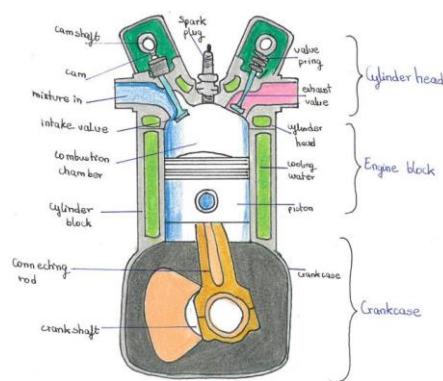


STUDENT A

You have to understand how a petrol four-stroke works in order to explain it to the members of your original team. Discuss it with the members of your Student A team. You have to memorize the parts of the petrol four-stroke engine, the name of each stroke, and what happens in each stroke. You can take some notes about the aspects proposed before, underlined the key words, or/and drawing some pictures.

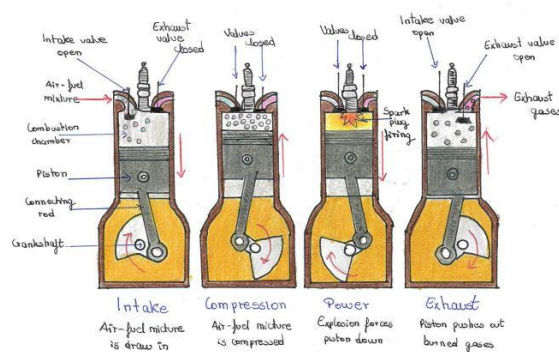
Petrol four-stroke engine

Four-stroke engine were designed by the German engineer Nikolaus Otto (1876). Follow the thermodynamic cycle with his name. A four-stroke engine completes the thermodynamic cycle in four movements of the piston (between the moment in which petrol come inside the cylinder and it is repeated this action, piston has four movements); for this reason, is called four-stroke engine. Use petrol as a combustile (to initiate the combustion process it is needed an air-fuel mixture). With a crankshaft and connecting rod system, the lineal movement is transformed in rotary motion. These engines are lightweight than Diesel engines.



Four-strokes: (You have the help of a draw)

1. **INTAKE STROKE:** Piston goes down, sucking a mixture of air and fuel into cylinder through the intake port. The intake valve then closes.
2. **COMPRESSION STROKE:** With both intake and exhaust valves closed, piston goes up, compressing fuel and air mixture. This heats mixture.
3. **POWER STROKE:** Spark from spark plug ignites mixture. Gases expand and force piston down.
4. **EXHAUST STROKES:** Piston rises again while the exhaust valve is open, pushing out remains of burned gases as exhaust fumes.



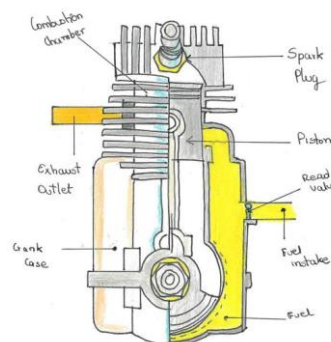
Go to this webpage to watch a simulation: <http://auto.howstuffworks.com/engine1.htm> or <http://www.myrc toys.com/fags/engine-diagrams-and-animations> (in this last page you have to go to A 4 -Cycle engine and click on a picture) and <http://www.animatedengines.com> (search for your internal combustion engine).

STUDENT B

You have to understand how a two-stroke works in order to explain it to the members of your original team. Discuss it with the members of your Student B team. You have to memorize the parts of the two-stroke engine, the name of each stroke, and what happens in each stroke. You can take some notes about the aspects proposed before, underlined the key words, or/and drawing some pictures.

Two-stroke engine

Invention of the two-stroke cycle is attributed to Scottish engineer Dugald Clerk who invented the 2-stroke engine in 1878 and in 1881 patented his design. The two-stroke engines follow the Otto thermodynamic cycle as well, but this engine completes the cycle in two movements of the piston; for this reason, it is called a two-stroke engine. This is accomplished by using the beginning of the compression stroke and the end of the combustion stroke to perform simultaneously the intake and exhaust functions. Two-stroke engines require a specific oil to gas ratio. It is used in some motorbikes.



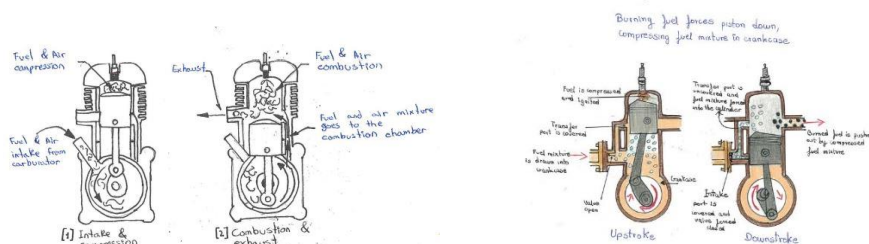
Two-strokes: (You have the help of a draw)

1. INTAKE AND COMPRESSION:

Piston starts its movement from the bottom of the cylinder starting to go up. The intake port is uncovered and the mixture of combustible and air is pushed to the crankcase where it is pressurized by the piston movement. In its up movement, the piston covers the exhaust port. When fuel and air in the cylinder have been compressed, the spark plug fires the mixture ignites.

2. COMBUSTION AND EXHAUST:

The resulting explosion drives the piston downward. As the piston approaches the bottom of its stroke, the exhaust port is uncovered. The pressure in the cylinder drives most of the exhaust gases out of the cylinder. Note that as the piston moves downward, it is compressing the air/fuel mixture in the crankcase.



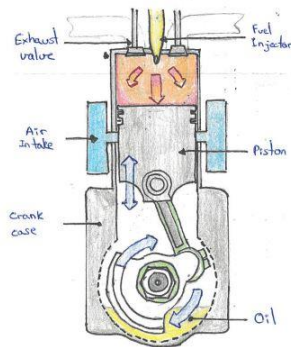
Go to this webpage to watch a simulation: <http://science.howstuffworks.com/transport/engines-equipment/two-stroke2.htm> or <http://www.myrctoys.com/faqs/engine-diagrams-and-animations> (in this last page you have to go to A 2 -Cycle engine and click on a picture) and <http://www.animatedengines.com> (search for your internal combustion engine).

STUDENT C

You have to understand how a diesel four-stroke works in order to explain it to the members of your original team. Discuss it with the members of your Student C team. You have to memorize the parts of the diesel four-stroke engine, the name of each stroke, and what happens in each stroke. You can take some notes about the aspects proposed before, underlined the key words, or/and drawing some pictures.

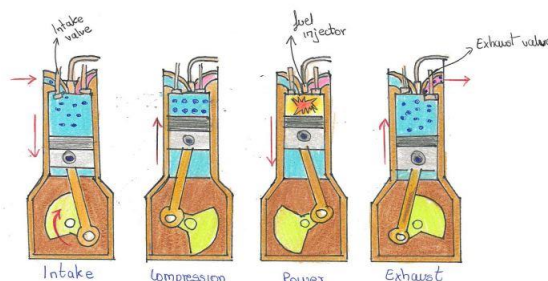
Diesel four-stroke engine

Diesel engine was designed by the German engineer Rudolf Diesel in 1897. Follow the thermodynamic cycle with his name (Diesel). Diesel engine is used mainly by larger vehicles and some trains, and in the last years is becoming more popular in private cars in Europe. Diesel engines work in a similar way to petrol engines, but at stroke one, only air is taken into the cylinder. This is compressed and heated to a very high temperature at stroke two. Diesel fuel is forced into the cylinder at stroke three, where it is so hot that the fuel burns without a spark. So, this kind of engines doesn't need spark plug. Diesel engines can be used for much more time than the petrol engines. Diesel engines have the highest thermal efficiency of any regular internal or external engine; the fuel is Gasoil. Diesel engines are noisier than petrol engines.



Four-strokes: (You have the help of a draw)

1. **INTAKE STROKE:** Piston goes down, sucking air into cylinder through the intake port. The intake valve then closes.
2. **COMPRESSION STROKE:** With both intake and exhaust valves closed, piston goes up, compressing the air. This heats the air.
3. **POWER STROKE:** As the piston reaches the top, fuel is injected at just the right moment and ignited with the hot air. Gases expand and force piston down.
4. **EXHAUST STROKES:** Piston rises again while the exhaust valve is open, pushing out remains of burned gases as exhaust fumes.



Go to any of these webpage to watch a simulation: <http://auto.howstuffworks.com/diesel1.htm> or <http://www.myrctoys.com/faqs/engine-diagrams-and-animations> (in this last page you have to go to Diesel engine and click on a picture) and <http://www.animatedengines.com> (search for your internal combustion engine).