	Anjuman College Of Engineering & Technology, Sadar, Nagpur		LABORATORY MANUAL
	DEPARTMENT OF MECHANICAL ENGINEERING		
	Practical Experiment Instruction Sheet		YEAR : 2017-18
Final Year	SEM-VIII	SUBJECT: REFRIGERATION AND AIR CONDITIONING	

## Experiment No:1

**Aim:** *To study construction and working of domestic refrigerator.*

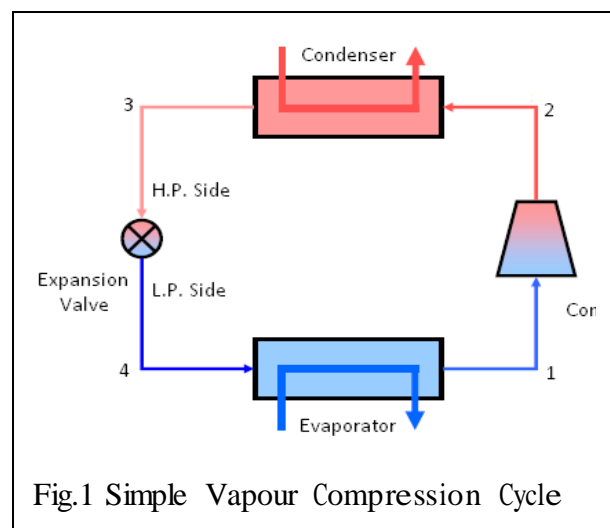
**Apparatus:** Refrigerator Samsung make, Capacity 192 Ltrs, Freezer Capacity 25 ltrs, Refrigerator Fresh Food Capacity 167 Liters.

**Theory:** Refrigeration is defined as the process of extracting heat from a lower-temperature heat source, substance, or cooling medium and transferring it to a higher-temperature heat sink. Refrigeration maintains the temperature of the heat source below that of its surroundings while transferring the extracted heat, and any required energy input, to a heat sink, atmospheric air, or surface water. A refrigeration system is a combination of components and equipment connected in a sequential order to produce the refrigeration effect. The refrigeration systems commonly used for air conditioning can be classified by the type of input energy and the refrigeration process as follows:


1. Vapor compression systems. In vapor compression systems, compressors activate the refrigerant by compressing it to a higher pressure and higher temperature level after it has produced its refrigeration effect. The compressed refrigerant transfers its heat to the sink and is condensed to liquid form. This liquid refrigerant is then throttled to a low-pressure, low temperature vapor to produce refrigerating effect during evaporation.

### Internal Parts of the Domestic Refrigerator

The internal parts of the refrigerator are ones that carry out actual working of the refrigerator. Some of the internal parts are located at the back of the refrigerator, and some inside the main compartment of the refrigerator. Some internal parts of the domestic refrigerator are (please refer the figure above):



1) **Refrigerant:** The refrigerant flows through all the internal parts of the refrigerator. It is the refrigerant

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that carries out the cooling effect in the evaporator. It absorbs the heat from the substance to be cooled in the evaporator (chiller or freezer) and throws it to the atmosphere via condenser. The refrigerant keeps on recirculating through all the internal parts of the refrigerator in cycle.

2) **Compressor:** The compressor is located at the back of the refrigerator and in the bottom area. The compressor sucks the refrigerant from the evaporator and discharges it at high pressure and temperature. The compressor is driven by the electric motor and it is the major power consuming device of the refrigerator.

3) **Condenser:** The condenser is the thin coil of copper tubing located at the back of the refrigerator. The refrigerant from the compressor enters the condenser where it is cooled by the atmospheric air thus losing heat absorbed by it in the evaporator and the compressor. To increase the heat transfer rate of the condenser, it is finned externally.

4) **Expansive valve or the capillary:** The refrigerant leaving the condenser enters the expansion device, which is the capillary tube in case of the domestic refrigerators. The capillary is the

thin copper tubing made up of number of turns of the copper coil. When the refrigerant is passed through the capillary its pressure and temperature drops down suddenly.

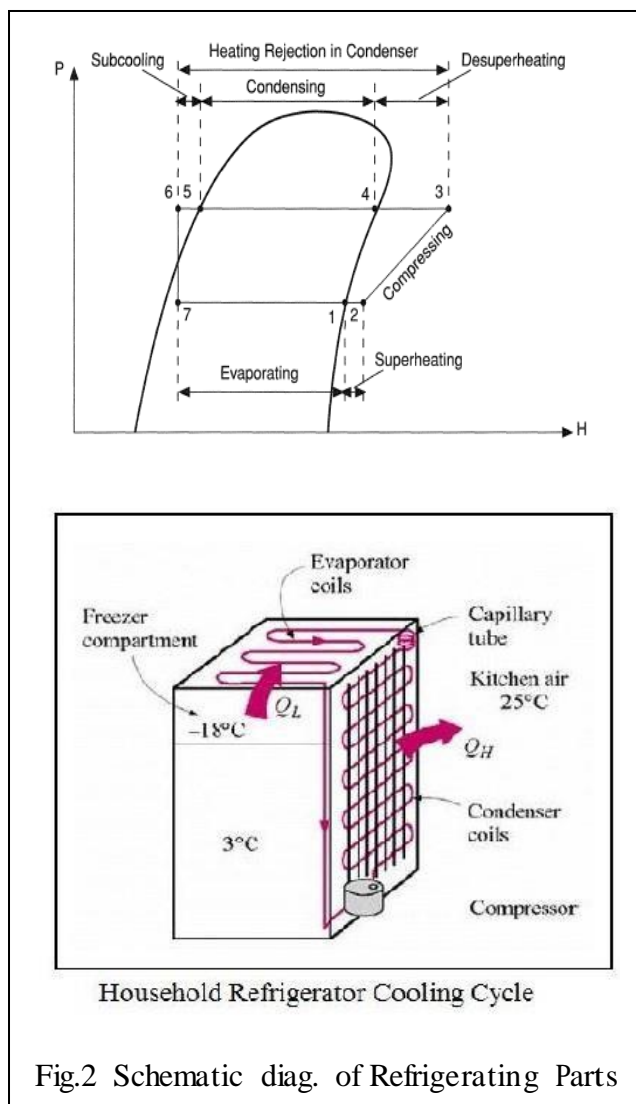



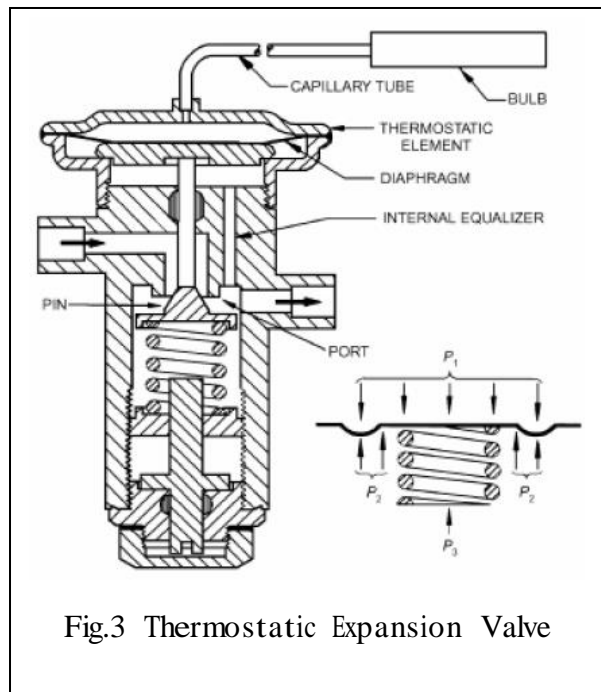
Fig.2 Schematic diag. of Refrigerating Parts


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5) **Evaporator or chiller or freezer:** The refrigerant at very low pressure and temperature enters the evaporator or the freezer. The evaporator is the heat exchanger made up of several turns of copper or aluminum tubing. In domestic refrigerators the plate types of evaporator is used as shown in the figure above. The refrigerant absorbs the heat from the substance to be cooled in the evaporator, gets evaporated and it then sucked by the compressor. This cycle keeps on repeating.

6) **Temperature control devise or thermostat:** To control the temperature inside the refrigerator there is thermostat, whose sensor is connected to the evaporator. The thermostat setting can be done by the round knob inside the refrigerator compartment. When the set temperature is reached inside the refrigerator the thermostat stops the electric supply to the compressor and compressor stops and when the temperature falls below certain level it restarts the supply to the compressor.

7) **Defrost system:** The defrost system of the refrigerator helps removing the excess ice from the surface of the evaporator. The defrost system can be operated manually by the thermostat button or there is automatic system comprising of the electric heater and the timer. Those were the some internal parts of the domestic refrigerator; now let us see the external parts of the refrigerator. The external parts of the refrigerator are: freezer compartment, thermostat control, refrigerator compartment, crisper, refrigerator door compartment, light switch etc.

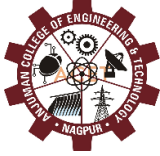


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### External Visible Parts of the Refrigerator

The external parts of the compressor are the parts that are visible externally and used for the various purposes. The figure below shows the common parts of the domestic refrigerator and some them are described below:

- 1) **Freezer compartment:** The food items that are to be kept at the freezing temperature are stored in the freezer compartment. The temperature here is below zero degree Celsius so the water and many other fluids freeze in this compartment. If you want to make ice cream, ice, freeze the food etc. they have to be kept in the freezer compartment.
- 2) **Thermostat control:** The thermostat control comprises of the round knob with the temperature scale that help setting the required temperature inside the refrigerator. Proper setting of the thermostat as per the requirements can help saving lots of refrigerator electricity bills.
- 3) **Refrigerator compartment:** The refrigerator compartment is the biggest part of the refrigerator. Here all the food items that are to be maintained at temperature above zero degree Celsius but in cooled condition are kept. The refrigerator compartment can be divided into number of smaller shelves like meat keeper, and others as per the requirement.
- 4) **Crisper:** The highest temperature in the refrigerator compartment is maintained in the crisper. Here one can keep the food items that can remain fresh even at the medium temperature like fruits, vegetables, etc.
- 5) **Refrigerator door compartment:** There are number of smaller subsections in the refrigerator main door compartment. Some of these are egg compartment, butter, dairy, etc.
- 6) **Switch:** This is the small button that operates the small light inside the refrigerator. As soon the door of the refrigerator opens, this switch supplies electricity to the bulb and it starts, while when the door is closed the light from the bulb stops. This helps in starting the internal bulb only when required.

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### DO AND DON'T – WHILE USING REFRIGERATOR:

1. The refrigerator should be placed away from the heat source such as sunrays, heating appliance, cooking gas, etc.
2. Install the refrigerator away from wall at least by one foot which provides good air circulation over condenser.
3. Hot fluids should not be kept in refrigerator.
4. Keep door openings at minimum.
5. Strongly flavored food must be kept wrapped.
6. Vegetables, fruits should be kept in polythene bags before placing into the refrigerator.
7. Clean with soft cloth. No soap, detergent should be used.

### IN HOLIDAYS:

1. Remove every stored item including ice trays.
2. Defrost refrigerator.
3. Make refrigerator dry.
4. Disconnect power (three-pin plug).
5. Leave the door slightly open for movement of fresh air.

### RESTARTING:

1. Clean the Refrigerator.
2. Connect 3-pin plug.
3. Load the refrigerator after temperature has stabilized.

**Conclusion:** The domestic refrigerators now a day are becoming essential part of life. These refrigerators are available in different capacities as well as different working models. These are having single door double door options, frost free refrigerators; quick chill refrigerators are also available. To make the refrigerators smart now a day the condensers are sealed and refrigerators are made flat back. The compressors used in household refrigerator are hermetically sealed reciprocating units. Now a days noise free rotary hermetically seals compressors are also used. The refrigerant R-12 which was popularly used in household refrigerators is discarded due to its ODP (ozone depletion potential). It is replaced by R-134(a).