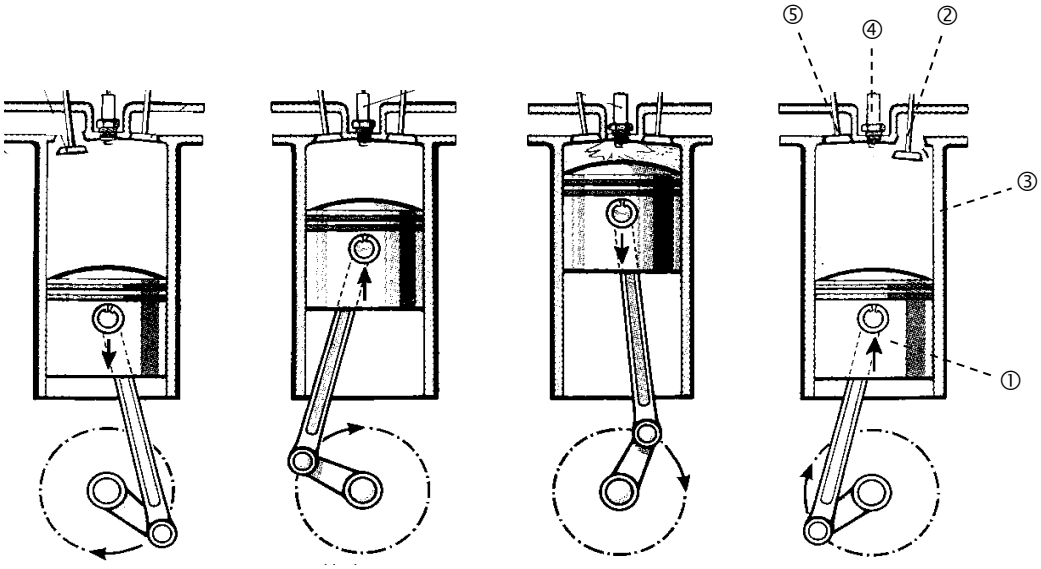
1. Four stroke gasoline engine (Otto engine)



a) *spark plug*: ④, *intake valve (poppet valve)*: ⑤, *exhaust valve*: ②, *piston*: ①, *cylinder*: ③

b) vaporized fuel/air mixture

c) 1) I. Intake valve open, exhaust valve closed
II. The vaporized fuel/air mixture flows into the cylinder, through the intake valve (doesn't flow out, no compression, no ignition)
III. No work done on the piston - it moves because of its momentum

2) I. Both valves closed
II. The vaporized fuel/air mixture is being compressed in the cylinder because the cylinder is moving upwards (doesn't flow in or out, no ignition)
III. No work done on the piston - it moves because of its momentum

3) I. Both valves closed
II. The spark plug ignites the vaporized fuel/air mixture in the piston. The gas burns very fast (explosion) and drives the piston downwards (doesn't flow in or out, no compression)
III. Work is done on the piston

4) I. Intake valve closed, exhaust valve open
II. The burned fuel/air mixture leaves the cylinder through the exhaust valve (doesn't flow in, no compression, no ignition)
II. No work done on the piston - it moves because of its momentum

2. Four stroke Diesel engine

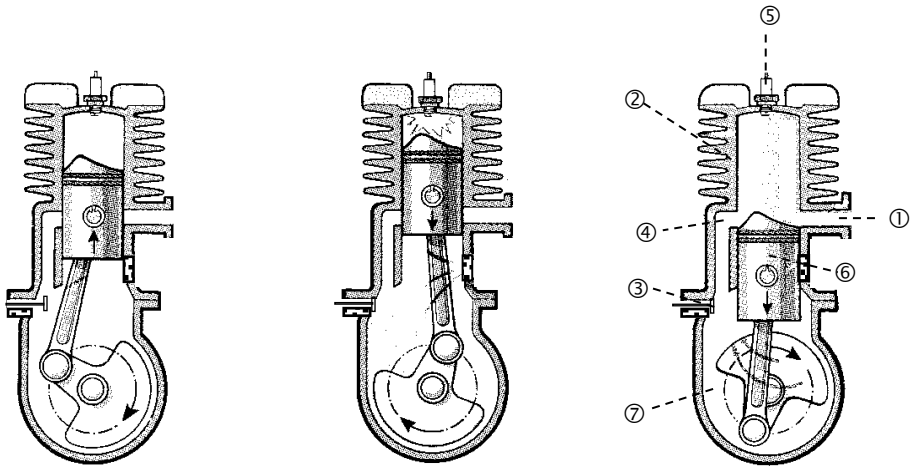
a) *fuel injector*: only Diesel engine
spark plug: gasoline engine
intake valve (poppet valve), exhaust valve, piston, cylinder: both engines

b) air

c) Diesel is injected at the moment when the piston is at its highest point and the air inside the cylinder is at high pressure and high temperature (about 600 °C).

d) Due to the high temperature of the compressed air the Diesel ignites spontaneously.

3. Two stroke engine



1) 2) 3)

a) *spark plug*: ⑤*, intake poppet valve*: ③*, intake port*: ④*, exhaust port*: ①*, crank case*: ⑦*, piston*: ⑥*, cylinder*: ②

b) vaporized fuel/air mixture

c) 1) I. Intake poppet valve open, intake port and exhaust port closed
II. The vaporized fuel/air mixture flows into the crank case, through the intake poppet valve (doesn't flow in or out of the cylinder, no ignition)
At the same time, the vaporized fuel/air mixture which is in the cylinder is being compressed as the piston moves upwards
III. No work done on the piston - it moves because of its momentum

2) I. All openings are closed
II. The spark plug ignites the vaporized fuel/air mixture in the piston. The gas burns very fast (explosion) and drives the piston downwards (doesn't flow in or out)
At the same time, the vaporized fuel/air mixture which is in the crank case is being compressed as the piston moves downwards
III. Work is done on the piston

3) I. Intake poppet valve closed, intake port and exhaust port open
II. The vaporized fuel/air mixture flows from the crank case through the intake port into the cylinder
At the same time, the burned fuel/air mixture leaves the cylinder through the exhaust port (no compression, no ignition)
III. No work done on the piston - it moves because of its momentum