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AUTOMOTIVE ENGINEERING IN TRANSPORT TECHNOLOGY (NEW TRENDS, INNOVATIONS AND RESEARCH)

Методические рекомендации
для студентов специальностей 23.05.01 «Наземные транспортно-технологические средства», специализация «Автомобильная техника в транспортных технологиях»

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AUTOMOTIVE ENGINEERING IN TRANSPORT TECHNOLOGY : методические рекомендации для студентов специальностей 23.05.01 «Наземные транспортно-технологические средства», специализация «Автомобильная техника в транспортных технологиях»

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Материал методических указаний направлен на развитие профессионально ориентированной иноязычной коммуникативной компетенции обучающихся. Основная цель методических указаний – формирование ключевых компетенций, обусловленных лексическими навыками и умениями чтения, говорения, письма, перевода и использования справочной литературы.

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Unit I Part 1

Technical Specifications of a Car

Ex. 1 Active vocabulary

engine – двигатель

cylinder – цилиндр

speed transmission – скорость передач

power – мощность

torque – крутящий момент

drivetrain – трансмиссия

suspension – подвеска

fuel tank capacity – емкость бака

wheelbase – колесная база

tread/track width – ширина протектора

turning radius – радиус поворота

kerbweigh– снаряженная масса

airbags – подушки безопасности

Ex. 2 Read and summarize the text:

Have you ever been in a conversation with someone linked closely to automobiles or tried researching a car but gave up because you didn't understand head or tail of what he was on about, or what was listed in the specifications list? We know it happens quite often, so we thought we'd break down some commonly heard basic automotive jargon as plainly and simply as we could for you.

Engine. The engine is like the heart of the car. It is a machine that converts power into motion or produces the force that propels the vehicle into motion. Engines commonly see three types - petrol (runs on gasoline), diesel (powered by diesel), electric (powered by batteries) and hybrid (using a combination of a fuel-driven engine and an electric one).

4-cylinder, 3-cylinder. A cylinder is a 'chamber' where fuel is ignited to power the car into motion. So a 4-cylinder engine will have four of these compartments, a 3-cylinder, three, and so on. The cylinder

houses a piston or large valve that creates compression that helps ignite the fuel.

5-speed transmission, 6-speed transmission. Much like you would choose different gears on a bicycle for varying inclines and pace, you need to choose gears depending on the speed of the car or the road situation. A 5-speed transmission has 5 gears or speeds you can choose from while driving. A manual transmission is one that requires you to change speeds manually, while an automatic transmission picks gears automatically, requiring you to only operate the brakes and accelerator.

Power. The easiest way to understand this is the unit of power-horsepower. One horsepower is informally defined as the amount of power one horse gives while pulling. So if your car has 75 horsepower, it has the pulling power of 75 thoroughbreds.

Torque. Torque is the ability (of the engine) to do work or a force that tends to cause rotation of the wheels in the case of a car or bike. Torque is measured in Newton Meters (Nm) and is usually higher in diesel engines when compared to similarly sized petrol ones.

Drivetrain. This is the system in a vehicle that connects the transmission or gearbox to the drive axles and is broken down into three main categories - front wheel drive (FWD), rear wheel drive (RWD) or all-wheel drive (4x4/4WD/AWD). FWD means the power goes to the front wheels, therefore 'pulling the car', RWD means the 'push' comes from the rear wheels, and AWD means all four wheels transfer power.

Suspension. The suspension is the system of springs and shock absorbers that connect the vehicle to its wheels and it is designed to reduce the shock of bumps and potholes, and contribute to the way your car behaves on the road.

Fuel tank capacity. The total amount of fuel your car can store, which usually includes the volume of the reserve and measured in liters, is the fuel tank capacity of your vehicle.

Wheelbase. The distance between the front and rear axles (the rods connecting the centers of the wheels) of a vehicle is known as its wheelbase. Generally, the longer the wheelbase, the larger the cabin of the car can be, therefore leading to more interior room. Wheelbase is usually measured in millimeters.

Tread/track width. The distance from tire center to tire center, measured width-of-the-car-wise, is called tread or track width. Usually,

the wider the track width, the more stable and better around the corners a car is. The tread is usually denoted in millimeters as well.

Turning radius. The radius of the smallest or tightest circular turn (or U-Turn) a car is capable of making is known as turning radius. It is used measured in meters-small cars generally, have a turning radius of around 5 meters.

Kerbweight. Kerbweight is the weight of the car without any occupants or cargo and is usually denoted in kilograms.

Airbags. Airbag is a rapidly inflatable cushion that is designed to protect the driver or passenger(s) in the event of a collision. Nowadays even cars in cheaper segments are beginning to feature airbags (at least for the driver).

ABS. ABS is an acronym for Anti-Lock Braking System, a system that prevents the wheels locking or skidding in the event of hard braking.

Ex.3 Answer the questions:

1. What is the heart of the car?
2. What mechanism houses a piston or large valve that creates compression that helps to ignite the fuel?
3. Which drive system components allows opposing wheels to rotate at different speeds?
4. How can we call the distance from tire center to tire center, measured width-of-the-car-wise?
5. What thing is necessary to protect the driver or passenger(s) in the event of a collision?
6. Where is fuel stored in a car?
7. What system prevents the wheels locking or skidding in the event of hard braking?

Ex. 4 Fill in the gaps:

1. Torque is measured in ...and is usually higher in diesel engines when compared to similarly sized petrol ones.
2. ... is a machine that converts power into motion or produces the force that propels the vehicle into motion.

3. The distance between the front and rear axles (the rods connecting the centers of the wheels) of a vehicle is known as its

4. A rapidly inflatable cushion that is designed to protect... in the event of a collision.

5. Kerbweight is the weight of the car without any ... and is usually denoted in kilograms.

6. ...is a system that prevents the wheels locking or skidding in the event of hard braking.

7. The suspension is the system of springs and shock absorbers that connect the vehicle to its

Ex.5 Decide if these sentences are true or false?

1. Kerbweight is the weight of the car with occupants or cargo and is usually denoted in kilograms.

2. Nowadays even cars in cheaper segments are beginning to feature airbags (at least for the driver).

3. The tread is usually denoted in centimeters.

4. Anti-Lock Braking System, a system that prevents the wheels locking or skidding in the event of hard braking.

5. A 5-speed transmission has 6 gears or speeds you can choose from while driving.

6. A manual transmission is one that requires you to change speeds manually.

7. Engine produces the force that propels the vehicle into motion.

Ex.6 Look through the text given below and tell your group-mates why aluminium alloy is used for car parts?

With the launch of the A2, Audi AG introduced the first vehicle in the world to have a volume-built all-aluminium body. In 1996, series production of the A8 began. The A8 is the first luxury limousine made of aluminium, and the Audi plant in Neckarsulm produces 20000 vehicles a year. The A8 combines high strength with low weight. At only 1690 kilos, the A8 3.2 is the lightest car in the luxury

class. The third-generation Audi Space Frame now has fewer makes it easier to build the car in large quantities.

Other car makers are also starting to take aluminium seriously. As engine sizes have increased, cars have become top-heavier. Using aluminium for the bonnet and front wings helps to get a better weight distribution between front and rear axles. Another advantage of aluminium is that it is cheaper to recycle than steel. This will be an important consideration in the future when the EU introduces tougher recycling regulations.

With the launch of the A2, Audi AG introduced the first vehicle in the world to have a volume-built all-aluminium body. In 1996, series production of the A8 began. The A8 is the first luxury limousine made of aluminium, and the Audi plant in Neckarsulm produces 20000 vehicles a year. The A8 combines high strength with low weight. At only 1690 kilos, the A8 3.2 is the lightest car in the luxury class. The third-generation Audi Space Frame now has fewer makes it easier to build the car in large quantities.

On the plus side, aluminium doesn't rust like steel, and in car crashes it has a higher energy absorption rate, which increases the cars active safety.

Ex.7 Complete the sentences with the correct form of the words.

Noun	Verb	Adjective
<i>power</i>	<i>transmit</i>	<i>explosive</i>
<i>ignition</i>	<i>ignite</i>	<i>combustible</i>
<i>rotation</i>		<i>rotational</i>
<i>transmission</i>		<i>powerful</i>
<i>combustion</i>		

1. In an engine, leaner motion is converted into...motion like crankshaft.
2. The power of the engine isthrough the clutch and gear-box.
3. The spark plug.....the air/fuel mixture and sets off an.....

4. A six-cylinder engine is..... more than a 4-cylinder engine.
5. The fuel and air is compressed in the ... chamber.

Ex.8 Complete the information about your own car if you have one or ask other students about their cars.

Top speed_____.

Fuel consumption_____

Engine type_____

Maximum power_____

Acceleration 0-60 mph_____

Ex.9 Work in pairs or groups. Discuss the following:

1. Do you know if all cars have the same parts and systems in general?
2. Then what makes difference between them?

Part 2

SPEED LIMITERS

Warm-ups

1. In pairs or groups talk about the following words/expressions from the article: new cars, technology, speed, safety, intelligent, assistance, alcohol, reversing, road deaths, mixed reaction, advanced, impact.
2. Speaking on **Speed Limiters**: Students A **strongly** believe speed limiters on cars are a great idea; Students B **strongly** believe they are not. Change partners again and talk about your conversations.
3. Spend one minute writing down all the words you associate with the word "**seatbelts**". Share your words with your partner(s) and talk about them.
4. Rank these aspects concerned the **road safety** with your partner. Put the best important ones of road safety at the top. Share your rankings.

- age of cars
- seatbelts
- airbags
- driver helmets
- speed
- overtaking
- police
- radar

5. Read the headline. Guess if 1-8 below are true (T) or false (F).

1. Europe's cars will have speed-limiting technology by 2022. **T / F**
2. Cars in Europe will also have a breathalyzer to check alcohol in drivers. **T / F**
3. Technology in cars will check to see if the driver is sleepy. **T / F**
4. Road accidents kill around 25,000 people a year in Europe. **T / F**
5. Most people hate the idea of the speed limiters in cars. **T / F**
6. The EU said the safety features will have a similar effect to seatbelts. **T / F**
7. There could be up to 60,000 fewer injuries by 2030. **T / F**
8. A British motorist said data recorders were like Big Brother is watching. **T / F**

6. Match the following synonyms from the article.

- | | |
|---------------|-------------------|
| a. driver | 1. mistake |
| b. reduce | 2. effect |
| c. limit | 3. permit |
| d. standard | 4. stay away from |
| e. allow | 5. normal |
| f. drowsiness | 6. motorist |
| g. error | 7. restrict |
| h. impact | 8. reasoning |
| i. avoid | 9. sleepiness |
| j. judgment | 10. lower |

7. Read the newspaper article.

All new cars sold in Europe from 2022 will have technology to limit their speed. New safety rules from the European Union will require new cars to have "intelligent speed assistance" systems. These will be standard equipment on cars, just like seatbelts and airbags. There are other things that cars will be fitted with. All cars will have breathalyzers that won't allow driving if the driver has drunk too much alcohol. Cars must also have advanced emergency braking, a built-in data recorder, drowsiness and distraction monitoring, and sensors to help when reversing. The EU said 25,000 people are killed each year on Europe's roads. Most accidents are caused by human error. The new safety systems will reduce road deaths.

There has been mixed reaction to the new safety features. Some people agree with them, while others disagree. The EU said the features would make driving a lot safer. It said : “ With the new advanced safety features we can have the same kind of impact as when safety belts were first introduced.” It added that the new safety features could save up to 10500 lives and avoid up to 60 000 serious injuries by the year 2030. Many drivers are unhappy with the technology. They say it could make roads more dangerous because driving requires human judgment. One British driver says he didn't want data recorders in his car because that was like Big Brother was watching him.

8. Answer the questions:

1. Where are the new safety rules from?
2. What will the new safety measures be like?
3. What will sensors help motorists do?
4. How many people are killed each year on Europe's roads?
5. What are most accidents caused by?
6. What kind of reaction has there been?
7. How many lives could be saved by the new safety measures?
8. What are many drivers unhappy with?
9. What did the article say driving requires?

9. Spell the words in **bold** correctly.

New **afesty** rules, speed **sitsaascne** systems, standard **upiqmenet** on cars, **dvancaed** emergency braking, **rosdni-wess** and distraction monitoring, **deruce** road deaths, there has been mixed **ecritaon**, while others **igarsdee**, have the same kind of **mpaict**, avoid up to 60,000 serious **ujirneis**, driving requires human **ugjemdnt**, data **crdroeers**.

10. Put the words in the right order.

1. intelligent assistance to speed systems . Require cars have
2. fitted that things cars Other be with . will
3. alcohol . too the drunk driver If much has
4. human caused are by Most error . accidents
5. new safety road deaths . The systems will reduce
6. mixed features . to safety the is There reaction
7. lot driving would features The safer . a make
8. have the kind same can impact . of We
9. dangerous . make They could say roads more it
10. didn't data his want recorders in He car .

11. Role play.

Student A – Speed

You think speed is the most important aspect of road safety. Tell the others three reasons why. Tell them what is wrong with their things. Also, tell the others which is the least important of these (and why): traffic police, wearing a seatbelt or drivers wearing a helmet.

Student B – Traffic Police

You think more traffic police is the most important aspect of road safety. Tell the others three reasons why. Tell them what is wrong with their things. Also, tell the others which is the least important of these (and why): speed, wearing a seatbelt or drivers wearing a helmet

Student C – Wearing a Seatbelt

You think wearing a seatbelt is the most important aspect of road safety. Tell the others three reasons why. Tell them what is wrong with their things. Also, tell the others which is the least important of these (and why): traffic police, speed or drivers wearing a helmet.

Student D – Drivers Wearing a Helmet

You think drivers wearing a helmet is the most important aspect of road safety. Tell the others three reasons why. Tell them what is wrong with their things. Also, tell the others which is the least important of these (and why): traffic police, wearing a seatbelt or speed.

Unit 2 Part 1**Automobile Safety Technology****Ex. 1 Active vocabulary**

traffic safety – безопасность движения

safety technology – технология обеспечения безопасности

vehicle safety control – контроль безопасности транспортного средства

traffic accidents – ДТП

ESC – электронная система безопасности

brake control – управление тормозом

to reduce the risk – снизить риск

data fusion – слияние данных

to detect the road environment information – предоставлять информацию об обстановке на дороге

vision and radar sensors – датчики обзора и радары

security warning system – система предупреждения об опасности

protection devices – защитные устройства.

Ex. 2 Read and summarize the text:

Karl Benz, a famous German engineer, invented the first car in history in 1886 and so far the reform and development of the automobile industry has lasted for nearly 130 years. In the meantime, automobiles have spread to all parts of the world and have rapidly penetrated into the social economy and people's daily life, and have become the most important and most common means of transportation for people. However, in recent years, due to the rapid popularization of automobiles, traffic safety has become more and more serious. The recent "World Disaster Report" pointed out that about 1.3 million people died in traffic accidents each year, and the number of injuries is up to 30 million. The world lost as much as \$3,000 billion due to traffic accidents, of which up to two-thirds were lost in developing countries. Therefore, car safety performance is of great significance to occupant safety.

The R & D of automotive safety technology mainly starting from the whole, the first is the most important thing is to ensure the vehicle safety and comfortable situation as far as possible to prevent the occurrence of traffic accidents, the second is when the vehicle traffic accidents, to minimize the damage caused to the people in the car. At present, automobile safety is divided into two categories: active safety and passive safety.

Active safety technology

Active safety technology means the reasonable design of automobile and scientific structure in the automotive R & D and production process, using the very advanced technology in automobile industry, as far as possible to avoid or reduce the vehicle in normal driving sudden collision accidents, to improve the safety of their performance, to reduce the risk of a traffic accident then, to reduce the losses caused by the occupant. In recent years, active safety technology has become an important research object of R & D institutions of major automotive companies.

Chassis active control technology

Vehicle active safety control is usually realized by active safety control of chassis. Electronic brake control is one of the most widely used technologies of chassis active control technology. Electronic stability control system (ESC) is considered to be one of the signs of vehicle active safety technology development, by comparing the running state of driver's intention and the actual vehicle system, reasonable distribution

of longitudinal and lateral tire force, dynamic behavior and precise control of the vehicle, the driver will try to follow the road, reducing the probability of traffic accident.

Security early warning technology

The security warning technology detects the road environment information through the ultrasonic vision and radar sensors, and it also analyzes the various information to remind and warn the driver thereby reducing the occurrence of accidents. At present, the technology mainly through the use of visual sensors in the car detects the surrounding environment, auxiliary driver operation. With the development of vision technology, the security warning system based on monocular vision sensor will be more widely used in vehicles, and data fusion with other sensors will further improve the security of security warning technology.

Passive safety technology Passive vehicle safety technology refers to the automobile after the collision, using the protection devices to protect the people inside and outside the automobile as much as possible, to minimize damage. Today, most of the car mounted occupant protection devices include anti-collision body, pre tightening seat belts and airbags and so on.

Safety belt

The seat belt was invented by Chaire L. Strath in 1935. It has been used as a must for automobiles. Seat belts are the most representative and major vehicle protection devices in the history of automotive passive safety system's research and development. In the process of automobile traffic accidents, it mainly uses the occupant restraint to absorb and buffer most of the energy generated by collision, so as to avoid the occupants hit into the cockpit or the happening of second collision, as much as possible to reduce occupant injuries and economic losses. According to NHTSA estimates, the use of seat belts reduced 45% of fatal injuries and 50% moderate to severe injuries to car front occupants, while 60% and 65% for light truck occupants. It saved the lives of 12802 people in the United States in 2014.

Airbag

Airbags were first invented by the Swedes. The first patent for American airbags was made in the 1950s, and some factories started to develop airbags in the 1970s. In 1972, General Motors took the lead in

large-scale airbag field test. After the 1980s, more cars equipped with airbags, airbag technology tended to improve. In the 1990s, the number of airbag installations increased rapidly and there were many new technology products. The first airbag to prevent side impact was first developed by General Motors in 1996. In the 21st century the airbag has become a very common and vital safety device in automobiles. The airbag is an auxiliary occupant restraint system, which works with the seat belt to prevent occupants from being hurt by the car's interior trim.

Ex. 3 Answer the questions:

1. Why is it important to have technological advancement in the automobile safety technologies?
2. What are the new safety technologies in automobiles?
3. Who invented the world's first car?
4. What are the most widely used technologies of chassis active control technology?
5. What are the most representative and major vehicle protection devices?
6. Where were the first airbags invented?
7. What system works with the seat belt to prevent occupants from being hurt in traffic accidents?

Ex. 4 Fill in the gaps:

1. In recent years, active ... has become an important research object of R & D institutions of major automotive companies.
2. Electronic ... is one of the most widely used technologies of chassis active control technology.
3. In 1972, General Motors took the lead in large-scale....
4. In the meantime, automobiles ...spread to all parts of the world and have rapidly penetrated into the social economy and ..., and have become the most important and most common means of transportation for people.
5. The first patent for American airbags ... made in the 1950s, and some factories started to develop airbags in the 1970s.

6. According to NHTSA estimates, the use of... reduced 45% of fatal injuries.

7. At present, the technology mainly through the use of visual sensors in the car, to detect the surrounding ..., auxiliary driver operation.

Ex.5 Decide if these sentences are true or false.

1. Airbags were first invented by the Americans.
2. The first patent for American airbags was made in the 1850s, and some factories started to develop airbags in the 1970s.
3. Seat belts are the least representative vehicle protection devices in the history of automotive passive safety system's research and development.
4. In recent years, active safety technology has become an important research object of R & D institutions of major automotive companies.
5. Vehicle active safety control is usually realized by active safety control of chassis.
6. In recent years, active safety technology has become an important research object of R & D institutions of major automotive companies.
7. However, in recent years, due to the rapid popularization of automobiles, traffic safety has become less serious.
8. Today, most of the car mounted occupant protection devices include anti-collision body, pre tightening seat belts and airbags and so on.

Ex.6 Look through the text given below and say why is it so important to design cars with airbags.

AIRBAGS

Until a short time ago, most of the progress made in auto safety was in front and rear accidents, even though 40% of all serious injuries from accidents are the result of side impacts, and 30% of all accidents are side-impact collisions.

Many car makers have reacted to these statistics and new standards of the NHTSA (National Highway Traffic Safety Administration) by making doors, door frames and floor and roof sections stronger. But cars that now offer side airbags represent a new type of occupant protection.

Engineers say that designing effective side airbags is much more difficult than designing front airbags. This is because much of the ener-

gy from a front-impact collision is absorbed by the bumper, hood and engine, and it takes almost 30 to 40 milliseconds before the impact reaches the car's occupant. In a side impact, only a relatively thin door and a few inches separate the occupant from another vehicle. This means that door-mounted side airbags must begin deploying within 5 or 6 milliseconds. It takes a collision of about 19 kph to trigger side air bags.

The seat-belt airbag is intended to give back-seat passengers the same level of protection as front-seat occupants. The airbag is incorporated in the rear-seat seat belt and inflates forward on impact.

Airbags, though, do not always save lives; They sometimes kill people who are too small or are in the wrong position when the airbags deploy. To prevent this from happening, car makers and suppliers are developing occupant-sensing systems. The three leading technologies for smart airbags are weight-sensing in the seat, position sensing within the car, and camera monitoring. These detection systems can automatically deactivate the airbags if the situation is dangerous.

Ex.7 Complete the text about car recalls with words from the box below

charge, dealer, fail, fault, fitted, handbrake, injuries, recall.

A leading car manufacturer is recalling 70,000 models in the UK to check for a potentially life-threatening _____. The brake pedal on the top-selling small MPV can _____ suddenly. The problem affects all UK cars sold since the launch in July 2000 except those delivered in recent weeks. A small clip – if incorrectly _____ – can allow the pedal to detach from the rest of the braking system. If this happens on the move, the driver is reduced to using the _____ and gears to bring the car to a halt. The car manufacturer says a small number of owners have experienced the problem but no _____ have been reported. The manufacturer says it has written to every owner asking them to take the car to their _____. Any work needed will be carried out free of _____. Since only 85% of owners respond to _____ notices, 10,000 potentially dangerous models could still be left on UK roads.

Ex.8 Work in pairs. Discuss the following.

1. Do you know anyone who has been saved by an airbag in the accident?
2. Which other safety features are car manufactures working on at the moment? Which do you think will be developed in the future?
3. How safe do you feel driving your car?

Part 2**CAR BATTERY**

Warm-ups

1. In pairs or groups talk about car batteries.
2. Can you explain these words: car makers, electric cars, atmosphere, battery, charge, petrol transform, electricity, highway.
3. Speak on Electric cars: Students A **strongly** believe electric cars are better than petrol cars; Students B **strongly** believe the opposite.
4. What will the future of these things look like? Will it be good or bad?
Complete this table with your partner(s).

	Good Things	Bad Things
Cars		
The Internet		
The Earth		
Healthcare		
Clothes		
Food		

5. Read the headline. Guess if 1-8 below are true (T) or false (F).

1. Car makers are spending very little money on electric cars. **T / F**
2. Some electric-car batteries take 12 hours to charge. **T / F**
3. A company in Israel developed a lithium-steel battery. **T / F**

4. The new battery is being made in China. **T / F**
5. The article says electric cars will be able to go farther than petrol cars. **T / F**
6. "Range anxiety" is worrying about getting stuck on a road somewhere. **T / F**
7. The battery company said a revolution is coming with charging. **T / F**
8. The company said the switch to electric cars will be very slow. **T / F**

6. Read the newspaper article.

Car producers are making more electric cars. They will replace petrol cars in the future. This will cut the amount of CO² in the atmosphere. A big problem is charging the battery. Some batteries in electric cars can take up to 12 hours to charge. However, a company in Israel says it has made a lithium-ion battery that can charge in just 5 minutes. This is the same amount of time it takes to fill a tank of gas. The new lithium-ion batteries were developed by the Israeli company StoreDot. They are manufactured by a Chinese company called Eve Energy.

The new batteries could transform driving. Electric cars could travel as far as petrol cars. Electric cars can give people "range anxiety". This is stress caused by worrying about the battery running out of power. A representative stated: " You are either afraid that you're going to get stuck on the highway, or to need to sit in a charging station for two hours." Then he added: " We're at the point of achieving a revolution in the electric vehicle charging experience". To the opinion of the car producers the switch from petrol to electric is going to happen quickly.

7. Phrase matching:

- | | |
|---|------------------|
| 1. fill a tank | a. of power |
| 2. making more | b. by worrying |
| 3. charge in just | c. of gas |
| 4. Electric cars can give people "range | d. electric cars |
| 5. This is stress caused | e. five minutes |

- | | |
|--------------------------------|-------------------|
| 6. the battery running out | f. on the highway |
| 7. get stuck on | g. to electric |
| 8. sit in a charging station | h. revolution |
| 9. at the point of achieving a | i. anxiety” |
| 10. the switch from petrol | j. for two hours |

8. Match the following synonyms from the article:

- | | |
|-------------------|-----------------|
| 1. only | a. replace |
| 2. worry | b. problem |
| 3. made | c. just |
| 4. change | d. developed |
| 5. time | e. manufactured |
| 6. take over from | f. transform |
| 7. invented | g. anxiety |
| 8. occur | h. afraid |
| 9. difficulty | i. point |
| 10. scared | j. happen |

9. Put the words in the right order to make sentences:

1. money lot Spending cars . of on electric a
2. up Take hours to charge to 12 fully .
3. is of the same amount time . This
4. tank Fill a with gas petrol . of
5. are by manufactured being They Chinese a company .
6. batteries driving . The new could totally transform
7. with People from cars range suffer electric anxiety .
8. the about electricity . battery running of Worrying out
9. a in two Sit charging for hours . station
10. experience . electric in the revolution charging vehicle A

10. Rank these things. Put the most important thing about cars at the top.

- Safety

- Speed
- Colour
- Fuel efficiency
- Performance
- Price
- Comfort
- Looks

11. Role play

Student A- You think **looks** is the most important thing in a car. Tell the others three reasons why. Tell them what is wrong with their things. Also, tell the others which is the least important of these (and why): safety, performance or comfort.

Student B- You think **safety** is the most important thing in a car. Tell the others three reasons why. Tell them what is wrong with their things. Also, tell the others which is the least important of these (and why): looks, performance or comfort.

Student C - You think **performance** is the most important thing in a car. Tell the others three reasons why. Tell them what is wrong with their things. Also, tell the others which is the least important of these (and why): safety, looks or comfort.

Student D - You think **comfort** is the most important thing in a car. Tell the others three reasons why. Tell them what is wrong with their things. Also, tell the others which is the least important of these (and why): safety, performance or looks.

12. Search the Internet and find out more about advantages and disadvantages of switching from petrol to electric cars. Write an essay.

Unit 3 Part 1

Automobiles & the Environment

Ex.1 Active vocabulary

environment damage – ущерб окружающей среде
 scrappage – утилизация, сдача в лом
 junkyard- авторазборка, механическая свалка
 to recycle – перерабатывать
 parts store- магазин запчастей
 air pollution – загрязнение воздуха
 poisonous – ядовитый
 hazardous pollutants – опасное загрязняющее вещество
 toxic substances – токсические вещества
 exhaust – выхлоп
 to cause global warming – вызвать глобальное потепление
 exhale –выдыхать, испарять
 fossil fuels –ископаемое топливо

Ex.2 Read and summarize the text:

Automobiles affect the environment in many ways. Impacts begin when a vehicle is manufactured and end with its scrappage in a junkyard. Over the life of an average motor vehicle, however, much of the environmental damage occurs during driving and is greatly associated with fuel consumption. Over the dozen or so years of a vehicle's life, nearly 90 percent of lifecycle greenhouse gas production for a typical automobile is due to fuel consumption.

Environmental impacts start with mineral extraction and the production of the raw materials that go into the parts of a car. For example, iron ore gets turned into steel, which now accounts for most of the mass in vehicles. Steel can be recycled, of course. On average, today's automobiles are about 75 percent recyclable, and using recycled steel helps reduce energy use and pollution. Other metal components, such as aluminum (used in some engine parts and wheels, for example) and copper (used for wiring) are also largely recycled. The lead and acid in batteries are poisonous and dangerous. But batteries can be recycled, if they are returned to a service station, a parts store, or brought to a municipal hazardous waste facility. Plastics, which are mostly made from petroleum, are more difficult to recycle. In any case, some degree of pollution is associated with all of these components, much of it due to the energy con-

sumption, air pollution, and releases of toxic substances that occur when automobiles are manufactured and distributed.

Most of the environmental impact associated with motor vehicles occurs when they are used, due to pollution in their exhaust and pollution associated with supplying the fuel. In the United States, nearly all of today's automobiles use gasoline; a lesser number use diesel fuel. In some areas, various alternative fuels are being introduced, but these are not widely available for most drivers. When gasoline, diesel, or other fuels are burned in car engines, combustion is never perfect, and so a mix of hazardous pollutants comes out the tailpipe.

If combustion were perfect and didn't create noxious by-products, the exhaust would contain only water vapor and carbon dioxide. Carbon dioxide (CO₂) isn't directly harmful to health, at least not in low concentrations. After all, CO₂ is also what we exhale after "burning" the calories in the food we eat. However, CO₂ from fossil fuels like gasoline and diesel is very harmful to the environment because it causes global warming.

Motor fuel is itself a product and so, like a car, environmental damage occurs throughout its lifecycle as well. For gasoline and diesel, the product lifecycle begins at the oil well and ends when the fuel is burned in the engine. Fuel cycle impacts are the forms of pollution and other environmental damage that occur between the oil well and the fuel tank. Gasoline and diesel fuel are poisonous to humans, plants, and animals, and their vapors are toxic.

Air pollution isn't the only problem associated with these petroleum-based fuels. Oil extraction lays waste to many fragile ecosystems, harming tropical forests in South America and Southeast Asia, deserts and wetlands in the Middle East, our own coastal areas, and the fragile tundra and arctic coastal plains of Alaska.

Ex. 3 Answer the questions:

1. What are the effects of vehicles on the environment?
2. What are the negative effects of cars?
3. How do cars pollute the air?
4. How do cars affect global warming?

Ex. 4 Fill in the gaps:

1. Gasoline and diesel fuel are... to humans, plants, and animals, and their vapors are toxic.
2. Air pollution isn't the only problem associated ... these petroleum-based fuels.
3. Steel can ... recycled.
4. Environmental impacts start with mineral extraction and the production of the raw materials that go into the
5. Plastics, which are mostly made from ...are more difficult to recycle.
6. ... is itself a product and so, like a car, environmental damage occurs throughout its lifecycle as well.
7. However, CO_2 from fossil fuels like gasoline and diesel is very harmful to the environment because it causes....

Ex.5 Decide if these sentences are true or false.

1. Environmental impacts start with mineral extraction and the production of the raw materials that go into the parts of a car.
2. Most of the environmental impact are not associated with motor vehicle.
3. Much of the environmental damage occurs during driving.
4. When gasoline, diesel, or other fuels are burned in car engines, combustion is never perfect, and so a mix of hazardous pollutants doesn't pollute the environment.
5. Fuel cycle impacts are the forms of pollution and other environmental damage that occur between the oil well and the fuel tank.
6. However, CO_2 from fossil fuels like gasoline and diesel is not harmful to the environment because it causes global warming.
7. Gasoline and diesel fuel are poisonous to humans, plants, and animals, and their vapors are toxic.

Ex.6 Look through the text given below and say what makes cars distinctive.

Every car has a brand DNA which makes it distinctive and instantly recognizable. When you see a BMW or Rover, for example, you know exactly what it is. The importance of national culture in brand

DNA is critical, even though global takeovers, mergers, and partnerships are constantly reshaping the car industry. Volvo, based in Sweden, is now owned by an American company, and Britain's Jaguar, Rolls-Royce, and Bentley are no longer British-owned. Chrysler, that most American of manufacturers, is now part of a German company. Spain's Seat and the Czech car maker Skoda are owned by Germany's Volkswagen. And General Motors has controlled Sweden's Saab for a number of years.

Brand DNA consists of corporate identity and an unmistakable design which is influenced by culture. 'Britishness' or 'Frenchness' is important. But how can 'Americanness' or 'Italianness*' be defined by a few hundred pounds of sheet metal bent over a frame and set down on four wheels?

To Fiat, Italian means 'sporty*'. "People buy Italian cars because they took Italian," said Richard Gadeselli, head of corporate affairs for Fiat Auto S.p.A. "Even the humble Seicento (Fiat's smallest car) has a sporty feel. In everything we design, we try and strive for that. If we took the badges off, people would say, 'I don't know what that is, but it feels Italian'."

Similarly, Japanese design is unmistakably Japanese because of its Zen-like purity and simplicity. Akira Fujimoto, chief editor of Japan's Car Styling magazine, says that the level of detail is the key to Japanese design. "With an American car, you can see the differences at 300 meters. With a Japanese car, you see the differences at three meters. Japan is a small country so there's no need to see the differences from far away."

Peter Horbury, chief designer for Volvo Cars, although British himself, says he believes the Swedish essence of Volvo is something the company should keep even if it is owned by Ford Motor Co. But what is Swedishness? "Sweden is known as a caring society," he said. "Swedish cars are safe, practical, and functional and have a timeless quality."

Ex.7 Work in pairs. Discuss the following:

1. You are planning to buy a car. Which one would you choose and why?

2. What are the most significant features for you when buying a car?
3. Is it an absolute must-have nowadays?
4. Do you know any official data concerned the number of cars per a person in the world?

Part 2

NEW MACHINE SUCKS CO₂ FROM THE AIR

Warm-ups

1. In pairs / groups, explain the meaning of the words from the article, if necessary consult a dictionary: engineers, fuel, renewable energy, gasoline, carbon footprint, the atmosphere, pollution.
2. Have a discussion: Student A **strongly** believes carbon emissions will not be a problem in the future; Student B **strongly** believes the opposite.
3. What can you do to reduce your carbon footprint? Make a list of your ideas.
4. Read the headline. Guess if a-h below are true (T) or false (F).
 - a. Engineers have found the solution to global warming. T/F
 - b. A new machine can extract CO₂ from the air and make it disappear. T/F
 - c. The name of the machine is very easy to remember. T/F
 - d. Using the machine may be better than storing CO₂ underground. T/F
 - e. The technology is still up to two decades away from everyday use. T/F
 - f. Only a smaller version of the machine is in use today. T/F
 - g. Fuel produced by the machine will replace petrol. T/F
 - h. Fuel produced by the machine will create further pollution. T/F
5. Read the newspaper article

Engineers at a U.S. laboratory may have discovered one answer to the problem of global warming. They have made a machine that can suck carbon dioxide from the air and convert it into liquid fuel. Researchers at the Sandia National Labs believe their creation can provide a sustainable form of renewable energy. Their device sounds like something from science fiction. In fact, the name of it is probably the most difficult thing to understand. It is the Counter-Rotating-Ring Receiver Reactor Recuperator, or CR5 for short. Lead developer Rich Diver is excited about his project. He said sucking CO₂ from the environment could be an alternative to carbon sequestration. This is a method of burying CO₂ deep underground.

Sandia calls the process carried out by CR5 “Sunshine to Petrol”. The researchers say their invention is still 15 to 20 years away from being in full operation. It is currently just a prototype – a small model of the real thing. A Sandia spokeswoman said: “... it holds a real promise of being able to reduce carbon dioxide emissions”. She added it would allow us “to keep using fuels we know and love”. It is possible that by 2030, cars and airplanes will run on the converted fuel. It will produce fuels such as methanol and gasoline. It will be interesting to see if this machine can actually lower our carbon footprint. Yes, it reduces carbon dioxide in the atmosphere, but its liquid fuel product causes pollution when it burns.

6. Match the following synonyms from the article.

- | | |
|----------------|---------------|
| 1. discovered | a. give |
| 2. covert | b. comprehend |
| 3. provide | c. complete |
| 4. understand | d. operate |
| 5. alternative | e. reduce |
| 6. process | f. change |
| 7. full | g. technique |
| 8. run | h. substitute |
| 9. lower | i. creates |
| 10. causes | j. found |

7. Look back at the article and write down some questions you would like to ask about the text.

8. Phrase matching:

- | | |
|------------------------------------|------------------------------|
| 1. one answer to the | a. renewable energy |
| 2. suck carbon dioxide | b. of the real thing |
| 3. a sustainable form of | c. the atmosphere |
| 4. sounds like something from | d. to carbon sequestration |
| 5. an alternative | e. from the air |
| 6. 15 to 20 years away from | f. carbon footprint |
| 7. just a prototype- a small model | g. problem of global warming |
| 8. reduce carbon dioxide | h. being in full operation |
| 9. lower our | i. emissions |
| 10. reduces carbon dioxide in | j. science fiction |

9. Vocabulary expansion. Look in your dictionary or computer to find collocations, other meanings, information, synonyms for the words 'liquid' and 'fuel'.

liquid	fuel

10. Matter discussion: the environment in 2030 taking into account new technologies, machines and equipment.

Unit 4 Part 1 Ground Transport

Ex. 1 Active vocabulary

transport hubs – транспортные узлы

highways – шоссе

route – маршрут

station maintenance cars – станции техобслуживания автомобилей

surface vehicle- наземное транспортное средство

maneuverability – маневренность

flexibility – гибкость

hovercraft – судно на воздушной подушке

ekranoplan -экраноплан

exhaust nitrogen and sulfur oxides– выхлопные оксиды азота и серы

mounted equipment – установленное оборудование

Ex.2 Read and summarize the text:

Transport is a collection of all types of communication routes, vehicle, technical devices and structures on the routes of communication, ensuring the process of moving people and goods for various purposes from one place to another

Depending on the environment in which transport performs its functions, it can be: water, including underwater, ground, including underground, air and space. It is possible to combine environments - amphibians, flying boats, ekranoplanes, hovercraft, etc.

Automobile transport is now the most widespread type of transport. Automobile transport is younger than rail and water transport; the first cars appeared at the very end of the 19th century.

The advantages of road transport are maneuverability, flexibility, speed. However, there is “ a dark side of the Moon”. At all stages of production, operation and disposal of cars, fuel, oils, tires, road construction and other automotive infrastructure, significant environmental

damage is caused in particular, nitrogen and sulfur oxides emitted into the atmosphere when gasoline is burned cause acid rain.

Cars are the most wasteful transport in comparison with other modes of transport in terms of the cost required to move one passenger. Road transport requires good roads. Now in developed countries there is a network of highways - multi-lane roads without intersections, allowing speeds of more than one hundred kilometers per hour.

Vehicles: various types of vehicles - Cars, buses, trolleybuses, trucks;

Communication routes: highways, bridges, tunnels, overpasses;

Signaling and control: regulations road traffic, traffic lights, road signs, motor transport inspections;

Transport hubs: bus stations, parking lots, intersections;

Power supply: car filling stations, contact network;

Technical support: station maintenance cars (STOA), parks (bus, trolleybus), road services

Surface vehicle. All cars are divided into transport, special and racing ones. Transport is used to transport goods and passengers. Special vehicles have permanently mounted equipment or installations and are used for various purposes (fire fighting and utility vehicles, car shops, truck cranes, etc.). Racing cars are intended for sports competitions, including for setting speed records (record-racing cars). Transport vehicles, in turn, are divided into cars, trucks and buses. Trolleybus - a bus with an electric drive. Passenger cars have a capacity of 2 to 8 people.

Trucks. Nowadays they transport almost all types of cargo, but even over long distances (up to 5 thousand km or more) road trains (a tractor truck and a trailer or semi-trailer) successfully compete with the railway when transporting valuable goods for which the delivery speed is critical, for example, perishable products.

Public road transport Low-floor city buses are now mainly used for operation in cities and suburbs, and intercity and tourist liners are used for intercity and international scheduled and tourist transportation. The latter differ from urban models in layout with increased level floor (to be placed under it luggage compartments), a comfortable cabin only with seating, the presence of additional amenities (kitchen, wardrobe, toilet), due to increased comfort tourist buses at the end of the 20th cen-

tury, they quite successfully compete with railways in the field of transporting tourists.

Ex. 3 Answer the questions:

1. What types of ground transportation do you know?
2. What is now the most widespread type of transport?
3. What are racing cars intended for?
4. What purposes are the special transport used for?
5. What transport can successfully compete with the railway when transporting goods?

Ex. 4 Fill in the gaps:

1. Depending on the environment in which transport performs its functions, it can be: ..., including underwater, ground, including ..., air and ...

2. Cars - ... most ... transport in comparison with other modes of transport in terms of the cost required to move one passenger.

3. Racing cars are intended for ..., including for setting speed records (record-racing cars).

4. Transport is used to transport

5. ... have permanently mounted equipment or installations and are used for various purposes.

6. Transport vehicles, in turn, are divided into....

Ex.5 Decide if these sentences are true or false?

1. Low-floor city buses are not used for operation in cities and suburbs, and intercity.

2. Trolleybus - a bus with an electric drive.

3. Now in developed countries there is a network of highways - multi-lane roads with intersections, allowing speeds of more than one hundred kilometers per hour.

4. Automobile transport is now the least widespread type of transport.

5. Automobile transport is older than rail and water transport; the first cars appeared at the very end of the 19th century.

6. It is possible to combine environments - amphibians, flying boats, ekranoplanes, hovercraft, etc.

Ex.6 Give examples of transport that is at the same time:

- a) ground, passenger, personal:
- b) ground, passenger, public:
- c) water, passenger, personal:
- d) water, passenger, public:

Ex.7 Write down the phone numbers that are called:

- a) firefighters –
- b) the police -
- c) "Ambulance" –

Ex.8 Make and write a general outline of the story of the history of different modes of transport.

- 1) Transportation in ancient times.
- 2) The invention of the steam engine.
- 3) The appearance of transport on the engine internal combustion.
- 4) The emergence of aviation.
- 5) Space flights.
- 6) Electric motors are the future of transport.

Part 2

TOYOTA SHOWS VIDEO OF DRIVERLESS CAR

Warm-ups

1. In pairs / groups, explain the meaning of the words from the article, if necessary consult a dictionary: driverless car, electronics show, safety features, radars, video cameras, crashes, showcase, highway, manufacturers, traffic jams, research, automated era.

2. Have a discussion: Student A **strongly** believes driverless cars are great technology; Student B **strongly** believes the opposite.

3. What would be the best thing about driverless cars? Rank these and share your rankings with your partner. Put the best at the top:

- no car crashes / no traffic jams / the driver can sleep /you never get lost / fewer deaths on the road/ four seats facing each other /
- more space in the car / get from A to B faster

4. Read the headline. Guess if a-h below are true (T) or false (F).

- a. Toyota has shown a video of a car that needs no driver. T/F
- b. No one will be able to see the car until 2015. T/F
- c. The car has technology that means it can "talk" to any other car. T/F
- d. Toyota's aim is to cut the number of car crashes by 50 per cent. T/F
- e. Toyota isn't the first car maker to make cars that do not need a driver. T/F
- f. The boss of the car company Ford said the cars could cut traffic jams. T/F
- g. The new driverless cars will add to gridlock problems on the roads. T/F
- h. Toyota believes its new car is the leader in safety vehicles. T/F

5. Read the newspaper article.

Toyota has released a video of its new driverless car. The real car will be on show at an electronics show in Las Vegas, USA. The car is full of special "intelligent" safety features to make sure it does not crash. It uses radars and video cameras to understand where other cars are. It can also "see" people and slow down to avoid hitting them. The car can also communicate with other cars that have the same technology. A Toyota spokesperson said: "We're looking at a car that would eliminate crashes. Zero-collision is our ultimate aim." He added that the car should be used with a driver, but that it can also drive itself. This would be useful if the driver wants to use his or her laptop, or falls asleep.

Toyota is not the first car maker to showcase self-driving cars. In May 2012, the Swedish company Volvo tested a self-drive convoy of

cars on a Spanish highway. The search engine Google has also invested a lot of money in the technology for these cars. The German auto manufacturers Audi and Mercedes are also developing similar cars. The chairman of the Ford Motor Company, Bill Ford Jr., said these cars will reduce traffic jams in the future. He said the cars will receive information from computers that monitor traffic and then the cars will take a different route around any gridlock. Toyota's video says: "Lexus advanced active safety research vehicle is leading the industry into a new automated era."

6. Match the following synonyms from the article.

- | | |
|-----------------|-------------------|
| 1. released | a. make contact |
| 2. special | b. highlight |
| 3. communicate | c. keep an eye on |
| 4. eliminate | d. launched |
| 5. ultimate | e. group |
| 6. showcase | f. put an end to |
| 7. convoy | g. purpose-built |
| 8. manufacturer | h. automobile |
| 9. monitor | i. basic |
| 10. vehicle | j. producer |

7. Phrase matching:

- | | |
|-------------------------------------|------------------------|
| 1. The real car will be on show at | a. aim |
| 2. safety | b. avoid hitting them |
| 3. make sure it | c. traffic |
| 4. slow down to | d. features |
| 5. Zero-collision is our ultimate | e. automated era |
| 6. invested | f. a different route |
| 7. these cars will reduce traffic | g. an electronics show |
| 8. computers that monitor | h. a lot of money |
| 9. the cars will take | i. does not crash |
| 10. leading the industry into a new | j. jams |

8. Answer the questions.

1. Where will Toyota show its driverless car?
2. What do the intelligent safety features stop the car from doing?
3. What kind of cars can the driverless car communicate with?
4. What is Toyota's aim for the number of car crashes?
5. Which car maker tested driverless cars in 2012?
6. What could the driver do instead of driving the driverless car?
7. From which country are the two other car makers mentioned?
8. What will the cars get from computers that monitor traffic?
9. What kind of era does the video say Toyota is leading the industry in?

9. Role play.

Student A is a Toyota boss. You are very excited about the driverless cars. Tell the others three reasons why. You think the others do not know what they are talking about. The safety expert has no background in cars. The driver needs to accept new technology. The environmentalist needs to be realistic – we need cars.

Student B is a safety expert. You are very worried about driverless cars. Tell the others three reasons why. Tell Toyota's boss (s)he is more interested in selling more cars and making money than car safety. You think driverless cars will increase the number of accidents.

Student C is a driver. You think the idea of driverless cars is stupid. Tell the others three reasons why. You love driving and think self-driving cars will take all the fun away. There will be more accidents many drivers will be driving normal cars.

Student D is an environmentalist. You think there should be no cars. Tell the others three reasons why. You don't care if cars are driverless or not, all cars make pollution; all cars crash and kill or injure people. You want everyone to stop driving cars and ride bicycles instead to help save the planet.

10. Spell the words in **bold** correctly.

- | | |
|--|--|
| 1. an lrsienteocc show in Las Vegas | 7. _cyovno of cars |
| 2. safety usfeaert | 8. computers that oritnom traffic |
| 3. vioda hitting them | 9. safety ecsarrhe |

4. **ilitemean** crashes
5. our **iuetalmt** aim
6. use his or her **atpplo**

10. leading the **yrundits**

11. Put the words in the right order to make sentences from the text.

1. released a video of its new driverless car Toyota has.
2. car of safety The full intelligent is special features.
3. and It people down also slow can "see"
4. driver a with used be should car the that added He.
5. his use to wants driver the if Useful laptop her or.
6. self -driving cars The first car maker to showcase.
7. money Invested in a the lot technology of.
8. in will jams future cars traffic the These reduce.
9. from that traffic Information computers monitor.
10. any Cars a around take route gridlock will different.

12. Search the Internet and find out more about the recent developments and engineering research connected with the car industry. Share what you discover with your partner(s).

Unit 5 Part 1

INNOVATIVE SOLUTIONS TO HELP ACHIEVE ZERO EMISSIONS

Ex.1 Active vocabulary

emission – выхлоп

sustainable transport – экологичный транспорт

greenhouse gas – парниковый газ

development goals - цели развития

meet challenge - выполнять сложную задачу

Eni- Итальянский нефтегазодобывающий концерн

carbon neutrality - углеродная нейтральность

bio-refinery - переработка биологических веществ
energy transition - переход к альтернативным источникам энергии
environmental impact - воздействие на окружающую среду
a boost – стремительный рост

Ex.2 Read and summarize the text:

About 24% of global CO₂ emissions come from the transport sectors. In Europe and the United States, emissions from transport are the most marked of any sector, accounting for almost 30%. Promoting sustainable transport means reducing greenhouse gases, which are the main cause of climate change, and taking on one of the world's biggest challenges: **protecting the environment**. In 2015 the **United Nations** approved its **2030 Agenda**, an action programme setting out **17 Sustainable Development Goals (SDGs)** for everyone in government, business and society to follow, to achieve sustainable growth from an economic, social and environmental point of view. **Eni's mission** now is the same as it was in 2016, but with the addition of the Sustainable Development Goals. Through this combination, we will meet global challenges by actively supporting a socially fair energy transition, to preserve our planet and provide efficient, sustainable energy resources for all.

Eni is playing a leading role in the long-term strategy for carbon neutrality, promoting a holistic approach to a technology neutral sustainable transport, aiming for a combination of innovative solutions which guarantee minimal environmental impact and increased efficiency for the consumer.

Furthermore, within the 2021-2024 Strategic Plan, the combination of the bio-refinery and marketing businesses will give a strong boost to the sustainable mobility sector.

Ex.3 Answer the questions:

1. What sector come the most marked emissions from?
2. What does promoting sustainable transport mean?
3. What is the world's biggest challenge?
4. When did the United Nations approve its 2030 Agenda?

5. Who is playing a leading role in the long-term strategy for carbon neutrality?

6. What does Eni promote?

7. What will give a strong boost to the sustainable mobility sector?

Ex.4 Fill in the gaps.

1. About 24% of global CO₂ emissions ... from the transport sectors.

2. They are the main cause of ... change.

3. An action programme sets out some goals to achieve ... growth from an economic, social and environmental point of view.

4. They have the same mission as it was ... 2016.

5. We ... meet global challenges ... actively supporting a socially fair energy transition.

6. The innovative solutions will guarantee ... environmental impact and ... efficiency for the consumer.

Ex.5 Decide if these sentences are true or false?

1. Promoting sustainable transport means increasing greenhouse gases.

2. Eni's mission now is the same as it was in 2016.

3. About 24% of global CO₂ emissions come from the industrial sectors.

4. One of the world's biggest challenges is protecting the environment.

5. Eni is playing a leading role in the short-term strategy for carbon neutrality.

6. The combination of the bio-refinery and marketing businesses will give a strong fall to the sustainable mobility sector.

Ex.6 Spell all the numbers from the text.

Ex.7 Look through the text given below and find out its main idea.

COMPLETING THE URBAN TRANSPORT CIRCLE

Circularity is essential to overcoming the old linear development models based solely on energy and natural resource-intensive production and consumption. Leading world enterprises are looking at the future as an opportunity for a change, a sustainable change, based on product and process innovation. Sustainable raw materials, reuse, recycling and recovery and extended lifespan are main challenges for them.

The big companies' researchers are also looking for a circular economy in the world of public transport and multi-utility services having a two-part strategy: the first one focuses on promoting the use of biofuels in public transport, while the other fosters the creation of networks for the collection of cooking oils, refining them into a tank-ready product. In recent years, more and more cities have chosen biofuel with HVO (hydrotreated vegetable oil) to fuel local buses and dustcarts.

Ex.8 Work in pairs. Discuss the following.

1. Why is it now really important to take measures to protect environment?
2. Do you have any ideas which can help to make any mode of transport non-destructive?
3. Do you agree with the main idea of the text, say why or why not?

Part 2

NEW PAINT TO SAY GOODBYE TO CAR WASHES

Warm-ups

1. In pairs / groups, explain the meaning of the words from the article, if necessary consult a dictionary: manufacturer, nanopatterning, weather conditions, chore, carefully engineered , everyday problems.

2. Have a discussion: Student A **strongly** believes car washes will go out of business because of the new self-cleaning paint; Student B **strongly** believes the opposite.

3. Rank these and share your rankings with your partner. Put the best at the top:

• self-cleaning cars • self-driving cars • self-answering e-mails • self-making beds • self-ironing shirts • self-making coffee • self-doing homework • self-finding keys

4. Read the headline. Guess if a-h below are true (T) or false (F).

- a. The new paint is currently at the prototype stage of development. T/F
- b. The paint keeps oil and water away from the surface of the car. T/F
- c. The technology coats the car with a totally smooth layer of paint. T/F
- d. The paint will be on sale from next month. T/F
- e. Nissan said washing a car is cheap but boring. T/F
- f. The new paint will come as standard on all new Nissan cars. T/F
- g. Nissan wants to make family life easier. T/F
- h. Nissan said it will always test cutting-edge technologies. T/F

5. Read the newspaper article. Check your answers of the exercise 4.

The Japanese automobile manufacturer Nissan has unveiled a prototype of a self-cleaning paint that means cars may no longer need washing. The new nanotechnology paint repels water, oil and other dirt the environment can throw at a car. The paint is called Ultra-Ever Dry and uses a process called nanopatterning. This coats the surface of something with tiny bumps and grooves that stop water and oil from sticking to it. Nissan said the paint has "responded well" to many weather conditions, including frost, rain, sleet and snow. The carmaker added that its engineers will continue testing the paint in the near future to see how close they can get to a product ready for market. Nissan's website says: "Washing a car can be a chore – and a costly one at that." However, it has no immediate plans to use the new paint as standard on its cars. It may offer it as an option in the future. Company spokeswoman Geraldine Ingham said the new paint is currently only be-

ing tested on the company's Note family car. She said: "The Nissan Note has been carefully engineered to take the stress out of customer driving, and Nissan's engineers are constantly thinking of new ways to make families' lives easier." She added: "We are committed to addressing everyday problems our customers face and will always consider testing exciting, cutting-edge technology like this incredible coating application.

6. Match the following synonyms from the article.

- | | |
|----------------|-----------------|
| 1. automobile | a. prepared |
| 2. repels | b. strain |
| 3. coats | c. cuts |
| 4. grooves | d. layers |
| 5. ready | e. choice |
| 6. chore | f. car |
| 7. option | g. devoted |
| 8. stress | h. keeps away |
| 9. committed | i. unbelievable |
| 10. incredible | j. burden |

7. Phrase matching:

- | | |
|----------------------------|---------------------------|
| 1. Nissan has unveiled a | a. families' lives easier |
| 2. tiny bumps | b. sticking to it |
| 3. stop water and oil from | c. they can get |
| 4. responded well to many | d. plans |
| 5. to see how close | e. prototype |
| 6. Washing a car can | f. edge technology |
| 7. it has no immediate | g. and grooves |
| 8. new ways to make | h. everyday problems |
| 9. committed to addressing | i. weather conditions |
| 10. cutting - | j. be a chore |

8. Answer the questions.

1. What does the paint do to oil and water?
2. What does nanopatterning coat a surface with?

3. What has the paint responded well to?
4. What are engineers trying to get the paint ready for?
5. What did Nissan say washing a car could be?
6. How many models of car are being tested?
7. What kind of technology does Nissan want to keep testing?

9. Spell the words in bold correctly.

1. automobile **arnuaufmrec**
2. The new nanotechnology paint **lpsree** water
3. its **enrgsneie** will continue testing
4. This coats the **fsucaer**
5. the paint has "**dsrpdonee** well"
6. **aatsddnr** on its cars
7. **nlcyntaso** thinking of new ways
8. **imtodetmc** to addressing everyday problems
9. **igtcutn-dege** technology
10. this **erbindilce** coating application

10. Put the words in the right order to make sentences from the text.

1. a of prototype a unveiled has Nissan paint cleaning - self.
2. no That longer means need cars washing may.
3. tiny This surface with the something bumps coats of.
4. has to conditions paint well weather The responded many.
5. the testing continue will engineers Its paint.
6. be a one and a car a chore can Washing costly -.
7. paint on new standard cars the as its Use.
8. option in the future It may offer it as an.
9. problems everyday addressing to committed are We.

11. Role play.

Student A – You think **self-cleaning cars** would help motorists most. Tell the others three reasons why. Tell them things that aren't so helpful about their ideas. Also, tell the others which is the least probable of

these (and why): self-driving cars, self-fuelling cars or self-repairing cars.

Student B – You think **self-driving cars** would help motorists most. Tell the others three reasons why. Tell them things that aren't so helpful about their ideas. Also, tell the others which is the least probable of these (and why): self-cleaning cars, self-fuelling cars or self-repairing cars.

Student C – You think **self-fuelling cars** would help motorists most. Tell the others three reasons why. Tell them things that aren't so helpful about their ideas. Also, tell the others which is the least probable of these (and why): self-cleaning cars, self-driving cars or self-repairing cars.

Student D – You think **self-repairing cars** would help motorists most. Tell the others three reasons why. Tell them things that aren't so helpful about their ideas. Also, tell the others which is the least probable of these (and why): self-cleaning cars, self-fuelling cars or self-driving cars.

12. Think of your own ideas and compare and contrast washing a car by hand and using the self-cleaning paint. Write it down.

SUPPLEMENTARY READING

1

Lightweight Vehicles. Automobile manufacturers are working hard to deliver vehicles that are efficient and give high performance. Studies have shown that reducing the weight of the vehicle by 10% will improve fuel efficiency by 6% or more. One of the best ways to make the material light is to replace the iron and steel with some other metals like carbon fiber construction and magnesium-aluminum alloy. However, manufacturers are still working to bring the idea to reality.

Hyperloop. Hyperloop is one of the most trending technologies in the field of transportation. It is a tube that uses physical properties of vacuum to transport users from one place to another. This Hyperloop can travel at a speed of 700 mph. The hyperloop projects are developing at various locations across the globe. This project will help to reduce the complexity of inner-city transport. This can act as a complete revolution in the transportation industry.

Flying Taxis. Whether it is a startup or large companies, flying taxis will be the future of the transportation industry. Uber has announced to come up with flying taxis by 2023, under the assistance of Nasa. The goal of Uber is focused on building a flying taxi, that is electrically powered and flies passengers to their destination. An example of such a flying taxi is Volocopter, an autonomous aircraft with electric power. As of now, Volocopter is under test in Dubai.

Autonomous Cars. Autonomous cars have turned from dream to reality with the help of technologies like IoT, AI, LiDAR, etc. Trial runs are being conducted by companies worldwide. Companies like Tesla and Waymo are the frontrunners of the autonomous revolution. Slowly and gradually, people are getting comfortable with the self-driving thing. An autonomous car is said to be safer than human-driven cars as they can overcome the human errors.

Bicycle Sharing System. Users who don't want to travel through the main transport hubs can use a bicycle as an alternative. In the bicycle sharing system, a user can rent a bicycle from the start of their trip and put them off at their destination. Now, businesses can use electric bicycles for various deliveries, henceforth can handle other services cost-effectively. Research has shown that bicycle sharing has a good impact on reducing traffic, thus having control over pollution.

2

HOW TRANSPORTATION TECHNOLOGIES WILL CHANGE EVERYTHING

The transportation systems around which the modern world has

been built are on the verge of a significant transformation. Intelligent transportation systems (ITS) are making driving and traffic management better and safer for everyone.

Transportation typifies the FutureStructure framework. (*FutureStructure* is a sister publication of *Government Technology*.) Soft infrastructure — the realm of concepts, policies and legislation — is rapidly evolving to accommodate the demand for global investment in hard transportation infrastructure. Technology is bridging the two as vehicles and the infrastructure on which they operate become increasingly connected.

Traffic and population growth create demand for more transportation infrastructure, but many jurisdictions don't have sufficient money or space to build more roads and rail.

Despite cities lacking funds population growth will continue — the World Health Organization expects 7 out of 10 people on the planet will live in cities by mid-century. Coupled with climate change concerns, cities leaders must start rethinking the very nature of existing transportation systems.

New transportation technologies are emerging to meet these challenges, including connected and autonomous vehicles, alternative fuels, keyless fleet management and traffic analytics, as well as local zoning and planning policies that support transit-oriented development. New technology for on-road communications will dramatically change how vehicles operate and provide information and capabilities for better, real-time traffic management — if the necessary network infrastructure is in place.

ITS is poised to transform transportation into a connected, dynamic component of the city-as-a-system. Perhaps more importantly, the greater ease in moving about will have a positive impact on quality of life and commerce for residents, visitors and local businesses.

AUTONOMOUS AND CONNECTED VEHICLES

Perhaps the most anticipated element of ITS is the connected vehicle. The imminent arrival of connected vehicles is one reason for new visions of transportation within a metro area.

Connected technology focuses on wireless communication: vehicle-to-vehicle (V2V), vehicle-to-pedestrian (V2P) and vehicle-to-infrastructure (V2I), collectively referred to as V2X. Intended primarily to improve safety, V2V technology allows cars to continually communicate to the vehicles around them so each are aware of the others' speed, heading and direction. Connected vehicles also help in recognizing and alerting drivers to dangerous situations. By adding communication points in hazardous road areas and intersections, V2I technology extends crash-reduction capabilities by allowing automatic control of signal timing, speed management, and operation of transit and commercial vehicles.

"The connected vehicle technologies are ready," said Suzanne Murtha, senior program manager for intelligent transportation initiatives at Atkins Global. "Now it's a matter of governments capturing and sharing data about real-time, on-the-street traffic conditions so drivers can make better choices."

A different but related technology is that of autonomous vehicles, perhaps the most famous example of which is the Google self-driving car. Autonomous cars use a combination of LIDAR (similar to sonar but with laser light), GPS, optical cameras and big-time processing power to analyze millions of possible roadway scenarios and then take the appropriate action. The ultimate goal for autonomous vehicle technology is to make the vehicle so intelligent that no driver input is needed. However, truly autonomous vehicles, wherein the driver can give up complete control to the car, remain on the distant horizon. According to Ford, it is incremental technological advancement that will one day lead to driverless cars.

"By the time we get to full autonomy, the last step won't seem like such a big deal," he said. "Even as we put in a lot of these features the driver still has to be vigilant and in control."

ELECTRIC VEHICLES

Oregon is gaining both environmental and economic development benefits from its infrastructure and program investments to support electric vehicles (EVs). The most visible of these investments is the West Coast Electric Highway, which includes charging stations along Interstate 5 in Oregon, Washington and eventually California. Based on posi-

tive public response, Oregon is installing EV charging stations along other key highways and encouraging private businesses to install stations as well.

Travel Oregon, the state's tourism office, runs a targeted EV tourism program, "Oregon Electric Byways," with suggested itineraries and a partnership with Enterprise Rent-a-Car for EV rental.

"It's hard to separate the infrastructure from economic development because the infrastructure starts the conversation about EVs, especially outside of major cities," said Ashley Horvat, Oregon's chief electric vehicle officer and the first person in the public sector to hold this role. "By placing charging stations around the state, we went into communities that had never seen EVs, which really increased adoption and created a positive perception for Oregon within the EV industry."

In September, California Gov. Jerry Brown signed Senate Bill 1275, which sets a goal for the state to put 1 million zero-emission vehicles on the road by 2023. The bill also authorizes the state to provide financial incentives for consumers to purchase such vehicles, part of the governor's effort to make electric cars affordable for lower-income workers.

"I'm excited that California is charging ahead with plans to have electric vehicles in every zip code across the state," the bill's author, California State Sen. Kevin De León (D-Los Angeles) said in a statement. "We're going to lead the way in the fight against climate change by putting a million EVs on the roads, which means making them affordable to all drivers, not just the wealthy."

TRAFFIC MANAGEMENT TECHNOLOGIES

Smart road design: Strategies are being developed that would add additional functionality to the actual road surface that could streamline traffic and provide safety features that would reduce not only injuries and casualties but congestion-inducing accident scenes. One such example includes a section of highway in the Netherlands that has been converted to a testing plot for "smart highway" features. The first phase involved simply adding solar-charged photo luminescent powder to the road paint to make lane lines glow in the dark during the night to increase visibility in an area where the streetlights are often turned off late

at night. However, proposed additions include temperature-sensitive indicators on the road surface to alert drivers to weather conditions, wind indicators, and even embedded induction coils that could recharge electric vehicles as they pass over.

Another interesting road surface development gaining traction in the U.S. is called Solar Roadways and is being developed by a husband and wife team. Scott and Julie Brusaw have integrated solar cells into panels that are combined and used as roadways. In words: “We’re building solar panels that you can drive on.” They earned a contract to test their technology in a parking lot in Idaho and finished the project in 2013. The results of the initial prototype were disappointing, but the firm is moving forward as of 2016 with a trial along a stretch of historic Route 66 in Missouri. Despite its shaky inception, the concept has been lauded by engineers, alternative energy investors, transportation planners, and other authorities. The idea may receive further attention and implementation as demand for alternative energies and electric vehicles increases.

Alternative transportation infrastructure: To increase the use of alternative transportation methods, cities and infrastructure planners have recognized the importance of providing the infrastructure necessary to ensure the safety and efficiency of these methods. Cities across America and around the world are increasing their investments in amenities including bike lanes, carpool lanes, bus-only lanes, bus tunnels, trolley or streetcar tracks, and more. According to an article compiled by Crowdsourced Transport, the degree of effectiveness expected from these types of designated alternative-transit infrastructures is increased by their degree of separation from conventional vehicle lanes. Thus, completely separated lanes or exclusive spaces more effectively streamline traffic than simply painting lanes or messages on existing pavement. Transit design will become an increasingly vital part of urban planning and revitalization efforts over the coming years.

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