

Explain the working of window air conditioner with neat sketch.

The low pressure and low temperature refrigerant vapour from evaporator is sucked by compressor. The compressor compresses the vapour to high pressure and high temperature and discharges to the condenser. On the condenser the refrigerant vapour condenses by dissipating heat to the cooling medium (air) the liquid refrigerant coming out of condenser passes through filter, dryer into capillary tube where it is again throttled back to the evaporated pressure.

Difference Heat Pump Refrigerator

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Difference heat pump refrigerator is elaborated in the following table. Actually both devices are same but just the application is different.

Explain the working principle of jet propulsion with a neat sketch.

Working principle of jet propulsion - Jet propulsion is based on

Newton's second law and third law's of motion. - Means producing forward axial thrust by means of reaction of jet of gases which are discharged rearward with a high velocity (aircraft, missile & submarine) - As applied to vehicle operating in fluid, a momentum is imparted to a mass of fluid in a such a manner that the reaction of imparted momentum furnishes a propulsive force. The magnitude of this propulsive force is termed as thrust.

What is MPFI ? Explain any one MPFI system with neat sketch

The MPFI means multi point injection system. In this system each cylinder has number of injector to supply/ spray fuel in cylinder as compared to one injector located centrally to supply and spray fuel in case of single point injection system

(a) **Port injection system :**

- In the port injection arrangement, the fuel injectors are mounted on the side of the intake manifold. The injector sprays petrol into the air stream inside the intake manifold.

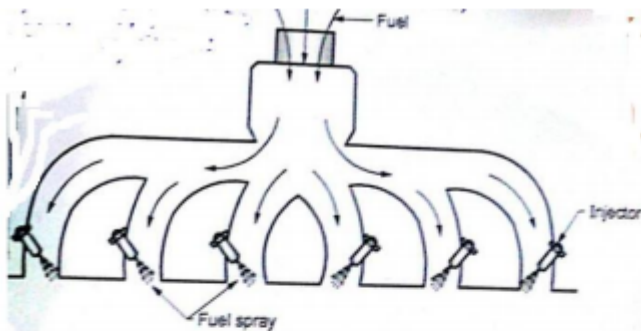
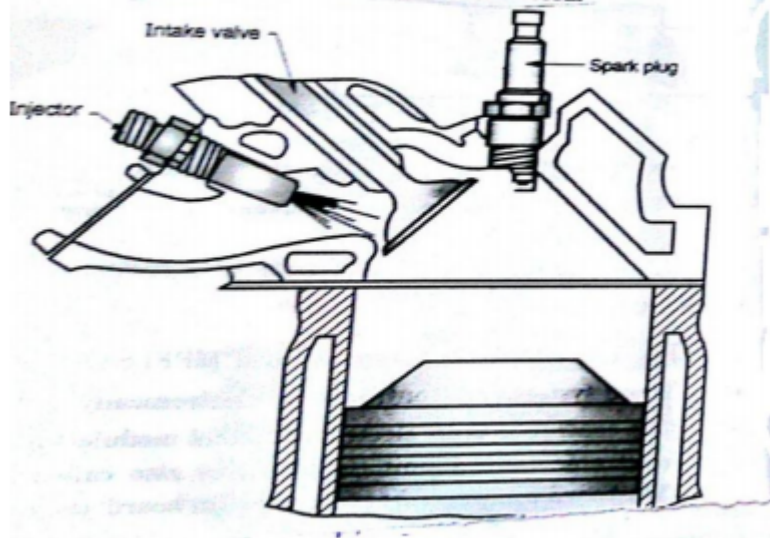
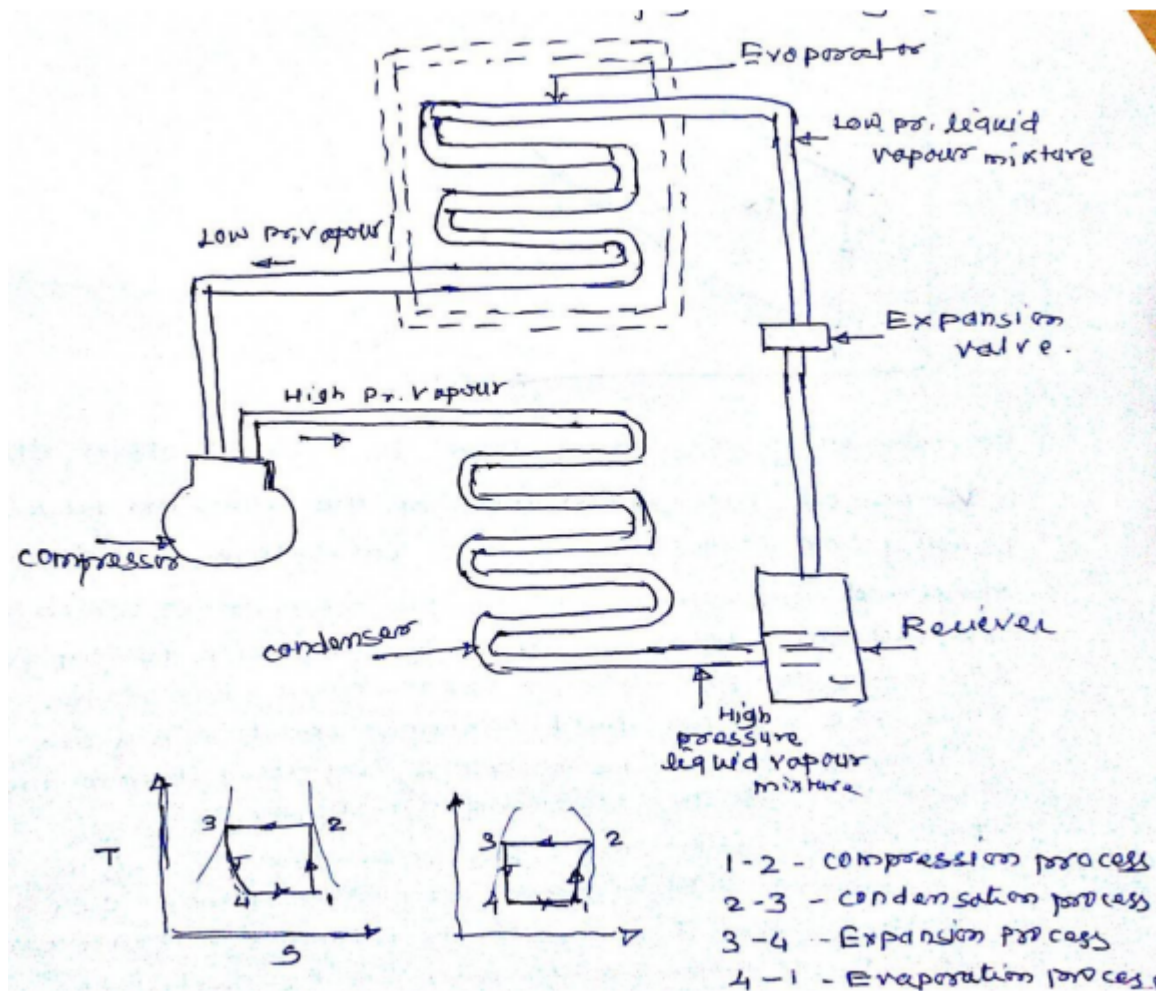


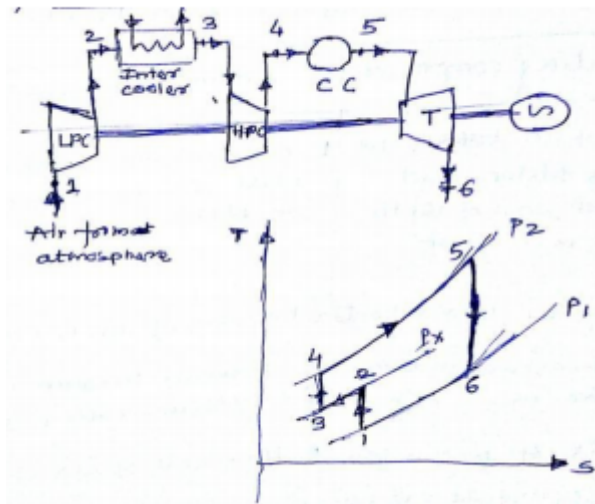
Fig. : Port injection or Multi-point fuel injection

- The petrol mixed in the air stream completely. This mixture of petrol and air then passes through the intake valve and enters into the cylinder.
- Each cylinder is provided with an injector in its intake manifold.
- The number of injector is always equal to number of cylinder (Fig. shows a simplified view of a port or multi point fuel injection (MPFI) system.

Draw a neat sketch of vapour compression refrigeration cycle. Describe its working



Explain intercooling and reheating in gas.....



LPC - LOW pressure cylinder HPC - high pressure cylinder CC - combustion chamber T - Turbine (2+ 2 marks) The net work of gas turbine cycle may be increased by saving some compression work. This is done by using several stages of compression with inter cooling of air between stages. The air from first stage of compression is cooled in inter cooler approximately to its initial temperature before entering to second stage of compressor.

Differentiate between reciprocating and rotary compressors

Reciprocating compressor	Rotary compressor
1. Compressor of air take place with help of piston and cylinder arrangement with reciprocating motion of piston.	1. Compression of air take place due to rotary motion of blades.

2. Delivery of air intermittent.	2. Delivery of air is continuous.
3. Delivery pressure is high i.e. pressure ratio is high.	3. Delivery pressure is low, i.e. pressure ratio is low.
4. Flow rate of air is low.	4. Flow rate of air is high.
5. Speed of compressor is low because of unbalanced forces.	5. Speed of compressor is high because of perfect balancing.
6. Reciprocating air compressor has more number of moving parts.	6. Rotary air compressor has less number of moving part.
7. It needs proper lubrication and more maintenance.	7. It required less lubrication and maintenance.
8. Due to low speed of rotation it can't be directly coupled to prime mover but it requires reduction of speed.	8. Rotary air compressor can be directly coupled to prime mover.
9. It is used when small quantity of air at high pressure is required.	9. It is used where large quantity of air at lower pressure is required.

The following results were obtained during Morse test on 4-stroke petrol engine. B.P.....

$$(B.P.)_{\text{engine}} = 16.2 \text{ kW}, (B.P.)_{2,3,4} = 11.55 \text{ kW}, (B.P.)_{1,3,4} = 11.63 \text{ kW}, (B.P.)_{1,2,4} = 11.68 \text{ kW}$$

$$(B.P.)_{1,2,3} = 11.51 \text{ kW}$$

$$I.P. \text{ of } 1^{\text{st}} \text{ cylinder} = I_1 = (B.P.)_{\text{engine}} - (B.P.)_{2,3,4} = 16.2 - 11.55 = 4.65 \text{ kW}$$

Similarly,

$$I_2 = (B.P.)_{\text{engine}} - (B.P.)_{1,3,4} = 16.2 - 11.63 = 4.57 \text{ kW}$$

$$I_3 = (B.P.)_{\text{engine}} - (B.P.)_{1,2,4} = 16.2 - 11.68 = 4.52 \text{ kW}$$

$$I_4 = (B.P.)_{\text{engine}} - (B.P.)_{1,2,3} = 16.2 - 11.51 = 4.69 \text{ kW}$$

Indicated power of engine

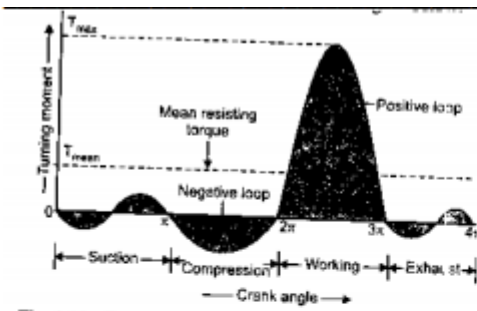
$$I.P. = I_1 + I_2 + I_3 + I_4 = 4.65 + 4.57 + 4.52 + 4.69 = 18.43 \text{ kW}$$

$$\text{Mechanical efficiency} = \frac{B.P.}{I.P.} * 100$$

$$\text{Mechanical efficiency} = \frac{16.2}{18.43} * 100$$

$$\text{Mechanical efficiency} = 87.9 \% \quad \text{-----Ans}$$

Explain with neat sketch turning moment diagram for a four-stroke engine.



During suction stroke, negative loop is formed as pressure inside engine cylinder is less than atmospheric pressure.

During compression stroke, work is done on gases therefore higher negative loop is formed.

During expansion or power stroke, fuel burn & gases expand therefore large positive loop is formed & during this stroke we get work output.

During exhaust stroke, work is done on the gas to expel it out of cylinder, hence negative loop is formed.

What is jet propulsion ? Give the classification of jet propulsion system.

Jet Propulsion: This is done by expanding the gas which is at high temperature & pressure through the nozzle so that the gas with very high velocity leaves the nozzle giving thrust in opposite direction. - Principle is based on Newton's Second & third law of motion. Jet propulsion - Classification (1) Atmospheric jet engines (breathing engine) - Turbojet engine - Turbo prop engines - Ram jet (2) Rocket engine (Non - breathing engine)

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