**Выполните практические работы**

**Практическая работа № 1.**

**The Engine**

**1. Match the phrases with the Russian equivalents:**

|  |  |
| --- | --- |
| 1. internal combustion engine 2. combustion chamber 3. stroke 4. piston 5. top dead center 6. bottom dead center 7. four-stroke cycle engine 8. two-cycle engine 9. crankshaft 10. intact stroke 11. valve opening 12. fuel system 13. power stroke 14. exhaust | * 1. поршень   2. верхняя мёртвая точка   3. четырёхтактный двигатель   4. коленчатый вал   5. отверстие клапана   6. двигатель внутреннего сгорания   7. нижняя мертвая точка   8. топливная система   9. такт впрыска   ( топлива)   * 1. двухтактный двигатель   2. камера сгорания   3. ход, такт (поршня)   4. выхлоп   5. рабочий ход |

**2. Translate international words:** cylinder, automobile, limit, center, cycle, compression, gas.

**3. Read and translate the text:**

The engine is the source of power that makes the car move. It is usually called an internal combustion engine because gasoline is burned within its cylinders or combustion chambers.

Most automobile engines have six or eight cylinders. The operating cycle of the **four-stroke** engine that takes place in the engine cylinder can be divided into four strokes. The upper limit of the piston movement is called the top dead center. The lower limit of piston movement is called the bottom dead center. A stroke is the piston movement from the top dead center to the bottom dead center or from the bottom dead center to the top dead center. In other words, the piston completes a stroke each time it changes the direction of its motion. Where the entire cycle of the events in the cylinder requires four strokes (two crankshaft revolutions), the engine is called four-stroke cycle engine. The four strokes are: intake, compression, power and exhaust.

**Two-cycles engines** have also been made, and in such engines the entire cycle of events is completed in two strokes or one revolution of the crankshaft. On the intake stroke the intake valve is opened. The mixture of air and vaporized gasoline is delivered into the cylinder through the inlet valve. On the compression stroke the inlet valve is closed so that the mixture can be compressed. On the power stroke both valves (inlet and exhaust) are closed in order to rise pressure during the mixture combustion. On the exhaust valve is opened to exhaust the residual gas.

**4. Make 5 questions closely to the text.**

**Практическая работа № 2.**

|  |  |
| --- | --- |
| * + - 1. water wheel       2. blade       3. wind-power engine       4. furnace       5. steam engine       6. fuel       7. internal combustion engine       8. jet engine | a.паровой двигатель  b.двигатель внутреннего сгорания  с. лопасть  d. водяное колесо   1. реактивный двигатель 2. ветряной двигатель 3. печь, топка 4. топливо |

**What the first engine was 1like?**

**1. Match the phrases with the Russian equivalents:**

**2. Translate international words:** ordinary, economical, boiler, machine, airoplane, locomotive, kerosene, diesel, gas, temperature, metal

**3. Read and translate the text:**

The first engine was called the “**water wheel**”. This was an ordinary wheel with blades fixed to it, and the current of the river turned it. These first engines were used for irrigating fields. Then a **wind-power engine** was invented. This was a wheel, but a very small one. Long wide wooden blades were attached to it. The new engine was driven by the wind. Some of these one can still see in the country. The water- and wind-operated engines are very economical, but they are dependent on the weather. Many years passed and people invented a new engine, one operated by steam. In a **steam engine**, there is a furnace and a boiler. The furnace is filled with wood or coal and then lit. The fire heats the water in the boiler and when it boils, it turns into steam which does some useful work. The more coal is put in the furnace, the stronger the fire is burning. The more steam there is the faster a train or a boat is moving. The steam engine drove all sorts of machines: steam ships and steam locomotives. The first airplane built by A.F. Mozhaisky had a steam engine. The steam engine had its disadvantages. It was too large and heavy, and need too much fuel.

The imperfections of the steam engine led to the design of a new type. It was called the **internal combustion engine**, because its fuel ignites and burns inside the engine itself and not in a furnace. It is smaller and lighter than a steam engine because it does not have a boiler. It is also more powerful, as it uses better-quality fuel: petrol and kerosene. The internal combustion engine is now used in cars, diesel locomotives and motor ships.

To enable airplanes to fly faster than the speed of sound another, more powerful engine was needed. One was invented and it was given the name “jet engine”. The gases in it reach the temperature of over the thousand degrees. It is made of a very resistant metal so that it will not melt.

**4. Answer the questions:**

1. What the first engine was like?
2. When can you see some of the wind-power engines?
3. What disadvantages have the water- and wind-operated engines?
4. How does a steam engine work?
5. What vehicles did drive a steam engine?
6. What advantages has an internal combustion engine?
7. Where is now used the internal combustion engine?
8. What is made the jet engine of?

**Практическая работа № 3.**

**Two-cycle principle**

**1. Match the phrases with the Russian equivalents:**

|  |  |
| --- | --- |
| 1. waste gases  2. scavenging  3. scavenger  4. working stroke  5. crankshaft revolution  6. pump | a. насос  b. поворот коленчатого вала  c. продувка  d. выхлопные газы  e. продувочное устройство  f. рабочий ход |

**2. Read and translate the text:**

Most smaller motorbikes use two-stroke engines. These are lighter and smaller than four-stroke engines, and therefore cheaper. The efficiency of such engines is less than that of four-stroke engines, and therefore the power of a two-stroke engine is always less than half that of a four-stroke engine of comparable size.

The general principle of the two-stroke engine is to shorten the periods in which fuel is introduced to the combustion chamber. The suction and exhaust strokes can be eliminated if, at the end of the power stroke, the two valves are opened simultaneously and the fresh charge is forcibly blown in through the inlet valve driving out the waste gases through the exhaust valve. Then the two valves are closed again and the charge is ready for compression. A simpler way of doing the same thing is to provide openings in the cylinder wall at the lower end in such a way that they are uncovered by the piston as it nears the end of the power stroke. Valves are then no longer necessary. Since the cycle can now be completed in two strokes, it is called two-stroke or two-cycle. A two-cycle has a working stroke at every crankshaft revolution, and, therefore, gives nearly twice the power of a four-cycle engine, which has a working stroke only at every other crankshaft revolution.

The process of blowing out the spent gases by the incoming fresh charge is called scavenging, and the fan or blower or pump required to force the charge in is called the scavenger.

**3. Find equivalents in English in the text:**

1. Они легче и меньше, чем четырёхтактные двигатели, и поэтому дешевле
2. Основной принцип двухтактного двигателя - это сокращение периода в который топливо поступает в камеру сгорания.
3. Более простой путь сделать то же самое - это сделать отверстия в стенке нижнего края цилиндра таким образом, чтобы они открывались поршнем, как только он приближался к концу рабочего хода.
4. Большинство маленьких мотоциклов используют двухтактные двигатели.
5. Процесс выдувания остаточных газов при поступлении свежей порции топлива называется продувкой, а вентилятор, воздуходувка или насос, необходимый для нагнетания топлива называется продувочным устройством.

**4. Answer the questions:**

1. What kind of land vehicles do two-stroke engines use?
2. Why are they cheaper than four-stroke engines?
3. Why the power of a two-stroke engine is always less than half that of a four-stroke engine of comparable size?
4. A two-cycle has a working stroke at every crankshaft revolution or at every other crankshaft revolution?
5. What process is called scavenging?
6. What is called the scavenger?

**Практическая работа № 4.**

**Four-stroke engine**

**1. Match the phrases with the Russian equivalents:**

|  |  |
| --- | --- |
| 1. exhaust  2. working stroke  3. four-cycle  4. suction  5. inlet valve  6. exhaust valve  7. combustion chamber  8. spent or waste charge  9. receding piston  10. the charge  11. ignition  12. hot-air motor  13. piston  14. reciprocating  15. crankshaft | a. коленчатый вал  b. четырёхтактный  c. рабочий ход  d. впускной клапан  e. выпускной клапан  f. всасывание  g. использованная порция топлива  h. камера сгорания  i. порция топлива  j. зажигание  k. поршень, совершающий обратный ход  l. поршень  m. тепловая машина  n. выхлоп  o. возвратно-поступательный |

**2. Translate international words:** Motor, function, compression, cylinder, cycle, operation, product, revolution.

**3. Put the appropriative word(s) :**

1. The space between the piston and the cylinder head is …

a. the working cylinder b. the combustion chamber c. exhaust valve

2) At the very beginning of the return stroke … closes, and the charge is compressed.

a. inlet valve b. exhaust valve c. combustion chamber

1. The process requires four piston strokes is called … .

a. two-stroke cycle b. four-stroke cycle

**4.Read and translate the text:**

All cars and larger motor-cycles use 4-stroke engines. In the hot-air motor the combustion piston performed its function in two strokes: suction of a fresh charge on the forward stroke and compression on return. The expansion piston likewise completed its duty in two strokes: expansion on its forward stroke and exhaust of the spent charge on return.

By merging the two cylinders in one, the same functions are retained, so that now the cycle of operation includes four strokes of piston. This is the way it is done: We have now one cylinder with a piston reciprocating therein. The space between the piston and the cylinder head is the combustion chamber. The first stroke is forward. With a valve (called the inlet valve) open a fresh charge is sucked into the cylinder from the outside by the receding piston. At the very beginning of the return stroke the inlet valve closes, and then the charge is compressed. Just before the end of this stroke ignition is made. On the next forward stroke the combustion is completed and the products of combustion expand. This is the working or power stroke. Last the exhaust valve is opened, and the piston on returning a second time pushes out the spent or waste charge. The piston then is back where it started, and the operation is repeated.

This process requires four piston strokes (two crankshaft revolutions) and is, therefore, called four-stroke cycle, or just four-cycle.

**5. Answer the questions:**

1. What kind of land vehicles do four-stroke engines use?
2. How many strokes of piston does the cycle of operation include in one cylinder now?
3. What kind of strokes did compete its duty the expansion piston in a hot-air motor in?
4. What is the combustion chamber?
5. Is the inlet valve closed or open at the very beginning of the return stroke ?
6. Where is ignition made?
7. Why is this process called four-stroke cycle?

**Практические работы № 5-6.**

**The Gasoline Engine**

**1. Read and translate the texts. Make a title to each letter:**

a) If the fuel (gas, oil) burns inside an engine cylinder, it is then called an internal combustion engine. A gasoline engine is the perfect example. There are two types of gasoline engines – the two-cycle and four-cycle engines. Both types have pistons that move up and down in cylinders.

One cycle (or stroke) is one up movement or one down movement of a piston. In a two-cycle engine, each piston goes down once and up once every time the spark plugs ignite the fuel. Two-cycle engines are used where the machine needs to be light in weight. A power lawn mower usually has a two-cycle engine. So does a model airplane engine. Speed and efficiency are not too important.

Most larger gasoline engines, such as those in automobiles, are four-cycle. In these four-cycle engines, each piston goes down twice and up twice while the fuel is ignited once. A starter mechanism sets the pistons in motion. Once started, explosions resulting from the spark plugs igniting the fuel help keep the pistons moving. Each piston is connected by a rod to a crankshaft which transfers the power to the wheels of the machine.

Every piston goes down twice and up twice (four cycles) to every explosion. The strokes are called (1) intake, (2) compression, (3) power, and (4) exhaust. As the drawing show, one down stroke draws in fuel (intake); one up stroke compresses or squeezes the fuel into the top of the cylinder where it is ignited by the spark plug (compression); a second down stroke uses the power of the explosion to turn the crankshaft (power); a second up stroke drives the burned gases out the exhaust valve (exhaust). This operation is, of course, repeated over and over in every cylinder. The four strokes in one cylinder are completed in a fraction of a second.

There are usually six or more pistons in a four-cycle engine. To get the most power the explosions are timed to go off at different times in each cylinder.

**b)**The diesel engine is also an internal combustion engine. It works on the same cylinder and pistons principal as a gasoline engine. There are, however, two main differences between the diesel and gasoline engine. A diesel engine uses a special grade of fuel oil – not gasoline. Hot compressed air – not the spark from a spark plug – ignites this fuel oil.

There are two-cycle and four-cycle diesel engines. Let’s look at the operation of the one cylinder in a four-cycle diesel engine:

A starter gets the piston moving. As the piston moves downward, it draws air into the cylinder through an air valve. (In some engines, air is forced in by a blower called a supercharger.) That completes one cycle (or stroke). The piston then moves up compressing or squeezing the air into the top of the cylinder. As the air is squeezed, its temperature is increased to about 900° F. this completes the second cycle. Next the oil intake valve opens and oil is sprayed into the cylinder. The heat from the air (like the spark in a gasoline engine) ignites the oil. The resulting explosion forces the piston dawn ward. This third cycle is the power stroke; it turns the engine drive shaft. Finally, as in a burned engine, the piston comes back up and forces the burned or exhaust gases out of the cylinder through an escape valve. This all takes only seconds and occurs in all the cylinders at timed intervals.

A diesel engine gets more energy out of its fuel than any other type internal combustion engine. It is more efficient than a steam engine. The fuel is cheaper, too, requiring less refining than gasoline. Much progress has been made in the design of diesel engines in recent years so more and more of them are in use today. This is especially true among automobiles and light trucks.

**2. Answer the questions.**

1. How do engines help you in your living?
2. What types of engines do you know?
3. What is an internal combustion engine?
4. What types of gasoline engines do you know?
5. Where are two-cycle engines used?
6. What is the function of four-cycle engine?
7. What is the stroke?
8. How many pistons are there in a four-cycle engine?
9. What is the difference between diesel and gasoline engine?
10. Is diesel engine an internal combustion engine?

**3. Use task 2 as a plan and retell the texts.**

**Практическая работа № 7.**

**Carburetor**

* 1. **Match the phrases with the Russian equivalents:**

|  |  |
| --- | --- |
| 1. gas burner  2. volatile  3. carburetor  4. nozzle  5. the engine inlet  6. jet of fuel  7. droplet  8. air intake tube | a. летучий  b. газовая горелка  c. капля  d. жиклёр, форсунка  e. карбюратор  f. впуск двигателя  g. воздушная впускная камера  h. струя топлива |

**2. Translate international words:** gas, ordinary, regulate, proportion, temperature, alcohol, gasoline, kerosene, carburetor, center, minute.

**3. Choose the right answer:**

1. If the fuel is a volatile liquid like …, it may mixed with the air in a carburetor.

a. gas b. kerosene

2. Carburetor consists essentially of a wide tube through which air is sucked into the …

a. working cylinder b. engine inlet c. gas burner

3. The liquid fuel is supplied to a small … .

a. nozzle b. tube c. valve

4. **Read and translate the text:**

If the fuel is gas, it is as simple to mix it with the air, as in an ordinary gas burner. The gas is piped to the air intake tube of the engine and a valve is provided by means of which the proportions of air and gas can be regulated.

If the fuel is a liquid which can easily evaporate at ordinary temperatures (a volatile liquid like alcohol, gasoline, or kerosene), it may mixed with the air in a carburetor. This consists essentially of a wide tube through which air is sucked into the engine inlet. In the center of this there is a small nozzle to which the liquid fuel is supplied. The flowing air produces a suction on the nozzle, and causes a fine jet of fuel to issue from it. This jet is picked up by the air and torn to minute droplets, which evaporate and mix with the air. In the world today carburetor engines far outnumber any other type of engines, and most of them use gasoline for fuel. Their widest application is in the automotive field.

**5.Answer the questions:**

1. Where may mixed the fuel with the air if it is gas?
2. Where may mixed the fuel with the air if it is liquid?
3. What does a carburetor consist of?
4. Where is the liquid fuel supplied to?
5. What engines do outnumber any other type of engines?