

# **АНГЛИЙСКИЙ ЯЗЫК**

**для студентов автомобильных, автодорожных и  
машиностроительных специальностей**

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## Предисловие

Данное учебное пособие предназначается для студентов II курса автомобильного факультета всех специальностей: автомобили, двигатели внутреннего сгорания, автомобили и автохозяйство, а также дорожные и строительные машины. Пособие составлено в соответствии с требованиями типовой программы по английскому языку для технических вузов.

Авторы ориентировались на конечную цель обучения, предусматривающую развитие навыков чтения литературы по специальности для получения информации.

Большое количество современной информации вызывает рост специальной научной литературы, которую необходимо читать и понимать.

Умение понимать специализированные тексты является неотъемлемой частью при подготовке специалистов в той или иной области, что и является непосредственной целью данного пособия. Другая цель- это развитие навыков перевода на русский язык оригинальной литературы. Тематические задания пособия способствуют развитию речевых навыков и умений в профессиональной сфере коммуникации. При составлении учебного пособия авторы уделили большое внимание проблеме отбора языкового материала в плане подготовки студентов к профессиональному общению на английском языке работников автотранспорта.

При отборе текстового материала в качестве основного критерия служила информативная ценность текстов и их соответствие интересам студентов.

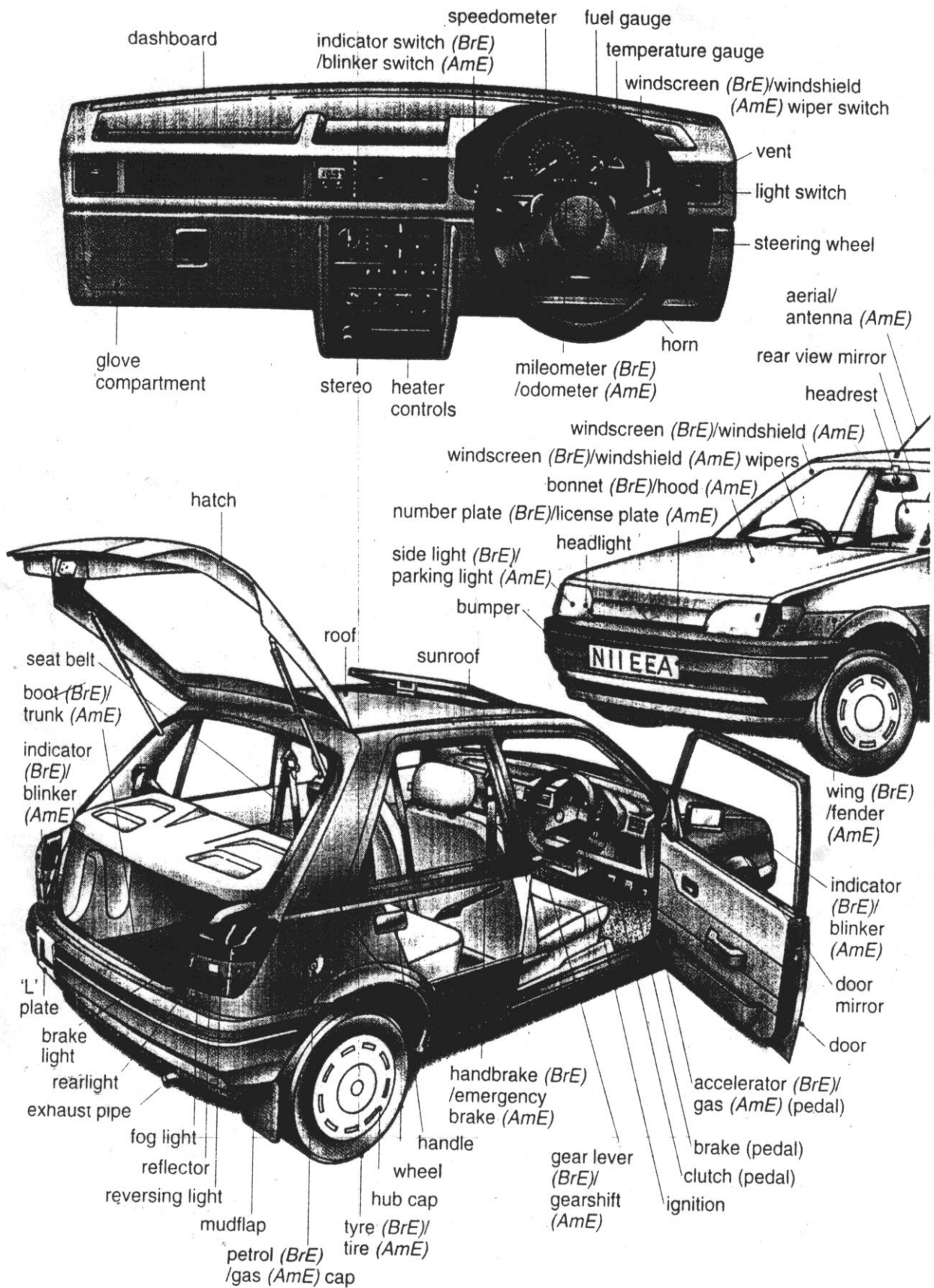
Пособие из 4 самостоятельных и законченных блоков, охватывающих следующие темы:

1. Car, its parts and systems
2. Trucks and Road Construction Vehicles
3. Future automobile Industry Trends
4. The history of the Open Joint-Stock Company "GAZ"

Отобранные из оригинальных источников (использовались материалы периодической зарубежной печати) тексты дают представление о главных составляющих автотранспортного средства, принципах действия отдельных компонентов автомобиля, о его будущем развитии. Каждый текст соответствующего блока иллюстрирован рисунком и схемами отдельных узлов автомобиля, сопровождаемые терминологическим словарём.

# Unit 1

## Car, its parts and systems



## **Text I**

### **An average automobile**

An average automobile is made of roughly 14000 parts, which can be divided into several structural and mechanical subsystems.

The most basic of these is the body of the automobile, which contains the passenger and storage space as well as the engine compartment. It is usually classified according to the number of doors and the type of roof it has (e.g., two-door hardtop) and is made of molded steel, which is painted and treated to retard corrosion. The body sits upon the chassis, a steel frame that also supports the engine, wheels, axle assemblies, transmission, steering mechanism, brakes, and suspension members.

The internal-combustion gasoline engine, with reciprocating pistons and a four-stroke cycle, is the most widely used power plant. In the United States in the 1940s engines were developed in size and design from four cylinders to the more powerful configuration of eight cylinders in a "V" shape. Since the 1970s, however, the trend has been toward smaller, less powerful and more efficient engines. A transmission-comprised of shafts, gears, and a clutch-is installed between the engine and the driving wheels to allow the engine to be disconnected when the engine is started and idling and to make the most efficient use of the engine's power varying loads. Transmissions are of two types: those in which the gears are shifted manually by the driver and those where the gears are shifted automatically by such a device as a hydraulic torque converter.

To control it once it is in motion, a car is equipped with steering and braking systems. The steering system consists of a series of linkages and gears that transmit the movement of the steering wheel to the front wheels. One braking system employs two semicircular "shoes" at each wheel that when activated press outward against the inner surfaces of drums attached to each wheel. More recently disk brakes, in which a clamp squeezes a disk attached to the wheel, have been used.

Automobiles have complex electrical systems that consist of a storage battery, alternator (alternating-current generator), devices for starting the engine and for vehicle operation (e.g., headlights and windshield wipers), and such accessories as heaters and radios. The battery provides enough power to engage the starting motor and to activate the ignition system. Once the engine is started, the alternator continually recharges the battery and supplies power to the other electrical equipment.

There are several other important subsystems. The fuel system provides storage space for the fuel, transports it to the engine, and mixes it with air for combustion in the engine. The exhaust system vents exhaust gases by way of a muffler, which helps reduce engine noise. The lubrication system keeps friction from wearing out moving parts. Relatively lightweight motor oils are used in the engine, and heavier weight oils and greases are used in such parts as transmissions and wheel bearings, the cooling system keeps the engine from overheating, generally by means of liquid

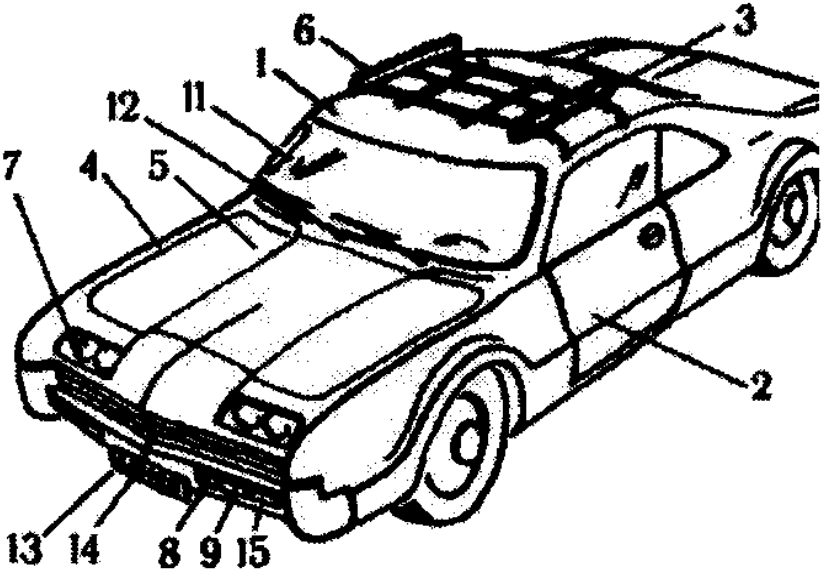
coolant, although many engines are air cooled. The suspension system, comprised of coil or leaf springs and shock absorbers, is combined with the tires to cushion the vehicle from the shock caused by driving over irregular surfaces. In addition, tires come in a variety of tread designs to provide traction in all driving conditions.

**I. Match the sentences on the left with the nouns on the right:**

- |  |                     |
|--|---------------------|
| 1. The mechanism used for stopping the car is ....                       | a) clutch;          |
| 2. The mechanism used for changing the speed is ....                     | b) gearbox;         |
|  | c) brakes.          |
| 3. The mechanism used for a) brakes;                                     | a) brakes;          |
| brakes;  | a) clutch;          |
| connecting (or disconnecting) the engine from the gearbox is....         | c) steering system. |
| 4. The unit carrying the power from the engine to the car wheels is .... | a) power plant;     |
|  | b) power train;     |
|  | c) chassis.         |
| 5. The instrument measuring the speed of the car is ...                  | a) heater;          |
|  | b) lights;          |
|  | c) speedometer.     |

**II. Make up an individual dictionary of 15 words from the given text.**

**III. a) Read the following text; b) Learn the names of various parts of a car.**



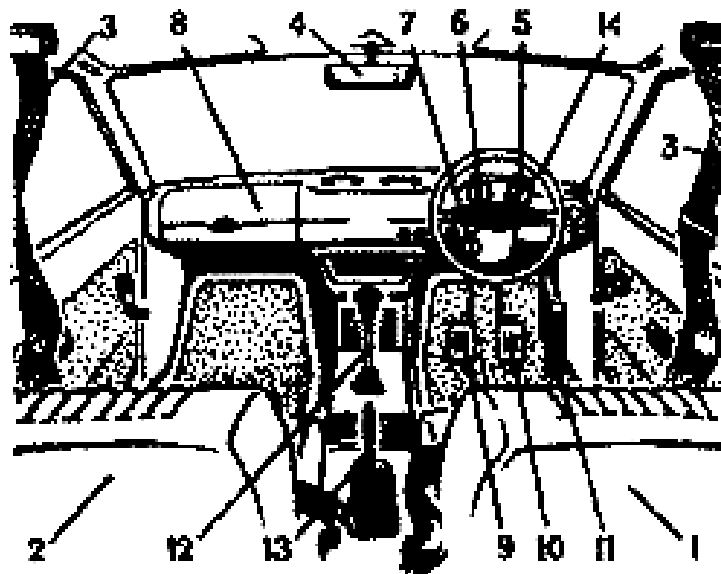
Let's have a look at the car in the picture. It shows the outside view of the car. Now, learn the names of its various parts. The main parts of a car's body are: roof (1), doors (2), boot (3), wing (4), hood (5). There is a roof rack (6) on the car roof.

The lights: headlights (7), sidelights (8), indicator lights (9) and rear lights (10).

The windscreen (11) is fitted with windscreen wipers (12).

Pay attention to a number plate (13) with the registration number (14), which is under the bumper (15).

**IV. Name all the parts of a car according to their reference numbers.**



**V. Match the names of the car elements with their definition.**

- |                   |  |
|-------------------|--|
| 1. windscreen     | 1. band of rubber over wheels                      |
| 2. clutch         | 2. instrument to measure speed                     |
| 3. exhaust pipe   | 3. mechanism for reducing speed and stopping       |
| 4. steering wheel | 4. wheel used to guide a car                       |
| 5. tyre           | 5. protective metal bar at front and back of a car |
| 6. bonnet         | 6. device used to increase speed                   |
| 7. brake          | 7. place for luggage at back of car                |
| 8. speedometer    | 8. outlet to allow carbon monoxide gas to escape   |
| 9. acceleration   | 9. device for changing gears                       |
| 10.gear lever     | 10. cover for engine                               |
| 11.bumper         | 11. front window                                   |
| 12.boot           | 12. mechanism for engaging and disengaging gears   |

## VI. What does it for and how it works?

*Example: Engine serves to provide energy to make a vehicle go.*

steering wheel	to light the road ahead when it is dark
gear box	to cover the engine
gear level	to prevent mud from getting into the outer parts of the car
clutch pedal	to prevent jolting and make driving smooth
brake pedal	to make it possible for the car to run
chassis	to protect the driver and passengers from rain, dust and strong wind
bumpers	to protect people from rain and sunshine
doors	space for transporting luggage
head lights	to place the instruments of the car
bonnet	to sit upon
wings	to radiate heat in order to cool the engine
tires	to steer the car
wheels	to change the gears
windscreen	to disconnect the crankshaft of the engine from the gear box making it possible to change gears
roof	to stop or slow down the car
boot	to shift the gears with the help of a gear level
dashboard	to put(maintain) the body of the car and the engine on the frame
seats	to show the direction of the car
radiator	to protect the front and rear parts of the car from bumping
indicators	to let people in and out of the car



## Ground Vehicle Systematics

**sedan, saloon, notchback three-box car** - седан, трехобъемный легковой автомобиль (закрытый автомобиль с жесткой крышей, двумя рядами сидений, двумя или четырьмя дверями, отдельным моторным отсеком, салоном и багажником)



**hatchback, fastback, two-box car** хэтчбек, автомобиль с двухобъемным кузовом (закрытый автомобиль с жесткой крышей, двумя рядами сидений, двумя или четырьмя боковыми дверями, отдельным моторным отсеком и салоном, объединенным с багажным отделением)



**cabriolet, convertible** кабриолет, автомобиль с убирающейся мягкой крышей, открытый автомобиль



**coupe** купе, закрытый двухдверный двухобъемный автомобиль с одним или двумя рядами сидений



**roadster, spider** родстер, спайдер (купе-кабриолет, спортивное купе со съемной крышей)



**coupe-cabriolet** купе-кабриолет (кабриолет с жесткой убирающейся крышей)



**station wagon, estate car** универсал, автомобиль с грузопассажирским кузовом (закрытый автомобиль с жесткой крышей, двумя-тремя рядами сидений, четырьмя боковыми дверями, одной задней дверью, расположенной почти вертикально, и двухобъемным кузовом с увеличенным объемом багажного отделения)



**minivan** универсал повышенной вместимости, минивэн (однообъемный автомобиль с жесткой крышей, тремя рядами сидений, четырьмя боковыми дверями и одной задней дверью, предназначенный для перевозки 7-8 пассажиров)



**delivery van** развозной фургон вагонной компоновки, предназначенный для перевозки мелких партий грузов



**all-terrain vehicle, cross-country vehicle**

легковой автомобиль повышенной проходимости (полноприводный автомобиль с жестким или съемным верхом и двухобъемным кузовом)



## Commercial vehicles

**multipurpose truck** грузовой автомобиль общего назначения



**pickup** пикап (грузовой автомобиль малой грузоподъемности с бортовым кузовом на шасси легкового автомобиля)



**drawbar train (tractor and trailer)** прицепной автопоезд (тягач с прицепом)



**semitrailer rig (tractor and semitrailer)** седельный автопоезд (тягач с полуприцепом)



**dump truck** автомобиль-самосвал



## Self-propelled earthmoving equipment

**track-type tractor** гусеничный промышленный трактор общего назначения



**track-type bulldozer-** бульдозерно-рыхлительный (бульдозерный) агрегат на базе гусеничного промышленного трактора



**hydraulic track-type excavator** гидравлический гусеничный экскаватор с обратной лопатой (обратным ковшом)



**hydraulic wheel-type excavator** гидравлический колесный экскаватор с обрат-экскаваторной лопатой (обратным ковшом)



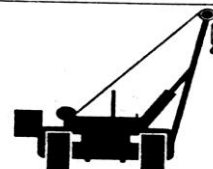
**front shovel hydraulic excavator** гидравлический гусеничный экскаватор с прямой лопатой (прямым ковшом)



**backhoe loader** колесный экскаватор-погрузчик



**pipelayer** трубоукладчик



**wheel tractor scraper** самоходный колесный скрепер (с одноосным тягачом)



**wheel-type bulldozer** колесный бульдозер



**wheel-type loader** колесный ковшовый погрузчик



**track-type loader** гусеничный ковшовый погрузчик



**soil, asphalt compactor** каток для уплотнения грунта, асфальта



**off-highway (off-road) dump truck** карьерный самосвал, предназначенный для эксплуатации вне шоссе-ных дорог

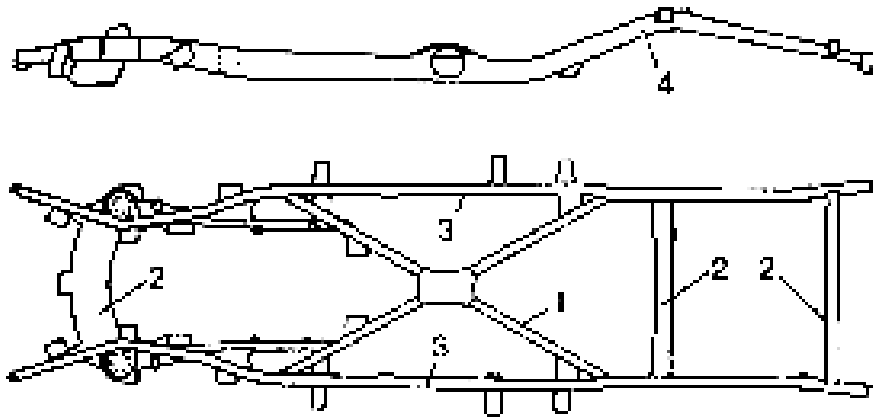


**articulated dump truck** сочлененный самосвал



## Text II

### Frame, unitized (chassis less) body and running gear



#### Frame | Рама

- |   |  |
|---|--|
| 1 – cruciform (X-cross, X-form cross) member              | 1 – крестообразная (X-образная) поперечина (балка) |
| 2 – frame member  | 2 – поперечина рамы                                |
| 3 – frame side member (girder)                            | 3 – лонжерон                                       |
| 4 – kick-up of frame (swept wheel arch, upsweep of frame) | 4 – изгиб рамы над задним мостом                   |

The frame of the motorcar supports all the driving units such as engine transmission and rear axle; besides, it is meant for the attachment of the spring system, front axle and steering system. In assembled condition, all these components are called the "chassis." The body is placed on the frame and tightly bolted. The most simple type of motorcar frame has two side members made of cold-rolled channel-section steel. They are connected by a number of cross members which support the radiator and the engine.

The most important requirement of the frame is that it shall be stiff and strong enough to resist the twisting and bending forces to which it is subjected, particularly when the vehicle is traveling over rough roads. Since the introduction of the independent wheel suspension by transverse springs etc., the shapes of the frames have changed considerably.

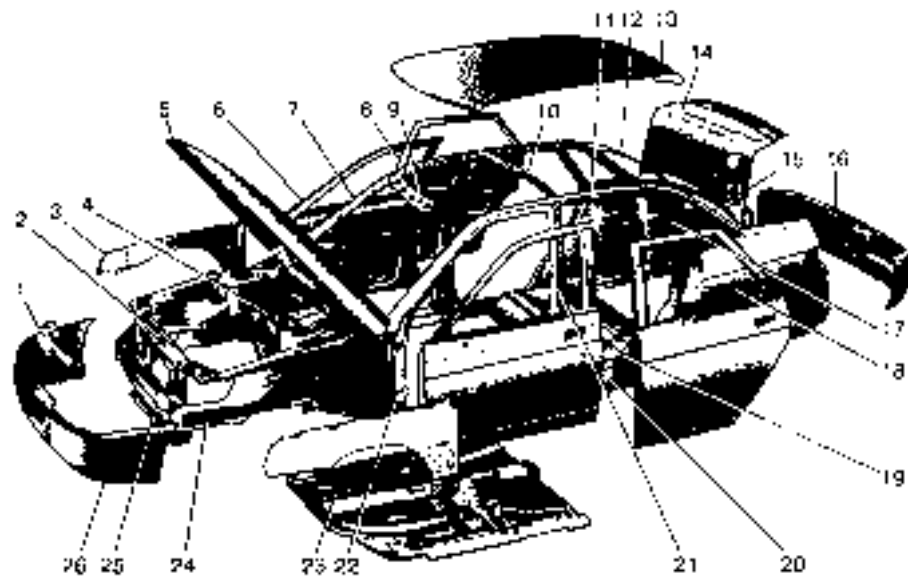
For some modern passenger cars and buses, the frameless construction, the so-called "chassis less body" is now used. In this case, the body is designed so stiff that it replaces the frame. All the units, such as engine, transmission, axle casing, springs and steering, otherwise arranged on the frame, are attached to the body. Therefore, only a limousine or bus body can be used for a chassis-less construction

since only these bodies may be built sufficiently resistant to torsion due to their particular type of construction.

A special type of frameless construction is the platform construction; in this case, the frame has been replaced by a corrugated continuous bottom plate. This construction can be used only for independent wheel suspension with front-wheel drive or rear-mounted engine since it has no oscillating universal shaft. It combines the advantages of light-weight construction and the possibility to attach various bodies. In addition, the continuous bottom plate offers a good protection against dirt and it permits convenient clearing.

### Text III

#### An Automobile Electric System



#### Unitized body structure | Конструкция несущего кузова

- |                           |                               |
|---------------------------|-------------------------------|
| 1 – radiator grille       | 1 – решетка радиатора         |
| 2 – radiator cross-member | 2 – поперечина радиатора      |
| 3 – fender                | 3 – крыло                     |
| 4 – firewall (bulkhead)   | 4 – щит передка               |
| 5 – hood                  | 5 – капот                     |
| 6 – front door            | 6 – передняя дверь            |
| 7 – windshield pillar     | 7 – стойка ветрового окна     |
| 8 – rear door             | 8 – задняя дверь              |
| 9 – front roof frame      | 9 – передняя поперечина крыши |

10 – roof reinforcing cross-piece	10 – поперечина крыши
11 – side roof frame	11 – боковина крыши
12 – rear roof frame	12 – задняя поперечина крыши
13 – roof panel	13 – крыша
14 – boot lid	14 – крышка багажника
15 – tonneau window mount	15 – рамка окна боковины
16 – rear bumper	16 – задний бампер
17 – C-pillar (post)	17 – задняя стойка кузова
18 – tonneau	18 – боковина задка
19 – middle floor panel	19 – задняя часть пола
20 – side member	20 – порог
21 – B-pillar (post)	21 – средняя стойка кузова
22 – A-pillar (post)	22 – передняя стойка кузова
23 – front floor panel	23 – передняя часть пола
24 – front frame side member (girder)	24 – передний лонжерон
25 – front cross-member	25 – передняя поперечина
26 – front bumper	26 – передний бампер

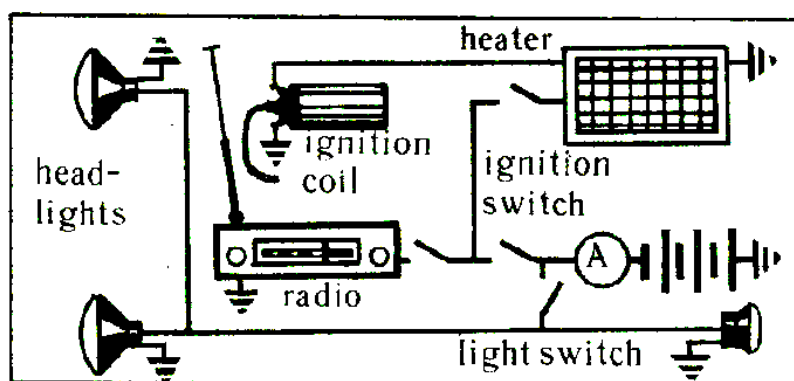


Fig. 1

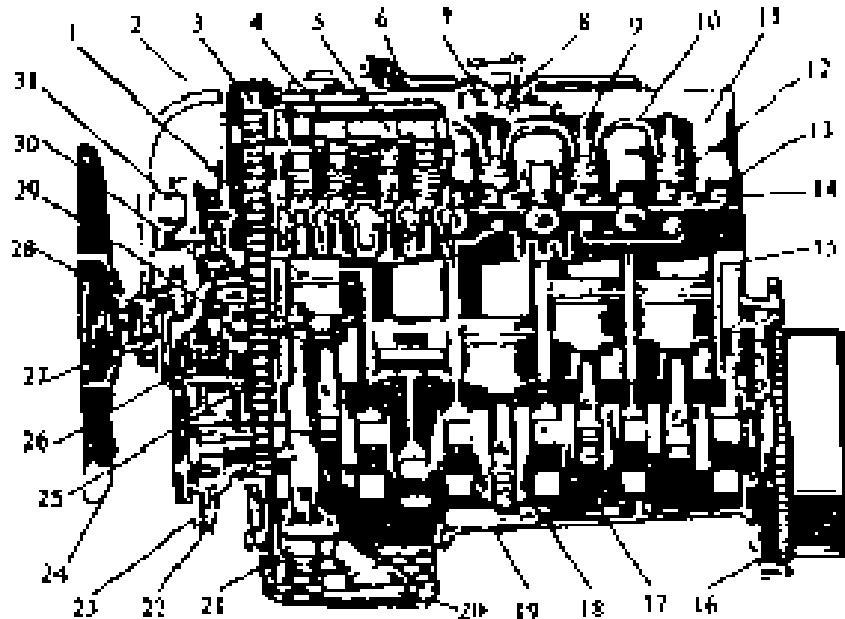
Fig.1 shows a simplified diagram of an automobile electric system. *Lights*, *radio*, *heater* and *ignition* are all connected in parallel with the *storage battery* of the car. An ammeter is placed between the battery and all the other apparatuses so that it measures the total current being drawn by them. When the *ignition switch* is turned on and current is drawn by the *ignition coil*, the ammeter shows a *discharge*. Lights, heater and radio also cause a discharge. When the motor *is started* and the generator begins to function, the ammeter shows a charge going into the storage battery. The generator, which is driven by the motor, is now supplying all the electric energy needed in addition to recharging the battery.

### Task

- a) Study the drawings in *Fig. 1*;
- b) Read the text and find out the meanings of the underlined terms without using a dictionary.

## Text IV

### THE INTERNAL COMBUSTION ENGINE



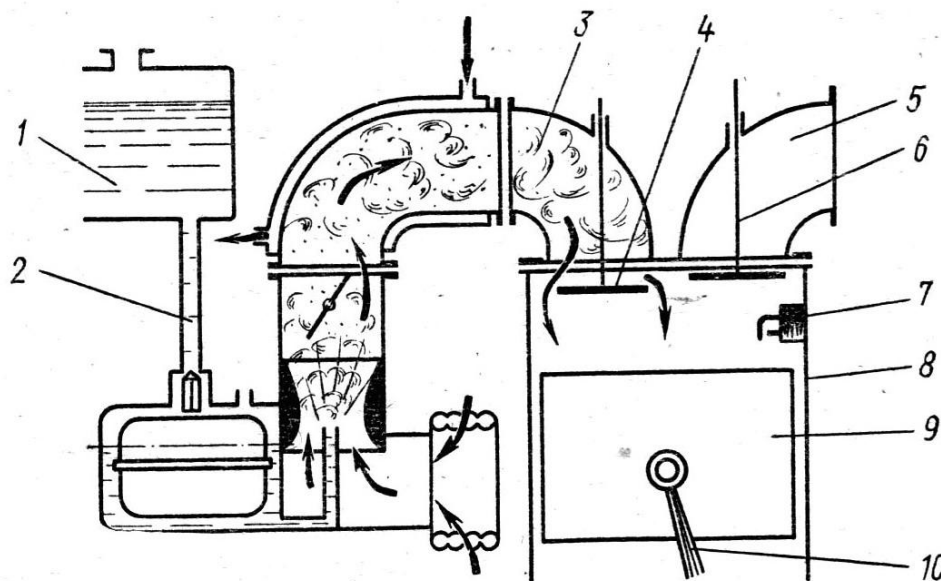
**Fig.1. Sectional view of five-cylinder in line diesel engine**

**Рис.1. Продольный разрез дизельного двигателя с пятью цилиндрами, расположенными в ряд**

- |  |  |
|--|--|
| 1 – exhaust valve                                  | 1 – выпускной клапан   |
| 2 – camshaft bearing                               | 2 – подшипник распределительного вала  |
| 3 – double bushing chain                           | 3 – цепь (привода) двухвтулочная   |
| 4 – oil filler neck                                | 4 – горловина маслоналивного отверстия   |
| 5 – camshaft, an overhead camshaft                 | 5 – распредвал, верхний распределительный вал  |
| 6 – oil pipe for camshaft lubrication              | 6 – маслопровод для смазки распредвала   |
| 7 – warm-up regulator                              | 7 – регулятор подогрева  |
| 8 – tapered needle for idling adjustment           | 8 – игольчатый клапан ( <i>карбюратора</i> ) для регулировки числа оборотов холостого хода |
| 9 – fuel pressure pipe (fuel pressure line)        | 9 – топливопровод высокого давления  |
| 10 – fuel leak line (drip fuel line)               | 10 – трубопровод подачи топлива  |
| 11 – cylinder head gasket                          | 11 – прокладка головки блока цилиндров   |
| 12 – injection nozzle (spray nozzle)               | 12 – распыляющая (впрыскивающая) форсунка  |
| 13 – cylinder head                                 | 13 – головка блока цилиндров   |
| 14 – heater plug                                   | 14 – запальная свеча   |
| 15 – piston with piston rings and oil scraper ring | 15 – поршень с поршневыми и маслосъемными кольцами   |
| 16 – flywheel                                      | 16 – маховик, зубчатое колесо  |
| 17 – crankshaft                                    | 17 – коленчатый вал  |
| 18 – connecting rod (piston rod)                   | 18 – шатун   |
| 19 – crankcase                                     | 19 – картер двигателя  |

- |   |  |
|---|--|
| 20 – oil bleeder screw                                    | 20 – пробка маслосливного отверстия                            |
| 21 – oil pump   | 21 – масляный насос  |
| 22 – thrust washer  | 22 – упорная шайба   |
| 23 – vibration damper                                     | 23 – вибропоглощающий демпфер                                  |
| 24 – fan  | 24 – вентилятор  |
| 25 – intermediate gear shaft for the injection pump drive | 25 – промежуточный вал привода управления насосом впрыскивания |
| 26 – injection timer unit                                 | 26 – блок управления синхронизации впрыска                     |
| 27 – vacuum pump (low-pressure regulator)                 | 27 – вакуумный насос (регулятор низкого давления)              |
| 28 – fan clutch for viscous drive                         | 28 – муфта вентилятора под привод из эластичной резины         |
| 29 – cam for vacuum pump                                  | 29 – кулачок вакуумного насоса                                 |
| 30 – water pump (coolant pump)                            | 30 – водяной насос, помпа (охлаждающей жидкости)               |
| 31 – cooling water thermostat                             | 31 – термостат охлаждающей жидкости (воды)                     |

It is known that for a long time scientists were looking for ways of converting fuel directly into power. As a result they invented the internal combustion engine in which the fuel is converted directly into power within the engine's cylinder.



**Fig.1. The carburettor:**

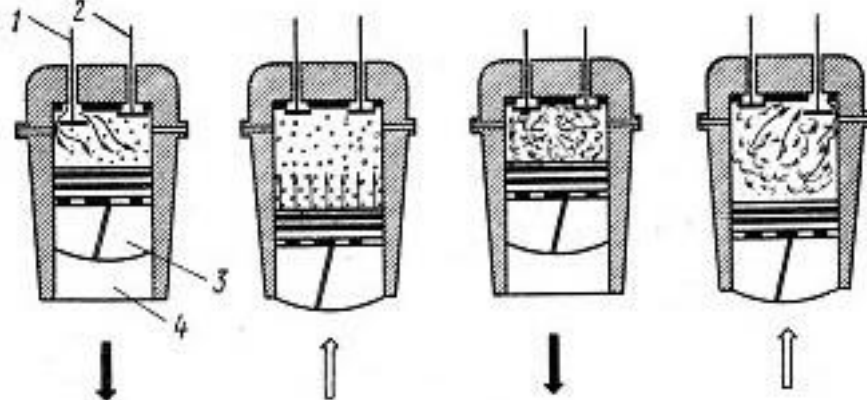
- 1 – fuel tank; 2 – small-diameter pipe; 3 – inlet pipe; 4 – inlet valve; 5 – exhaust pipe; 6 – exhaust valve; 7 – sparking-plug; 8 – cylinder; 9 – piston; 10 – connecting rod

The method of turning refined petrol into power is as follows: The petrol is stored in the tank, which is connected by a small diameter pipe to the carburetor — a device for turning it into gas and mixing it with air in the correct proportions. The carburetor is attached to the inlet pipe. The explosive petrol-air mixture is sucked into the engine's cylinder through the inlet pipe and, at the correct instant, is exploded by an electric spark inside the cylinder at the point of the sparking plug.



When all the work is extracted from the gas, the exhaust valve opens and the burnt gas escapes through the exhaust pipe into the air. The problem is to convert the latent power of the gas in the inlet pipe into the power which will be driving a car.

Let us imagine the engine with the piston near the top of its stroke. The piston is descending and the gas is being sucked into the engine past the open inlet valve. This is the first phase of the cycle, and it is called the suction or induction stroke because the gas is being sucked into the cylinder.

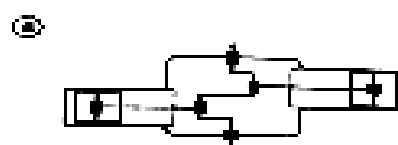
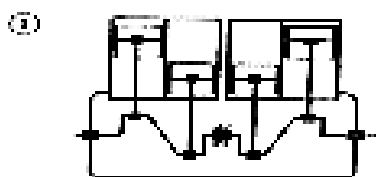


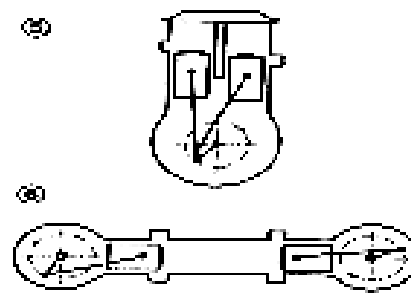
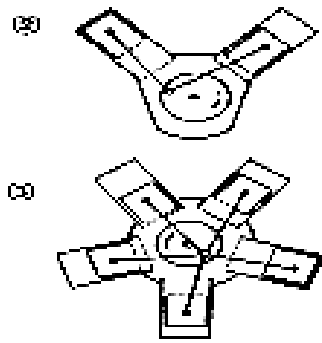
**Fig.1. The four strokes of the internal combustion engine:**

1 – inlet valve; 2 – exhaust valve; 3 – piston; 4 – cylinder

When the piston reaches the bottom of the stroke, the inlet valve closes. Now the cylinder is filled with clean explosive gas and the piston begins to ascend to the top of the cylinder. This is the second or compression stroke, so called because the gas is being compressed. By the time the piston reaches the top of the stroke, the charge is fully compressed and a spark appears at the sparking-plug point, igniting the charge. The pressure of the gas within the cylinder immediately rises and the piston is pushed down with considerable force. It is the force which drives the car, and the third stroke is therefore called the "power" or "firing" stroke. One must remember that this is the only stroke during which the gas is doing any useful work. The momentum supplied to the flywheel by this stroke makes it possible for the other three strokes to occur.

## Engines | Двигатели





### Types of reciprocating-piston engines

### Типы поршневых двигателей с кривошипно-шатунным механизмом

- 1 – in-line engine
- 2 – V-, Vee-engine
- 3 – radial engine
- 4 – opposed-cylinder engine
- 5 – U-engine
- 6 – opposed-piston engine

- 1 – рядный двигатель
- 2 – V-образный двигатель
- 3 – звездообразный двигатель
- 4 – двигатель с оппозитным расположением цилиндров
- 5 - U-образный двигатель (двухрядный двигатель с параллельными цилиндрами)
- 6 – двигатель с расходящимися (оппозитно расположенными) поршнями

As the piston descends, the gas pressure falls and when the piston is near the lower end of its stroke, there is little pressure left in the cylinder. When the piston is at the bottom of its stroke the exhaust valve begins to open and the burnt gas rushes past the open exhaust valve into the exhaust pipe. During its ascent the piston is pumping the exhaust gas out of the cylinder. This is the fourth and final stroke of the cycle, and it is known as the exhaust stroke because the burnt gas is being exhausted out of the cylinder. When the piston reaches the top of the stroke, the exhaust valve closes and the cycle of operations is completed.

### I. Answer the following questions:

1. In what kind of engine is the fuel converted directly into power?
2. Where is the petrol stored in the internal combustion engine?
3. What is the tank connected to?
4. What is a carburetor?
5. Where is the petrol-air mixture exploded?
6. What is it exploded by?
7. What are the four strokes of the engine?
8. Why is the first stroke called the suction stroke?
9. Why is the second stroke called the compression stroke?
10. During which stroke is the gas doing useful work?
11. During which stroke is the exhaust gas pumped out of the cylinder?
12. When is the cycle of operations completed?

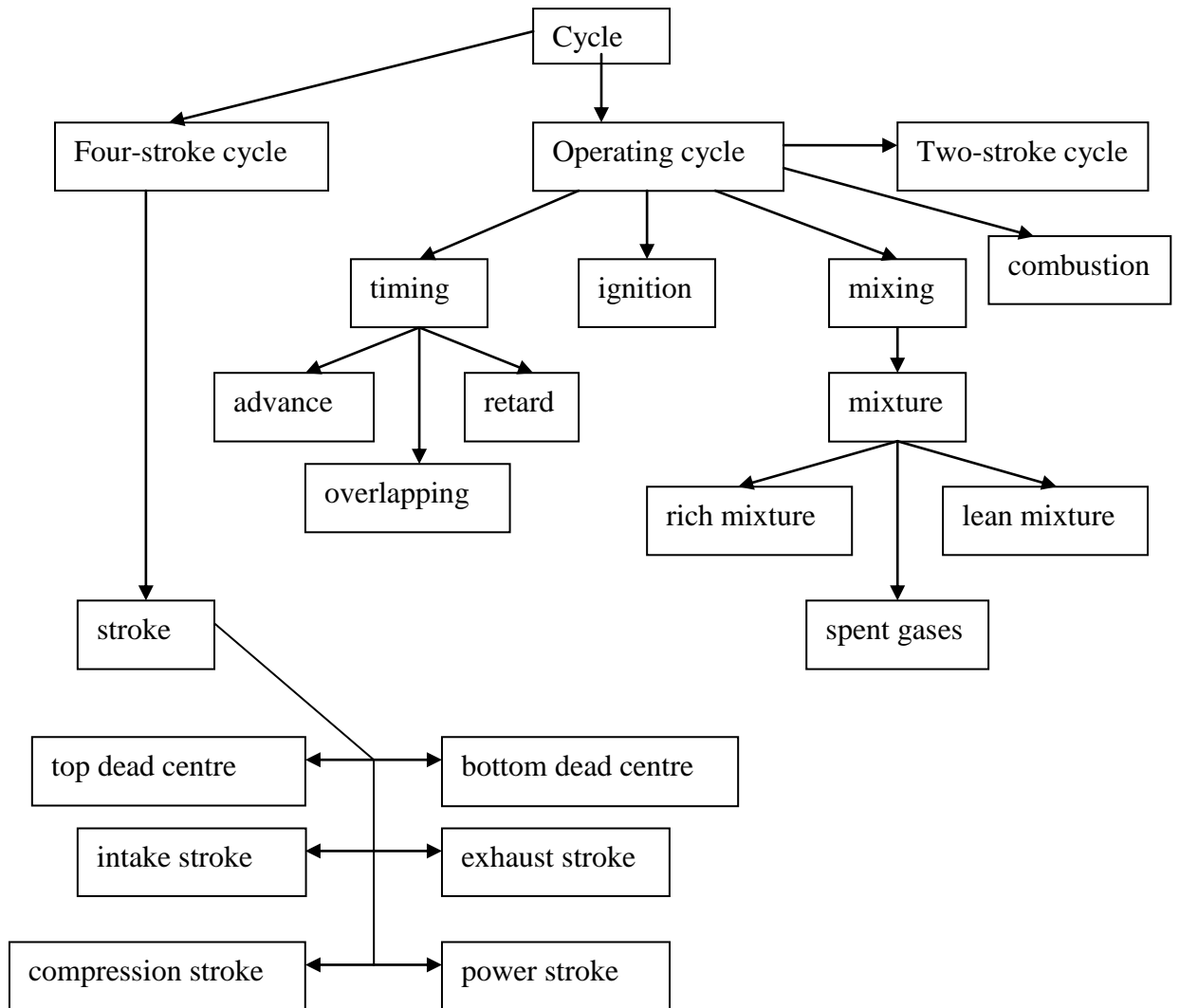
**II. Match the nouns on the left (1-14) with the Russian words (a-n) on the right:**

- |                               |                                    |
|-------------------------------|------------------------------------|
| 1. internal combustion engine | a. поршень                         |
| 2. combustion chamber         | b. верхняя мертвая точка           |
| 3. stroke                     | c. четырехтактный двигатель        |
| 4. piston                     | d. коленчатый вал                  |
| 5. top dead centre            | e. отверстие клапана               |
| 6. bottom dead centre         | f. двигатель внутреннего сгорания  |
| 7. four-stroke cycle engine   | g. нижняя мертвая точка            |
| 8. two-cycle engine           | h. топливная система               |
| 9. crankshaft                 | i. такт впрыска ( <i>топлива</i> ) |
| 10. intake stroke             | j. двухтактный двигатель           |
| 11. valve opening             | k. камера сгорания                 |
| 12. fuel system               | l. ход, такт ( <i>поршня</i> )     |
| 13. power stroke              | m. выхлоп                          |
| 14. exhaust                   | n. рабочий ход поршня              |

**III. Complete the sentences:**

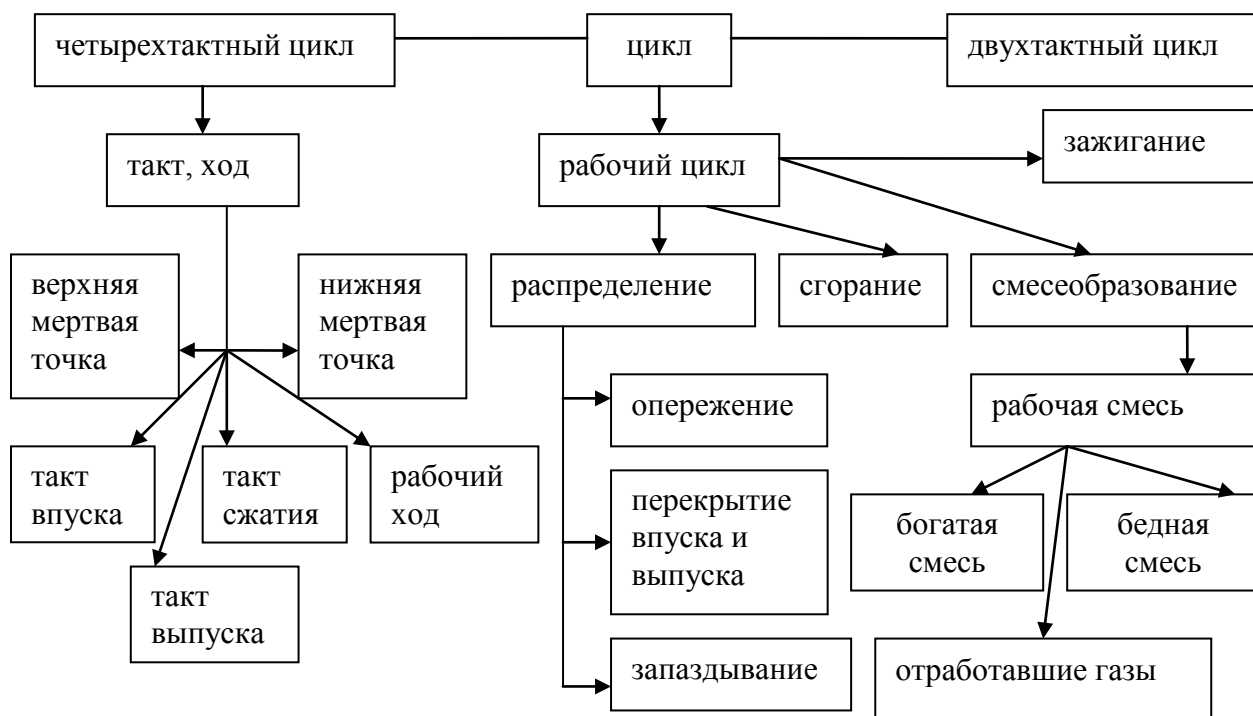
- |  |   |
|--|---|
| 1. An internal combustion engine is called so because gasoline is burned ... | a) inside the combustion chamber;   |
| 2. The upper limit of the piston movement is called ....                     | b) outside the combustion chamber.  |
| 3. The lower limit of the piston movement is called ....                     | a) the bottom dead centre;<br>b) the top dead centre.   |
| 4. The four-cycle engine requires ... .                                      | a) two strokes of piston movement;  |
| 5. The mixture of air and gasoline is delivered into the cylinder ...        | b) four strokes of piston movement.   |
|  | a) on the power stroke;<br>b) on the exhaust stroke;<br>c) on the intake stroke;<br>d) on the compression stroke. |

**IV. Complete the scheme by putting the numbers below in the correct place:**



рабочий цикл	1	такт сжатия	7
такт впуска	2	рабочая смесь	8
в.м.т.	3	распределение	9
отработавшие	4	двухтактный цикл	10
газы		сгорание	11
рабочий ход	5	богатая смесь	12
такт выпуска	6	опережение	13
н.м.т.	14	смесеобразование	18
ход	15	бедная смесь	19
четырёхтактный	16	зажигание	20
цикл		перекрытие впуска и	21
цикл	17	выпуска	

**V. Use numbers (1-22) below to complete the Russian scheme:**



spent gases	1	four-stroke cycle	12
mixing	2	bottom dead centre	13
two-stroke cycle	3	retard	14
combustion	4	exhaust stroke	15
top dead centre	5	lean mixture	16
stroke	6	operating cycle	17
intake stroke	7	compression stroke	18
advance	8	power stroke	19
rich mixture	9	overlapping	20
timing	10	ignition	21
cycle	11	mixture	22

**VI. Complete the following sentences to show the typical features of the engine.**

- a) The usual layout is to use...
1. two cylinders
  2. four cylinders
  3. more cylinders
- b) Ignition is usually achieved...
1. by spark plug
  2. by magneto

c) The engine is mounted...

1. forward
2. backward
3. in the middle

## **VII. Pay attention to this information and answer the questions below.**

The two most common types of engine for land vehicles are the petrol engine and the diesel engine.

Petrol engines are usually lighter and smaller than diesel engines. This makes them cheaper, and this is why most cars and motorbikes use petrol engines. Petrol engines are also less noisy than diesel engines. They usually go faster. On the other hand, diesel engines use less fuel and last longer than petrol engines, and this is why larger vehicles such as trucks and trains use them. They are also safer than petrol engines, because there is less danger of fire.

There are two main types of petrol engine - 4-stroke and 2-stroke. All cars and larger motor-cycles use 4-stroke engines. But the most of smaller motorbikes use 2-stroke engines. These are lighter and smaller than 4-stroke engines, and are therefore cheaper.

1. Which is the lightest of the three engines?
2. Which is the least expensive?
3. Which is the noisiest?
4. Which is the largest?
5. Which is the safest? Why?
6. Which uses the least fuel?

## **VIII. Translate the terms in brackets into English. Translate the sentences from English into Russian.**

- 1) The combustion mixture is drawn into the cylinder of an internal combustion engine on (такт всасывания).
- 2) Another necessary component of the (четырёхтактный двигатель) is a camshaft which controls the cams that open or close valves.
- 3) When the (поршень) nears the top of this stroke, the (впускной клапан) is opened and the exhaust valve closed.
- 4) The (крутящий момент) is liable to be uneven in any case when the engine is running slowly, and a (маховик) is fitted to the (коленчатый вал) to damp out these variations.
- 5) During the (такт впуска) of the piston, the pressure in the (впускной двигатель) is below atmospheric.
- 6) The level of petrol in the jet is kept constant by the (поплачковый клапан) and (игольчатый клапан) in the (поплачковая камера), which acts as a reservoir for the fuel.

- 7) The (компенсационный жиклер) can now supply only as much petrol as can pass through the small compensator orifice in the float chamber.
- 8) This difficulty is overcome by the provision of an (жиклер холостого хода) in the wall of the intake manifold near the (дроссельная заслонка).

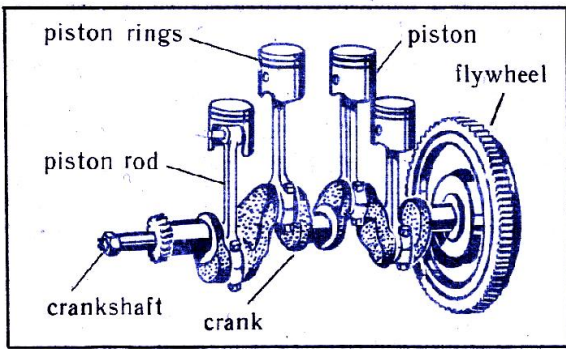
### **IX. Translate the sentences from English into Russian:**

- 1) The first fuel tried was gunpowder, with a predictably explosive result.
- 2) It was not until the second half of the nineteenth century that the development of petroleum products made possible today's internal combustion engine.
- 3) The Otto device was a four-stroke engine in which each piston made four movements (two up and two down) for each combustion in the cylinder using gasoline vaporized and mixed with air in a carburetor.
- 4) Since only the third stroke produces work, the piston needs help over the other strokes.
- 5) Before the development of modern jet engines, to be explored in the next unit, airplanes were powered by gasoline internal combustion engines.
- 6) When the mixture is ignited, the products of combustion expand down the cylinder which is fitted with a reciprocating piston.
- 7) The spark is timed to occur before the piston reaches top dead centre, otherwise maximum pressure would not be reached in time.
- 8) Since it is essential to secure rapid and complete combustion in the cylinder of an internal combustion engine, the fuel and air mixture must be thoroughly mixed.
- 9) This simple form of a single-jet carburetor will not give correct mixture strength for all engine speeds.
- 10) The chief difficulty encountered is that, at high running speeds, the amount of petrol taken up at the jet will increase faster than the increase in air-flow.

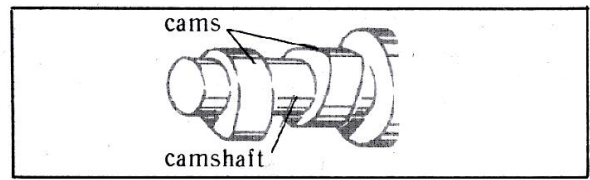
### **Text V**

#### **The Crankshaft and Flywheel**

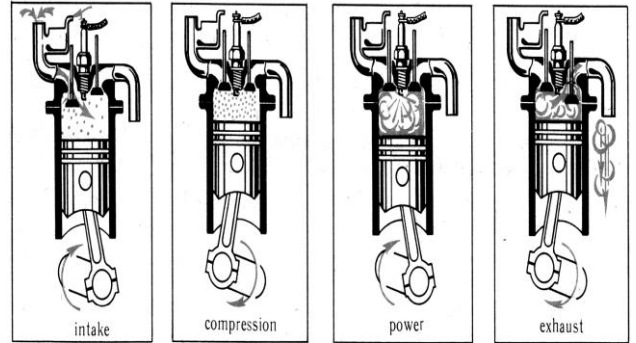
A piston rod connects the piston with the crank on the crankshaft. The crank changes the up and down motion of the piston into rotary motion of the crankshaft. A heavy flywheel mounted on the crankshaft rotates with the shaft. The heavy flywheel has inertia: that is, once it starts spinning it tends to keep on spinning. Hence the flywheel helps to keep the engine running smoothly. By means of gears, the crankshaft also rotates a parallel shaft called a camshaft. Cams are so placed on the camshaft that they move valve rods up and down at the right time. The valve rods in turn open and close the intake and exhaust the valves.



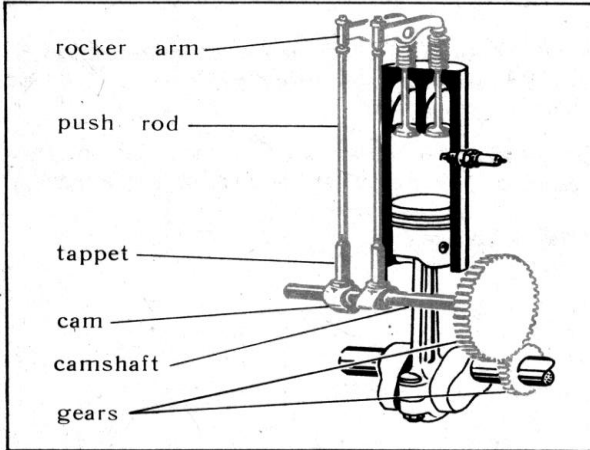
**Fig. 1**  
The four strokes of a four-stroke engine



**Fig. 2**



**Fig. 3**



**Fig. 4**

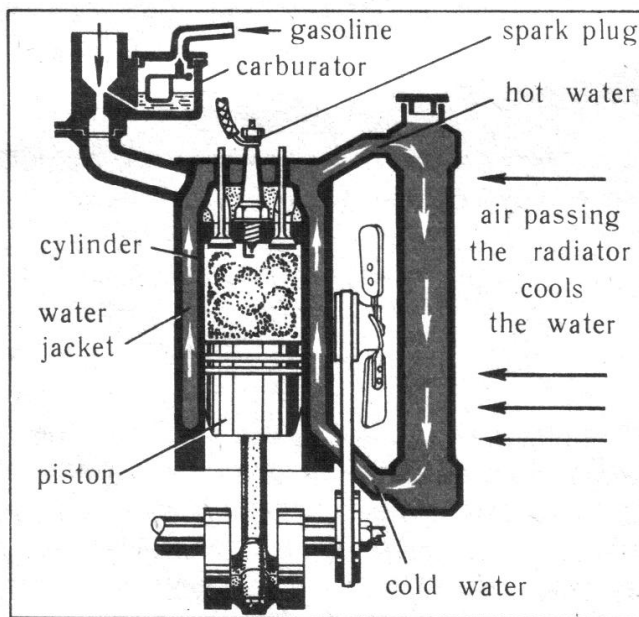
**Task**

- a) Analyse the drawings in Figs. 1, 2, 3, 4.
- b) Find out the meanings of as many terms given in the drawings as you can and translate the text given, using a dictionary.

**Text VI**

**Cooling System of Automobile**

Immediately after the gas in the cylinder has burned the temperature in the cylinder is almost 4,500<sup>0</sup>F. This is higher than the melting point of steel. Unless the engine is cooled, the moving parts such as valves and pistons, will expand enough to stick. This will stall the engine and may even ruin it. To cool the engine the cylinder walls are made hollow, so that water from the radiator can circulate through the space. Hot water from the top of the engine flows into the top of the radiator and passes downward through the air-cooled metal tubes. From the bottom of the radiator the water re-enters the engine near the bottom of the engine to complete the circuit. To keep the water in circulation about 5 gallons in all, a centrifugal pump, driven by the engine,



**Fig. 1**

to stick. This will stall the engine and may even ruin it. To cool the engine the cylinder walls are made hollow, so that water from the radiator can circulate through the space. Hot water from the top of the engine flows into the top of the radiator and passes downward through the air-cooled metal tubes. From the bottom of the radiator the water re-enters the engine near the bottom of the engine to complete the circuit. To keep the water in circulation about 5 gallons in all, a centrifugal pump, driven by the engine,



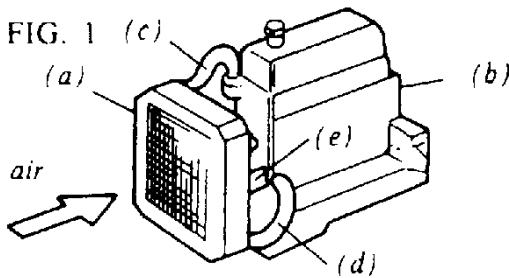
aids the natural process of convection.

The radiator is in front of the car. As the result, air is forced past the tubes when the car is in motion and the water is cooled. In addition a fan is placed between the engine and the radiator. The fan draws air through the radiator and drives it against the engine.

**Task**

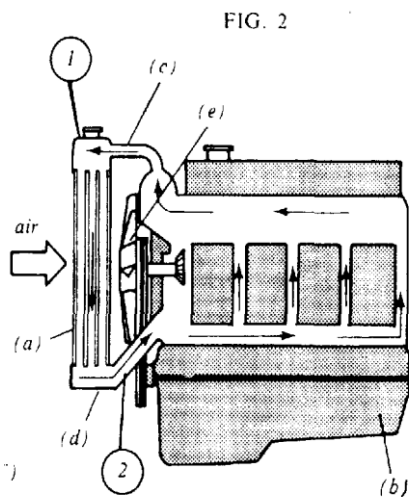
- a) Find the Russian equivalents of the terms in the drawing in Fig.1 without using a dictionary.
- b) Translate the text.

**A car cooling system**

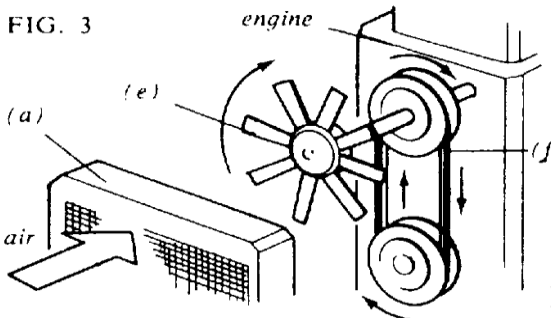


Most car engines are cooled by water. The water flows around the *engine* and then passes through the *radiator*. It then passes through the water pump and around the engine again.

**Here are the stages:**



1. Water flows around the engine. The engine is cooled and the water is heated.
2. The hot water enters the radiator through the *top hose*.
3. It flows down through the radiator. Here it is cooled by air.
4. The cool water leaves the radiator through the *bottom hose*.
5. The water is pumped around the engine again.



Look at FIG. 3. Air is pulled through the radiator by a *fan*. This fan is turned by a *belt*, which is driven by the engine.

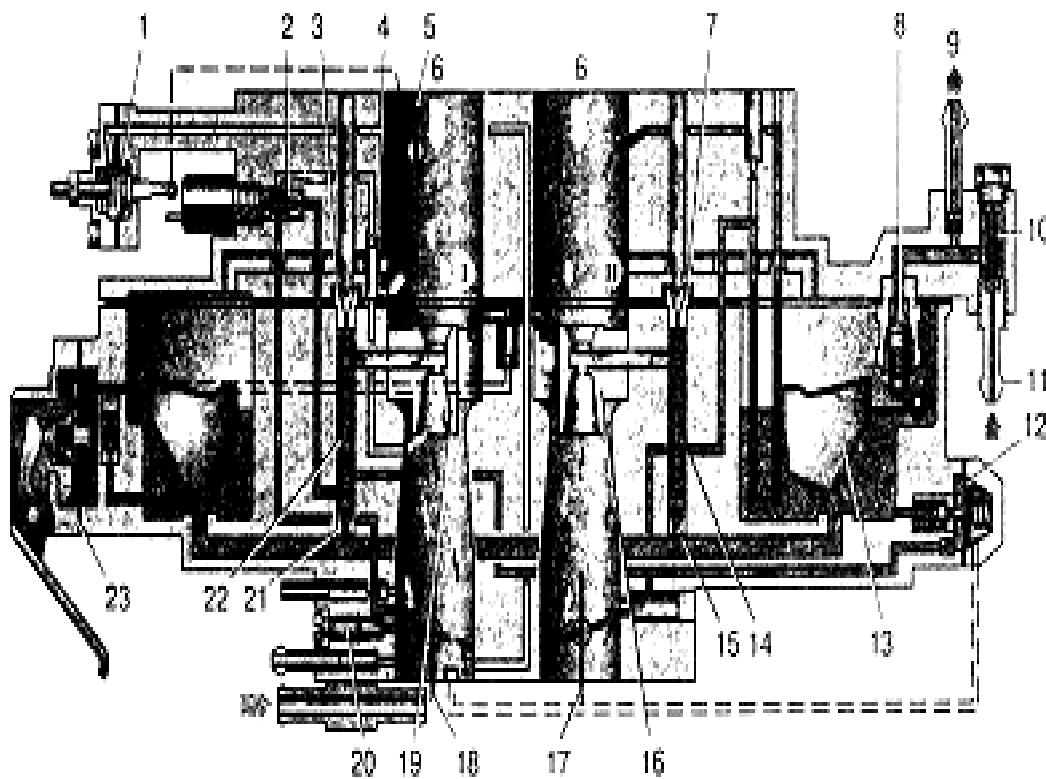
**Answer the questions:**

1. What cools the engine?
2. What makes the water hot?
3. What makes the water cool?

4. What pumps the water round the engine?
5. What pulls air through the radiator?
6. What does the belt turn

## Text VII

### Carburetor



### Two-stage carburetor | Двухкамерный карбюратор

- |                                  |   |
|----------------------------------|---|
| I – primary barrel               | I – первая камера   |
| II – secondary barrel            | II – вторая камера  |
| 1 – starting device              | 1 – пусковое устройство                                       |
| 2 – idle fuel jet                | 2 – топливный жиклер системы холостого хода                   |
| 3 – primary air correction jet   | 3 – воздушный жиклер главной дозирующей системы первой камеры |
| 4 – idle air jet                 | 4 – воздушный жиклер системы холостого хода                   |
| 5 – choke                        | 5 – воздушная заслонка  |
| 6 – air intake                   | 6 – вход воздуха  |
| 7 – secondary air correction jet | 7 – воздушный жиклер главной дозирующей системы второй камеры |
| 8 – needle valve                 | 8 – игольчатый клапан   |
| 9 – fuel return                  | 9 – возврат топлива (в топливный бак)                         |
| 10 – fuel filter                 | 10 – топливный фильтр   |
| 11 – fuel supply                 | 11 – топливоподводящий штуцер                                 |

12 – part-throttle control valve	12 – клапан регулирования при частичном открытии дроссельной заслонки
13 – float	13 – поплавок
14 – secondary emulsion tube	14 – эмульсионная трубка второй камеры
15 – secondary main jet	15 – топливный жиклер главной дозирующей системы второй камеры
16 – secondary venturi chamber	16 – диффузор второй камеры
17 – secondary throttle valve	17 – дроссельная заслонка второй камеры
18 – primary throttle valve	18 – дроссельная заслонка первой камеры
19 – primary venturi chamber	19 – диффузор первой камеры
20 – volume control screw (idle mixture screw)	20 – регулировочный винт качества смеси на холостом ходу
21 – primary main jet	21 – топливный жиклер главной дозирующей системы первой камеры
22 – primary emulsion tube	22 – эмульсионная трубка первой камеры
23 – accelerator pump	23 – ускорительный насос

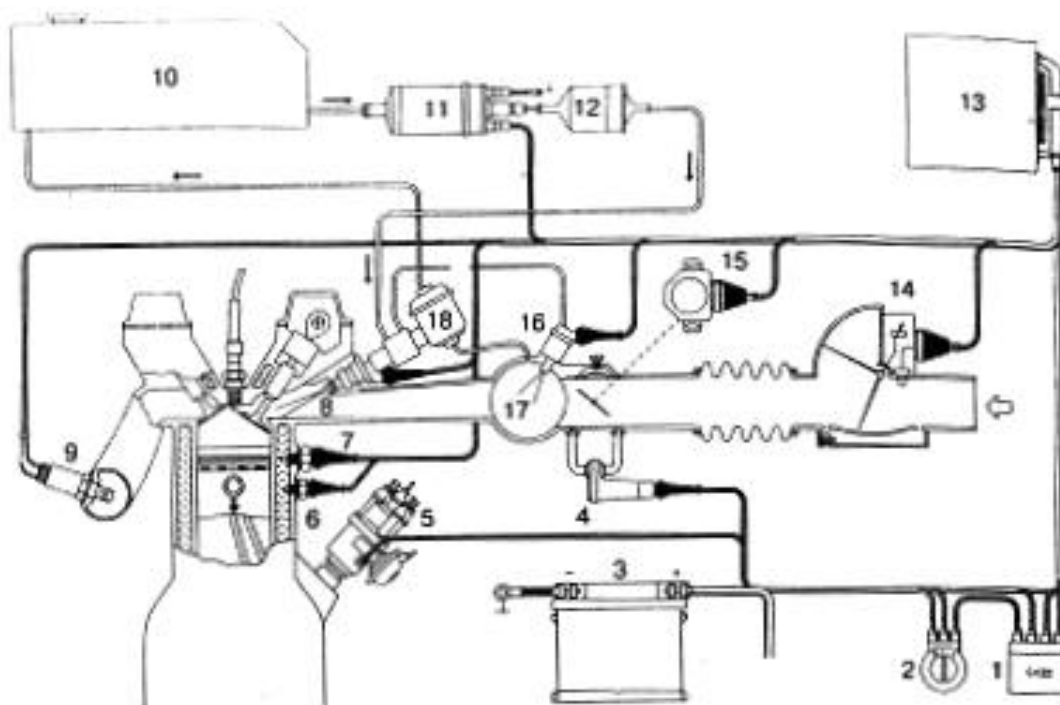
The mixture consisting of fuel vapour and air burned in the cylinder is produced in the carburetor. It supplies a uniform fuel-air mixture in the ratio 1 : 15 to 1 : 16 for the entire engine speed range, i.e., for idling, changeover, partial load and full load. The fundamental principles of a carburetor are as follows: during the suction stroke outside air is drawn by the flowing through the intake pipe of the carburetor.

When the intake pipe is narrowed at some place, the speed of the induction air will be increased at this place, if a little opening is arranged at the bottle-neck and connected with the fuel supply, fuel will be dragged along from this opening while the air is passing and mixed with the air as finely atomized droplets. Thus, the fuel-air mixture is produced.-The quantity of fuel-air mixture fed to the engine and consequently the quantity of fuel is generally metered by a throttle valve incorporated into the induction pipe of the carburetor between carburetor and engine.

By means of selection of the jet bores, the mixing ratio of fuel and air can be maintained sufficiently constant within wide ranges of engine speed and load. A "choke valve" is inserted into air intake passage in front of the main jet. During starting the cold engine, it is closed; as a result, nearly the entire intake pressure is acting on the fuel nozzle and excess in fuel is achieved.

In case of unskilled operation and especially if the choke valve is kept open too long after the engine has started, the engine may be flooded with fuel to such an extent that it does not ignite. This leads to serious damages of the engine.

On modern engines, the starting devices are small secondary carburetors to be switched in and off. They are additionally incorporated in the main carburetor and are equipped with a fuel nozzle and air jet. Switching in or off is performed either by a rotary slide valve or starter valve operated by means of a cable. In this case, too, the fuel from the fuel nozzle is mixed with the air from the air jet to form a fuel-air mixture. With the starting device in operation and the throttle valve closed, the engine draws the additional "starting mixture" through a feed duct discharging into the intake pipe behind the throttle valve. After the engine has been warmed up the starting device is closed since the starting mixture is not required any more.



**L-injection system (Bosch) | Электронная система впрыска топлива L-jetronic (фирмы «Бош»)**

- 1 – relay
- 2 – ignition/starter switch
- 3 – battery
- 4 – auxiliary-air valve
- 5 – ignition distributor
- 6 – coolant-temperature sensor
- 7 – thermo-time switch
- 8 – injector
- 9 – lambda sensor
- 10 – fuel tank
- 11 – electric fuel pump
- 12 – fuel filter
- 13 – electronic control unit
- 14 – airflow sensor
- 15 – throttle switch
- 16 – electric start valve
- 17 – intake manifold
- 18 – fuel-pressure regulator

- 1 – реле
- 2 – выключатель зажигания
- 3 – аккумуляторная батарея
- 4 – регулятор частоты вращения коленчатого вала на холостом ходу
- 5 – прерыватель-распределитель зажигания
- 6 – датчик температуры охлаждающей жидкости
- 7 – термовыключатель и реле времени
- 8 – форсунка
- 9 – лямбда-зонд
- 10 – топливный бак
- 11 – топливный насос с электроприводом
- 12 – топливный фильтр
- 13 – электронный блок управления
- 14 – датчик расхода воздуха
- 15 – датчик положения дроссельной заслонки
- 16 – пусковая форсунка
- 17 – впускной трубопровод
- 18 – регулятор давления топлива

The simple carburetor consists of a mixing chamber with a diffuser (venture), a fuel jet with an outlet in the diffuser, a float chamber with a float and a float needle valve, a throttle valve for controlling the rate of mixture delivery to the engine and a choke valve which serves as an aid in starting.

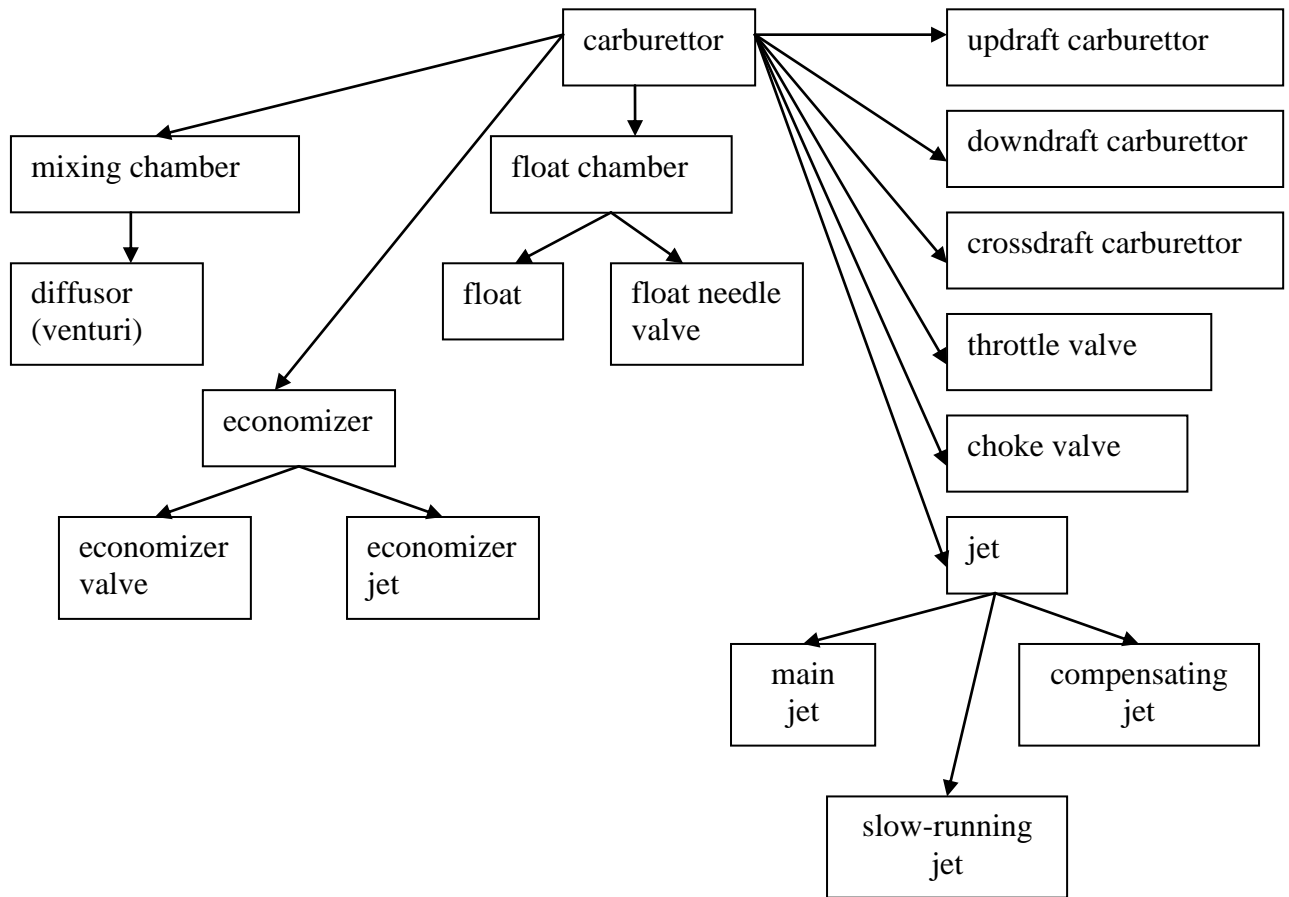
There are 3 general types of carburetors. The first to come into use was the updraft type in which the air enters at the bottom and leaves at the top, so that the direction of its flow is generally upward.

When the maximum possible power is wanted the operator opens the throttle valve wide. The economizer jet which is usually closed by the economizer valve is opened when the throttle is wide opened. Additional gasoline is delivered and the mixture is enriched. The economizer performs the "economizing" function indirectly as it permits the orifice of the main jet to be so proportioned that it will give a lean "economy" mixture.

**Task: Complete the scheme with Russian terms or numbers from the list of words.**

**The list of words:**

жиклер экономайзера	1	главный	1
		жиклер	0
жиклер холостого хода	2	экономайзе	1
		р	1
смесительная камера	3	карбюратор	1
		с	2
		горизонтал	
		ьным	
		потоком	
карбюратор с восходящим потоком	4	поплавок	1
			3
дроссельная заслонка	5	воздушная	1
		заслонка	4
жиклер	6	поплавковая	1
		камера	5
игольчатый клапан поплавка	7	компенсаци	1
		онный	6
		жиклер	
диффузор	8	клапан	1
		экономайзе	7
		ра	
карбюратор с падающим потоком	9		



## Text VIII

### Clutch

The internal-combustion engine is not a self-starting type. It has to be started and only after its speed has been increased it develops a sufficient torque. For putting the vehicle in motion, all internal-combustion engines require some disengageable connection between engine and axle drive. This disengageable connection is designed as a friction clutch.

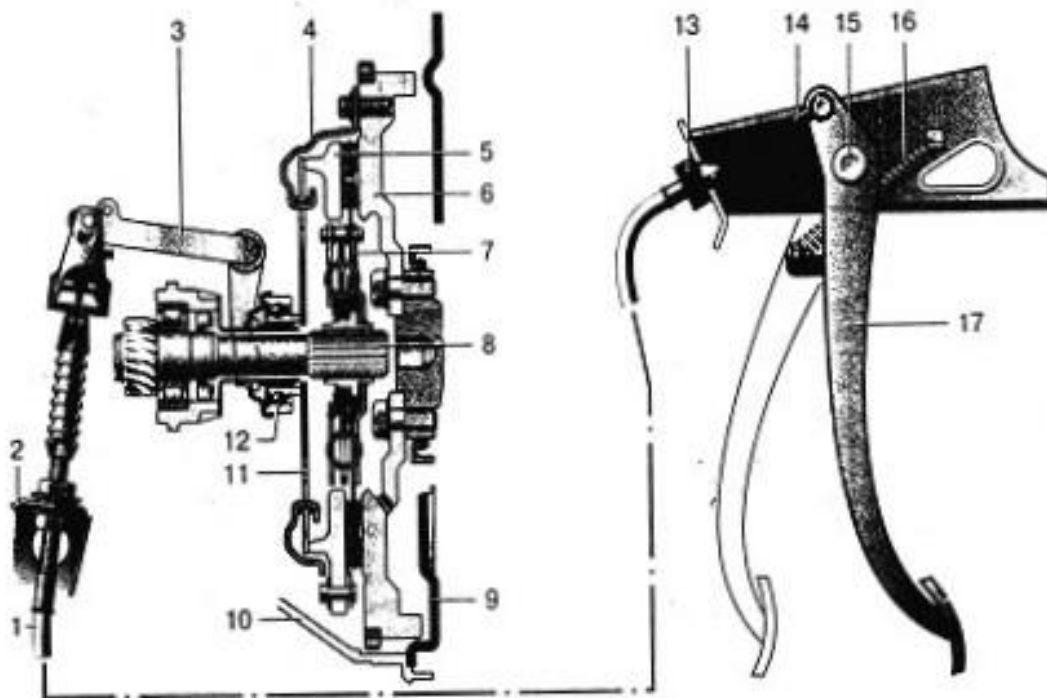
The disk clutches are built as multiple-disk and single-disk clutches. A difference is made between dry clutches and oil-bath clutches. The motorcar clutch is required to engage smoothly and to transmit the full engine torque without any slippage when completely engaged. Since the clutch is foot-operated, the force (pedal force) required for its disengagement should be as small as possible. Coupling is performed by friction. The friction surfaces of disks alternately connected with the engine and the change-speed gear to be driven are forced together by spring pressure.

They have been replaced by the single-disk clutch after wear-resistant clutch linings with high friction values had been developed. In modern automotive engineering it is used almost exclusively.

Nearly the whole diameter of the flywheel is employed for its housing resulting in a maximum friction surface area. It has only one clutch disk whose hub rests in the spines of the gear shaft, and it is forced between the clutch pressure plate and the flywheel by the spring-loaded pressure plate. The elastic force is acting concentrically.

Six pressure springs are located at the circumference of the clutch in height of the clutch bolt. The springs are supported by a spring cage toward the outside and by the clutch pressure plate toward the inside, and they push the clutch disk against the flywheel.

Disengagement of the clutch is performed by the slip ring connected with the clutch pedal via the throttle lever; in some models, this slip ring corresponds to a thrust ball bearing. This slip ring made of hard graphite pushes against the pressure ring when the clutch is disengaged. The three clutch levers actuated by the pressure ring are lifting the clutch pressure plate from the clutch disk by the adjusting screw.



### Clutch | Сцепление

- 1 – flexible
- 2 – shaft bracket
- 3 – clutch-operating fork
- 4 – clutch cover
- 5 – pressure plate
- 6 – flywheel
- 7 – clutch plate
- 8 – gearbox input shaft
- 9 – clutch housing bottom cover
- 10 – clutch housing
- 11 – pressure spring

- 1 – гибкая оболочка троса
- 2 – кронштейн крепления троса
- 3 – вилка выключения сцепления
- 4 – кожух сцепления
- 5 – нажимной диск
- 6 – маховик
- 7 – ведомый диск
- 8 – первичный вал коробки передач
- 9 – нижняя крышка картера сцепления
- 10 – картер сцепления
- 11 – нажимная пружина

12 – release thrust bearing

13 – buffer

14 – shaft end

15 – pedal axle

16 – pedal spring

17 – clutch pedal

12 – подшипник выключения сцепления  
(выжимной подшипник)

13 – буфер

14 – наконечник троса

15 – ось педали

16 – пружина педали

17 – педаль сцепления

As a result, the contact pressure of the clutch spring has no effect on the clutch disk and the flow of power from the flywheel to the clutch shaft is interrupted.

Since only two friction surfaces have to be separated in this case, the space of separating amounts to 2 or 3 mm. The pedal path is approx. 100 mm so that the reduction ratio is high and the exertion required by the driver is little.

In lorries (trucks) and buses equipped with air brakes, the clutch is sometimes operated by compressed air, j. e. not directly.

Instead of the mechanical friction clutches, modern automotive engineering uses fluid flywheel clutches (automatic transmission). The clutch housing is filled with oil. When driven by the engine and beginning with a certain speed, the oil in the primary wheel is pushed toward the outside by the centrifugal force and receives a rotary motion. As a result, the vanes of the secondary wheel are dragged along. Due to the low energy of flow oil the oil when idling, no dragging is occurring. The more the speed is increased, the higher will be the dragging force acting on the secondary wheel. Thus, this type of clutch results in smooth starting, and it works nearly without any slippage in the higher speed range.

### **I. Comprehension:**

- 1) What is the function of a clutch?
- 2) What purpose is a hydraulic clutch used for?
- 3) Why has the clutch disengagement to be as small as possible?
- 4) How is coupling performed?
- 5) What is used instead of the mechanical friction clutch?

### **II. What is the Russian for the following words? Insert them into the blanks.**

Disengageable, foot-operated, surface, spring, coupling, space, automotive, flywheel, path, combustion, friction, axle-drive.

In order to put the vehicle in motion, all internal \_\_\_\_ engines require some \_\_\_\_ connection between engine and \_\_\_\_ . This connection is designed as a \_\_\_\_ clutch. Since the clutch is \_\_\_\_, the force necessary for it disengagement has to be as small as possible \_\_\_\_ is performed by friction. It means the friction \_\_\_\_ of disks are forced together by \_\_\_\_ pressure. Since only two friction surfaces are to



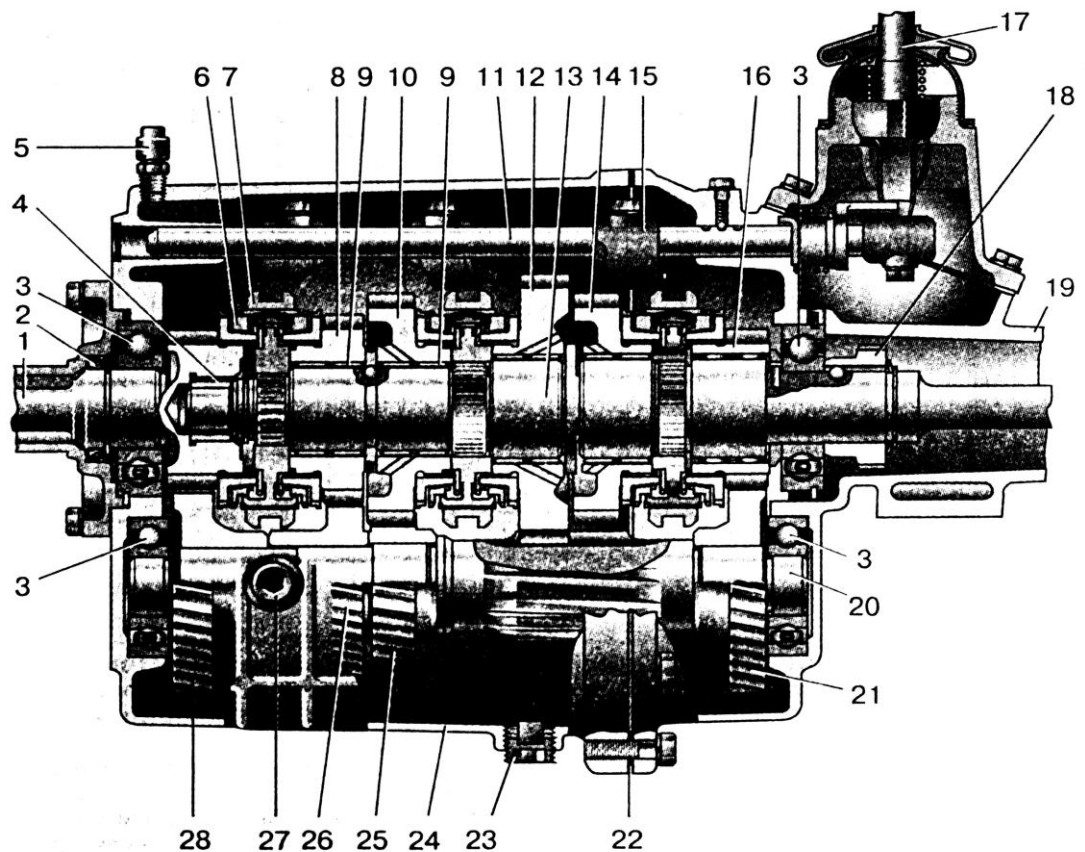
be separated, the \_\_\_\_ of separation amounts to 2 or 3 mm. The pedal \_\_\_\_ is approximately 100 mm. Modern \_\_\_\_ engineering use fluid \_\_\_\_ clutches.

### III. Explain the differences of below given words. Translate them.

1. assembly, assembled, assemble, assembling, assembles.
2. advance, advanced, advancement, advancing, advances.
3. adjust, adjustable, adjusted, adjusting, adjustment, adjuster.
4. drive, driver, driving, drives, driven, drove.
5. contribute, contribution, contributed, contributes, contributor.
6. refine, refinement, refining, refined, refiner, refines, refinery.

### Text IX

#### Change-Speed Gear



1-input shaft-первичный вал;

2-seal ring-уплотнительное кольцо(сальник);

3-single-row radial ball bearing-однорядный радиальный шариковый подшипник;

- 4-cylindrical roller bearing-радиальный роликовый подшипник с цилиндрическими роликами;
- 5-bleeder-сапун;
- 6-speed synchronizer-синхронизатор;
- 7- speed synchronizer sleeve-муфта включения передачи;
- 8-third speed driver gear-ведомая шестерня передачи;
- 9-needle bearing-игольчатый подшипник;
- 10-second speed driver gear-ведомая шестерня второй передачи;
- 11-selector rod-шток механизма переключения;
- 12-first speed driver gear-ведомая шестерня первой передачи;
- 13-output shaft-вторичный вал;
- 14-reverse drive gear-шестерня заднего хода;
- 15-fifth-and-reverse change speed fork-вилка включения пятой передачи и заднего хода;
- 16-fifth speed driver gear-ведомая шестерня пятой передачи;
- 17-speed change level-рычаг переключения передач;
- 18-speedometer drive gear-шестерня привода спидометра;
- 19-rear gearbox housing-задний картер коробки передач;
- 20-countershaft-промежуточный вал;
- 21- fifth speed driving gear-ведущая шестерня правой передачи;
- 22- housing gasket-прокладка картера;
- 23-grain plug-пробка сливного отверстия;
- 24-front gearbox housing-картер коробки передач;
- 25- second speed driving gear-ведущая шестерня второй передачи;
- 26- third speed driving gear- ведущая шестерня третьей передачи;
- 27-oil filler plug-пробка маслозаливного отверстия;
- 28- countershaft driving gear- шестерня привода промежуточного вала;

It is the purpose of the change-speed gear to adapt the movement of the car to the particular conditions. The Internal combustion engine can develop the desired

power only within a specified speed range. Therefore, the change-speed gear is meant to adapt the driving speed to the particular situations with the engine operating at uniform speed as much as possible and to permit to back up the car. The particular ratio is called "gear" and, depending on the number of ratios, the change-speed gear or transmission is called a three-speed, four-speed or five-speed gear or transmission.

Every change-speed gear or transmission has two gear shafts. The upper shaft is the main or sliding shaft, the lower shaft is the countershaft or lay shaft. The clutch or drive shaft transmits the engine torque to the transmission via the clutch; its one end is supported in the transmission housing and the other end in the crankshaft. It carries the clutch thrust plate causing the shaft to follow and the main drive gear, located inside the transmission housing and constantly in mesh with a gear on the countershaft. The main shaft is supported in the drive shaft and has longitudinal grooves carrying the individual gear clusters to be shifted in longitudinal direction by shifter forks. In addition to these two shafts, the reverse idler gear shaft is laterally supported in the housing; it carries also the reverse idler gear for changing the direction of rotation when backing

In some cars, the gear-shift handle is located in the centre of the instrument panel and this is also a very convenient arrangement. In this case, the motion of the gear-shift handle is transmitted to the shifting lever of the transmission via some pipe passed through the instrument panel.

The torque delivered by the transmission shaft has to be transmitted to the driving wheels. The drive of a motorcar can be performed both by the front wheels or rear wheels. In either case, some construction elements have to be incorporated between the transmission and the drive wheel, namely: the cardan or universal shaft, required only for rear-wheel drive from the engine arranged in the front end of the car; the final drive and the differential or differential gear; the axle shafts up.

The gears of the countershaft are firmly connected to it and are permanently rotating due to the gears constantly in mesh.

In modern motorcars, especially in passenger cars, the "steering column gear-shift mechanism"\* is preferred to the "stick control" arranged in the centre of the car. The gearshift lever is mounted on the steering column underneath the steering wheel and its operation is very convenient since it is within easy reach. Besides, the passage from the left seat toward the right side is free. The hand brake is not arranged in the conventional way next to the gear-shift lever but it is located underneath the instrument panel.

### **I. Answer the questions:**

1. What is the purpose of the change-speed gear?
2. How is the gearbox called?
3. What are the upper and lower shafts?
4. Where is the gear-shift handle located?
5. Why is it very convenient when the gear-shift lever is mounted on the steering column underneath the steering wheel?

## II. Insert the missing words into the blanks:

motive, engine, composed, mechanism, drive, shaft, wheels, device, revolve, rear-axle, gearbox

The power from the \_\_\_\_\_ to the \_\_\_\_\_ wheels is transmitted through the transmission which is \_\_\_\_\_ of the following mechanisms: clutch, gearbox and differential.

Gearbox is a \_\_\_\_\_ regulating the \_\_\_\_\_ power of the engine, which is transmitted to the drive \_\_\_\_\_ of the automobile. Through drive \_\_\_\_\_ power is transmitted from the engine to the \_\_\_\_\_. It is \_\_\_\_\_ between the \_\_\_\_\_ and the rear-axle. Differential is the \_\_\_\_\_ that permits the rear wheels \_\_\_\_\_ at different speeds independently one of the other.

## III. Retell the above given text.

### Text X

#### Steering System

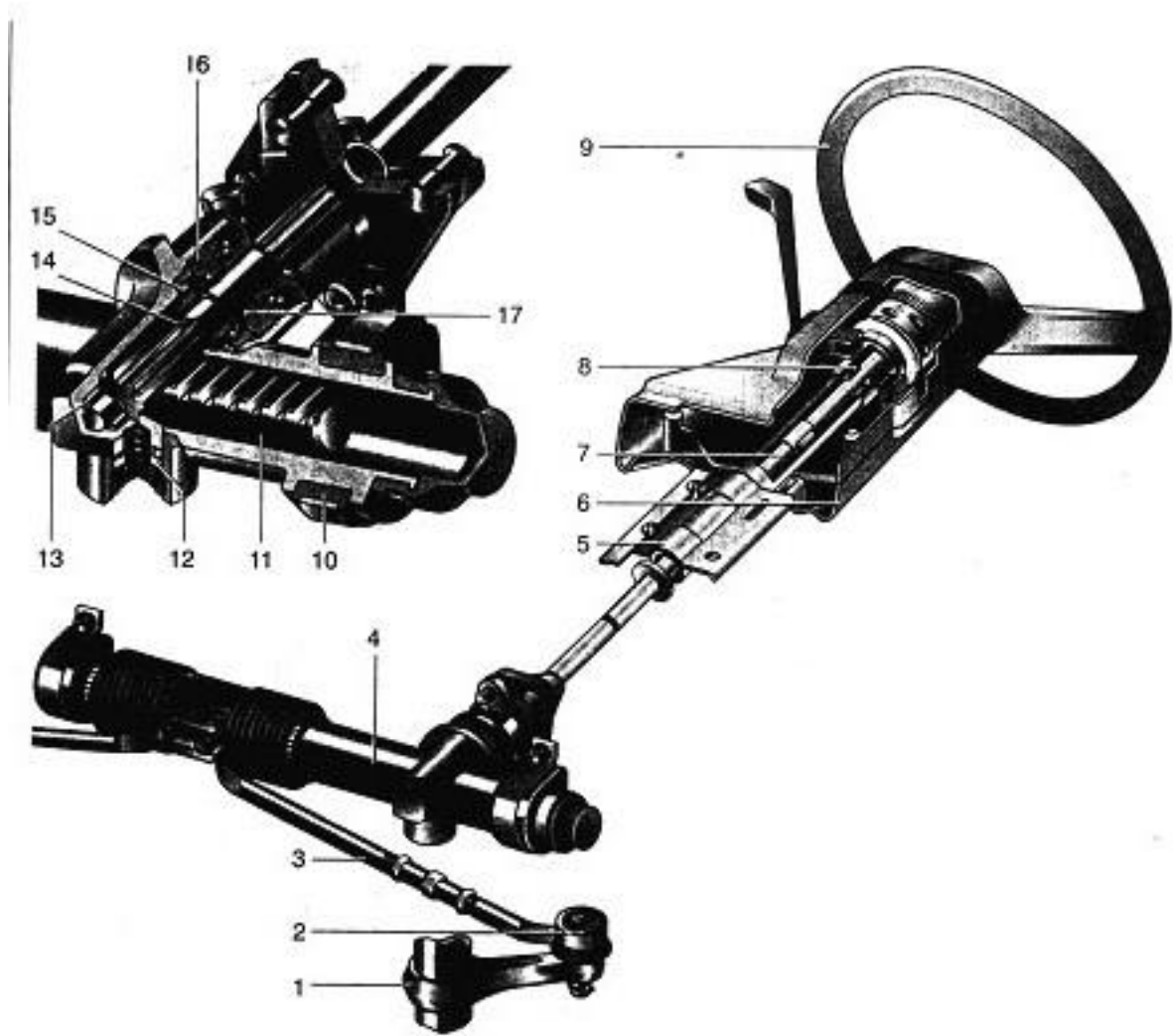
The steering system of a motor vehicle is composed of the following components: steering wheel, steering column and steering-gear case, the steering control arms at the steering arm and at the steering knuckles, the drag rod, and the tie rod.

The mechanism for transmitting the rotary motion of the steering wheel to the steering-gear arm is arranged in the steering-gear case. It is bolted to the frame; in case of a frameless construction, it is attached to a member of the body.

Many motor vehicles, especially passenger cars, are now equipped with the rack-and-pinion\_ steering. It consists of a straight-guided rack arranged at right angles to the driving direction, and a spur-gear pinion, attached to the end of the steering column, engaged with the rack.

This type of steering requires a minimum of joints; as a result, it features long service life and minimum steering slack. It is especially used in case of axleless front-wheel suspension. A friction shock absorber is arranged behind the spur-gear pinion to prevent road shocks from being transmitted to the steering wheel.

The operation of the steering system should not require great effort. The force to be applied to the steering wheel depends on the load of the front wheels. In some special cases it is required to assist the driver's effort by means of a pneumatic or hydraulic servo-steering unit. Generally, this unit consists of a compressed-air cylinder; by means of the piston rod, its piston acts directly on the steering control arm of the front axle, while turning of the steering wheel guides the front wheels and additionally actuates the control valves of the compressed-air cylinder. Thus, rather effortless steering is achieved.



### Rack-and-pinion steering | Реечный рулевой механизм

- |                             |                                       |
|-----------------------------|---------------------------------------|
| 1 – steering arm            | 1 – рычаг поворотного кулака          |
| 2 – ball joint              | 2 – сферический шарнир                |
| 3 – drag link               | 3 – рулевая тяга                      |
| 4 – steering gearbox        | 4 – картер рулевого механизма         |
| 5 – steering shaft bracket  | 5 – кронштейн крепления рулевого вала |
| 6 – steering column housing | 6 – кожух рулевой колонки             |
| 7 – steering (pinion) shaft | 7 – рулевой вал                       |
| 8 – bearing part            | 8 – подшипник                         |
| 9 – steering wheel          | 9 – рулевое колесо                    |
| 10 – supporting bush        | 10 – опорная втулка                   |
| 11 – rack                   | 11 – рейка                            |
| 12 – stop                   | 12 – упор                             |
| 13 – roller bearing         | 13 – роликовый подшипник              |
| 14 – pinion                 | 14 – шестерня                         |
| 15 – ball bearing           | 15 – шариковый подшипник              |
| 16 – bearing nut            | 16 – гайка подшипника                 |
| 17 – seal ring              | 17 – уплотнительное кольцо            |

Furthermore, adherence to the specified tire pressure is important for a good steering. Besides, troubles in the steering system may be traced back to wrong position of the front wheels.

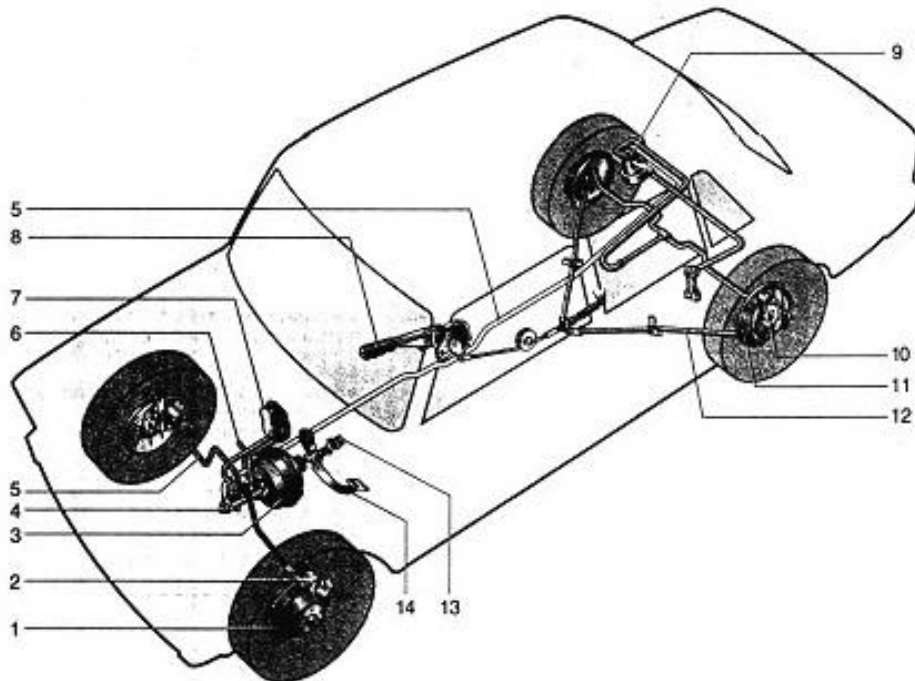
**I. Fill in the table with numerals of the sentences according to the necessary tense.**

	Present	Past	Future	
Simple	1.(p)			<u>Example:</u> The steering wheel is mounted. A-Active Voice P-Passive Voice
Perfect				
Cont				

1. The driver is steering....
2. The car moved...
3. The system will be checked...
4. The result was achieved...
5. The car has been fitted with...
6. The steering arms are being connected...
7. The driver was turning...
8. Wheels were replaced...
9. The system is efficient...

**Text XI**

**Brakes**



### **Brake system with hydraulic braking-force distribution and cable parking brake**

- 1 – brake disk
- 2 – calipers
- 3 – vacuum booster (servo)
- 4 – master brake cylinder
- 5 – brake tube
- 6 – vacuum tube
- 7 - master brake cylinder tank
- 8 – parking brake lever
- 9 – pressure regulator
- 10 – wheel cylinder
- 11 – brake shoe
- 12 - parking brake cable
- 13 – brake stop-light switch
- 14 – brake pedal

### **Тормозная система с гидравлическим тормозным приводом и тросовым приводом стояночного тормоза**

- 1 – тормозной диск
- 2 – суппорт
- 3 – вакуумный усилитель
- 4 – главный тормозной цилиндр
- 5 – тормозной трубопровод
- 6 – вакуумный трубопровод
- 7 – бачок главного тормозного цилиндра
- 8 – рычаг привода стояночного тормоза
- 9 – регулятор движения
- 10 – колесный цилиндр
- 11 – тормозная колодка
- 12 – трос привода стояночного тормоза
- 13 – выключатель сигнала торможения
- 14 – тормозная педаль

Every motor vehicle is to be equipped with two independent brakes. Each brake must be able to stop the vehicle within the shortest distance. Above all, braking of a vehicle depends on the friction between tires and road surface. Brakes operate most efficiently when they are applied so that the wheels do not quite lock but continue to turn without slipping on the road. The force of the slipping friction between tires and road is much smaller than the brake power. In addition, the wheel loses all of its road-holding ability and tends to skidding. In order to utilize the whole wheel load, i. e. the total ground adhesion of a vehicle for its braking, all vehicles are now equipped with all-wheel brakes.

Almost without any exception, motor-vehicle brakes are "shoe-type brakes." Depending on their actuation, a difference is made between foot brakes and hand brakes. The foot brake is also called service brake, while the hand brake is called parking brake. However, the parking brake should not be considered as an interior brake.

According to their mode of operation, the brakes are classified as mechanical (rod-linkage and cable-operated) brakes hydraulic brakes (oil brakes), air brakes.

Depending on their action on the front or rear wheels or on the drive, the brakes are classified as front-wheel brakes, rear-wheel brakes or transmission brakes respectively.

Besides, brakes are classified as external-contracting or internal-expanding brakes.

Modern motor vehicles are almost exclusively equipped with internal-expanding brakes acting on all the wheels of the car.

### **I. Answer the questions:**

What is the purpose of the brakes?

What kinds of brakes are used in modern cars?

What brakes are more powerful?  
What causes the brake action?  
Most of brakes are fluid operated, aren't they?

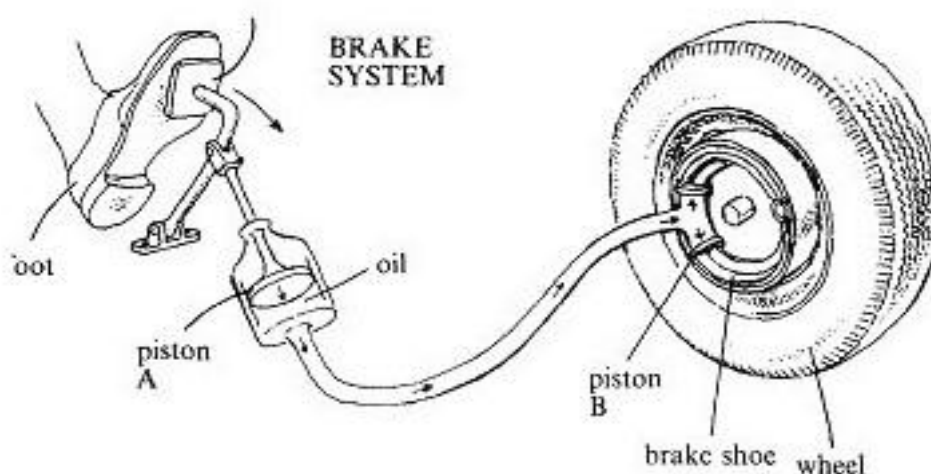
## II. Choose corresponding Russian meanings:

- |               |                |
|---------------|----------------|
| 1. drum       | a. расширять   |
| 2. friction   | b. движение    |
| 3. shoe       | c. жидкость    |
| 4. to revolve | d. снабжать    |
| 5. motion     | e. колодка     |
| 6. surface    | f. колесо      |
| 7. to fit     | g. барабан     |
| 8. wheel      | h. вращать     |
| 9. to expand  | i. поверхность |
| 10. fluid     | j. трение      |

## III. Translate from Russian into English.

Уход за тормозами.

Техническое обслуживание тормозов начинается с проверки движения тормозной педали. Кроме того, надо снять тормозные барабаны и убедиться в исправности тормозных механизмов всех колес. Поверхности тормозных колодок и барабанов должны быть сухими. По мере прокачки тормозную жидкость доливают.



1. The foot presses the pedal.
2. The pedal pushes piston A down.
3. The piston squeezes the oil.
4. The oil pushes piston B outwards.
5. Piston B pushes the brake shoe against the wheel.
6. The wheel stops.



## Text XII

### Suspension System

For dampening the road shocks otherwise transmitted to frame and body as much as possible, springs have to be arranged between axles and frame. Spring suspension of motor vehicles is performed in various ways.

The type of spring most frequently used is the leaf spring, designed either as a "semi elliptic leaf spring" or "one-quarter elliptic leaf spring." Leaf springs are composed of a number of flat spring leaves arranged one upon another. Depending on the load of the axles, springs of different strength for front and rear axle are used.

Since the length of the spring varies with the load, one of the spring eyes has to be suspended in swinging condition by means of a shackle. The spring is attached to the axle by U-bolts, and the centre bolt connecting the leaves secures the spring assembly against shifting on the axle by its pin. Rebound clips are located at intermediate positions in the length of the spring to prevent any shifting of the leaves.

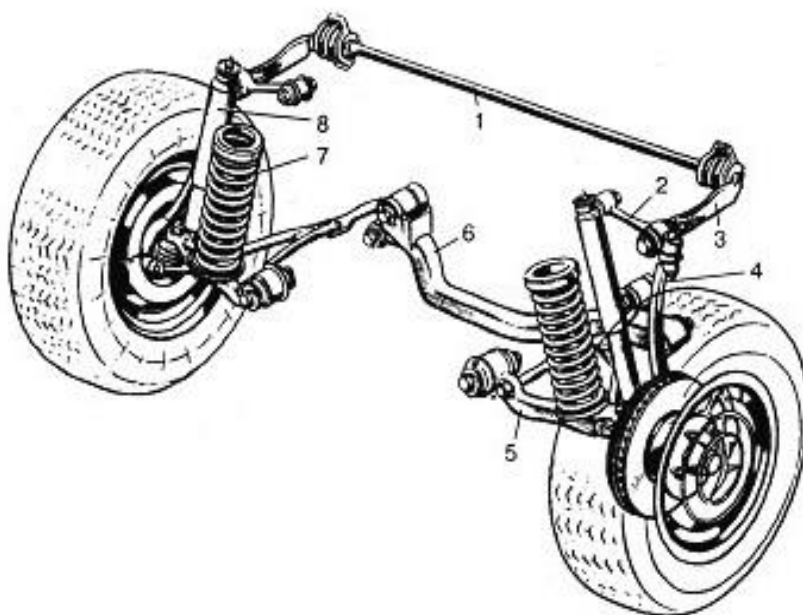
Another type of leaf-spring suspension is the cantilever spring with the spring incorporated upside down. Lighter motor vehicles are frequently equipped with the quarter elliptic leaf spring with its thick end firmly connected to the frame.

Reduction of the "unsprung weight" — comprising wheels, rims, tires, axles, steering and driving components attached to the axle — has led to the application of the transverse leaf spring. Arranged either as a single spring or in pairs, the transverse leaf spring takes the function of the front axle. The rear-axle suspension of floating half-axles is likewise performed by a transverse leaf spring. In these cases, the transmission of the driving and braking thrust and torque cannot be performed by the spring but by special rods connecting axle and frame.

#### Parallel arm suspension

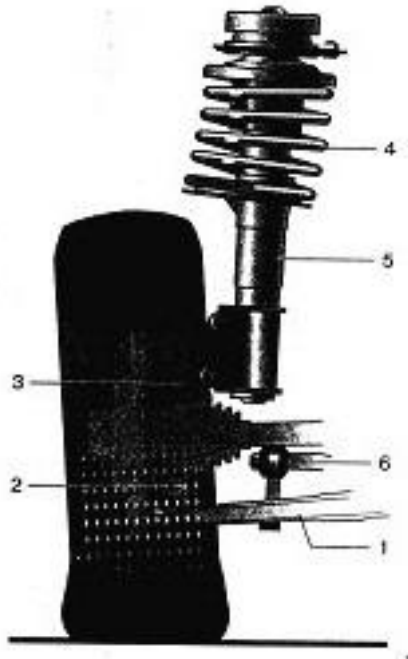
- 1 - antiroll bar (stabiliser bar) – штанга стабилизатора оперечной устойчивости;
- 2- upper arm - верхний рычаг;
- 3- antiroll bar link - продольное плечо стабилизатора поперечной устойчивости;
- 4- steering knuckle (support) – стойка передней подвески;
- 5- lower arm - нижний рычаг;
- 6- suspension cross-member – поперечина подвески;
- 7-coil spring (sprial spring) – цилиндрическая пружина;
- 8-shock absorber - амортизатор;

#### Двухрычажная подвеска на параллельных рычагах



Spring suspension is performed by spring bolts supported in a bushing in the spring eye requiring always ample lubrication. Frequently, intermediate rubber bushings (silent blocks) are used. They require less servicing and have long service life.

In case of the cantilever spring the loaded end is placed on the rear axle. Generally, it rests on a spring roller riding on the deflecting spring leaf. For heavy lorries (trucks), one spring alone cannot be expected to meet all the requirements. A supplementary spring is arranged above the normal car spring.



### McPherson strut

### Подвеска типа качающаяся свеча, Макферсона

- 1- swinging arm- поперечный качающийся рычаг;
- 2- ball bearing- шаровая опора;
- 3- swivel member- поворотный кулак;
- 4- coil spring - цилиндрическая пружина;
- 5- suspension strut-стойка подвески;
- 6- antiroll bar-штанга стабилизатора поперечной устойчивости;

A special type of rear-axle suspension is the torsion-bar spring. It is fixed at both ends and is loaded in torsion on springing. This type of suspension is very simple.

Pneumatic cushioning is used in modern automotive engineering replacing the mechanical suspension by a compressed-air cushion.



Mercedes-Benz CLK Fitment



Volkswagen Golf 3 Fitment



*BMW Z3 Fitment*



*Mazda Miata Fitment*

## **I. Comprehension**

1. Why have springs to be arranged between axles and frame?
2. What type of springs is most frequently used and from what are they composed?
3. Do you know anything about another type of leaf-spring suspension?
4. What has led to the application of transverse leaf spring?
5. Can one spring alone meet all the requirements for heavy lorries?
6. What is the torsion-bar spring and where is it fixed?

## **II. Choose Russian equivalents to the following words and word combinations:**

spring, strut, stabilizer bar, lower arm, shock absorber, sub frame, diagonal (transverse) link, front strut tower bar, strut assembly, multilink rear suspension.

7. Do you know anything about another type of leaf-spring suspension?
8. What has led to the application of transverse leaf spring?
9. Can one spring alone meet all the requirements for heavy lorries?
10. What is the torsion-bar spring and where is it fixed?

## **II. Choose Russian equivalents to the following words and word combinations:**

spring, strut, stabilizer bar, lower arm, shock absorber, sub frame, diagonal (transverse) link, front strut tower bar, strut assembly, multilink rear suspension.

### III. Translate from Russian into English. These words will help you:

front-axle, rear axle, serve, carry, withstand, jerk, jars, stiff.

Передняя и задняя подвески служат опорой для автомобиля.

Передняя подвеска автомобиля выдерживает (несёт) около 80 % веса двигателя. Она должна противостоять ударам, толчкам и тряске.

Поэтому передняя подвеска должна быть сильной и прочной. Она так же выдерживает от 20 до 40 процентов веса всего автомобиля.

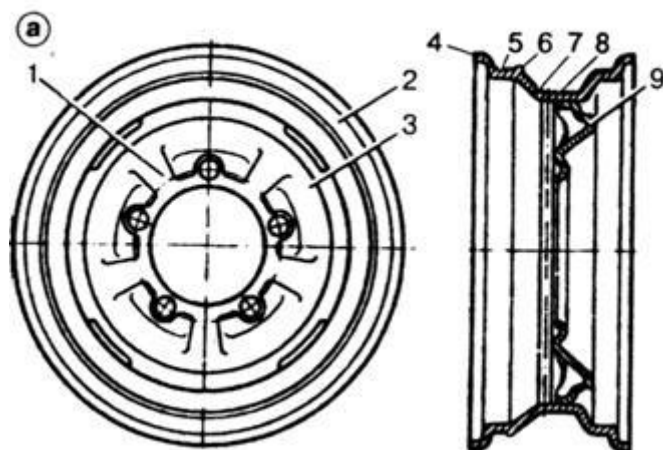
### Text XIII

#### Wheel and tires

There's a lot of good reading on your tires but the information is presented in code. Solving the "Mystery of the Tire Code" is bit like being a master detective and master spy all rolled into one, so it can be fun as well as informative.

Apart from the tire manufacturer's name and the tire model, such as "Goodyear Eagle GT," those numbers and letters on the sidewalls of your vehicle's tires will tell you the tire size, the maximum load rating, maximum inflation level, whether the tire is of radial or bias design, and whether it is a tube or tubeless tire. You'll also find out the tire ply composition and materials used, the Department of Transportation (DOT) safety code, treadwear, traction and temperature grade, and get a safety warning. Tire manufacturers put this information on every car and truck tire they manufacture and the markings have been standardized under the Uniform Tire Quality Grading (UTQG) system, so all brands and types of tires are marked in the same way.

If you own a new car or have always let the local professional tire dealer put tires on your vehicle, you may not think it is important to be able to read a tire -- and you might be right. Tires generally last a long time and you could be into your next car by the time your current treads need replacing. On the other hand, you could be driving away from home and get a blowout. If this happens, you need to be sure the tire you are buying is the right one for your vehicle.



Wheel

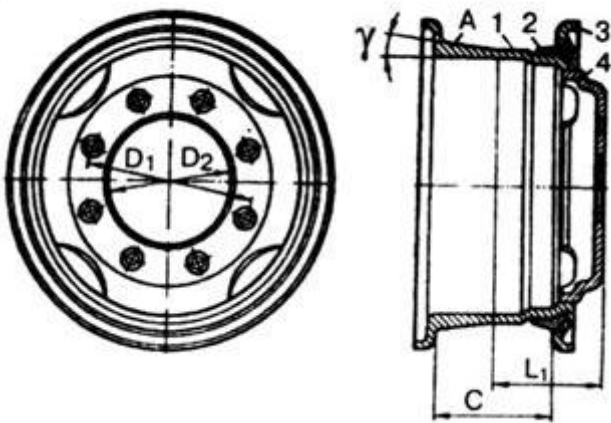
Колесо

- a- passenger car wheel- колесо легкового автомобиля;
- 1- rim of rigidity- ребро жесткости
- 2- rim- обод
- 3- wheel disc(nave)- диск Колеса;
- 4-rim flange- закраина обода
- 5- bead seat- посадочная полка обода

- 6- hump-кольцевой выступ(для дополнительной фиксации борта бескамерной шины)
- 7- drop center-ручей (центральное углубление обода)
- 8-flat base-цилиндрическая поверхность
- 9-cover disc hump-выступ для установки декоративного колпака

**b-three-piece wheel of commercial vehicle- компонентное колесо грузового автомобиля**

(b)



- 1- flat base- цилиндрическое основание обода
- 2- locking slit ring-замочное разрезное кольцо
- 3- removable flange-съёмное бортовое кольцо
- 4-disk wheel-колесо

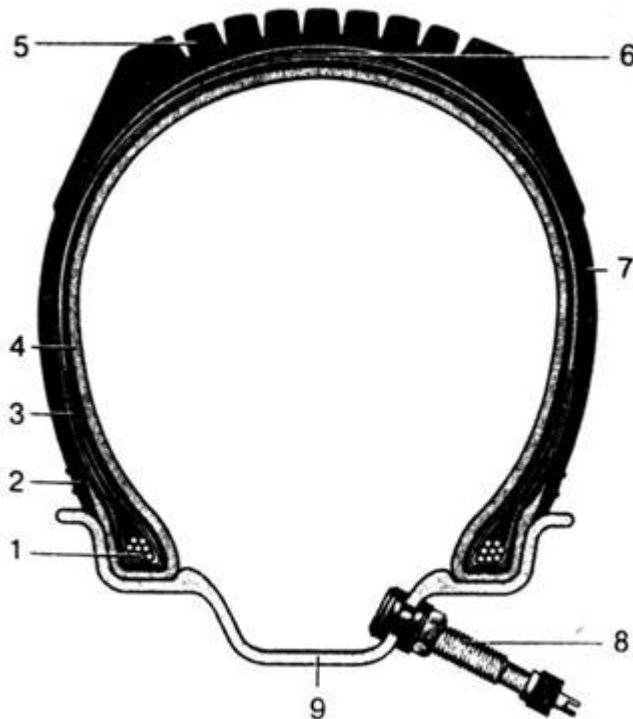
- A- tapered-bead seat- конусная посадочная полка обода
- D1-hole circle diameter- диаметр окружности, на которой расположены центры крепежных отверстий
- D2-center hole- внутренний диаметр диска
- C- rim width- ширина обода
- L1-rim offset-вылет диска
- $\gamma$  - angle of tapered-bead seat- угол конуса посадочной полки обода.

### Reading the sidewall

A typical tire sidewall might have P205/60R15 89H molded into the surface. In this example, the "P" means the tire is designed for use on passenger cars (though it might also be used as original equipment on some light trucks). The "205" is the nominal width of the tire in millimeters, the "60" refers to the ratio of the tire's height to width, and "15" is the diameter of the tire in inches. The "R" means that the tire is a radial. The "89" is the tire's load rating. It tells you the maximum weight the tire can carry. A load rating of "89" means the tire is rated at a maximum of 1279 pounds. The "H" is the vehicle's speed rating (up to 130 mph).

An "LT" instead of a "P" means the tire is rated for use on light trucks (pickups, vans, sport utilities) and a "B" or "D" in place of the "R" signifies the tire is belted bias or diagonal bias construction, respectively. Virtually all passenger

and light truck tires installed as original equipment these days are radials, but many trailer and specialized use tires still use bias or diagonal bias construction.



Tubeless  
radial tire for  
passenger car

Бескамерная  
радиальная шина  
для легкового  
автомобиля

- 1- bead core- сердечник борта;
- 2- bead- борт покрышки ;
- 3-casing-каркас;
- 4-air tight inner liner-  
воздухонепроницаемый  
слой;
- 5-tread-протектор;
- 6- breaker- брекер;
- 7-sidewall- боковина;
- 8- valve- вентиль;
- 9- rim -обод .

### Tread wear

A tire's tread wear rating, printed on the sidewall as a three-digit number, is a comparative rating designed to give you an idea of the expected tread life of a tire. The base tread wear rating for passenger tires is 100, which translates into an expected tread life of 30,000 miles. Tread wear numbers go up in increments of 10, with each increase indicating an increase in tread life over the base rating. So a tire with a tread wear rating of 150, for example, means it should have a 50 percent longer tread life, or 15,000 additional miles over a base tire rating. But don't make the mistake of thinking that you'll actually get that mileage out of the tire. Tread wear ratings for a given tire are determined by controlled test conditions on a racetrack and your tire wear will vary, depending upon the actual driving conditions, maintenance, climate, road type, and driving habits.

### Traction rating

A tire's ability to grip the road is rated alphabetically as either "AA," "A," "B" or "C," with "AA" being the highest. These letters represent the tire's ability to stop on wet pavement (asphalt and concrete) as measured under controlled conditions on a test track. A tire that is given "AA" traction rating has superior wet

braking traction (this rating is usually reserved for specially-designed rain tires) over standard tires. An "A" grade signifies that the tire has excellent wet braking traction on concrete and asphalt, "B" is the middle performance standard (average), and "C" is the lowest traction grade. Don't make the mistake of thinking that a "B" or a "C" grade means a tire has poor traction. The alphabetic rating is only a measurement of a vehicle's traction on wet pavement and is for comparison purposes only. What it really means is that you should pay attention to the type of weather and road conditions in your area. If you live in the Arizona desert, for example, a C-rated tire may provide excellent traction for weather and road conditions that are usually dry. If you live in the rainy Pacific Northwest, however, you may want to consider a tire that has an "A" or "AA" rating for maximum gripping power during inclement conditions.

### **Speed rating**

Passenger tires will be marked with one of several speed symbols, for example "S", "T", "H", "V", or "Z." These symbols indicate a tire's speed capability based upon laboratory tests under ideal conditions and aren't valid if the tire is under inflated, worn out, damaged, or overloaded. The following list shows each tire speed symbol with its equivalent speed rating:

"S"	--	maximum	speed	of	up	to	112	mph.
"T"	--	maximum	speed	of	up	to	118	mph.
"H"	--	maximum	speed	of	up	to	130	mph.
"V"	--	maximum	speed	of	up	to	149	mph.
"Z"	-- over 149 mph.							

Most compact economy cars and sedans have tires rated at "S" or "T." Performance sedans and sports cars have tires rated "H," "V," or "Z," depending upon the vehicle's capability. It is important to remember, however, that just because a tire is rated at a certain speed; it doesn't mean you can drive the vehicle safely at that maximum speed. A sports car outfitted with "Z" rated tires, for example, cannot be safely driven on most U.S. highways at the speed for which the tire is rated because the roads aren't in good enough condition. Additionally, traffic volume, weather conditions, vehicle condition, driver skill and a maximum speed limit of 70mph on most freeways, preclude such folly -- not to mention the ever-vigilant state highway patrol!

### **Load rating**

The load rating is the amount of weight a tire can safely carry. Passenger car tires are rated for their load carrying ability with a numeric designation ranging from 65 (639 lbs.) to 104 (1,984 lbs.), with most passenger tires rated between 75 and 100. Deciphering a specific load carrying ability by reading this code isn't all that important as the maximum load rating, in pounds load rating (in pounds) is stamped in small letters on the sidewall near the edge of the wheel rim.

Light truck tires are rated differently from passenger tires and may not have a load index or speed rating in the size designation, as it isn't required. Instead, you may see letters like "M+S" (mud and snow) or A/T (all-terrain) that indicate the

tire's intended use at the end of the size listing. This is because truck tires are designed for load carrying ability, rather than high-speed performance. As for load index, it is listed alphabetically, from "A" to "E," with "E" being highest. Generally, the lighter the intended use of the truck, the lighter the index rating of its tires. A two-wheel drive compact pickup may have "A" rated tires because it isn't designed as a vehicle that regularly carries heavy loads. A full-size Suburban with four-wheel drive and a Class IV hitch, on the other hand, is designed to haul heavy loads and will probably have tires that carry an "E" rating.

Making sense of all the numbers and letters stamped on the sidewall of a tire can be a bit daunting at first, but pays to have a better understanding of your tire's intended use and capabilities. If you'd like to learn more about tire size, tire ratings, tire construction, tire technology or tire care, click here to go to crumb's Car Care Encyclopedia.

### **I. Comprehension:**

- 1) What will tell you the numbers and letters on the side walls of the vehicle's tires?
- 2) Are all brands and types of tires marked in the same way?
- 3) Is it important to read a tire especially when you have just purchased a used car?
- 4) Installing the correct rubber will increase the margin of safety, won't it?
- 5) What does the "P" mean in P205/60R15 89H molded into the surface of a wheel?

### **II. Insert the proper terms to show the meanings of the figures.**

Load rating, ratio, speed, radial, diameter, width

The "205" is the nominal \_\_\_\_\_ of the tire in millimeters.

The "60" refers to the \_\_\_\_\_ of the tire's height to width.

The "15" is the \_\_\_\_\_ of the tire in inches.

The "R" means that the tire is a \_\_\_\_\_.

The "89" is the tire's \_\_\_\_\_ the maximum weight the tire can carry 1279 pounds.

The "H" is the vehicle's \_\_\_\_\_ rating up to 130 mph.

### **III. Say it in Russian:**

The other numbers are designed to give you an idea of the expected tread life of a tire, a tire's ability to grip the road, a tire's speed capability based upon tests under ideal conditions. Passenger car tires are also rated for their load carrying ability, the amount of weight a tire can safely carry. All



the numbers and letters stamped on the sidewall of a tire give a better understanding of your tire's intended use and capabilities.

**IV. Compose a dialogue to the above text using the following phrases as a model.**

1. I've heard a lot about... Could you give me an idea of what it is?
2. Well, as far as I know the general idea is...
1. That's interesting. Is this a new idea?
2. Certainly. To my mind...

## Unit 2

### Trucks and road construction vehicles

#### Text I

#### Road

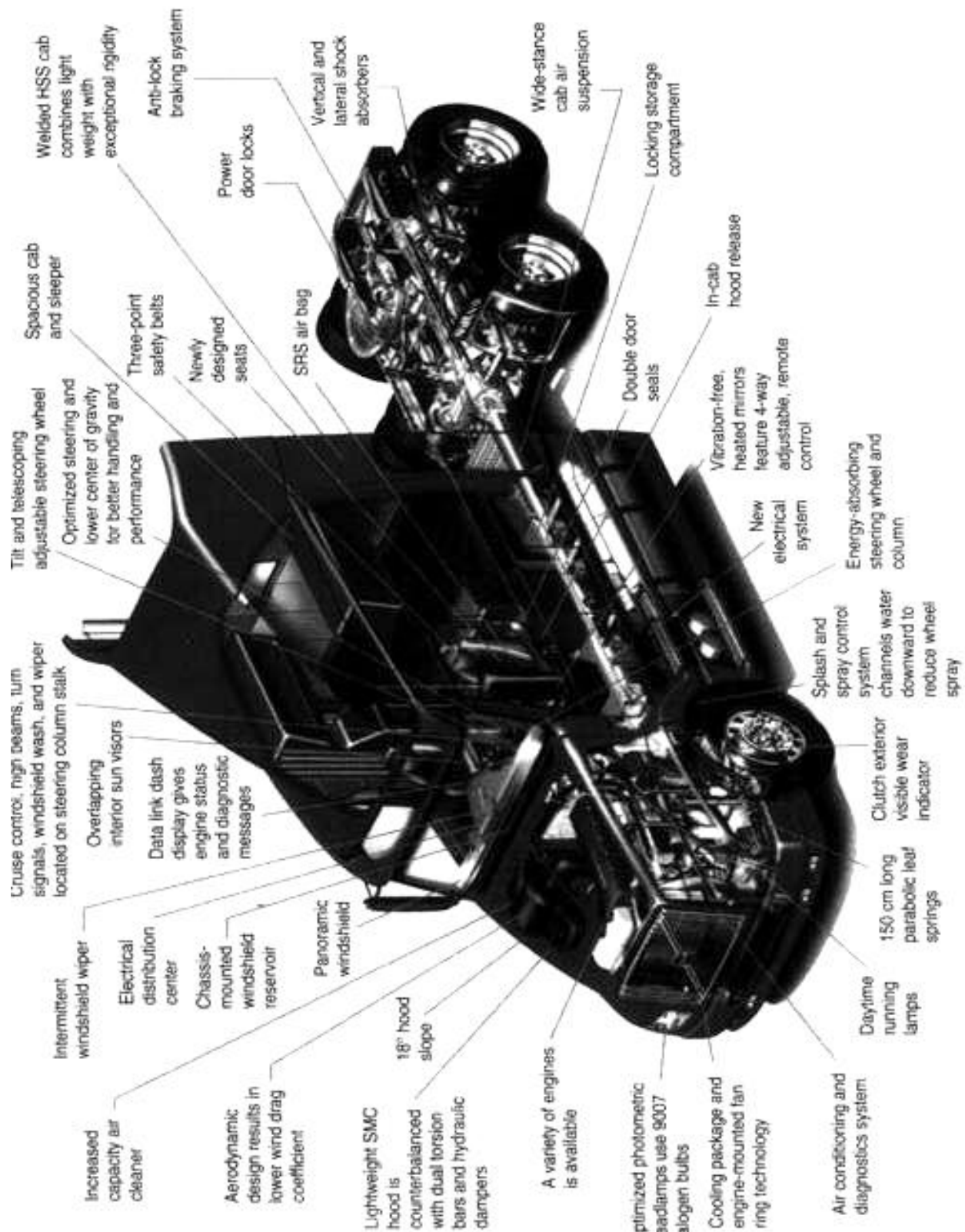
Transportation is a system consisting essentially of three components: 1) driver, 2) vehicle, 3) road. Whenever any one of these three components of the system would fail, and conditions of hazards would be created on the road. If therefore it is desired to provide a safe and efficient transportation system it is necessary that all these three components should function efficiently in a well coordinated manner.

**Driver.** Of all the above-mentioned components driver is the most powerful component influencing safety on a road. Studies have shown that 86% of the serious accidents are caused by drivers.

**Vehicle.** This component also plays a vital part in determining safety on roads. Just like an unsafe driver, an unsafe vehicle is a source of constant danger in a road transportation system. With the growing percentage of old vehicles the risk of accidents on roads has also been growing considerably. This risk could be minimized by eliminating unsafe vehicles from roads. One way of doing it is to carry out periodical inspection of old vehicles.

**Road.** To ensure maximum safety for the transportation system, it is very necessary to plan and design highways on sound engineering techniques. It is possible to obtain maximum safety on highways by controlling their geometry, alignment, vertical and horizontal curves and providing adequate sight distances for the speeds which it is desirable to obtain on these highways.

The traffic on the road has completely altered within the last twenty-five years and therefore the existing system of roads in our country should also be



changed in order to meet modern requirements. The modern trend is undoubtedly towards national and consequently uniform planning, design and construction.

The efficiency of a country's road network has a profound effect on its prosperity. The ability of roads to enable traffic to flow freely and safely between the industrial and commercial centers contributes enormously towards a progressive economy.

Motorways, besides serving each individual country, fulfil the desirable function of linking countries more closely together. Through the medium of travel,

they help to promote cordial relations among the peoples of the various nations. In fact, the importance of good roads, both nationally and internationally, cannot be overstressed.

In order to serve their purpose in the best possible manner, modern roads should, as far as possible, possess the following principal features:

- 1) They should be designed according to the anticipated volume and speed of the traffic likely to use them.
- 2) Bends and gradients, where necessary, should always be slight.
- 3) Visibility should not be hindered.
- 4) They should be well and clearly signposted.
- 5) Adequate provision should be made for both cyclists and pedestrians with regard to their safety.
- 6) They should be well lit, where necessary.
- 7) Hedge and tree planting on the sides and central reservations should be arranged to provide a pleasant and interesting outlook for the road user, to avoid monotony and boredom.

In modern road construction, there is a much greater recognition of the importance of the subsoil beneath a road than years ago. It is regarded nowadays as an integral part of the road, and no longer as merely the formation on which to build a road. As a result of this various methods have been devised in recent years to improve its quality and consequently its stability. Stabilization can be achieved in a number of ways, the most simple being mechanical.

In case of mechanical stabilization granular or cohesive materials are added to the subsoil. In particularly dry climates it is often found necessary to add substances helping to retain sufficient moisture.

Alternatively, stabilization can be effectively carried out by adding substances that harden the soil, and greatly increase its compressive strength.

The constantly increasing volume of modern traffic, especially in the towns, indicate that there is an urgent need for countless road construction projects in the near future. This involves the construction of numerous auxiliary structures, such as bridges, flyovers, tunnels and underpasses. It is mainly these structures that will present problems for the engineers.

### **I. Answer the following questions:**

1. What are the three main components of transportation?
2. Why is it necessary that all these components should function in a well coordinated manner?
3. Which of the three components is considered to be the most important?
4. Why is it necessary to inspect the vehicles periodically?
5. How should highways be designed to ensure safety?
6. Why should the existing system of roads be changed?

7. What are the main functions of motorways?
8. What principal features should modern roads possess?
9. What is supposed to be of great importance in modern road construction?
10. What does mechanical stabilization consist in?
11. Why is there an urgent need for a great number of road construction projects?

**II. Make up sentences of your own using the following word combinations:**

principal roads; to avoid hazards; to eliminate danger; to eliminate disadvantages; to ensure good maintenance; to ensure good performance; to contribute to traffic safety;

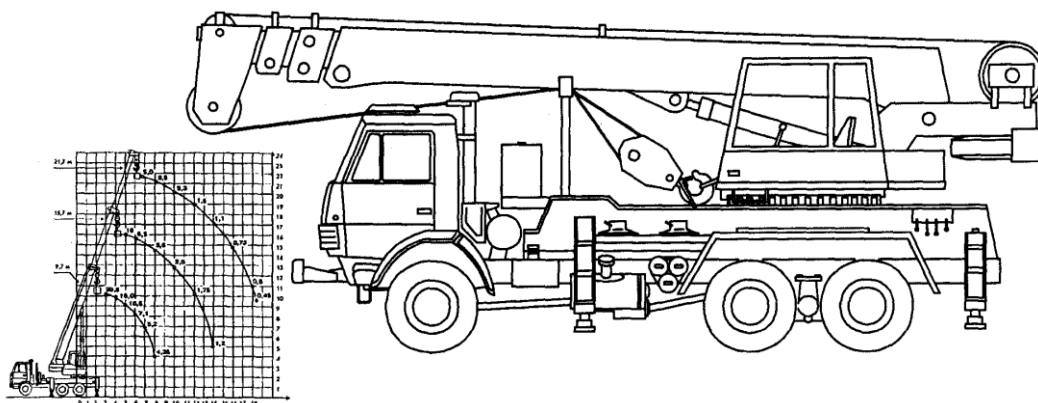
to contribute to pollution reduction; to possess land; to anticipate changes in the layout; to function in a coordinated manner; a slight damage; good visibility; to limit visibility; to hinder development; clear atmosphere; beneath the ground surface; integral part; sufficient information; sufficient time; to retain moisture in the soil; a slight bend; clear sky; auxiliary components; to harden steel; to meet requirements; profound changes; to fulfill our duties; to perform just in the same manner; to have just been accepted; the alignment of the road; to align the wheels; the alignment of the adjacent parts; to anticipate the volume and speed of the traffic; the volume of car production; a bend of the road; to bend an iron bar.

**III. Make up sentences using the following word combinations:**

1. principal roads layout;
2. water volume increase;
3. poor visibility conditions;
4. poor visibility hazard;
5. serious danger elimination;
6. profound changes anticipation;
7. profound safety studies;
8. clear visibility provision;
9. road-side plants arrangement.

## Text II

### Hydraulic Gantry Truck KC-45719-4 (KAMAZ-53228 6x6)



Crane **KC-45719-4**, 20 t load capacity is designed for load handling and construction-installation work at dispersed sites including places difficult of access with an access road in bad condition. The crane is mounted on the all wheel drive chassis of KAMAZ-53228 truck with the locking interaxle differential, interwheel lockup and lateral stabilizers. The front axle drive is positive done by the handle located in the driver's cab. At the rapid increase of the load on the engine at starting up the front axle drive is switched on automatically.

The crane is easy and safe in operation and maintenance. The crane devices have a hydraulic drive from two axial-piston hydraulic pumps<sup>^</sup> which are connected with the power take off box of the truck through the cardan shafts. The power take off is done from the truck engine through the gear box. The crane devices have an individual drive with an independent control from the hydraulic motors and hydraulic cylinders» If needed the operations could be combined. The crane is equipped with the hydraulic supports with the ejecting support beams.

The hydraulic system provides an easy and smooth control of the crane units and ejecting supports in a wide range of the operation speed adjustment.

Three-section telescopic jib 9.7- 21.7 m long with the individual ejecting/retracting of each of two movable sections ensures the compactness and maneuverability during transportation, a wide range of the load handling operations and high load lifting; the telescopic function of the jib with the load on the hook makes it possible to perform special operations - placing the load in the location difficult of access carrying it over the mounted structures.

The safety of the crane is ensured by a set of instruments and devices including the microprocessor device limiting the load with the numeric indication of the parameters on the display in the driver's cab.

## Specifications

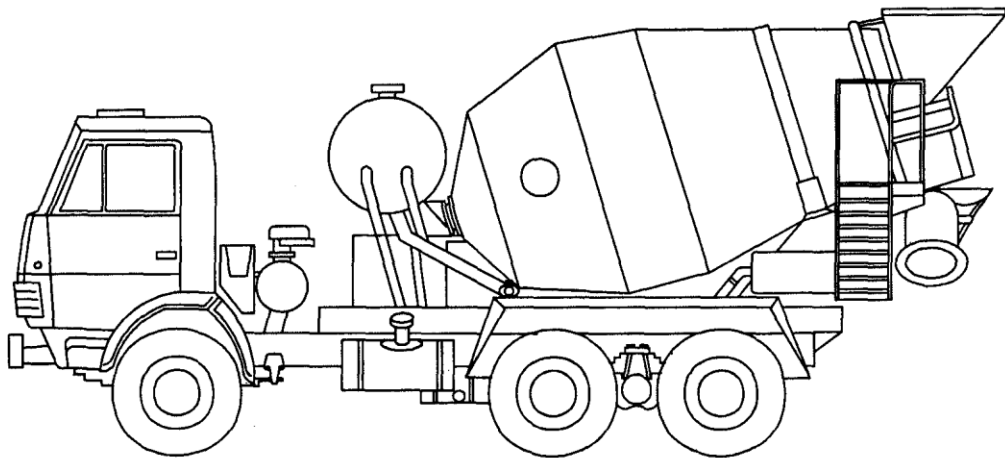
Type.....	KC-4571 9-4
Max. load moment, t/m.....	64
Load capacity, max, t/overhang, m.....	..20/3.2
Jib length, m....	..9.7-21.7
Max. hook lift, m.....	..21.8
Max. hook lowering depth....	.....up to 12
Load lifting/lowering speed, m/min	
- max.( with the load up to 6 t).....	..... up to 24
- rated. ....	.....up to 12
Load placing speed, m/min.....	0.3
Jib sections ejecting/retracting speed (m/min), no more.....	'8
Crane radius of operation change speed,m/min.....	.. 8
Rotating unit speed,rev/min.....	up to 2.2
Crane inertia moving speed, km/h..	.....up to 75
Crane weight in transporting position, t... ..	...22.5
Support contour size,- along and across chassis axis, m..	..... ..3.85x4.8
Crane dimensions in transporting position, m.....	12x2.5x3.8
Operational temperature, (C degrees).....	-40... +40

## Base chassis

Type.....	<b>KAMAZ-53228</b>
<b>Engine:</b>	
Model .....	..7403..... ..740.11
Type.....	Type-.....diesel, turbo
Rated horsepower, h.p.(kW), at 2600 rpm .....	260 (191)....240(116)
Maximum speed, km/hr .....	90

## Text III

### CONCRETE MIXER СБ-92В-2 (KAMAZ chassis-55111 6x4)



Concrete mixer is a modern means for delivery of dry concrete components, their mixing during driving of a truck or at a construction site as well as for delivery ready-made concrete to a customer.

The mixer is designed for operations in any climatic environment including high temperature conditions.

The mixer has a reversing drum installed on the safe and efficient chassis KAMAZ-55111.

Concrete mixer **SB-92B-2** produced by the plant for many years enjoys stable demand. Its mixing drum is power driven by an independent diesel engine D144-66, which provides successful operation of vehicles in the mountain country. It is easy in maintenance and reliable in operation.

#### Specifications

Effective volume of a drum, m <sup>3</sup> .....	.5
Mixing drum geometric capacity, m <sup>3</sup> .....	8
Mixing drum rotation speed, min.....	0-20
Weight, kg:	
- curb weight... ..	9500
- GVW.... ..	19150
Time of mixing, min. ....	15-20
Charging height, mm.....	3620
Maximum GVW distribution for a mixer, kg	
- front axle.. ..	4470
- rear axle.. ..	14680
Water tank capacity, l.....	400
Maximum speed of a fully loaded mixer on a horizontal section of a straight road with firm pavement, km/h.....	60

Overall dimensions, mm..... ..7500x2500x3620  
 Type of a drum drive.. .from an independent motor D1 44-66 Determined  
 power, kw.. .....37  
 Discharge rate with 3-4 cm movability  
 of concrete, m<sup>3</sup>/min. .... 1

**Base chassis**

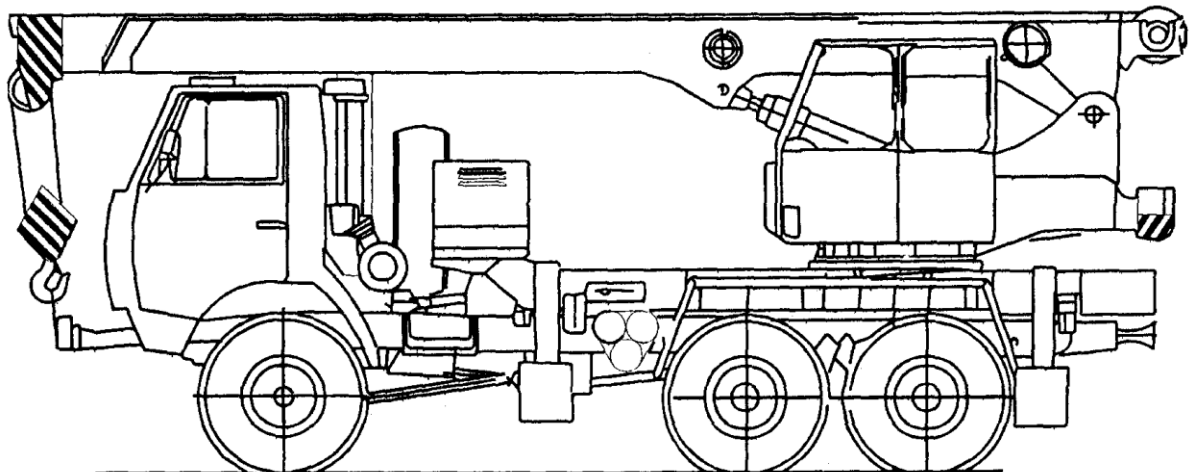
**Type.....KAMAZ-55111**

**Engine:**

Model .....7403.....740.11  
 Type.....diesel, turbo  
 Rated horsepower, h.p.(kW),  
 at2600rpm .....260(191).....240(176)  
 Maximum speed, km/hr .....90

**Text IV**

**Truck Crane KC-55713-5 (KAMAZ-43118 chassis 6x6)**



Hydraulic-operated crane on the truck chassis is designed for freight handling and erection work at different sites.

Such track crane has a 25t load capacity and is mounted on KAMAZ -43118 truck.

Crane mechanisms provided with hydraulic drive from two axial and piston hydraulic pumps.

Crane hydraulic system provides smooth control of its mechanisms as well as a combination of operations and a wide range of working speed change.

Three-part telescope jib of 9,7 - 21,7 m length makes the truck crane compact during driving and provides a wide zone of freight handling. Jib telescope system comprises two hydraulic cylinders and such system of telescoping the jib with a loaded hook enables the crane to perform special operations. »



A set of instruments and devices providing safety in work, comprises a microprocessor load limiter with digital data indication displayed in the operator cab. Such load indicator operates in a mode of coordinate crane protection when the crane operates in restricted areas or in the vicinity of power lines. The crane also is equipped with an inbuilt instrument for recording of characteristics, i.e. “a black box”. Warranty operation period for the crane is 18 months. Each crane is equipped with a tool kit and additionally each batch of tracks over three is equipped with a common tool kit.

## Specifications

Truck Crane .....	KC-55713-5
Max load carrying capacity, t/overhang, m.....	25/3,2
Max. loading moment, t/m .....	80
Max hook lifting height (m) with main jib length 21,7 m .....	21,9
Max hook lowering depth with 9,7 m jib .....	up to 12
Jib length, m.....	9,7-21,7
Load lifting & lowering speed, m/min:	
- maximum ( up to 6000 kg load).....	up to 21
- rated .....	up to 7
Pull-out and retraction speed of the jib sections, m/min. 3 Average speed of overhang change, m/min.....	18,2
Load landing speed, m/min.....	0,3
Turn section rotation speed, rpm.....	up to 1,4
Crane driving speed, km/h .....	up to 80
Crane weight in a transport position, kg.....	20750
Support contour dimension along and across chassis axis, m .....	4,6x5,6
Crane overall dimensions in a transport position, m:	
-length-width-height.....	12x2,5x3,8
Operating temperature, °C.....	- 40 - +40

## Base Chassis

Model..... KAMAZ-43118

## Engine

Model.....7403.....740.11

Type..... diesel, turbo

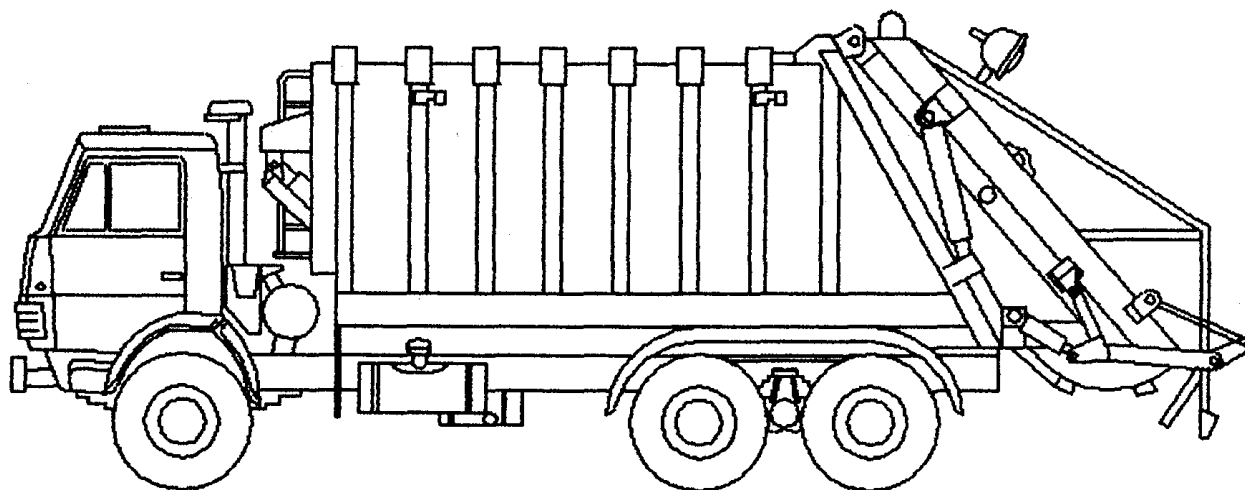
Max power, hp (kWt):

\$\$\$600 rpm.....260 (191).....240(176)

Max speed, km/h..... 90

## Text V

### KO-427 GARBAGE TRUCK (KAMAZ chassis-53213 or -53229 6x4)



The Garbage Truck **KO-427** on KAMAZ chassis with rear-end discharge is designed for collection and transportation of hard domestic waste to the point of utilization.

Discharge of different container types is effected by a special tipper mechanism.

Garbage hopper allows manual loading, out of small containers, bags, etc.

Garbage pressing mechanism runs automatically, the operations of grasping and container tipping can be performed simultaneously.

Domestic waste is shifted by the pressing mechanism plate to the garbage truck body and is additionally pressed by a special plate.

This helps to achieve a high density level.

Garbage discharge is effected by a pushing out plate.

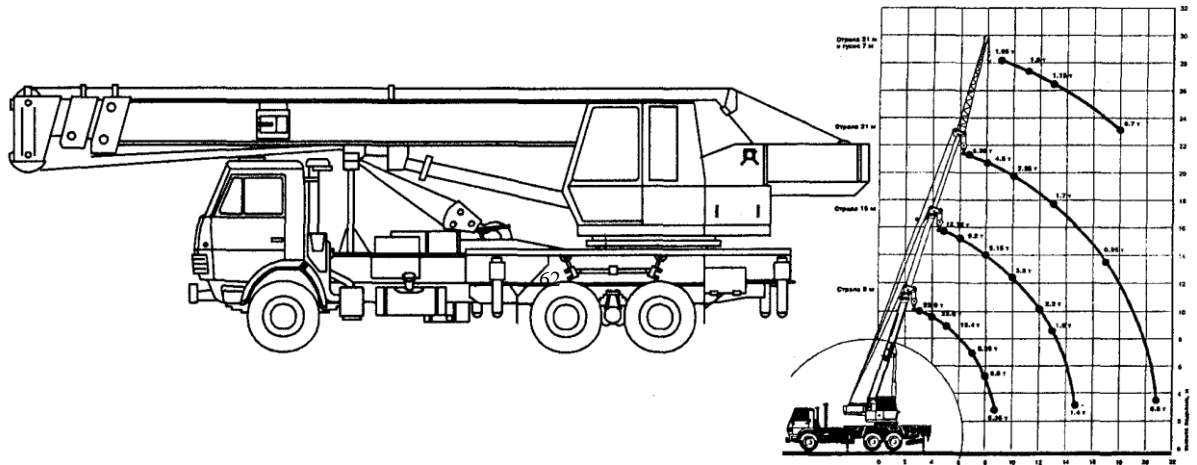
. Control of grasping, container discharge and waste pressing is effected from the control panel located on the left side of the rear board.

### Specifications

Truck model	<b>KO-427</b>	<b>KO-427-01</b>	<b>KO-427-02</b>	<b>KO-427-03</b>
	with a tipper		with a tipper-fork	
Chassis model	Kamaz-53213	Kamaz-53229	Kamaz-53213	Kamaz-53229
Spec. equipm. weight, kg	5250	5450	5250	5450
Body capacity, cub.m	16	18	16	18
Loaded waste weight, kg	8250	11200	8250	11200
Dimensions, m - length	8.9	8.9	8.9	8.9
- width	2.5	2.5	2.5	2.5
- height	3.5	3.7	3.5	3.7

## Text VI

### Hydraulic Grane Mounted KC45717 K (KAMAZ chassis-53213 6x4)



Truck crane **KC-45717K** of 22 t load carrying capacity is mounted at KAMAZ chassis 53213.

Crane mechanisms have hydraulic pump drive which is actuated by the chassis engine. Hydraulic drive provides easy and simple crane control, smooth operation of all mechanisms, wide range of working speeds and combination of crane operations.

The crane is equipped with a three-part telescope jib with sections, pulled out by hydraulic cylinder and solipsists

As an optional equipment a light lattice jib extension is supplied for the purpose of increasing under- the- jib space.

Microprocessor digital device for limiting the lifting capacity allows to monitor the crane load, jib length and overhang as well as height of raising an upper end of the jib. It also indicates an actual hook load and maximum" lifting capacity for the given overhang while automatically limiting the crane working area in compliance with programmed data in case of operation in restricted environment or in the vicinity of electric power lines.

Telemetric memory of the limiter ("Black box") indicates operating data as well as the level of the crane load over its entire life period.

### Specifications

Type.....	KC-45717 K
Load carrying capacity, t.....	22
Load lifting moment, tm.....	65
Overhang, m.....	2-19,7
Lifting height, m:	
- with main jib.....	10-21,3
- with lattice jib extension.....	28,2

Jib length, m.....	9-21
Length of extension, m.....	7
Load lifting (lowering) speed, <i>m/min</i> .....	7
Max. lifting (lowering) speed of idle hook and up to 4,5 t load.....	14
Load landing speed, m/min.....	0,2
Rotation speed, rev/min.....	1,7
Driving speed, km/h.....	60
Overall dimensions in non-operating mode, mm:	
- Length.....	10900
- Width.....	2500
- Height.....	3600
GVW with main jib, t.....	20,25
Load distribution on the road, t/f	
- via front wheels.....	4,42
- via bogie wheels.....	15,83
<b>Base chassis</b>	
Type.....	KAMAZ-53213
<b>Engine:</b>	
Model .....	7403.....740.11
Type.....	-...diesel, turbo
Rated horsepower, h.p. (kW), at 2600 rpm .....	260 (191)....240(176)

### Task

**Summarises the common and individual features of the road machines.  
Make up a corresponding table.**

Common

Individual

## Unit 3

### FUTURE AUTOMOBILE INDUSTRY TRENDS

#### Text I

At the start of the 21st century the trends of global trade and manufacturing flexibility continue. Computerization continues to be a major part of auto design and manufacture, as do the search for alternative fuels and more efficient automobile design.

## **A. Hybrid-Electric Cars**

Hybrids are a hot subject today, but they are the most complex vehicles to correctly design and the most complex to adequately discuss. It looks the go-anywhere family sedan of year 2010 and beyond will likely be some form of hybrid vehicle. The deciding factor hinges mainly on the economics of producing a complex hybrid power system, rather than the inherent capabilities of the technology itself.

The idea of a hybrid-electric vehicle naturally evolves from the inherent limitations of the storage battery. As first conceived, a hybrid vehicle would employ an onboard means of generating electricity in order to augment the limited energy available from the battery. The vehicle might then run on battery energy alone when range is within the capability of the battery's energy stores, then use the genset when range requirements exceed the energy stores of the battery. Although simple in concept, the task of achieving significant improvements in energy efficiency depends on the correct integration of subsystems within a sophisticated control strategy that continuously monitors and balances the energy flow onboard the vehicle. When approached as a system, a hybrid power system is no longer a simple battery-electric system augmented by a genset. Instead it is an integrated, self-adapting propulsion system that may ultimately utilize batteries (or ultracapacitors) as an energy reservoir for load leveling, rather than in their traditional role of supplying total vehicle motive power. Much of the research today is oriented toward developing the most effective control strategy, the best bias between subsystems, and the correct combination of subsystem types needed to achieve maximum efficiency with a minimum of hardware, mass, and manufacturing costs.

Hybrid power systems began as a way to make up for the shortfall in battery technology. Since batteries could supply only enough energy for short trips, then an onboard ICE-powered generator could be installed and switched on for longer trips in order to extend range. In the old days, we thought that by biasing the system toward battery-electric power and operating on wall-plug electricity as much as possible, efficiency and emissions would then be about as optimal as one could hope for until better batteries came along. The natural conclusion of this concept was that, with better batteries, we probably would not need hybrids at all. But after some 20 years of study, it's beginning to look as though a correctly designed hybrid vehicle may actually be just as clean (+/—10%) and energy efficient as a battery-electric car, and perhaps even cleaner and more energy efficient (considering the entire fuel chain, and depending on the source fuel used to generate electrical power).

There are lots of possible configurations with a hybrid vehicle. On a fundamental level, a hybrid combines an energy storage system, an energy conversion system, and a vehicle propulsion system.

### **What's a Hybrid Car?**

What makes it a 'Hybrid'?

Any vehicle is a hybrid when it combines two or more sources of power. In fact, many people have probably owned a hybrid vehicle at some point. For

example, a moped (a motorized pedal bike) is a type of hybrid because it combines the power of a gasoline engine with the pedal power of its rider.

Hybrid vehicles are all around us. Most of the locomotives we see pulling trains are diesel-electric hybrids. Cities like Seattle have diesel-electric buses—these can draw electric power from overhead wires or run on diesel when they are away from the wires. Giant mining trucks are often diesel-electric hybrids. Submarines are also hybrid vehicles - some are nuclear-electric and some are diesel-electric. Any vehicle that combines two or more sources of power that can directly or indirectly provide propulsion power is a hybrid.

### **Hybrid Structure**

#### **Types of Hybrids**

Hybrids are normally divided into the subtypes of either *series* or *parallel*, which refers to the way in which the engine supplies power to the propulsion system. In the series hybrid, a heat engine powers a generator, which either charges the battery or supplies power directly to the propulsion circuit and thereby reduces demand on the battery. In a parallel hybrid, the heat engine delivers mechanical power directly to the drivetrain, and the generator is eliminated. With this type, either the battery-electric system or the heat engine may be used to propel the vehicle, or they may be used simultaneously for maximum power.

In comparison, the series hybrid is less complex because the interface with the drivetrain is electrical rather than mechanical. But originally, the parallel hybrid was preferred design because of the large size, high mass, and limited power of existing gensets. With a parallel hybrid it was possible to obtain more power from a smaller, lighter package. Today, due to lighter, smaller, and more powerful gensets that have been developed, the emphasis has shifted to the series hybrid.

### **Hybrid Components**

Hybrid cars contain the following parts:

- **Gasoline engine** — The hybrid car has a gasoline engine much like the one you will find on most cars. However, the engine on a hybrid is smaller and uses advanced technologies to reduce emissions and increase efficiency.

- **Fuel tank** — The fuel tank in a hybrid is the energy storage device for the gasoline engine. Gasoline has a much higher energy density than batteries do. For example, it takes about 1,000 pounds of batteries to store as much energy as 1 gallon (7 pounds) of gasoline.

- **Electric motor** — The electric motor on a hybrid car is very sophisticated. Advanced electronics allow it to act as a motor as well as a generator. For example, when it needs to, it can draw energy from the batteries to accelerate the car. But acting as a generator, it can slow the car down and return energy to the batteries.

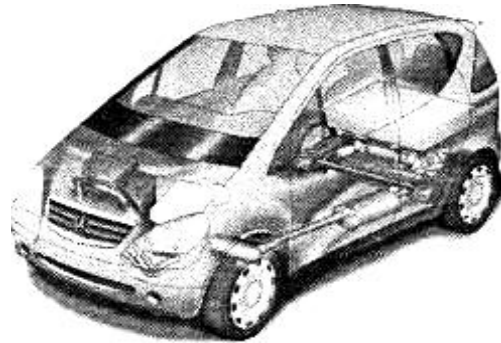
- **Generator** — The generator is similar to an electric motor, but it acts only to produce electrical power. It is used mostly on series hybrids.

- **Batteries** — The batteries in a hybrid car are the energy storage device for the electric motor. Unlike the gasoline in the fuel tank which can only power the gasoline engine, the electric motor on a hybrid car can put energy into the batteries as well as draw energy from them.

- **Transmission** — The transmission on a hybrid car performs the same basic function as the transmission on a conventional car. Some hybrids, like the Honda Insight, have conventional transmissions.

Others, like the Toyota Prius, have radically different ones.

## Text II



The Mercedes-Benz M-Class HYPER—a hybrid concept vehicle

### **How Hybrids Save Energy and Gasoline:**

- Hybrid engines are much smaller than those on conventional cars. A hybrid car engine is built small to accommodate the 99% of driving time when a car is not going up hills or accelerating quickly. When extra acceleration power is needed, it relies on **the battery to** provide additional force.

- Hybrid gasoline motors can shut off when the car is stopped and **run** off their electric motor and battery.

- Hybrid cars are lighter, and their tires create half the drag of conventional cars because they are stiffer and inflated to a higher pressure.

- Hybrid cars often recover braking energy. Electric hybrid motors take the kinetic energy lost in braking and use it to charge the battery.

- Hybrid cars are often more aerodynamic, reducing wind resistance.

### **Hybrid Performance**

The key to a hybrid car is that the gasoline engine can be much smaller than the one in a conventional car and therefore more efficient. But how can this smaller engine provide the power your car needs to keep up with the more powerful cars on the road?

Let's compare a car with its big V-8 engine, to our hybrid car with its small gas engine and electric motor. The V-8 engine has more than enough power to handle any driving situation. The engine in the hybrid car is powerful enough to move the car along on the freeway, but when it needs to get the car moving in a hurry, or go up a steep hill, it needs help. That help comes from the electric motor and battery—this system steps in to provide the necessary extra power.

The gas engine on a conventional car is sized for the peak power requirement (those few times when you floor the accelerator pedal). In fact, most drivers use the peak power of their engines less than one percent of the time. The

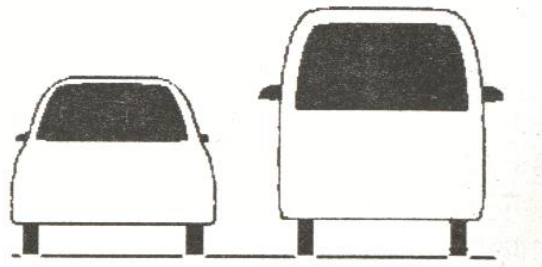
hybrid car uses a much smaller engine, one that is sized closer to the average power requirement than to the peak power.

### **Hybrid Efficiency**

Besides a smaller, more efficient engine, today's hybrids use many other tricks to increase fuel efficiency. Some of those tricks will help any type of car get better mileage, and some only apply to a hybrid. To squeeze every last mile out of a gallon of gasoline, a hybrid car can:

- **Recover energy and store it in the battery** - Whenever you step on the brake pedal in your car, you are removing energy from the car. The faster a car is going, the more kinetic energy it has. The brakes of a car remove this energy and dissipate it in the form of heat. A hybrid car can capture some of this energy and store it in the battery to use later. It does this by using 'regenerative braking'. That is, instead of just using the brakes to stop the car, the electric motor that drives the hybrid can also slow the car. In this mode, the electric motor acts as a generator and charges the batteries while the car is slowing down.

- **Sometimes shut off the engine** — A hybrid car does not need to rely on the gasoline engine all of the time because it has an alternate power source—the electric motor and batteries. So the hybrid car can sometimes turn off the gasoline engine, for example when the vehicle is stopped at a red light.



*Sports car SUV. The frontal area profile of a small and large car*

- **Use advanced aerodynamics to reduce drag** — When you are driving on the freeway, most of the work your engine does goes into pushing the car through the air. This force is known as **aerodynamic drag**. This drag force can be reduced in a variety of ways. One sure way is to reduce the frontal area of the car. Think of how a big SUV has to push a much greater area through the air than a tiny sports car.

Reducing disturbances around objects that stick out from the car or eliminating them altogether can also help to improve the aerodynamics. For example, covers over the wheel housings smooth the airflow and reduce drag. And sometimes, mirrors are replaced with small cameras.

- **Use low-rolling resistance tires** — The tires on most cars are optimized to give a smooth ride, minimize noise, and provide good traction in a variety of weather conditions. But they are rarely optimized for efficiency. In fact, the tires cause a surprising amount of drag while you are driving. Hybrid cars use special tires that are both stiffer and inflated to a higher pressure than conventional tires. The result is that they cause about half the drag of regular tires.



• **Use lightweight materials** — Reducing the overall weight of a car is one easy way to increase the mileage. A lighter vehicle uses less energy each time you accelerate or drive up a hill. Composite materials like carbon fiber or lightweight metals like aluminum and magnesium can be used to reduce weight.

### **Why Do Hybrid Cars Help the Environment?**

*A well designed hybrid can reduce smog pollution by 90% or more compared with the cleanest conventional vehicles on the road today.* Hybrids burn less gasoline per mile, so they release much less pollution and fewer greenhouse gases.

A typical hybrid might travel 50-60 miles per gallon of gasoline in the city, while a typical SUV might travel 15-20 miles per gallon, or use three times as much gas for the same distance'

### **Why Hybrids Are Not All-Electric?**

Most electric cars cannot go faster than 50-60 mph, and need to be recharged every 50-100 miles. Hybrids bridge the gap between electric and gasoline-powered cars by traveling further and driving faster.

### **What's Available Now**

Three hybrid cars are now available in the United States—the **Honda Civic Hybrid**, the **Honda Insight** and the **Toyota Prius**.

### **Text III**



*The Honda Insight*



*The Toyota Prius*

The cars have a gasoline engine, an electric motor and batteries, but that is where the similarities end.

**The Honda Insight**, which was introduced in early 2000 in the United States, is designed to get the best possible **mileage**.

**The Honda Insight** is a two-seater hatchback with a 1.0-liter 3-cylinder gasoline engine and a 10-kilowatt electric motor drivetrain.

The model is equipped with manual transmission and achieves an EPA estimated fuel economy of 61/68 city/highway

Electric motor starts the car (no starter needed), and recaptures braking energy, but the gasoline motor must also run for the electric motor to work.

You never have to plug the Insight into an outlet; the gas engine and braking charges the batteries.

### **The New Honda Civic Hybrid**

Never needs to be plugged in — the engine charges the batteries.

Its 1.3-liter 4-cylinder gasoline engine and 10-kUowatt electric motor achieve an EPA estimated fuel economy of 46/51 city/highway squeezing 650 miles from a single tank of gas.

The Civic Hybrid seats five passengers.

The Civic won't be as clean as the Insight; it gives off higher carbon dioxide emissions and worse HC/CO/NO emissions.

The **Toyota Prius**, which came out in Japan at the end of 1997, is designed to reduce emissions in urban areas. It meets California's super ultra-low emissions vehicle standard. One of the main goals of the Toyota Prius is to improve emissions in urban driving. To accomplish this, Toyota has designed a parallel hybrid powertrain, called the Toyota Hybrid System (THS), that adds some of the benefits of a series hybrid.

Unlike Honda, Toyota has focused primarily on the powertrain to achieve its emissions and mileage goals. The Prius weighs 2,765 pounds (1,255 kg) and has as much interior space and trunk space as a Toyota Corolla.

It is a four-door sedan that seats five, and the powertrain is capable of accelerating the vehicle to speeds up to 15 mph (24 kph) on electric power alone.

The Prius was honored as the 2004 North American Car of the Year.

### **Hybrid Maintenance**

Both the Honda and the Toyota have long warranties on the hybrid systems. The Insight has an eight-year/80,000-mile warranty on most of the powertrain, including batteries, and a three-year/36,000-mile warranty on the rest of the car. The Prius has an eight-year/100,000-mile warranty on the battery and hybrid systems and a three-year/ 36,000-mile warranty on everything else.

The motors and batteries in these cars don't require any maintenance over the life of the vehicle. And the engine doesn't require any more maintenance than the one in any **other** car. And because both hybrids have regenerative braking, the brake pads may even last a little longer than those in most cars.

### **Coming Soon!**

Over the past four years, more than 100,000 hybrids have been sold in the United States. (The Prius and the Honda Civic Hybrid account for the majority of these sales.) Even though that's not a huge percentage of the more than 17 million new cars and trucks that are sold in the U.S. each year, it's enough of an incentive to get more manufacturers on the hybrid bandwagon.

Below are some of the models manufacturers soon plan to integrate into the consumer market.

Manufacturer	Model	Model Year
Daimler-Chrysler	Dodge Ram	2005
Daimler-Chrysler	Mercedes S-class	2006
Ford	Escape	2005
General Motors	Chevy Equinox	2006
General Motors	Chevy Silverado	2005
General Motors	GMC-Sierra	2005

General Motors	Saturn-VUE	2005
Toyota	Highlander	2005

Below is the hybrid-electric version of Daimler-Chrysler's Dodge Ram pickup. Recently dubbed the 'Contractor Special' according to the folks at Daimler-Chrysler, this hybrid truck boasts 15 percent better fuel efficiency, lower emissions and better performance than the comparably-powered conventional Ram.



*The new 'contractor special' hybrid Dodge Ram pickup*

Some other hybrids that are being considered for production are:



*Chrysler Citadel concept vehicle*

The hybrid's inherent complexity, and the fact that some of the best storage and conversion systems have yet to be fully developed is responsible for the varied opinions on a hybrid's energy efficiency, environmental benefits, and manufacturing costs. In addition to technical capability, enormous economic challenges also have to be overcome in order to produce a refined hybrid vehicle that sells for about the same as a conventional family sedan.

### **B. Fuel Cells and The Future**

It is difficult to imagine a future without electric vehicles. Over the near term, some form of hybrid vehicle, most likely using a diesel auxiliary power unit, **is** probably the best alternative to conventional vehicles.

Hybrid technology is an interim solution that can lessen, but not eradicate, our dependence on fossil fuel.

There is another new technology called 'Fuel Cells' that should be available by the end of the decade that will eliminate our dependence on non-renewable resources.

Fuel cells convert hydrogen and oxygen to electricity without going through a combustion process; thereby virtually eliminating emissions. They also operate at much higher efficiencies than internal combustion engines, producing double the amount of energy

Most of the world's auto manufacturers have a fuel cell project in progress and virtually all of them agree that fuel cells are the propulsion system of the future.

By 2010, you should expect mid-sized sedans with all the trimmings and power that we enjoy today, with the ability to deliver upwards of 100 miles per gallon.

**COMMENTARIES**

1. *Seattle* - г.Сиэтл, США

4. *EPA* — Environmental Protection Agency — Управление по охране окружающей среды.

**CHECKING COMPREHENSION**

**I. Find information on the structure of the hybrid system and feel in the blanks in the following table:**

	<i>Hybrid components</i>	<i>Functions</i>	<i>Features of the deign</i>
1			
2			
3			
4			
5			
6			
7			

**II. Make up a table summarizing types of modern hybrids, covering the examples of each type.**

**III. List the advantages and disadvantages of the modern hybrid system taking into account:**

- a. performance
- b. efficiency
- c. maintenance

**IV. Speak on 'What is available now' and 'What is coming soon' (Use the pictures as a support).**

## Unit 4

### The history of the Open Joint-Stock Company "GAZ"

#### Text I

The history of the Open Joint-Stock Company "GAZ" (formerly the Gorky Automobile Plant) started in 1929.

On the 4-th of March 1929, the USSR Government took the decision and signed the Decree on building an automobile plant. On the 6-th of April 1929, the Government approved the determined construction site for the future plant near the city of Nizhniy Novgorod.

On the 31-st of May 1929, the USSR Government and the American "Ford Motor Company" signed an agreement on technical assistance in establishing and commissioning mass production of Ford-A type of passenger cars and of Ford-AA type of trucks.

Engineering and construction project planning was mainly carried out by the Russian engineers, in close collaboration with Ford Motor Company. The architectural-construction project was developed by Austin Co.

The first cornerstone of the foundation for the future automobile plant near Nizhniy Novgorod was laid down on May 2, 1930. Thanks to the well-prepared project, efficient management and personal commitment of practically everyone, the plant was built in 18 months.

It was put in operation on January 1, 1932. The first vehicle rolled off the production line on January 29, 1932.

GAZ-A medium-class passenger car was launched into production in December 1932.

The first GAZ-A and GAZ-AA vehicles were manufactured using the drawings provided by Ford Motor Company. But they differed somewhat from their American prototypes due to their reinforced clutch case and steering mechanism. Ford expertise combined together with GAZ findings and decisions, the GAZ designers developed a number of versions of the 1.5-t truck basic model. GAZ-03-30 office bus was developed in 1933. GAZ-AAA 3-axle truck went into production by the end of 1934. Later, GAZ-410 dump truck was designed. GAZ-55 ambulance bus was launched into production in 1937. GAZ-42 gas-generator truck was created in the same period of time. GAZ-A was used as the basis for GAZ-4 pick-up featuring an all-metal cabin and metal cargo platform with 500 kg payload capacity. GAZ-4 pick-ups started rolling off the production line in 1933.

The 100.000-th vehicle, a GAZ-A passenger car, was assembled on April 17, 1935, which became an important date in the history of the GAZ plant.

GAZ plant was the first plant in the country to introduce in-line production of vehicles with the support of American experts from the Ford Motor Company.

Another important milestone in the history of the GAZ plant was development and production of M-1 passenger car.

Mass movement for mastering the equipment and raising labor productivity made it possible to prepare for the production of new vehicles within the shortest time limits.

According to the agreement with Ford Motor Company, M-1 car was supposed, similarly to GAZ-A, to have its own Ford prototype.

But the team of GAZ designers and engineers, headed by the talented specialist and manager A. A. Lipgart in 1933, completely refused to copy the American example, in view of their own understanding of the concept of a national vehicle and capitalizing on the experience gained during the production of the first model.



Thus, instead of a V-8 from the American analogue, a 4-cylinder engine, already in production then, was significantly modified and boosted from 40 h. p. to 50 h. p. But the main changes concerned the chassis: an extra-strong

frame and a new structure of the suspension were developed (on four leaf springs instead of two cross ones of the analogue); spoke wheels were replaced with disk stamped ones with bigger tires. And for quite understandable reasons, as the Ford chassis proved to be really unsuitable for the Russian road conditions.

As a result, GAZ M-1, like all the other following models of GAZ vehicles turned out to be enduring, robust and easy to service.

The exterior of the vehicle was also changed: due to larger front end and longer frame and wheel base the vehicle became proportionally better-looking, and its front end became more interesting, including the front fenders and the radiator facing.

Created by the team of GAZ designers and engineers, GAZ-M1 not only became a successfully passed test but also laid down the foundation of the GAZ school of design. In 1937, M-1 produced a notable impression representing the USSR at the Paris world industrial exhibition.

GAZ-M1 has its own peculiar history. Year in, year out, partly modified, it served the needs of people beginning from the late 30-s till the 50-s, including the War years. M-1 was used as a basis for GAZ-415 pick-up with 400 kg payload capacity. They were sometimes powered with 6-cylinder engines, code-named as GAZ-11. This engine, with displacement of 3485 cm<sup>3</sup> and 76 h. p., helped improve the dynamics and opened up its prospective usage for further trucks, including their application in light tanks and self-propelled guns.

This passenger car equipped with the new engine was code named as GAZ-11-73. Its initial samples were ready in 1938. Besides the new power plant, it had a number of other improvements, such as longer front leaf springs, more efficient

brakes, a new instrument panel, etc. GAZ-11-73 was used as the basis for GAZ-11-40 convertible the production of which was aborted due to the War. But GAZ-61, a full-wheel drive version, designed by V. A. Gratchev, was put into mass production. It could climb the gradient of 38°, and negotiate the fords 720 mm deep. Some specialists also assumed that GAZ-61, as a cross-country vehicle, was even better than semi-caterpillar vehicles, provided it was fitted with tires featuring developed grousers.

By the end of the 30-s, GAZ plant became the leading car-producer in the USSR and assembled 450.000 vehicles. It launched into production 17 models and versions of different vehicles, producing 68.3% of the vehicles manufactured in the USSR. The greater part of credit for this goes to S. S. Dyakonov, its first director (1898 - 1938).

**I. Devide all the events of this text into some parts. Draw up a plan.**

**II. Inform your friends about the development of vehicles produced by GAZ.**

## **Text II**

### **Automobiles “GAZ”**



**The GAZ-31105 Volga car developed by GAZ specialists is a restyled version of the previous GAZ-3110 model.**

In addition to updated chassis made in 2003 (front wheel ball joint suspension, rear wheel suspension antiroll bar, improved gearbox), appearance, lighting devices and body equipment were changed in the Volga GAZ-31105 model.

The main purpose of changes is to improve the car look, enhance design safety and make the car more comfortable in use.

Significant changes in the style of the front part of GAZ-31105 appearance were made: along with head lights, the radiator case, the fenders and the hood as well as the front bumper were changed.

Volga GAZ-31105 cars are equipped with modern and effective head lights made by Osvar (Vyazniki). They look like a unit combining optical elements of low beam, high beam lights and turn indicators located in one body with high-

strength optical diffuser that has a "free" surface. Lighting of road and road side became more even and intensive, safety of the car improved.

The outer lights can be operated by the driver by using new switches located under the wheel, ensuring softer and accurate switching.

Design and location of ignition lock was altered completely together with under-wheel switch unit.

The new compact ignition lock is more easily accessed when it is on the steering column side surface. Also changed were the steering column shape and the steering wheel style.

The front seats were drastically modified: profile and style of cushions and backs were changed. The new front seats, providing a lot of comfort for the driver and passenger, allow more room overhead, between the steering wheel and the seat cushion as well as between the steering wheel and the seat back. Lowered cushion profile significantly increased room in the front doorway. It is easier for both the driver and the front passenger to get in and out of the car.

As usual numerous packaging of Volga cars can be ordered by customers and additional pieces of equipment can be installed to cars by request.

a)



**GAZelle range vehicles, roomy and easy to maneuver, are designed to carry fragile types of cargo in the heavy city traffic.**

These vehicles are able to carry one ton or more of various types of cargo, having quite comfortable conditions both for the goods and for the driver. Reasonable prices and maintenance costs make this type of vehicle a most profitable investment for those people who deal in small businesses of all kinds.

The van has a frame that makes the vehicle even more robust and reliable. An all-metal body, ensuring long life cycle of the vehicle, is manufactured by use of state-of-the-art welding and painting equipment.

GAZ-2705 three-setter is the base model with 1359 kg payload capacity. Its cargo compartment volume is 9 m<sup>3</sup>. The rear hinged swinging doors and the side sliding door makes it easy to load and unload the van. The loading height is only 725 mm.

b)





**GAZ-3221 is the base model for the GAZelle microbus family. It can be very well used either as an office car or as a tourist bus. It has 8 comfortable passenger seats that could be equipped with headrests and armrests. There is ample room for 250 kg of luggage behind the back seats.**

The most comfortable GAZ-32212 version is designed for carrying 6 passengers only. The vehicle can also be equipped with a folding table.

GAZ-32213 13-seat bus is the most spacious one in this lineup of GAZelle buses. Its still another version is GAZ-32132 taxi bus.

The years of practical operation of these taxis under very hard conditions typically characterized by extreme wear, give sufficient evidence of the fact that these vehicles are durable and reliable.

An additional heater inside the salon is another important feature. The side windows have sliding glasses. The sunroof is standard equipment.

Like any other GAZelle model, the buses have full-wheel drive versions.

c)



**Dynamic and easy-to-drive GAZ-3302 truck has a robust and reliable design. It is easy for maintenance and can serve as a multi-purpose means of transport in every situation - both as a family car and as a working horse. That is why it enjoys growing popularity with urban and rural entrepreneurs.**

Its cargo platform is one meter above the ground and can carry up to 1.5 tons of cargo that can be covered with a canvas top, if necessary.

Even drivers with passenger car license are allowed to drive the "GAZelle" trucks and the road signs prohibiting or limiting the movement of conventional trucks are not applicable to them.

The GAZelle designers tried to do all they could do, to make the driver really enjoy sitting behind the wheel of this vehicle. Its front disk brakes make you relax and not worry about safe and easy deceleration, no matter what speed you are traveling at. Very light steering wheel effort and a small turning radius make this truck highly maneuverable even in heavy city traffic.

d)



**Multi-purpose cargo-passenger GAZ-33023 "GAZelle-farmer" truck can carry up to 1000 kg on its 4.5 m<sup>2</sup> cargo platform besides accommodating six passengers in its comfortable and roomy cabin with two rows of seats. The folding front passenger seat provides for easy passage to the back row.**

The vehicle can be used for transportation of municipal services personnel or agricultural laborers to the place of their work. Cargo-carrying or cargo-and-passengers carrying "GAZelle" vehicles are very often used in rural areas, as compared to the other versions of this truck. All-time AWD, locking center differential, increased ground clearance and cross-country tread tires allow AWD "GAZelle" vehicles overcome quite rough terrain.

The "Sobol" range vehicles enjoy great popularity thanks to the same features and characteristics as the "GAZelle" range vehicles have, i. e. simplicity of design and easiness of service, high reliability and excellent maintainability, affordable prices and good maneuverability. This kind of vehicle is just indispensable for the dynamically working businesses, municipal services, small-size enterprises. They are made to make profit.

The three-seat GAZ-2752 van has 770 kg payload capacity with the cargo compartment volume of 6.9 m<sup>3</sup>. Rear swinging doors and the side sliding door make loading or unloading an easy process. The loading height is 700 mm. Even greater-sized types of cargo can be easily placed inside the cargo compartment due to its height of slightly over 1,5 m.

Thought the "Sobol" is 660 mm shorter than the "GAZeHe", the overall dimensions of their cabins are the same.

e)



**"Sobol-Barguzin" is a top-level modification in this family. This comfortable and elegantly looking vehicle clearly demonstrates that wheels can be used not only for moving, but also for relaxation and work.**

The cosy interior of this LCV looks like a compartment in a railway car, with the two rows of seats facing each other. Its six passenger seats have head-rests and arm-rests. There is a small table between the seat rows on which one can put a portable PC or some documents on which

you can work even at night, because there is a reading lamp just above the table.

Independent front suspension of this LCV helps improve its handling, smoothness of ride and stability at high speeds. All this makes it almost as comfortable as any passenger car. It can serve as a kind of a mini-office, as an entertainment center on wheels, as a comfortable and roomy means of transport for

a family or possibly for a company of friends. It is up to you to decide on its application. "Sobol-Barguzin" will always be there to satisfy all your needs in the best of all possible ways.



**This medium-roof "Sobol" model has two versions. One has a luxury-trim interior for carrying six passengers on seats with arm rests and head-rests, with an illuminated table and cup-holders.**

The other is designed for carrying 10 passengers. It can serve as a school bus or as a municipal services vehicle or as a tourist carrier.

All the versions of this LCV are equipped with effective heating and ventilation systems, sliding side windows and a sun-roof. Its NVH isolation helps to make the intercourse between the occupants easy and comfortable.

Rear hinged swinging doors provide for easy handling of the baggage that can be placed behind the back row of seats.

## II. Complete the table. Make up a list of the GAZ automobiles.

Company	Date of creation	Models produced	Famous names	Distinguished features
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## II. from Russian into English:

## Translate

### Автомобиль "Волга"

Автомобиль "Волга" комфортабелен, прост и легок в управлении, удобен в обслуживании и обладает высокими динамическими и экономическими показателями. Благодаря удачному размещению агрегатов в автомобиле при сравнительно небольших габаритных размерах размещается пять человек. Хорошая устойчивость автомобиля на дороге, мягкая эластичная подвеска и шины низкого давления дают возможность движения на высоких скоростях, обеспечивая отличную плавность хода. Большой дорожный просвет и хорошее качество подвески позволяют, держать достаточно высокую скорость на дорогах, ухудшенного качества, а также преодолевать участки дороги и крутые подъемы. Надежное рулевое управление и гидравлические тормоза гарантируют безопасность движения.

## Unit 5

### Grammar Exercises

#### 1. Use the correct form of the verbs “to be” and “to have” in the Present Simple:

1. This car (to be) not front Gorky Automobile Plant.
2. These cars (to be) of different marks.
3. The car (to have) five seats.
4. Terrano II (to have) a manual 5 speed gearbox and 2 speed transfer gearbox.
5. There (to be) a dashboard in front of a driver.
6. The speed (to be) about 130 km in hour.

#### 2. Mind the difference:

1. The Gorky Automobile **Plant** produces new types of cars.
2. Engine is the power **Plant** of any vehicle.
3. The car has a new **number**.
4. The **number** of cylinders in a car may be different.

#### 3. Use the Present or Past Simple of the verbs given in the brackets:

1. This experiment (to be) of great importance for the development of an automobile.
2. It (to have) a great effect on us design.
3. Brakes (to become) more efficient now.

#### 4. Put the verbs in brackets into Future Simple:

1. The rapid growth (to be) in the manufacture of engines at ZMZ.
2. The car of the future not (to run on) petrol which is dirty and noisy.
3. The designers (to work out) a new shape of the engine.
4. The spare parts (to be assembled) in the assembly shop.

#### 5. Use the verbs in brackets in the Present Perfect Passive. Translate the sentences into Russian:

1. The system (to give) an additional support.
2. Good results (to achieve) in effective braking.
3. The maximum slack (to regulate) automatically.
4. The need of adjustment (to eliminate).

## 6. Put general questions:

1. Since the clutch is foot-operated, the force necessary for its disengagement has to be as small as possible.
2. All internal combustion engines require some disengageable connection between engine and axle drive.
3. The internal combustion engine has to be started.
4. Modern automotive engineering may use fluid flywheel clutches.

## 7. Put special questions:

1. **The internal combustion engine** develops a sufficient torque only after its speed has been increased.
2. Lorries and buses are equipped with **air brakes**.
3. Coupling is performed **by friction**.

## 8. Fill in the blanks with the proper tenses of the verbs given in brackets.

1. What you (to do) when I came in? I (to read) an article on internal combustion engines.
2. Where you (to go) when I met you? I (to go) to Dzerzhinski Square, I (to intend) to visit the exhibition in the Politechnical Museum.
3. We (to arrive) at the station when the train (to approach) the platform.
4. At the corner of the street we (to see) a car. The driver (to examine) its engine.
5. A man was stopped by a militiaman while he (to cross) the square. The militiaman said: "Why you (to cross) the square in the wrong place?"
6. The new device was taken care of by the lab assistant.
7. The invention of the ICE was spoken of as the greatest achievement of the time. It was devoted great attention to by specialists in various branches of engineering.
8. The possibility of converting latent power of the gas into energy was thought of as a great advantage in the field of power generation.

## 9. Replace the Modal Verbs by their equivalents:

1. Before the designer begins his work he **must** know the specification of the vehicle.
2. You **may** use this device for steering the car.
3. Buying a car you **must** know how to steer it.
4. We **can** obtain various fuels from crude oil

## 10. Analyse and translate. Put questions to the subjects of the sentences.

1. There are several advantages in keeping the cooling fluid in the engine jacket.
2. Any gas when compressed will become heated ; in the diesel engine the air

- drawn into the cylinder on the suction stroke is heated during the compression stroke to a temperature far higher than required for ignition.
3. The air - injection engine uses compressed air to force the fuel into the cylinder.
  4. To help bring fuel and air together, designers have made many adaptations from the simplest form of the open chamber .
  5. We know increased power output without any increase in engine capacity to have been one of the outstanding features of the automobile industry.
  6. It is necessary to learn internal construction of the gear for to imagine the work of the car on the whole.
  7. The oil required is different from that suitable for an engine , conditions being quite different.
  8. The other method of overcoming the difficulty of a slipping wheel is the provision of a differential lock.
  9. The frame and the parts attached to the frame being sprung, their weight is supported on the car springs.
  10. On operation, the leaf spring is known to act much like a flexible beam.

#### **11. Translate the following sentences into English.**

1. Мы работали в лаборатории, когда вошел декан и обратился к преподавателю.
2. Он спросил: «Какие испытания (test) проводятся вашими студентами?»
3. Он пришел, когда испытывался новый тип запальной свечи.
4. Декан хотел посмотреть, как проводится это испытание.
5. Студенты все время внимательно наблюдали за давлением в цилиндре.
6. Следите внимательно за этим процессом: поршень опускается и всасывает газ через открытый впускной клапан; теперь поршень поднимается и газ сжимается.
7. Теперь искра воспламеняет смесь.

#### **12. Translate the following sentences paying attention to the passive constructions.**

1. In accordance with the well-known law of mechanics latent power may be converted into mechanical work.
2. During the lectures on mechanics great attention is paid to linking theory with practice.
3. One of the students was told to draw a cylinder of the engine with the piston at the top of its stroke.
4. Only a hundred years ago the steam engine was considered an efficient engine.
5. Much energy produced in the steam engine was lost while the steam was being

- conducted through the pipe to the cylinder.
6. In a gasoline engine petrol is turned into gas and mixed with the air in a device which is called the carburetor.
  7. The electric spark necessary for the explosion of the mixture is produced inside the cylinder at the point of the sparking plug.
  8. The inlet and exhaust valves and the sparking plug are housed in the head of the cylinder.
  9. The piston is pushed down when it is acted upon by the pressure of the gas within the cylinder.
  10. It is the force with which the piston is pushed down that drives the car.
  11. The four-stroke cycle is used to convert the latent power of the gas into the power which drives the car.
  12. In a diesel engine the fuel mixture is being constantly fired by the heat of compression, while in a gasoline engine the fuel is being ignited by an electric spark.
  13. At the time of maximum compression the fuel is being injected into the cylinder and ignited by special injectors set in the head of each of the four cylinders.
  14. Fuel is being delivered to the injector by a pump.

**13. Translate the following passive constructions paying attention to the verbs followed by prepositions.**

**a)**

1. At technical institutes drawing is paid great attention to.
2. Drawing must be paid attention to by the students of engineering colleges.
3. He is an experienced designer; his advice may be relied on.
4. All the achievements of modern science are being made use of in modern production processes.
5. All the possibilities of the new machine were being spoken of at the last sitting of the design circle.

**b) Translate into English:**

1. Вчера нам показали устройство для перемешивания очищенного бензина с воздухом
2. Нам сказали: «Этот прибор называется карбюратором. Он соединяется с баком малого диаметра».
3. Из карбюратора горючая смесь подается в цилиндр двигателя. Она (смесь) воспламеняется внутри цилиндра искрой от запальной свечи.
4. Потенциальная энергия газа преобразуется в энергию, которая приводит в движение автомобиль.
5. После лабораторной работы нас попросили объяснить конструкцию и

работу двигателя.

**14. Translate the following sentences. Mind the tense of the predicates:**

1. Interesting investigation in various fields of science **are being carried out** at our University.
2. Kamaz **is being manufactured** three-axle trucks of high capacity.
3. A number of Russian automobile enterprises **are being expanded now**.
4. These cars **are being tested** for speed, durability, and wear.
5. A series of up-to-date new trucks and cars **is being produced**.
6. **The order** of assembling this engine includes 3 stages.
7. An engine cooling system is used **in order to** retain heat.

**15. Translate the Participles into Russian:**

reducing the life...  
heat generated by...  
having connected...  
air drum mounted...  
escaping from the pipe...  
tires cooled by...  
absorbing the heat...  
pedal depressed by...  
having ignited...  
checking the brakes...

**16. Open the brackets:**

1. The carburetor engines (to be called) light oil engines.
2. The cylinder heads (to be bolted) to the top portion of the crankcase.
3. Cylinders (to be arranged) in one block.
4. The engine (to be assembled) of various cast pieces.

**17. Translate into Russian:**

1. A sharp **increase** in the effectiveness of braking will insisted **upon**.
2. The durability of this engine may be **relied upon**.
3. The reduction of the auto's weight **is referred to** in this article.
4. The problem of raising the efficiency of the machines was **dealt with** in a number of scientific articles.
5. When designing new types of autos all the latest achievements of scientific and engineering progress are **taken into account**.



6. Electronic systems and many other innovations are much **worked at** to make cars more efficient.

## A

**acceleration** ускорение; разгон  
**accelerator** акселератор  
**accessories** арматура;  
вспомогательные приборы  
**accommodation** размещение;  
приспособление  
**accumulator** аккумулятор  
**accumulator battery** аккумуляторная  
батарея  
**actuate** приводить в действие;  
возбуждать  
**adhesion** сцепление; слипание  
**air cleaner** воздухоочиститель;  
воздушный фильтр  
**air cooled engine** двигатель с  
воздушным охлаждением  
**air-cooling** воздушное охлаждение  
**air filter** воздухоочиститель,  
воздушный фильтр  
**air intake** впуск воздуха; отверстие  
для впуска воздуха, всасывающее  
отверстие  
**aiv (automatic inlet valve)**  
автоматический впускной клапан  
**alternator** генератор переменного  
тока  
**antifreeze** антифриз  
**antiroll bar** стабилизатор поперечной  
устойчивости  
**arm** плечо; рукоятка; рычаг;  
коромысло  
**assembly** агрегат; узел; сборка  
**assembly line** линия сборки в  
поточном производстве; сборочный  
конвейер  
**automatic gearbox** автоматическая  
коробка передач  
**automatic transmission**  
автоматическая коробка передач  
**atomizer** распылитель  
**axle** ось; полуось; мост (*автомобиля*)  
**axle shaft** вал колеса; полуось  
**axle tube** труба полуоси

## B

**badge** эмблема; значок  
**ball bearing** шариковый подшипник  
**ball joint** шаровой шарнир  
**bandwagon** фургон  
**batch** группа, партия, серия  
**bearing** подшипник; опора  
**belt** приводной ремень; лента  
**bench** верстак; станина; стенд  
**bhp (brake horsepower)** эффективная  
(тормозная) мощность  
**block** блок; загораживать,  
задерживать  
**blow out** продувать; спускать (*воду*)  
**blowout** обдувка, продувка;  
прокол (*шины*)  
**body** кузов (*автомобиля*),  
корпус, остов  
**body shell** обшивка кузова  
**boiler** котёл; бойлер  
**bonnet** капот (*двигателя*)  
**boot** багажник (*место в кузове  
автомобиля, предназначенное для  
размещения багажа*)  
**bore** отверстие; диаметр отверстия  
цилиндра; растачивать  
**bottle of compressed air** баллон с  
сжатым воздухом  
**bottom dead center brake** нижняя  
мертвая точка  
**brake** тормоз; тормозить  
**brake drum** тормозной барабан  
**brake lining** фрикционная накладка  
тормоза  
**brake pedal** тормозная педаль  
**brake shoe** тормозная колодка;  
тормозной башмак  
**brougham** «брогам»  
(*комбинированный пассажирский  
кузов легкового автомобиля с  
открывающейся частью крыши над  
передним рядом сидений*)  
**bumper** бампер  
**burner** горелка; форсунка

**bus** автобус

**bush** втулка; гильза; вкладыш

## C

**cam** кулак; эксцентрик; кулачок

**cam and roller** червяк и ролик (*схема рулевого механизма*)

**camshaft** распределительный вал; кулачный вал

**cantilever** консоль; кантиливер

**capacitor** конденсатор

**capacity** ёмкость, вместимость; рабочий объем; производительность, мощность

**carburetor** карбюратор

**carburetor butterfly throttle**

дроссельная заслонка карбюратора

**cardan joint** карданный шарнир

**cardan shaft** карданный вал; кардан

**cardan shaft transmission** привод

карданного вала

**carriage** повозка, вагон; шасси

**cart** колёсный экипаж, повозка, телега

**casting** литьё, отливка

**cell** элемент; ячейка, секция

**chain** цепь; соединять цепью

**charge** свежий заряд (*горючей смеси или воздуха*), погрузка; нагружать; заряжать

**chariot** колесница

## D

**damper** амортизатор; демпфер

**dashboard** щиток управления; приборный щиток

**dc (direct current) motor**

электродвигатель постоянного тока

**degree** градус; степень

**detachable** съёмный; отделяемый

**dial** циферблат; круговая шкала; лимб

**diesel engine** дизель

**differential** дифференциал

**dipstick** щуп, указатель уровня (*напр., масла*)

**disengage** выключать; разъединять, выводить из зацепления

**disk brake** дисковой тормоз

**distributor** распределитель

**ditch** кювет, канава

**double ignition** двойное зажигание

**double-reduction axle**

двухступенчатый ведущий мост

**drag** лобовое сопротивление (*воздуха*)

**draw up** затягивать (*болт*); составлять (*план, смету*)

**drive** привод; приводить в

**drive shaft** ведущий вал; приводной вал

**driven shaft** ведомый вал

**drivetrain** трансмиссия; силовая передача

**drum brake** барабанный тормоз

**durable** долговечный, износостойкий

**dwel** цилиндрическая часть кулачка, не перемещающая сопряженную деталь; отсутствие движения

**dynamo** генератор; динамо

## E

**electric ignition** электрическое зажигание

**electric lighting** электрическое освещение

**electric spark** электрическая искра

**electric starter** электростартер

**electrolyte** электролит

**electronic ignition** электронное зажигание

**eliminate** устранять; уничтожать

**elliptical spring** эллиптическая рессора

**emergency** критическое положение; аварийный; вспомогательный

**engage** зацеплять, включать *или* вводить в зацепление

**engine** двигатель

**engine capacity** рабочий объем двигателя

**equip** оборудовать  
**estate car** (легковой) автомобиль с кузовом типа «универсал»  
**evolution** эволюция, постепенное развитие  
**exceed** превышать  
**exhaust** выпуск; выпускать  
**exhaust pipe** выхлопная труба  
**exhaust port** выхлопное отверстие  
**exhaust valve** выпускной клапан  
**expand** расширять(ся)  
**expansion** расширение  
**explode** взрывать(ся)  
**explosion** взрыв; вспышка  
**explosive mixture** горючая смесь

**F**

**fan** вентилятор; крыло, лопасть  
**fan belt** ремень вентилятора  
**feeler** шуп; калибр толщины  
**filler** горловина бака; заливное отверстие; наполнитель  
**filler cap** крышка заливного отверстия  
**fill in** заливать; вставлять  
**filter** фильтр; фильтровать  
**fin** ребро  
**final drive** главная передача; мост  
**front suspension** передняя подвеска  
**firing** зажигание; сжигание; воспламенение  
**firing order** порядок зажигания  
**first gear** первая передача  
**fit** пригонка, посадка; пригодный, пригнанный  
**fittings** фитинги, соединительные части; арматура  
**fix** устанавливать неподвижно, закреплять, фиксировать  
**flash boiler** котел с быстрым разведением паров  
**flat** равнина; плоский, ровный  
**flexibility** гибкость; приспособленность; маневренность  
**float** поплавок

**float chamber** поплавковая камера  
**-type carburetor** карбюратор поплавкового типа  
**fluid clutch** гидравлическое сцепление  
**flywheel** маховик  
**flywheel magneto** магнето, выполненное в маховике  
**footbrake** ножной тормоз  
**force** сила, усиление  
**fork** вилка; разветвляться  
**forward mounted engine** двигатель, расположенный спереди  
**four-cylinder** четырехцилиндровый  
**four-stroke** четырехтактный  
**four-wheel drive** привод автомобиля с четырьмя ведущими колесами  
**four-wheeler** четырехколесное средство транспорта  
**frame** рама; станина, корпус  
**friction** трение  
**friction clutch** фрикционное сцепление  
**front** передняя сторона; передний  
**front axle** передняя ось; передний  
**front wheel** переднее колесо  
**front wheel drive** передний привод; привод на передние колеса  
**fuel** горючее, топливо; заливать топливо  
**fuel cell** топливный элемент  
**fuel consumption** расход топлива  
**fuel filter** топливный фильтр  
**fuel injection** впрыск топлива  
**fuel pump** топливный насос  
**fuel tank** топливный бак  
**fuel elliptic spring** эллиптическая рессора

**G**

**gallery** продольный канал  
**gap** зазор; искровой промежуток  
**gas-turbine engine** газотурбинный двигатель, ГТД

**gear** шестерня; зубчатая передача  
**gearbox** коробка передач  
**gear change** переключение передач  
**gear lever** рычаг управления  
коробкой передач  
**genset (generating set)** генераторная  
установка  
**governor** регулятор  
**gravity** тяжесть, сила тяжести  
**ground clearance** клиренс, дорожный  
просвет

**Н**

**half-elliptic spring**  
полуэллиптическая рессора  
**halfshaft** полуось  
**hand brake** ручной тормоз  
**hand control** ручное управление  
**handicap** препятствие  
**handle** рукоятка; управлять  
**handling** уход; управление; способ  
эксплуатации  
**hatchback** тип (*легкового  
автомобиля*)  
**head** головка; днище  
**headlamp** фара  
**heat** тепло; нагревать  
**heater** обогреватель  
**heavy** тяжелый, трудный (*об условиях  
работы*); мощный (*о двигателе*)  
**heavy duty** тяжелая работа;  
предназначенный для тяжелого  
режима работы  
**helical** винтовой, спиральный  
**high-tension magneto** магнето  
высокого напряжения  
**hollow** полый, пустотелый  
**hood** капот (*двигателя*)  
**horizontally-opposed engine**  
двигатель с горизонтально  
расположенными оппозитными  
цилиндрами  
**hose** рукав, шланг  
**hot-tube ignition** воспламенение

**gas-vacuum engine** двигатель на  
газовом топливе  
**Housing** корпус; кожух; картер  
**hp=horsepower** лошадиная сила, л.с.  
**hub** втулка; ступица  
**hydraulic shock absorber**  
гидравлический амортизатор  
**HT= high tension** высокое  
напряжение

**I**

**ICE – powered generator** генератор,  
работающий от двигателя  
внутреннего сгорания  
**ignition** зажигание, воспламенение  
**ignition advance** опережение  
зажигания  
**ignition key** ключ зажигания  
**in=inch** дюйм (2,54 см)  
**inclined valve** наклонно  
установленный клапан  
**independent suspension** независимая  
подвеска  
**induction** индукция; впуск;  
всасывание  
**inlet** впуск; впускное отверстие; ввод;  
вход  
**inlet port** впускное отверстие  
**inlet valve** впускной клапан  
**inlet valve spring** пружина впускного  
клапана  
**inline** лежащий на одной прямой, на  
одной линии; рядный  
**inline engine** рядный двигатель  
**input shaft** первичный вал; ведущий  
вал  
**integral** цельный; неразъемный  
**internal combustion engine** двигатель  
внутреннего сгорания

**J**

**Jeep** джип  
**jet** струя; форсунка  
**jet engine** реактивный двигатель

**К**

топливовоздушной смеси в двигателе  
калильной трубкой

**km/h= kilometers per hour** км/ч,  
километр в час

**kw = kilowatt** киловатт, кВт

## L

**L=liter** литр, л

**layout** расположение, планировка

**Lb=pound** фунт (0,453 кг)

**lead-acid battery** свинцовый  
кислотный аккумулятор

**lead battery** свинцовая  
аккумуляторная батарея

**leaf** пластинка

**leaf spring** листовая рессора

**leather** кожа

**lever** рычаг

**lever arm** плечо рычага

**life** долговечность; срок службы

**light** свет, освещение; фара;  
легкий (*no весу*)

**lining** прокладка; вкладыш

**linkage** рычажной механизм

**liquid** жидкость; жидкий

**live axle** ведущая ось, ведущий мост

**lockout** стопорная гайка

**locomotion** передвижение

**long life** продолжительный срок  
службы

**long wheelbase** длинная база (*между*  
*осями автомобиля*)

**loom** оплетка (*проводов*)

**lorry** грузовой автомобиль

**lubricant** смазка; смазочный  
материал

**lubrication** смазка, смазывание

## M

**machine** машина. Станок;

обрабатывать резаньем на станке

**magnetic clutch** электромагнитная  
муфта

**magneto** магнето

**main jet** главный жиклёр

**maintenance** уход, обслуживание

**key** ключ зажигания

**kg = kilogram** килограмм, кг

**km = kilometer** километр, км

**meter** измерительный прибор; метр;  
дозировать

**mileage** пробег в милях

**minibus** миниавтобус

**mixture** смесь

**monoblock** моноблок

**monoblock casting** цельная отливка

**monocoque body** бескаркасный  
несущий кузов

**mortar** известковый раствор

**motion** движение

**motor car** автомобиль

**motorcycle** мотоцикл

**motorway** автострада

**mould** линейная форма; литьё

**mount** опора; монтировать,  
устанавливать

**mounting** установка, сборка, монтаж

**mpg=miles per gallon** число миль  
пробега автомобиля на галлон  
израсходованного топлива

**mph=miles per hour** миль в час

**mudguard** брызговик

**multi-cylinder engine**

многоцилиндровый двигатель

**multipurpose** универсальный

## N

**Nm=Newton-meter** ньютонметр

**noise** шум

**nose** передняя часть (*автомобиля*)

**notch** паз; выемка; надрезать

**nozzle** сопло; форсунка

**numberplate** номерная дощечка;  
номерной знак

## O

**ohv=overhead valve** верхний клапан;  
подвесной клапан

**oil pump** масляный насос

**output** отдача; производительность;  
эффективная мощность

**manifold** коллектор; патрубок  
**manual control** ручное управление  
**overdrive transmission** коробка передач с ускоряющей передачей  
**overhead-camshaft engine** двигатель с верхним распределительным валом  
**overhead valve** верхний клапан; подвесной клапан  
**overload** перегрузка  
**overspeed** чрезмерная скорость; превышать скорость

## Р

**pad** заливка вкладыша; прокладка; подушка; заливать вкладыш; подкладывать  
**panel** панель; доска  
**performance** производительность; характеристика; эксплуатационные качества  
**petrol** бензин  
**petrol engine** бензиновый двигатель  
**petrol filter** топливный фильтр  
**pick up** зажимать; разгоняться  
**pickup body** кузов «пикап»  
**pickup truck** грузовой автомобиль особо малой грузоподъемности, пикап  
**pinion** шестерня; сателлит  
**piston** поршень  
**piston crown** днище поршня  
**piston rod** шатун  
**piston skirt** юбка поршня  
**plug** пробка; свеча  
**plunger** плунжер  
**pneumatic** пневматический  
**pneumatic tyre** пневматическая шина, пневматик  
**point** точка; вершина  
**points of sparking plug** электроды свечи зажигания  
**popper-valve** подъемный клапан  
**power** сила, мощность; энергия; приводить в действие  
**power-assisted steering** рулевое

**output shaft** вторичный вал; ведомый вал

**power steering** рулевое управление с усилителем  
**powertrain** силовая передача; трансмиссия  
**power unit** силовой агрегат  
**power/weight ratio** мощность на единицу веса  
**preselector gearbox** коробка передач с преселективным переключением  
**pressure** давление  
**presswork** штампованное *или* прессованное изделие  
**primary** первичный  
**private** частный  
**private vehicle** автомобиль индивидуального пользования  
**produce** производить  
**propel** приводить в движение  
**propeller shaft** карданный вал  
**propulsion** приведение в движение; движение вперед  
**public vehicle** автомобиль коммунального пользования  
**pulley** шкив, блок  
**pump** насос; накачивать  
**puncture** прокол, пробой  
**push** толкание, нажим; нажимать, надавливать  
**pushrod** штанга толкателя

## Q

**quadrant** кулиса рычага переключения передач; четверть круга  
**quantity** количество  
**quarter-elliptic spring** четверть эллиптической рессоры

## R

**racing single-seater** одноместный гоночный автомобиль  
**rack-and-pinion drive** реечная передача

управление с усилителем

**rear drive** задний привод; привод на задние колеса

**rear driving wheel** заднее ведущее колесо

**rear suspension** задняя подвеска

**rear wheel** заднее колесо

**rear-wheel drive** привод на задние колеса

**reciprocate** перемещаться возвратно-поступательно

**reliability** надежность; прочность

**return spring** возвратная пружина

**reverse** реверсирование, реверс

**reverse gear** шестерня заднего хода

**rim** обод (*колеса*)

**ring** кольцо

**rocker** коромысло

**rotation** вращение

**rpm (revolutions per minute)** число оборотов в минуту

**running board** подножка

**running gear** ходовая часть (*оси, колеса*); передаточный механизм (*двигателя*)

**S**

**saloon** салон; легковой автомобиль с кузовом «седан»

**scooter** мотоцикл с пониженным сиденьем, скутер

**scrap** брак; лом; браковать; уничтожать

**seal** сальник, уплотнение; закупорить; положить пломбу

**sedan** седан (*тип кузова*)

**select** выбирать

**self-changing gear** автоматическое переключение передач

**self-moving** самоходный

**self-propelled** самоходный

**self-starting** самопуск; с самопуском; с автоматическим пуском

**semi-elliptical spring**

**radiation** радиация

**radiator** радиатор

**rear axle** задний мост

**service** обслуживание; эксплуатация

**shackle link** сцепная серьга

**shaft** вал

**shaft drive** карданная передача

**shock absorber** амортизатор

**short-stroke engine** короткий двигатель

**side member** боковина; лонжерон

**side-valve engine** двигатель с боковым расположением клапанов

**silencer** глушитель

**slave cylinder** вспомогательный цилиндр

**sleeve-valve engine** двигатель с гильзовым распределением; бесклапанный двигатель

**suspension** подвеска

**sliding pinion** скользящая шестерня

**slip** скольжение; буксовка; скользить; буксовать

**slipping** скольжение; буксование

**socket** штепсель; патрон

**solid** твердое топливо; цельный, неразъемный

**solid tyre** массивная шина, каток

**spark-ignition engine** двигатель с искровым зажиганием

**spark plug** свеча зажигания

**speed** скорость

**speed of rotation** скорость вращения

**spoke** спица (*колеса*)

**spoke wheel** бездисковое колесо

**Sports Utility Vehicle (SUN)** полноприводный автомобиль повышенной проходимости, повышенной комфортности, предназначенный для активного отдыха

**sprag** подкладной тормоз

**spray carburetion** карбюрация впрыскиванием

**spring** пружина, рессора



полуэллиптическая рессора  
**start** пуск; запуск  
**starter** стартер  
**steamer = steam car** автомобиль с паровым двигателем  
**steam pressure** давление пара  
**steam propulsion** приведение в движение паром  
**steering** рулевое управление  
**steering arm** рулевая сошка  
**steering box** картер рулевого управления  
**steering column** рулевая колонка  
**steering wheel** рулевое колесо  
**stroke** ход (*поршня*)  
**stroke bore ratio** отношение длины хода поршня к диаметру цилиндра  
**stub axle** поворотный кулак  
**suspension arm** рычаг подвески  
**sv (side valve)** клапан, расположенный сбоку  
**sv (specific volume)** удельный объём  
**swept volume** рабочий объём  
**synchromesh gearbox** коробка передач с синхронизатором

## T

**tail** хвостовая часть; задняя часть  
**tank** бак; цистерна; резервуар  
**tappet** толкатель  
**taximeter** таксомотор  
**thermostat** термостат  
**three- speed gearbox** трехступенчатая коробка передач  
**three- wheeler** трехколесный автомобиль  
**throttle** дроссель  
**tiller** рукоятка; Т-образный руль  
**tiller steering** управление при помощи рукоятки  
**tire** шина  
**top gear** высшая передача  
**torque** крутящий момент  
**torsion bar** торсионный вал  
**track rod** поперечная рулевая тяга

**spur gear** цилиндрическая прямозубая шестерня  
**traction engine** тяговый двигатель  
**tractor** трактор; тягач  
**traffic light** светофор  
**transfer** передача; переносить  
**transmission** передача; трансмиссия  
**transmit** передавать  
**transverse** поперечина  
**transverse engine** двигатель с поперечным расположением  
**transverse spring** поперечная рессора  
**travel** движение, перемещение  
**tread** протектор; поверхность качения шины; гусеница  
**tricycle** трехколесный автомобиль  
**tubular radiator** трубчатый радиатор  
**tune up** регулировать; настраивать  
**turning** поворот; вращение  
**twin** парный; двойной  
**twin-cam engine** двигатель с системой газораспределения с двумя распределительными валами  
**twin-cylinder** двухцилиндровый  
**twist grip** поворачивающийся наконечник руля  
**two-stroke engine** двухтактный двигатель  
**tyre** см. **tire**

## U

**universal joint** универсальный шарнир  
**upward stroke** ход вверх

## V

**valve** клапан  
**valve guide** направляющая клапана  
**valve head** головка клапана  
**valve spring** пружина клапана  
**van** фургон; вагон  
**vane** лопасть; лопатка  
**V-belt** клиновым ремень  
**vee-twin** V-образный двухцилиндровый двигатель  
**vehicle** транспортное средство;

**venture** диффузор

## W

**wagon** фургон; вагон; вагонетка

**wash-leather** замша

**water-cooled** водяным охлаждением

**water-cooling** водяное охлаждение

**water jacket** водяная рубашка

**water pump** водяной насос

**wheel** колесо; шестерня

**wheelbase** колёсная база; полная база

**wheel hub** ступица колесо

**wick** фитиль

**windscreen** ветровое стекло

**windscreen wiper** стеклоочиститель

переднего *или* ветрового стекла

**wing** крыло (*кузова*)

**wishbone** поперечный рычаг

подвески

**wishbone lever** вильчатый рычаг

**wishbone suspension** независимая

подвеска рычажного типа

**worm** червяк

## X

**x-type** x-образный

## Y

**yoke** вилка; коромысло; крестовина

кардана

## Z

**zebra crossing** пешеходный переход

типа «зебра»

**zero** нулевая точка

автомобиль

**v-engine** V-образный двигатель

## СОКРАЩЕНИЯ

<b>ATDC</b> after top dead center после верхней мертвой точки	<b>LT</b> light-truck предназначенный для лёгких грузовых автомобилей ( <i>обычно о шинах</i> )
<b>BTDC</b> before top dead center до верхней мертвой точки	<b>MAP</b> manifold absolute pressure абсолютное давление во впускном коллекторе
<b>CPU</b> central processing unit центральный процессор	<b>M+S</b> mud and snow зимняя шина
<b>CSI</b> cold start injector форсунка холодного пуска	<b>n/a</b> not available отсутствует, нет данных
<b>ctrl</b> control управление; регулирование	<b>NVH</b> noise, vibration, harshness шум, вибрация, неплавность движения
<b>cu ft</b> cubic foot кубический фут ( <i>0,02837 м<sup>3</sup></i> )	<b>OEM</b> original equipment manufacture изготовитель подлинного оборудования, машин, деталей и т.п.
<b>cu in</b> cubic inch кубический дюйм ( <i>16,387 см<sup>3</sup></i> )	<b>PLPD</b> personal liability, property damage персональная ответственность, ущерб частной собственности
<b>cu yd</b> cubic yard кубический ярд ( <i>0,76455 м<sup>3</sup></i> )	<b>RH</b> right-hand 1. правый; с правой резьбой 2. правосторонний 3. правого вращения
<b>cyl</b> cylinder цилиндр	<b>ROPS</b> roll-over protection system система защиты при опрокидывании
<b>DFI</b> direct fuel injection непосредственный впрыск топлива	<b>RV</b> recreational vehicle автомобиль с жилым кузовом для отдыха
<b>EDC</b> electronic diesel control электронное управление дизельным двигателем	<b>R+W</b> road and winter зимняя дорожная шина
<b>EMS</b> engine management system система управления двигателем	<b>SIPS</b> side impact protection system система защиты от бокового удара
<b>EV</b> electric vehicle электромобиль	<b>TL</b> tubeless бескамерная ( <i>о шине</i> )
<b>F</b> full полный	<b>TT</b> tube-type камерная ( <i>о шине</i> )
<b>FMCSR</b> Federal Motor Carrier Safety Regulations Федеральные правила безопасности для автоперевозчиков ( <i>США</i> )	<b>TWI</b> tire wear indicator указатель износа шины
<b>ICE</b> internal combustion engine двигатель внутреннего сгорания	<b>yd</b> yard
<b>L</b> low низкий	
<b>LH</b> left-hand 1. левый; с левой резьбой 2. левосторонний 3. левое вращение	

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