



### Experiment No: 6

**AIM:** - To study Two-stroke & Four-stroke Petrol Engines. **APPARATUS USED:** - Model of Two-stroke & Four-stroke Petrol Engines.

#### **THEORY-**

**CYCLE-** When series of events are repeated in order, it completes one cycle. Cycle is generally classified as four stroke cycle and two stroke cycle.

**Four stroke cycle-** In Four stroke cycle, four operations are required to complete one cycle. These four operations are suction, compression, power and exhaust.

**Two stroke cycles-** In a two stroke cycle, the series of events of the working cycle is completed in two strokes of the piston and one revolution of the crankshaft. The four operations i.e. suction, compression, power and exhaust are completed during two strokes of the piston.

**ENGINE-** A power producing machine is called an engine.

**HEAT ENGINE-** An engine which converts heat energy into mechanical energy is called a heat engine.

*Types of heat engine –*

a) **External Combustion engine**- The engine in which the combustion of fuel takes place outside the cylinder is called an external combustion engine.

b) **Internal Combustion engine**- The engine in which the combustion of fuel takes place inside the cylinder is called an internal combustion engine.

#### FOUR STROKE PETROL ENGINE-

In four stroke petrol engine or spark ignition engine all the events of the cycle i.e. suction, compression, expansion and exhaust take place in two revolutions of the crank shaft i.e.  $720^\circ$  of the crank rotation. Thus each stroke is of  $180^\circ$  crank shaft rotation. Therefore the cycle of operation for an ideal four stroke engine consists of the following four strokes:

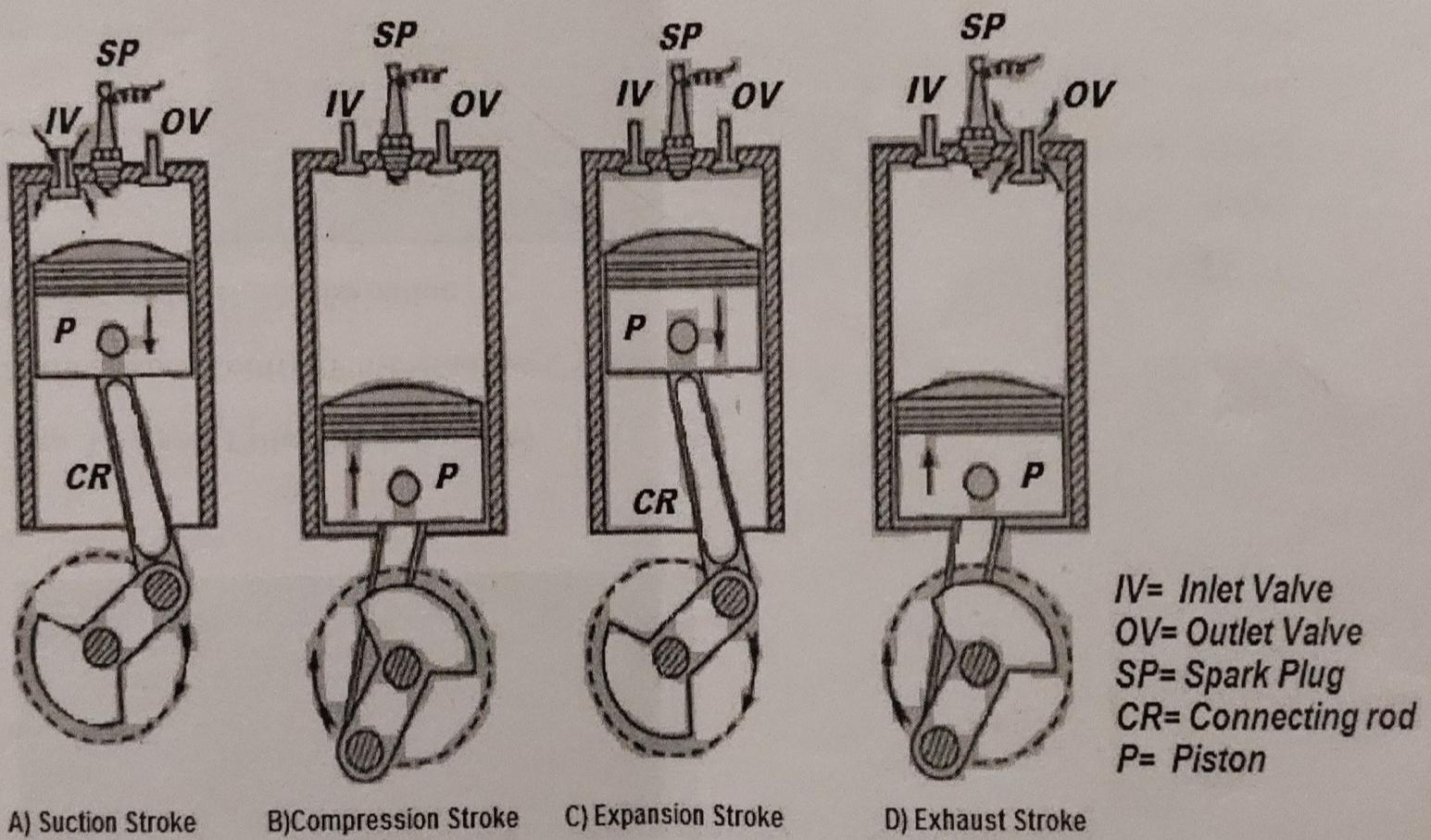
- a) **Suction Stroke**- The piston moves from Top Dead Centre (TDC) to Bottom Dead Centre (BDC). The inlet valve opens and a fresh charge of fuel and air mixture enters the cylinder. The exhaust valve remains closed. When the piston reaches Bottom Dead Centre (BDC), the inlet valve also closed.
- b) **Compression Stroke**- The piston moves from Bottom Dead Centre (BDC) to Top Dead Centre (TDC) position. Both the valves remain closed. The charge drawn



during suction stroke is compressed in this stroke.

c) **Expansion or Power or Working Stroke-** Just before the piston completes its compression stroke, the charge is ignited by the spark plug and the rapid explosion takes place. The expansion of hot gases pushes the piston down to BDC position. Both the valve remains closed and the useful work is obtained from the engine.

d) **Exhaust Stroke-** The piston moves from BDC to TDC, the exhaust valve opens and the inlet valve remains closed. The piston pushes the exhaust gases out through the exhaust valve to the atmosphere till it reaches the TDC position and the cycle is completed.



**Figure- Four Stroke Petrol Engine**

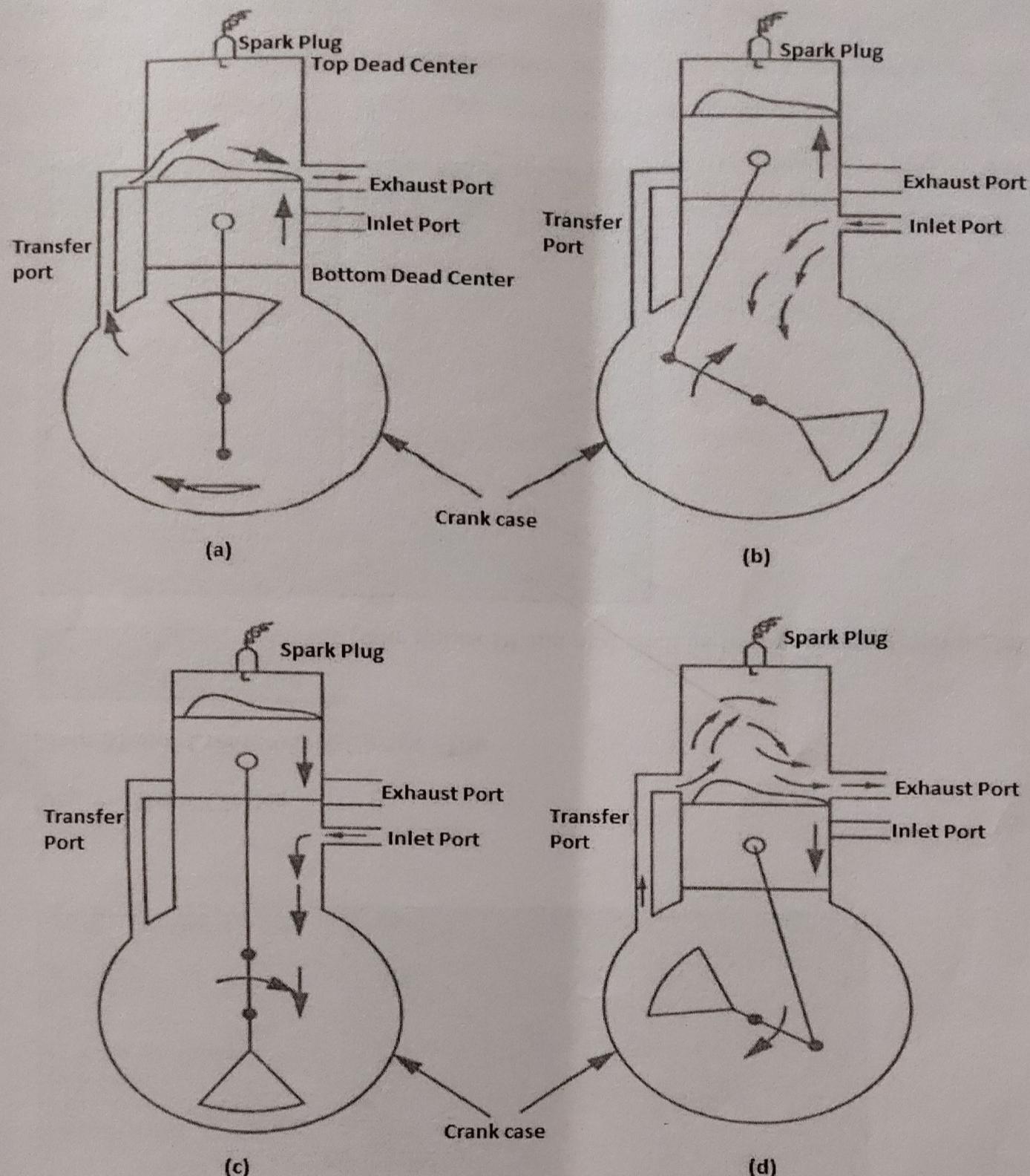
#### TWO STROKE PETROL (S.I.) ENGINE-

In two stroke cycle petrol engine, there are two strokes of the piston and one revolution of the crankshaft to complete one cycle. In two stroke engines ports are used instead of valve i.e. suction port, transfer port and exhaust port. These ports are



covered and uncovered by the up and down movement of the piston. The top of the piston is deflected to avoid mixing of fresh charge with exhaust gases. The exhaust gases are expelled out from the engine cylinder by the fresh charge of fuel entering the cylinder. The mixture of air and petrol is ignited by a spark produced at the spark plug. The two stroke of the engine are-

**First Stroke-** Assuming the piston to be at the BDC position. The inlet port is converted by the piston whereas the transfer port and exhaust port are uncovered. The piston moves from BDC to TDC. The air petrol mixture enters the cylinder. On the upward movement of the piston, first of all the transfer port is converted and then immediately, the exhaust port is covered. Simultaneously the suction port also gets uncovered, the upward movement of the piston helps to compress the air fuel mixture at the top and creates partial vacuum at the bottom in the crankcase which gets filled with air fuel mixture by the atmospheric pressure. At the end of the stroke, the piston reaches the TDC position completing the compression stroke as shown in Fig. (a) and (b).



**Fig-TWO STROKE CYCLE PETROL (S.I.) ENGINE-**

**Second Stroke-** Just before the completion of the compression stroke, the compressed charge is ignited in the combustion chamber, by means of an electric spark produced by the spark plug. Combustion of air fuel mixture pushes the piston in the downward direction, on the power stroke producing useful work. The movement of the power action is over, the exhaust port is uncovered. The exhaust



gases escape to the atmosphere. Further movement of the piston covers the inlet port and the fresh charge is compressed in the crankcase. Simultaneously the transfer port is also uncovered. The compressed mixture of air fuel enters the combustion chamber. The deflected shape of the piston avoids inter-mixing of the fresh charge and exhaust gases i.e. the fresh charge rises to the top of the cylinder and pushes out most of the exhaust gases. Thus the three actions, power, exhaust and induction are completed from TDC to BDC position completing one cycle i.e. two stroke of the piston and one revolution of the crankshaft as shown in Fig. (c) and (d).