16 The energy crisis

Natural resources, alternative fuels

Natural resources

1.1 **Answer the questions in this quiz.**

1 You decide to fly to an island 5,000 miles away for a holiday. How many trees would you need to plant to offset or make up for the CO_2 emissions produced by the flight?
A 0.2 B 20 C 2

2 Which is the most environmentally friendly way to clean your clothes?
A Hand-wash the clothes in hot water.
B Take them to the dry cleaners.
C Machine-wash the clothes in cold water.

3 You are tidying up your house in the evening, going back and forth between the bedroom, kitchen and living room, spending five to ten minutes in each room as you sort out the clutter. What is the best way to make sure your lights aren't needlessly wasting energy?
A Keep the lights on as you go from room to room until the job is done.
B Turn the lights off every time you leave a room and then on again when you return.

4 You decide to cook a baked potato for lunch. Which is the most energy-efficient way of cooking the potato?
A Put it in an electric oven to cook slowly for an hour.
B Quickly zap it in the microwave.

5 You want to really make a significant contribution to the reduction of CO_2 emissions. Which of these would be of the most benefit over the course of a year?
A Taking the train instead of driving a car.
B Hanging your washing out to dry rather than using the tumble dryer.
C Working from home one day a week.

1.2 16 **Listen to the answers to find out how environmentally aware you are.**

1.3 **Complete the text with one word in each gap. Then look at the recording script at the back of the book to check your answers.**

If we want to (1)..... energy then we need to change the way we behave. We need to buy appliances that are more energy (2)..... and limit the amount of time we use them. To reduce the (3)..... the greenhouse gases have on our (4)..... we should plant more trees. Trees can (5)..... carbon dioxide and so they help to (6)..... the fumes produced by our cars. Turning off lights even for a few minutes can (7)..... the negative effects of turning them on again later.

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2.1 **Read the text and then answer the questions below.**

The future of energy

CO_2 plays a critical role in maintaining the balance in the Earth's atmosphere and the air that we breathe. It is also a waste product of the fossil fuels that almost every person on the planet uses for transport and other energy requirements. Because we create CO_2 every time we drive a car, cook a meal or turn on a light, and because the gas lasts around a century in the atmosphere, the proportion of CO_2 in the atmosphere is rapidly increasing.

The best evidence indicates that we need to reduce carbon dioxide emissions by 70 per cent by 2050. If you own a four-wheel-drive car and replace it with a hybrid car – a car that is powered by a combination of electricity and petrol – or a smaller standard-fuel car, you can achieve a reduction of that magnitude in a day rather than half a century. Unfortunately, our past history of change is considerably slower than this. Samuel Bowser first invented the petrol pump in 1885 but it wasn't until 1988 that all new cars manufactured in the UK were required to use unleaded petrol only.

Not only do fossil fuels pose an environmental hazard but there is also a pressing need to find an alternative energy source that is renewable. Opinions as to how much oil remains vary considerably. Some say that the Earth has produced only 18 per cent of its potential yield of oil; others say supplies may run out as early as 2015. Many countries are exploring alternative energy sources such as solar energy or wind power, which uses large turbines to capture the energy of the wind.

1 How do you write CO_2 in full? .....

2 What do we call fuels such as coal and oil? .....

3 What are two names for the substance that comes out of the exhaust of a car? ....

4 What do we call fuels that can be produced at any time? .....

5 Name two types of alternative energy. ....

6 What is a turbine most similar to?
A a large engine B a windmill C a car

Alternative fuels

2.2 **Complete the text with words from the box.**

alternative converting eco-friendly emit engine fuel fumes greenhouse gases plant solar

Fueling our cars

Our love of the fuel-burning car with its poisonous exhaust (1)..... has had a devastating effect both on our environment and on oil supplies. It is unlikely we will abandon our cars in large enough numbers to resolve this problem, so there is a pressing need to find an (2)..... fuel. Many car companies are exploring (3)..... energy sources. Hybrid cars were first developed in 1997 and these are likely to become more commonplace in the future. Hydrogen vehicles that use (4)..... panels to extract hydrogen from water are also likely to be readily available in the near future. These vehicles (5)..... only water vapour and so do not contribute to (6)..... . However, critics say that building a network of fuelling stations and (7)..... existing petrol stations to hydrogen will prove too costly and will limit this vehicle's potential. Nevertheless, countries such as the US, Germany, Japan and Iceland already have ambitious hydrogen plans.

Others believe that biofuels are the future. These fuels are based on (8)..... oils and so can be grown. The concept of using vegetable oil as a (9)..... dates back to 1895 when Dr Rudolf Diesel developed the first diesel (10)..... to run on vegetable oil. He demonstrated his engine at the World Exhibition in Paris in 1900 and described an experiment using peanut oil as fuel in his engine. In 1912, Diesel said, 'The use of vegetable oils for engine fuels may seem insignificant today. But such oils may become in the course of time as important as petroleum and the coal tar products of the present time.'

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Error warning!

Gas is the American word for *petrol*. *Smoke* is produced when something burns. *Fumes* are the gases produced by chemicals such as petrol: *Older cars generate a great deal of* ***fumes***. NOT ~~*a great deal of gas*~~ /~~*a great deal of smoke*~~

2.3 **Decide whether these sentences are true or false. Underline the parts of the text that gave you your answer.**

1 Cars that run on electricity and petrol appeared in 1997. ....True....

2 Water is produced from the exhausts of hydrogen cars. .....

3 It will be relatively inexpensive to change current petrol stations for hydrogen cars. .....

4 Biofuels are non-renewable. .....

5 In 1912 diesel was seen as an important fuel source. .....

2.4 **Which is the odd one out? Try to explain why.**

1 curb / limit / ~~promote~~ / restrict ....The other words mean 'to reduce'.....

2 electricity / nuclear energy / solar energy / wind power .....

3 economical / effective / efficient / emission .....

4 carbon / fuel / gas / petrol .....

5 emit / discharge / release / retain .....

6 renewable / disposable / rechargeable .....

7 diminish / dwindle / deplete / drastic .....

8 consume / extend / exhaust / expend .....

9 conserve / preserve / reserve / save .....

2.5 **Answer these questions using as many new words and phrases from this unit as you can. If possible, record yourself and then listen to your answers.**

1 Do you think that you waste too much energy in the home?

2 What can the government do to encourage people to save energy?

3 Why do you think people prefer to drive a car instead of using public transport?

4 Do you feel optimistic about the future in terms of energy?

5 What changes do you think will happen in the next 20 years?

Test Tip

In the speaking test you will be assessed on your 'lexical resource' – in other words, whether you can use a wide range of vocabulary accurately. Think about your answers to these questions. Did you have to hesitate to search for words? Which words did you manage to use? Which words do you still need to practise?

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Test practice

Academic Reading

America is abuzz with talk of replacing imported oil with 'biofuels' produced from homegrown materials. The US Environmental Protection Agency recently honoured famous country and western singer Willie Nelson for his efforts to promote the use of biodiesel through his own 'BioWillie' brand, a vegetable oil-based fuel which is now being distributed at filling stations nationally. Clearly, many hurdles stand in the way of making such biofuels commercially viable with traditional sources. Indeed, it remains very difficult to forecast whether powering our vehicles with crop derivatives will ever be a truly economic proposition. Nevertheless, it is not too early to ponder what impact the widespread adoption of biofuels would have on our environment.

Michael S. Briggs, a biodiesel advocate at the University of New Hampshire, has estimated that the United States would need about 140 billion gallons of biodiesel each year to replace all the petroleum-based transportation fuels currently being used. This calculation is premised on the idea that Americans could, over time, switch to using diesel vehicles, as European drivers are clearly doing – half of the new cars sold there now run on standard diesel. Although one could make a similar appraisal for the amount of sugar-derived ethanol needed to meet our needs, it is unlikely that drivers would ever want to fill up their tanks entirely with ethanol, which contains only two-thirds of the energy of gasoline, whereas biodiesel is only 2 per cent less fuel-efficient than petroleum-based diesel. Hence a switch to biofuels would demand no new technology and would not significantly reduce the driving range of a car or truck.

The main source of biodiesel is plant oil derived from crops such as rapeseed. An acre of rapeseed could provide about 100 gallons of biodiesel per year. To fuel America in this way would thus require 1.4 billion acres of rapeseed fields. This number is a sizeable fraction of the total US land area (2.4 billion acres) and considerably more than the 400 million acres currently under cultivation. Consequently, the burden on freshwater supplies and the general disruption that would accompany such a switch in fuel sources would be immense.

Such calculations are sobering. They suggest that weaning ourselves off petroleum fuels and growing rapeseed instead would be an environmental catastrophe. Are more productive oil crops the answer? Oil palms currently top the list because they can provide enough oil to produce about 500 gallons of biodiesel per acre per year, which reduces the land requirement fivefold. Yet its cultivation demands a tropical climate, and its large-scale production, which currently comes from such countries as Malaysia and Indonesia, is a significant factor in the ongoing destruction of what rainforest remains there. Conservationists have been warning that palm oil production poses a dire threat to the dwindling population of orang-utans, for example, which exist only in the wild in Borneo and Sumatra. So here again, the prospect of dedicating sufficient land to growing feedstock for the world's transportation needs promises to be an environmental nightmare.

There is, however, a 'crop' that is widely recognised as having the potential to meet the demands of a biodiesel-based transportation fleet without devastating the natural landscape: algae. Algae is a single-celled plant, some varieties of which can contain 50 per cent or more oil. They also grow much more rapidly than ordinary plants and can double in quantity within several hours.

The US Department of Energy funded considerable research on biofuel production using algae after the oil problems of the 1970s, an effort known as the Aquatic Species Program. Although this programme was terminated in the 1990s, a lot of experience was gained through research and various demonstration projects. The results suggested that algae can be grown in sufficient density to produce several thousand gallons of biodiesel per acre per year – a full order of magnitude better than can be expected using palm oil and two orders of magnitude better than soybeans.

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It is not surprising then that many scientists and entrepreneurs are once again looking hard at the prospects for using algae to produce transportation fuels and sizeable amounts of money are being invested in various schemes for doing so. David Bayless, a professor of mechanical engineering at Ohio University, has been working with scientists to engineer a device that can grow cyanobacteria (blue-green algae). It uses carbon dioxide from the gases emitted from power-plant chimneys and sunlight that is distributed to the growing surfaces through optical fibres. Bayless uses an enclosed bioreactor and claims to be able to produce as much as 60 grams of biomass per square metre of growing surface per day.

Another recent effort is being carried out in San Diego by KentSeaTech Corporation. This company gained experience growing algae as a part of its aquaculture operations so was quick to respond when the California state government started looking for ways to treat the huge quantities of nutrient-laden water which runs off from adjacent farm lands. 'It's no real difficult feat to turn nutrients into algae,' says director of research Jon Van Olst, 'but how do you get it out of the water?' This is what Van Olst and his co-workers have been trying to achieve.

The people working on these ventures are clearly eager to make growing algae a commercial success. Yet it is not hard to find experts who view such prospects as dim indeed. John Benemann, a private consultant in California, has decades of experience in this area. He is particularly sceptical about attempts to make algae production more economical by using enclosed bioreactors rather than open ponds. He points out that Japan spent hundreds of millions of dollars on such research, which never went anywhere. Even Van Olst has serious reservations. 'It may work,' he says, 'but it is going to take a while and a lot of research before we get anywhere.'

Questions 1–5

Classify the following characteristics as belonging to

A biodiesel
B ethanol
C ordinary diesel

Write the correct answers A–C next to questions 1–5.

1 Produced by a popular American entertainer. .....

2 50% of new cars in Europe use this fuel. .....

3 Provides two thirds of the power of standard petrol. .....

4 Your car's performance will be almost unchanged if you change to this fuel. .....

5 Production can have a negative impact on water resources. .....

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Questions 6–12

Do the following statements agree with the claims of the writer in the reading passage?

Next to questions 6–12 write

Yes	if the statement agrees with the claims of the writer
No	if the statement contradicts the claims of the writer
Not given	if it is impossible to say what the writer thinks about this

6 2% of Americans already use biodiesel. .....

7 At present in America, 400 million acres of land are used for agriculture. .....

8 The use of palm oil as a fuel source will require more land than using rapeseed oil. .....

9 Growing biodiesel crops has had a positive effect on local wildlife in some areas. .....

10 One advantage of algae is the speed with which it grows. .....

11 David Bayless believes that algae can produce more energy than solar power. .....

12 It is easy to grow algae using agricultural waste water. .....

Question 13

Choose the correct answer **A**, **B**, **C** or **D**.

13 What is the main purpose of this article?

A To prove that biofuels could totally replace petrol in America.
B To examine the environmental impact of standard fuel sources.
C To assess the advantages and disadvantages of different types of fuel.
D To show that an international effort is required to solve the fuel crisis.

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