find out when it is, where it is and what happens. Try to find out about the different technologies people use and why they help the environment. Present your findings to the class.

Lessons 7–8 **Practise and prepare**

- Look at the pictures A to D and match them with the statements 1 to 4 below. What do the statements mean? Discuss your ideas with a partner.

Carbon footprint

Solar power

Caring for the planet

Carbon dioxide

1 You've got the whole world in your hands. C
2 A natural gas that the planet's system removes unless there is too much of it in the environment. D
3 The impact a person has on the environment. A
4 The conversion of sunlight into electricity. B

The statement that matches picture A is number 3. Everything you do has an impact on your environment. If you leave rubbish, this pollutes the area.

Reading

1 **Read the text and choose the correct option:**

The main idea of the text is …

a living in the desert.

b living in Eco City.

c living an eco-friendly life.

2 **Which paragraph describes:**

1 the temperature in Eco City? D

2 being mindful of not wasting natural resources? C

3 what living in an environmentally-friendly way is and is not? A

4 not contributing to the amount of CO_2 in the environment? B

Footprints in the Desert

A Being eco-friendly means living life in a way that protects the planet for ourselves and future generations. It is not just about switching off the lights when we leave a room, but completely changing our lifestyles to minimise our carbon footprint.

B Everything we buy needs to be produced and often packaged, which uses energy. We should try to buy only what we need. By reducing what we buy, we increase our chances of being carbon-neutral. To be carbon-neutral means not adding to the amount of CO_2 gases which are created during manufacturing and waste disposal processes. We should also reuse products like bags, containers and bottles, instead of polluting our earth by throwing them away. We should try to recycle paper and glass.

C Individual awareness is so important. Everyone can walk more and use cars less. We can all think about how we can conserve natural resources, for example by not wasting water or by using sustainable energy, such as solar power to heat and cool our homes.

D To take eco-friendly living to the next level, Capitalia is building a car-free city on its outskirts called Eco City. The city will be totally serviced by public transport which will include an underground metro, a light rail transit and a personal rapid transit (PRT) system (also called podcars). The city has been built in a way that will capture the cool wind which will then flow through its streets. A surrounding wall will create shade, restrict the desert heat and cool the wind so that it will be much less hot within Eco City than in Capitalia. Eco City will run on renewable energy, such as solar power, and will show that sustainability can be about creating commercial opportunities for businesses in an eco-friendly environment.

3 **Match these extra sentences with the different paragraphs in *Footprints in the Desert*.**

1 Where possible, we should choose products with little or no wrapping. B

2 It may feel inconvenient not to have your own car, but when you get used to a system that eliminates traffic congestion, you will understand the benefits of public transport in Eco City. D

3 In addition to everyone making individual lifestyles choices that ensure we conserve natural resources and use sustainable clean energy, being eco-friendly also means encouraging others to do the same. C

4 This includes making appropriate choices to reduce, reuse and recycle, conserve our natural resources by being less wasteful and use sustainable clean energy. A

Vocabulary

4 **Choose the correct words for the definitions.**

conserve awareness congestion
carbon-neutral outskirts eco-friendly

1 The borders or the edge of a city. outskirts
2 To maintain and not use up or destroy natural resources. conserve
3 Understanding and thinking about how you use resources. awareness
4 Avoiding the creation and increase of CO_2 gases. carbon neutral
5 Having a lifestyle that is good for the environment. eco-friendly

Speaking

5 Discuss with your partner if you would like to live in Eco City. Explain the reasons why you would, or would not, like to live there.

6 Compare the two pictures. How do you think the drivers and the passengers feel in both pictures? Why do they feel like this? Which situation would you prefer to experience – the first or the second? Why?

Did you know?

The average commuter in the United States spends about 42 hours a year stuck in traffic jams.

Lessons 9–10 **Desalination**

- How often does it rain in the UAE? Where does the UAE get its water from? Look at the photos. What do we use water for in towns and on farms? How much water do you think the average person uses every day? Is there enough water for everyone? What ways do you think we waste water?

Listening

1 35 **Listen to the first part of a presentation. What is it about?**

- Ways to save water at home, work and school. ☐
- The water supply and usage in the UAE. ■
- Methods for finding more fresh water in the UAE. ☐

2 36 Now listen to the whole presentation. Complete the sentences with words from the box.

desalination plant	rain	evaporation	solar power
sustainable water supply	fresh water	reverse osmosis	

1 Fresh water is drinkable water found in rivers, lakes and streams.

2 Reverse osmosis is a method of desalination.

3 A sustainable water supply will continue to provide water in the future.

4 Evaporation is when a liquid turns into a gas when it boils.

5 A desalination plant is the place where desalination of sea water happens.

6 Solar power is power that we get from the energy of the sun.

Listening strategy

If you have a long presentation to listen to, it is helpful to listen in sections and focus on the information in one section at a time.

3 37 Listen to the middle section of the presentation again. Complete the table with the advantages and disadvantages of these desalination methods. Use the words in the box.

uses a lot of power	expensive	high carbon emissions	
cheap	increases salt levels in sea water	no carbon emissions	
uses the most power			

Method	Advantages	Disadvantages
reverse osmosis	none	
heat evaporation	none	uses the most power
solar power	No carbon emissions	none

Disadvantages of reverse osmosis :
Uses a lot pf power , expensive , high carbon emissions, increase salt levels in sea water

4 38 Circle the correct words. Then listen and check.

1 **Maybe / Actually** we all use too much water. We could easily use less.
2 **Actually / Perhaps** we could build more solar power desalination plants?
3 I've got an idea. **Maybe / Actually** we could water the plants at home with the dishwater?
4 **Perhaps / Actually** we need to develop cleaner desalination methods.
5 We should think of ways to save water. **Maybe / Actually** we could wash the car less often?
6 **Actually / Perhaps** we need to create more water-saving devices as soon as possible.

Language tip

Use these adverbs to help you express your opinion.

Use *perhaps* … and *maybe* … when expressing an uncertain opinion.

Use *actually* … when expressing a reality or a truth.

Speaking

5 21st **In small groups, discuss these questions. Use the adverbs in the *Language tip* box to help you express your opinion.**

- The demand for water is increasing. What can be done to provide enough water for the UAE in the future?
- What are the advantages and disadvantages of the different desalination methods?

Speaking tip

When we speak, we sometimes pause and vary the **pace** or **speed**. This helps to make our speech clearer and sound natural. But remember, don't pause for too long and don't speak too quickly.

Remember to invite your classmates to speak during a discussion.

Say, *What do you think?*

Lessons 11–12 Hydroponics and aquaponics: alternative ways of growing food

- Have you ever grown any plants? Where did you grow them? What do plants need to grow? Look at the photos. What do you notice about how these plants are being grown?

Reading

1 Why does hydroponics need less water than traditional farming? Read and find out.

Hydroponics is a farming technique which is useful in areas where there is little, or no soil, or where water is scarce.

'As they are not grown in soil,' explains Eisa, 'the crops need food from other sources, so they are grown in tanks or trays of nutrient-rich liquid. This is made by dissolving essential minerals, such as nitrogen, in water.'

One advantage of this type of farming is that it uses a lot less water than traditional outdoor farming, as the water doesn't drain away into the ground. This is particularly important in dry areas of the world where water management has to be carefully controlled.

Another advantage is that farmers can grow the plants in racks one above the other. This means crops can be grown in a smaller area.

'Farmers in desert regions are increasingly turning to hydroponics as the most economical way of producing plants on a commercial scale,' insists Amer.

2 Circle the correct words.

1 The water used in hydroponics is high in **nutrients / soil**.
2 **Nitrogen / Water** is an example of an essential nutrient.
3 Hydroponics uses **more / less** water than outdoor farming.
4 Farmers can grow more plants in **more / less** space in hydroponics.
5 Hydroponics is an **economical / expensive** way of producing crops.

Writing

3 21st Read the text again. Underline the key points. Use the points to write a short text explaining why hydroponics is useful in desert regions.

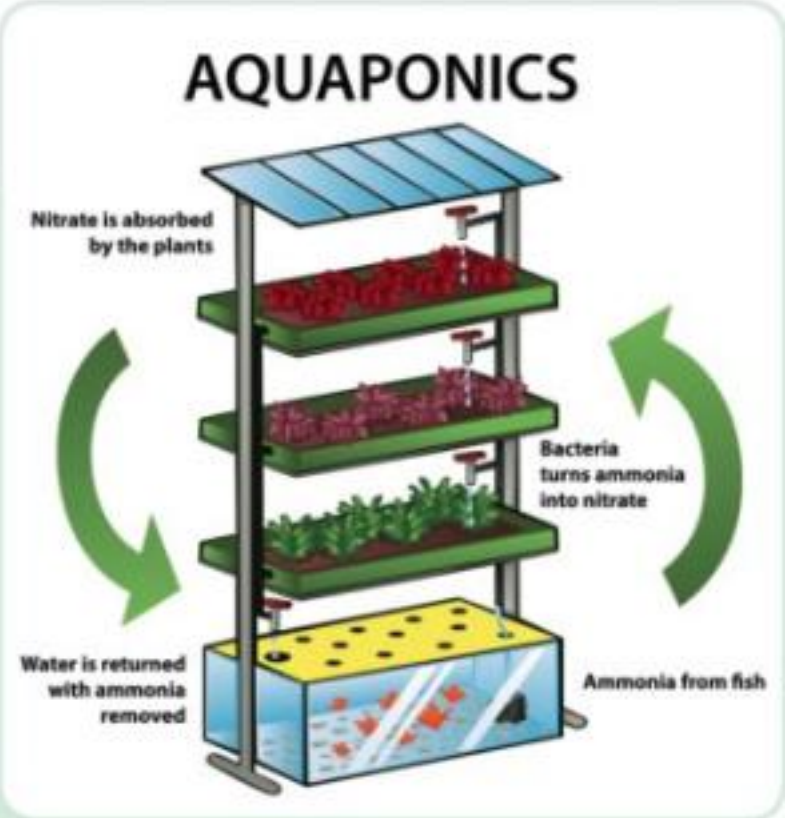
Aquaponics is aquaculture combined with hydroponics.
Hydroponics doesn't involve fish; aquaponic does.

Reading

4 Read and answer. What is aquaponics? What is the difference between hydroponics and aquaponics?

'If that's hydroponics,' asks Eman, 'then what is aquaponics? How does it work?'

'Aquaponics combines aquaculture — which is fish farming — with hydroponics,' explains Midiya. 'First of all, fish are kept in tanks and fed fish food,' he says. 'The fish produce waste which could be toxic to them, so this is pumped out into other tanks where plants are being grown hydroponically. The plants take up the nutrient-rich waste water through their roots and cleanse it naturally, so that finally it can be pumped back to the fish tank and the cycle starts all over again. It's quite simple!' he adds.



Today, most farms using aquaponics are in areas of the world that have little natural access to fish and vegetables. As a result, these areas are no longer as dependent on importing produce as before. The food is fresher and, in addition, there are fewer food miles between farm and table.

Language focus

5 Re-read the text in Activities 2 and 4 with your partner, choosing different reporting verbs to change the speaker's purpose.

Speaking

6 In pairs, compare and contrast hydroponics and aquaponics with traditional farming. Think about:

- climate
- terrain
- financial considerations
- access to water
- space

Language tip

We use reporting verbs when we quote the actual words someone used:

'Even though there is no soil,' ***explains*** *Eisa, 'plants still need to get nutrients to grow so nutrient-rich water is used.'*

The choice of reporting verb gives more information about the speaker's purpose – whether they are asking or answering *(ask, enquire, answer, reply)*, agreeing or disagreeing *(admit, agree, confirm)*, trying to persuade us of something *(advise, explain, suggest, insist)*, giving more information *(add, continue)* or simply giving a fact *(announce, mention, say, state)*. They can also indicate the speaker's mood *(shout, laugh, cry)*.

Lessons 13–14 **Saving the tiger**

- What do you know about tigers? Look at the photos. What do you think the people in the second photo are doing? Why?

Vocabulary

1 **Read and match the word with the definition.**

d	1 extinction	a	something or someone that poses a danger
f	2 conservation	b	the natural environment where an animal or plant lives
b	3 habitat	c	an area that is marked out by an animal as theirs
g	4 camouflage	d	when an animal or plant no longer exists
h	5 predator	e	killing animals illegally
a	6 threat	f	trying to protect the natural environment
e	7 poaching	g	when the skin or fur of an animal is similar to the area around it
c	8 territory	h	an animal that kills and eats another animal

Listening 39

(tigers sometimes kill domestic livestock as a substitute their natural prey

2 Listen and answer: What causes conflict between human[illegible] tigers?

3 21st Listen again and make notes.

Length of time tigers have existed:	*For ever . . .*
Continent they live in:	large areas of South-East Asia.
Number of tigers in the wild today:	around 4,000 today.
Natural habitat of tigers in the wild:	of this habitat have been developed by man, pushing
Main reason for the decline of tigers in the wild:	hunting grounds are lost.
Reason tigers go close to human settlements:	
Problem of tigers going near human settlements:	
Other information:	

the tigers and their prey into much smaller areas.

for food closer to human communities.

Reading

4 Read the following text. Are the statements true (T), false (F) or not given (NG)?

Conservation in action: Today's challenge to save the tiger

The challenge we face to increase the number of tigers in the wild in India is huge! Furthermore, we are running out of time. With all the threats facing these beautiful creatures, only education and real commitment will give us a chance of saving them.

Conservation bodies and scientists are starting to work together to study the behaviour of tigers in order to understand them better. They hope this will help us find and protect areas where tiger populations live. However, the difficulty is that tigers usually live and hunt alone over enormous areas. So, what can be done?

One option is to fit tigers with satellite collars. These collars allow scientists to track the movements of the tiger. As a result, they are able to measure the size of the tigers' territory.

In addition, camera traps are being used to help track tigers. These traps use infrared sensors. The sensors are activated by an animal's movements and body heat. Researchers work 24 hours a day recording images (photos and videos) that we would not normally be able to see. The information from these images provides scientists with vital data about tiger habitats. Hopefully, this information will prove crucial in the fight to save the tiger from extinction.

1 The threat to tigers is not very big. F
2 One job of conservation bodies is to help protect the wildlife. T
3 Tigers hunt in groups. F
4 Satellite collars help scientists follow tigers. T
5 Camera traps are activated by the light levels. NG
6 Data only comes from photos. F

5 Re-read the text in Activity 4. Find examples of different linking adverbials and underline them.

Use of English: Linking adverbials

We have already seen that linking adverbials can help clarify a text by specifying the sequence in which things happen (*firstly, then, finally*).

They can also provide cohesion by giving us extra information (*in addition, additionally, besides*) or reinforcing an opinion (*furthermore, moreover*), contrasting (*however, whereas, on the other hand, in contrast*), showing cause and effect (*consequently, accordingly, as a result*) and telling us something of the writer or speaker's attitude (*unfortunately, fortunately, thankfully, hopefully, sadly, happily*):

***However**, over the last one hundred years, the tiger population has decreased.*

***As a result**, domestic livestock are sometimes killed.*

***Unfortunately**, over the past century, enormous areas of this habitat have been developed.*

Reading

4 Read the following text. Are the statements true (T), false (F) or not given (NG)?

Conservation in action: Today's challenge to save the tiger

The challenge we face to increase the number of tigers in the wild in India is huge! Furthermore, we are running out of time. With all the threats facing these beautiful creatures, only education and real commitment will give us a chance of saving them.

Conservation bodies and scientists are starting to work together to study the behaviour of tigers in order to understand them better. They hope this will help us find and protect areas where tiger populations live. However, the difficulty is that tigers usually live and hunt alone over enormous areas. So, what can be done?

One option is to fit tigers with satellite collars. These collars allow scientists to track the movements of the tiger. As a result, they are able to measure the size of the tigers' territory.

In addition, camera traps are being used to help track tigers. These traps use infrared sensors. The sensors are activated by an animal's movements and body heat. Researchers work 24 hours a day recording images (photos and videos) that we would not normally be able to see. The information from these images provides scientists with vital data about tiger habitats. Hopefully, this information will prove crucial in the fight to save the tiger from extinction.

Lesson 15

- You read about the aquaponics process earlier in this unit. What can you remember?

Reading

1 **Read the following exam task for science students and the model answer. Then answer questions 1 to 4.**

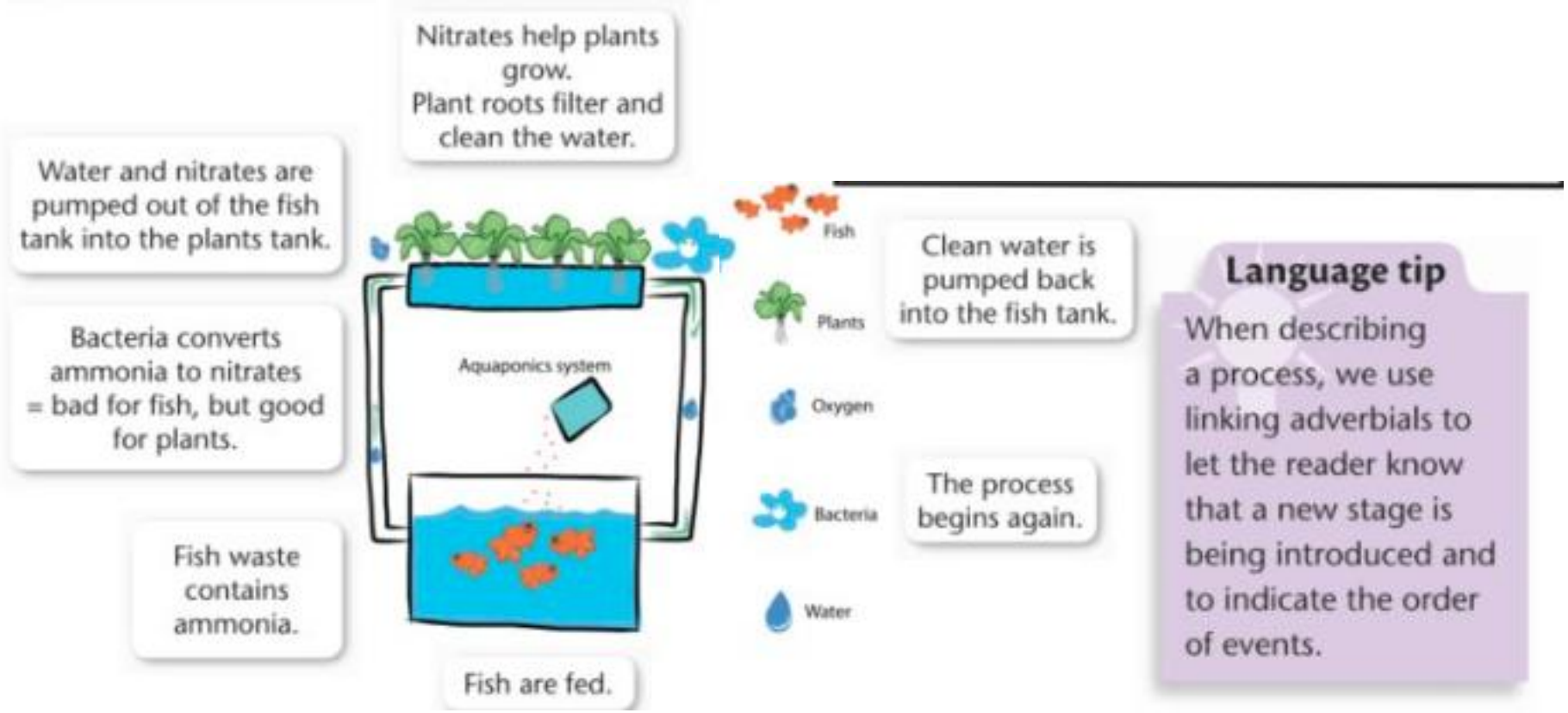
Exam task The picture below and the adjacent text show the process used in an aquaponics system. Write an introduction which briefly states what the diagram explains and gives an overall view of the process. Then summarise the information by selecting and reporting the main points.

Model answer

Introduction: The diagram explains an aquaponics system for growing plants. The process includes a number of stages, during which fish in a tank are fed food and produce waste which contains chemicals that are bad for fish, but good for plants.

Main body:

First, after being fed, the fish contaminate the water with their waste and produce a chemical called ammonia. Then, bacteria in the fish tank breaks down the ammonia and creates nitrates. These chemicals are not good for the fish. Next, the chemicals are pumped with the fish tank water into the area where the plants grow. The plants soak up the water. The plants use the nitrates as a fertiliser which feeds the plants and helps them to grow. In addition, the roots of the plants help filter and clean the water. Finally, the water is pumped back into the fish tank, but it is now clear of chemicals so the fish can stay healthy. Then the whole process begins again.



1 The purpose of the text is to a) persuade b) warn c) describe d) claim something.
2 The text is a) an advert b) a journal c) an article d) a report.
3 Identify the sentence that briefly states what the diagram explains.
4 Which sentence gives the overall view of the process?

The diagram explains an aquaponics system for growing plants

The process includes a number of stages, during which fish in a tank are fed food and produce waste which contains chemicals that are bad for fish but good for plants.

Language focus

2 How many examples of linking adverbials can you find in the passage? Write a list.

- First

- Then
- Next
- In addition
- Finally
- Then

Lesson 16 **Review**

Vocabulary

1 **Complete the sentences with words from the box.**

solar sunroofs	rechargeable	flexible
antennae	batteries	solar energy

1 We should buy _____ batteries, which are cheaper in the long run, as you don't have to buy new ones. rechargeable

2 If you look at the roofs of some houses in the UAE you will see large panels which collect solar energy

3 More and more cars now have _____ so they can capture and use solar energy to power their vehicle. solar sunroofs

4 My new smartwatch is really _____ – it bends and adjusts to the exact shape of my wrist. flexible

5 The _____ on my brother's radio sometimes pick up signals from other people's phones. antennae

Use of English

2 Complete the sentences by choosing the correct reporting verb a–e.

1 'Shall we try and build our own aquaponics system?' the science teacher ... suggested
2 'The exam will be on the 4th of October,' the headmaster ... announced
3 'It's best to buy rechargeable batteries,' the shop assistant ... advised
4 'Don't waste water! You must turn the tap off,' my mother ... insisted
5 'Hydroponics is about creating the best growing conditions,' the teacher ... explained

a insisted
b announced
c suggested
d explained
e advised

3 **Circle the correct relative pronoun.**

1 That is the hou**s which / where** has solar panels.
2 That's Ahmed **whi / who / here** bought the electric car.
3 The latest high definition T **– where / who** I saw in the shop was fantastic.
4 Are you using those rechargeable batteri **– / who / where** I bought you?
5 That's the sh **where / that** I bought the rechargeable batteries.

Reading

4 **Skim read the text. Is it about a, b or c?**

a How solar power is good for the environment and for saving money.
b How technology has made solar power accessible to the average person.
c How businesses use solar power to promote their image.

Solar power is increasing in popularity as an alternative form of energy all over the UAE. Not just by government departments and industries wanting to promote an image of being environmentally responsible, but by people who want to protect the environment and save money at the same time.

But can the average person afford the solar panels that have to be installed on the roofs of their houses? In the last two decades, there has been a revolution in technology, making solar panels smaller, easier to install and therefore cheaper. Now, the everyday person can afford to choose this alternative form of energy too.

Lessons 17–18 **Project: How green is your school?**

- To consolidate knowledge on eco-friendly living.

Project research and planning

1 Aquaponics	2 Desalination	3 Eco-living	4 Solar cars
A 3	B 4	C 2	D 1
green, eco-friendly, sustainable, clean energy, solar power, innovation, carbon footprint, carbon-neutral, fossil fuels	rechargeable battery, hybrid, solar energy, photovoltaic cell, silicon, sunroof, flexible, solar challenge, solar power	desalination plant, rain, evaporation, solar power, sustainable water supply, fresh water, reverse osmosis	nutrients, nitrates, root, solar power, economical, fish, chemicals, waste, ammonia, bacteria, converts

1 Match the headings 1, 2, 3, 4 with the words and phrases in A, B, C and D. Which two words appear in each of A, B, C and D? Solar power

2 Think about the topics from Unit 6. Make notes in your notebook under the headings A to D and write an example sentence explaining why each category is good for the environment or for people's lives.

A: Eco-living. Masdar City is good for the environment because everything in it has been created for eco-living.

3 **Read the text and answer the questions. Which paragraph ...**

1 gives examples of what we should do to be more effective in energy use?
2 tells us about solar power and what we can do if we don't have access to it?
3 suggests public sectors and services need to become more energy efficient?
4 says that we need to learn about energy saving and its long-term benefits?

A Sunlight is a renewable energy source which plants convert naturally. It can be scientifically converted into usable energy by man. Electricity made in this way is called low-carbon as it does not produce CO_2 gas, which has high levels of carbon and is dangerous for the environment. But the initial set-up costs of solar power can be too expensive for some. In that case, we can minimise waste by being careful to only use energy when we need to. If we consume less energy, we will not have to generate as much and this will be more cost-effective and result in fewer CO_2 gas emissions.

B There are many ways we can become more energy efficient. In schools, we can use devices which have good energy efficiency levels such as solar powered calculators. In the home, we can boil only as much water as we need in a kettle, we can close fridge and freezer doors, and we can turn down the heating or air conditioning. Do you think that leaving on the computer, TV or bathroom light doesn't take up much electricity? Why should we bother to turn them off? But imagine if everyone neglected to do this. With 9.2 million people currently living in the UAE, that would add up to a lot of wasted energy.

C Major changes in attitudes and habits are needed if we are to become energy efficient in spite of initial costs. For example, it is true that rechargeable batteries are more expensive than non-rechargeable batteries, but we need to think in the long-term. If we bought rechargeable batteries, not only would we not have to buy new batteries time after time, but we would save on trips to the shops, thereby saving on petrol use or public transport costs. In the context of 9.2 million people, it could make a huge difference.

D The challenge, it seems, is to educate people and to develop a more global approach. For instance, educational institutions, hospitals and government services could all make an effort to become more energy efficient, therefore more eco-friendly and set a good example for the rest of us.

- To create a web page based on one of the topics in the unit.

4 **Look at this web page. Notice how the header has been created using important words and ideas from paragraph A of the text. Notice how the points in the main body have been taken from paragraphs B and C. Notice how the points in the footer expanded on paragraph D.**

Energy Efficiency Equals Eco Environment

Sunlight = Renewable energy = Low-carbon electricity

Only use energy when you need to – minimise waste – consume less energy – Generate less energy = cost effectiveness and fewer CO_2 gas emissions

Become more energy efficient

- Use solar powered products
- Only use what you need
- Do not leave fridge and freezer doors open
- Turn down heating or air conditioning
- Turn off TVs, bathroom lights, etc.

Change attitudes and habits

- Think long-term
- Buy rechargeable products
- Save money and energy on shopping

Challenges: Educate, develop a more global approach, set a good example

- Educational insitutions and schools: Reduce, re-use, recycle
- Hospitals: Re-think medical packaging
- Government services: Create laws to reduce carbon emissions

5 **In pairs, design a web page based on one of the topics in the unit.**

Checklist

In your notebook, make notes on the topics you have studied in Unit 6 or have researched on the Internet.

On paper, design the header of your web page. Include an interesting title to attract attention. Include attractive content and pictures to persuade people to read your web page.

Design the main body and the side panels of your web page. The side panel can be a lead-in, supporting information or a sub-topic for the main body.

Design the footer as a conclusion or action that is required in the future.