AKTU

B. Tech I-Year

Gateway Classes

Semester -I & II

Common to All Branches

Fundamentals of Mech. Engg.(BME101/201)

UNIT-3 : Refrigeration & Air-Conditioning

Hand Written Notes

Gateway Series for Engineering

- Topic Wise Entire Syllabus
- Long - Short Questions Covered
- AKTU PYQs Covered
- DPP
- Result Oriented Content

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B. Tech I-Year

Gateway Classes

Fundamentals of Mech. Engg.(BME101/201)

Hand Written Notes

Unit-3

Introduction to Refrigeration and Air-Conditioning

Syallbus

Refrigeration: Refrigerating effect, Ton of Refrigeration; Coefficient of performance, methods of refrigeration, construction and working of domestic refrigerator, concept of heat pump.

Air-Conditioning: Its meaning and application, humidity, dry bulb, wet bulb, and dew point temperatures, comfort conditions, construction and working of window air conditioner.

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Fundamentals of Mech. Engg. **By M. S. Tomer Sir**

Topic : Refrigeration & AC

Lecture - 1

Topics to be covered

- Refrigeration and Refrigerant
- Applications of Refrigeration
- 1 tonne of refrigeration
- Refrigerator and Heat Pump
- Coefficient of Performance (COP)
- PYQs

Refrigeration and Refrigerant

Refrigeration is a process of maintaing a lower temperature compared to surrounding temperature.

- In order to maintain temperature continuously, the refrigeration system must run on a cycle.

Refrigerant is a substance used for producing lower temperature.

- Example are NH_3, water, air, R-11, R-12, R-32, R-134 etc.
- Refrigerants absorb heat at a low temperature and reject heat at a higher temperature.

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Applications of Refrigeration

- Refrigeration has numerous applications across various industries and everyday life.

These are some common applications of refrigeration:

1. Food Preservation:
   - Domestic Refrigerators
   - Commercial Refrigeration
   - Cool storage
2. Medical and Pharmaceutical:
   - Vaccine storage
   - Blood Banks
   - Laboratories
3. Industrial Applications:
   - Chemical Processing
   - Plastics Manufacturing
4. Transport:
   - Refrigerated Trucks & containers
   - Marine Refrigeration
5. Comfort Cooling
   - Air conditioning

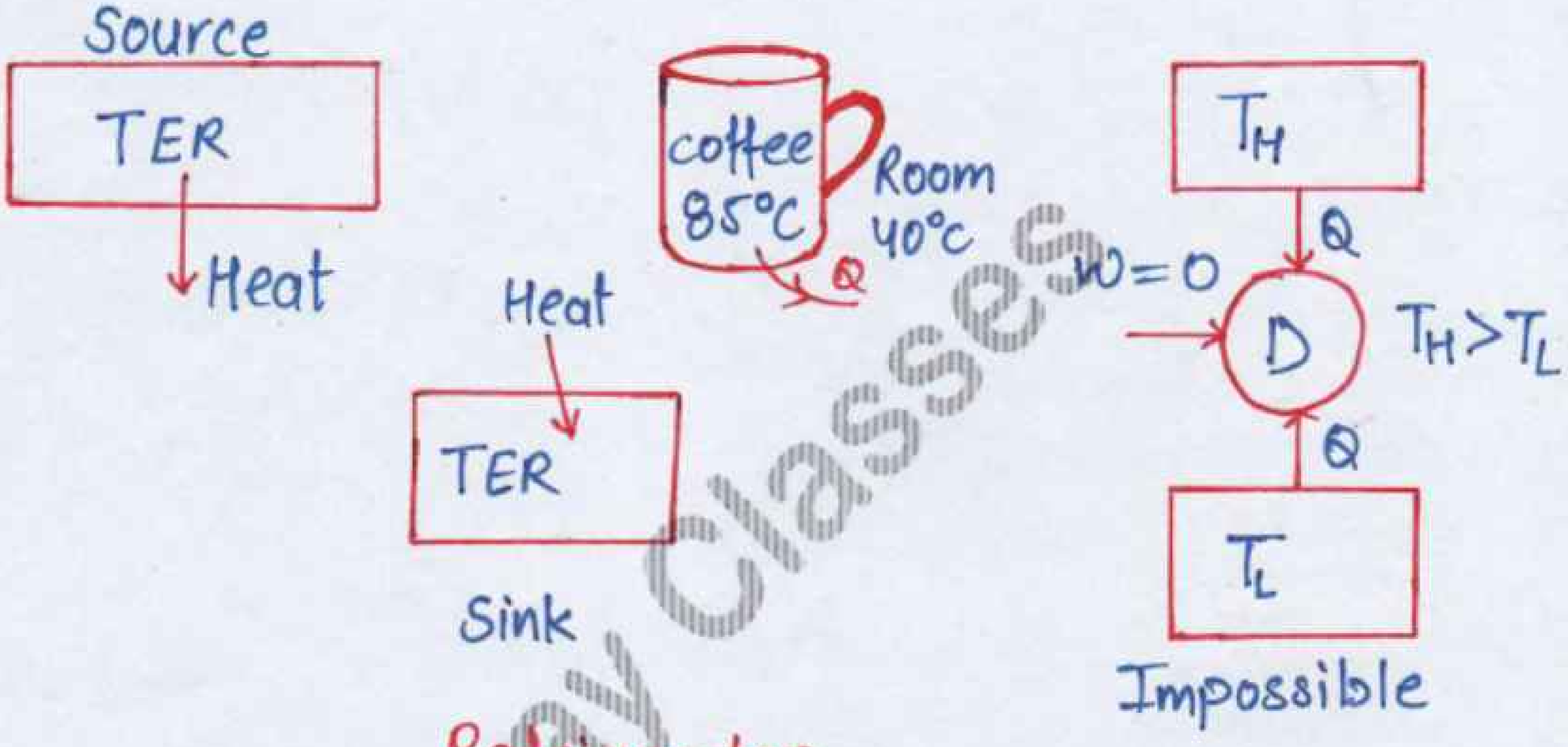
1 tonne of refrigeration [AKTU]

- It is the amount of heat that is to be removed from one tonne of water at zero (0°C) in order to convert it into ice at 0°C in one day (24 Hours).
- Tonne of refrigeration represents heat transfer rate.

$$1\,TR = 3.5\,kJ/s = 3.5\,kW = 210\,kJ/min$$

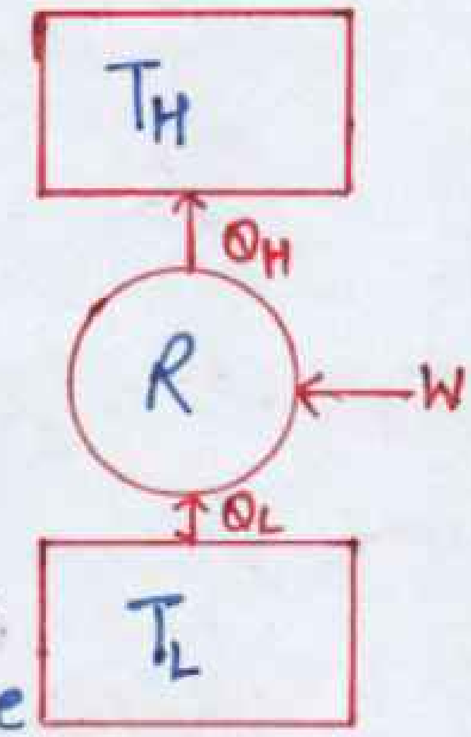
Refrigerator and Heat Pump [AKTU: 2020-21]

Clausius Statement: "It is impossible to construct a device which operates on a cycle and transfer heat from low temperature body to high temperature body without any external work".



Refrigerator

- Refrigerator works on the clausis statement.
- It absorbs the heat (Q_L) from the low temperature medium and rejects heat into the high-temperature (Q_H) medium by consuming external work (W).
- Refrigerator is used to maintain low temperature as compared to the surrounding temperature.



$E_{in} = E_{out}$

$Q_L + W = Q_H$

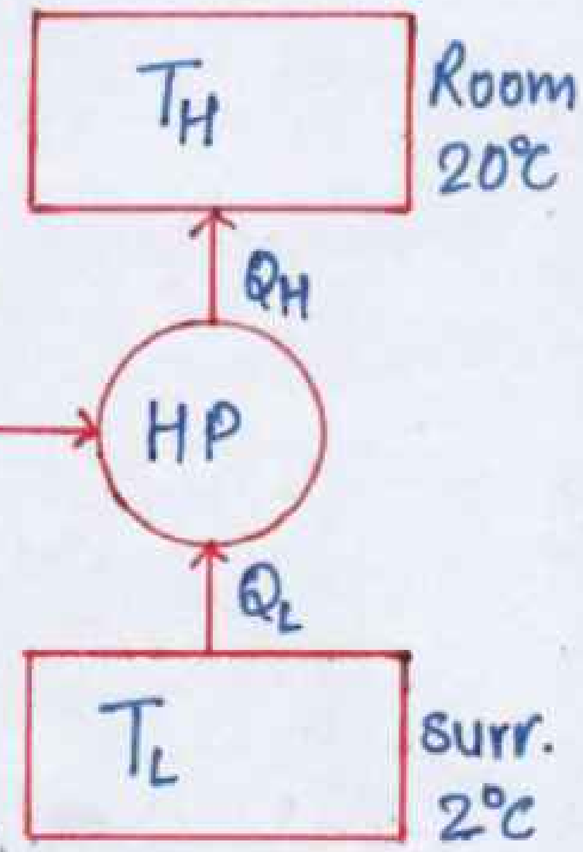
$\boxed{W = Q_H - Q_L}$

$$(COP)_R = \frac{\text{Desired Effect}}{\text{Required Input}} = \frac{\text{Cooling Effect}}{\text{Work Input}}$$

$$\boxed{(COP)_R = \frac{Q_L}{W} = \frac{Q_L}{Q_H - Q_L} = \frac{T_L}{T_H - T_L}}$$

Heat Pump

- Heat Pump ~~Refrigerator~~ works on the Clausis Statement.
- It absorbs the heat from the low-temperature medium and rejects heat into the high-temperature medium by consuming external work.
- Heat Pump is used to maintain high-temperature as compared to surrounding temperature.



$$(COP)_{HP} = \frac{\text{Desired Effect}}{\text{Required Input}} = \frac{\text{Heating Effect}}{\text{Work Input}}$$

$$\boxed{(COP)_{HP} = \frac{Q_H}{W} = \frac{Q_H}{Q_H - Q_L} = \frac{T_H}{T_H - T_L}}$$

Relation between the COP of refrigerator and heat pump

$$(COP)_{HP} - 1 = \frac{Q_H}{Q_H - Q_L} - 1$$

$$(COP)_{HP} - 1 = \frac{Q_H - Q_H + Q_L}{Q_H - Q_L}$$

$$(COP)_{HP} - 1 = \frac{Q_L}{Q_H - Q_L}$$

$$\boxed{(COP)_{HP} = 1 + (COP)_R}$$

$$\boxed{(COP)_R = \frac{Q_L}{Q_H - Q_L}}$$

$$\boxed{(COP)_{HP} = \frac{Q_H}{Q_H - Q_L}}$$

Coefficient of Performance [COP) [AKTU]

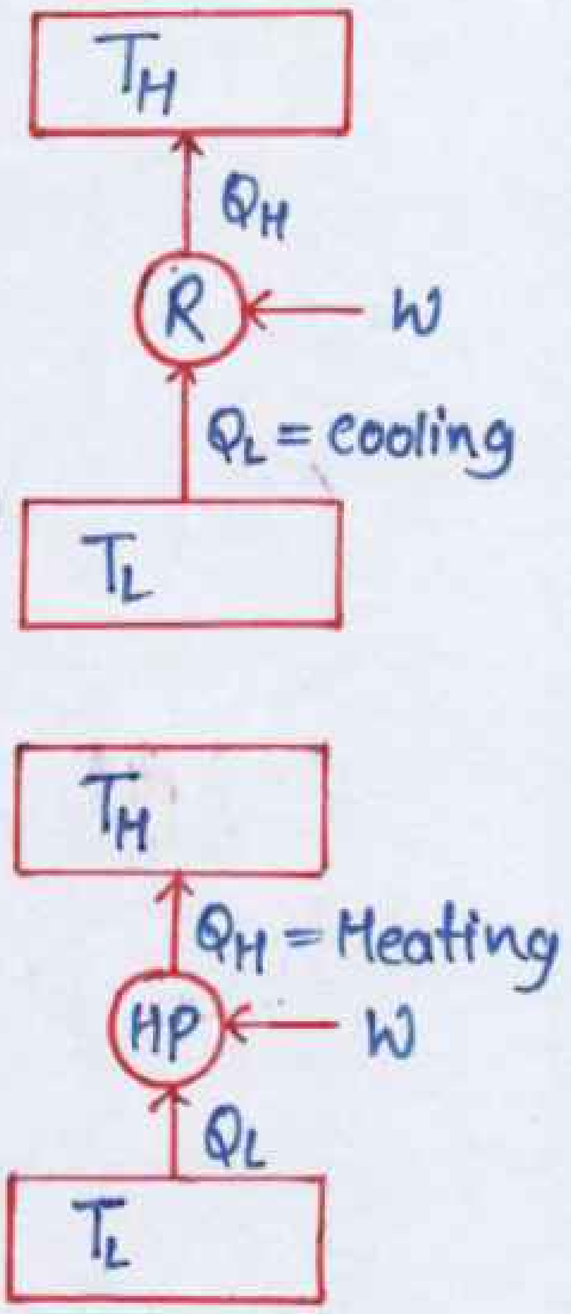
It is defined as the ratio of useful heating or cooling provided to the work (energy input) required to produce that heating or cooling.

For a refrigeration system, the COP is given by

$$(COP)_R = \frac{Q_L}{W} = \frac{Q_L}{Q_H - Q_L}$$

For a heat pump, the COP is given by

$$(COP)_{HP} = \frac{Q_H}{Q_H - Q_L} = \frac{Q_H}{W}$$



COP and Thermal efficiency

- The efficiency of a refrigerator and heat pump is expressed in terms of the coefficient of performance (COP).
- The value of COP can be greater than unity $(COP) \geq 1$
- Thermal efficiency can never be greater than 1. $(\eta < 1)$
- The COP represents the running cost of refrigerator and heat pump.

- Higher COP indicates a more efficient system, as it produces more cooling or heating for a given amount of energy input.
- Higher the value of COP lower the running cost. COP↑ ⇒ R.C↓

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Fundamentals of Mech. Engg. **By M. S. Tomer Sir**

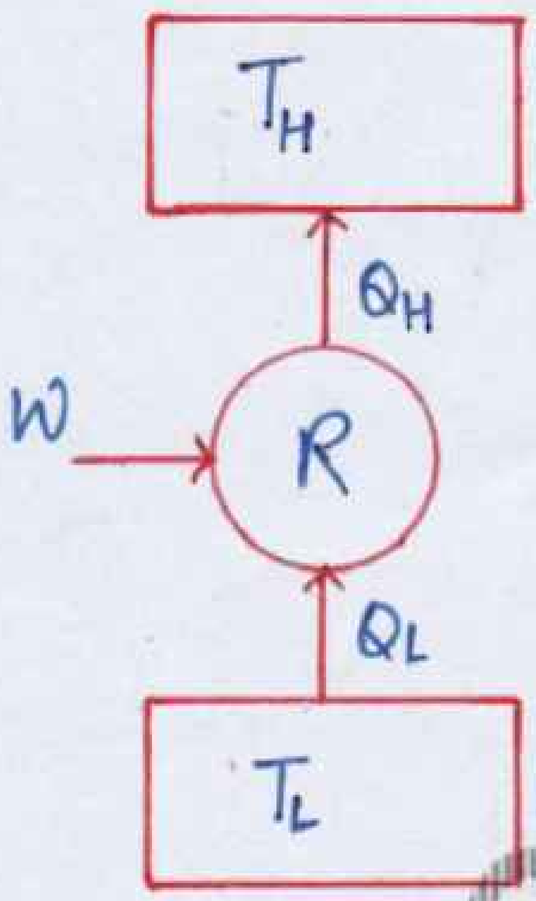
Topic: Introduction to Refrigeration and Air-Conditioning

Lecture-2

Today's Target

- Numeral Problems based on Refrigerator and Heat pump.
- AKTU PYQs

Numerical Problems based on Refrigerator and Heat Pump.



$$(COP)_R = \frac{Q_L}{W} = \frac{Q_L}{Q_H - Q_L} = \frac{T_L}{T_H - T_L}$$

$T \rightarrow K$

$$(COP)_{HP} = \frac{Q_H}{W} = \frac{Q_H}{Q_H - Q_L} = \frac{T_H}{T_H - T_L}$$

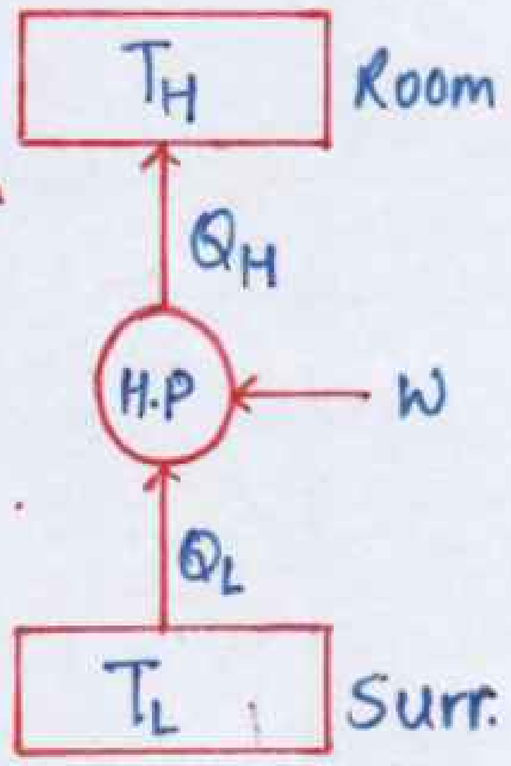
$$(COP)_{HP} = (COP)_R + 1$$

$E_{in} = E_{out}$

$Q_L + W = Q_H$

$$W = Q_H - Q_L$$

1 tonne = 1TR. = 3.5 kJ/s = 210 kJ/min



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Q.1 The food compartment of a refrigerator is maintained at 4°C by removing heat from it at a rate of 360 kJ/min. If the required power input to the refrigerator is 2KW, determine (a) the ~~cop~~ COP of the refrigerator and (b) the rate of heat rejection to the room.

Soln Given

$T_L = 4°C$

$Q_L = 360$ KJ/min

$= 360/60$ KJ/s

$= 6$ KJ/s $\Rightarrow Q_L = 6$KW

$W = 2$kW

(a) $(COP)_R = ?$

(b) $Q_H = ?$

(a)

$$(COP)_R = \frac{Q_L}{W} = \frac{6KW}{2kW}$$

$\boxed{(COP)_R = 3}$ Ans

(b) $W = Q_H - Q_L$

$2KW = Q_H - 6KW$

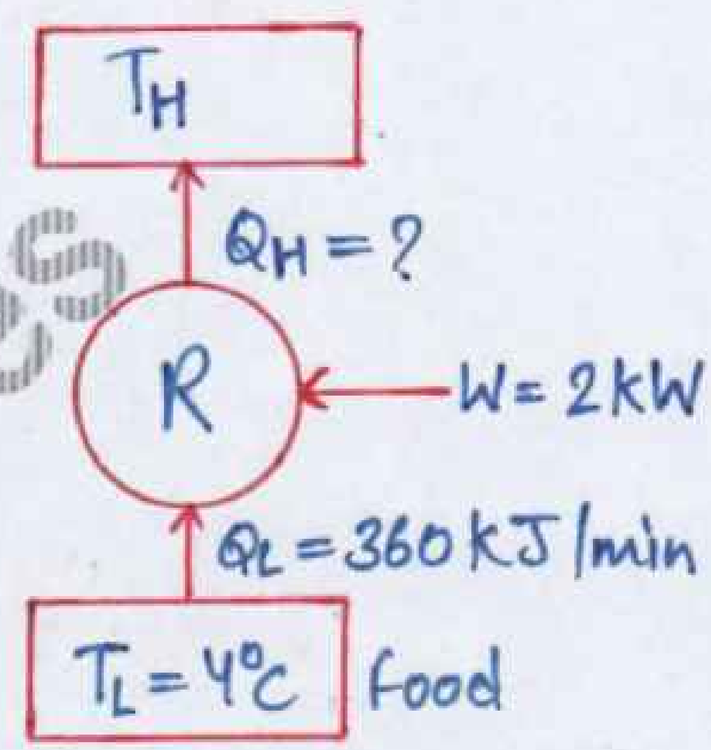
$Q_H = 8$ kW

KW = KJ/s

or

$Q_H = 8 \times 60$ KJ/min

$\boxed{Q_H = 480 KJ/min}$ Ans



Q.2 A heat pump has a COP of 1.7. Determine the heat transferred to and from this heat pump when 50KJ of work is supplied.

Soln Given

$(COP)_{HP} = 1.7$

$W = 50$KJ

To determine

Q_L & $Q_H = ?$

$(COP)_{HP} = \frac{Q_H}{W}$

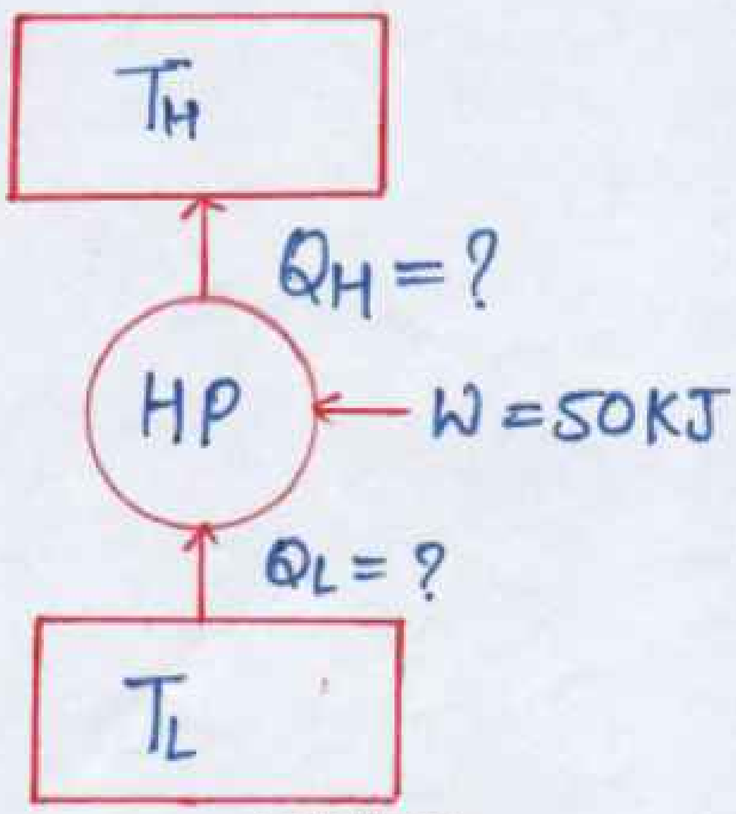
$1.7 = \frac{Q_H}{50}$

$\boxed{Q_H = 85 KJ}$

$W = Q_H - Q_L$

$50 = 85 - Q_L$

$\boxed{Q_L = 35 KJ}$



Q.3 What is the refrigeration effect? 1.5 kW per tonne of refrigeration is required to maintain the temperature of -40°C in the refrige-rator. If the refrigeration cycle work on carnot cycle, determine the following:

(i) COP of the cycle

(ii) Temperature of the sink

(iii) Heat rejected to the sink per tonne of refrigeration

(iv) Heat supplied and COP, if the cycle if used as a heat pump.

Ans The refrigeration effect refers to the amount of heat that is absorbed or extracted from a substance or space during the refrigeration process.

Given:

Q_L = 1 tonne = ~~135~~ 3.5 kJ/s

$Q_L = 3.5$ kJ/s

$W = 1.5$ kW $= 1.5$ kJ/s

$T_L = -40°C$

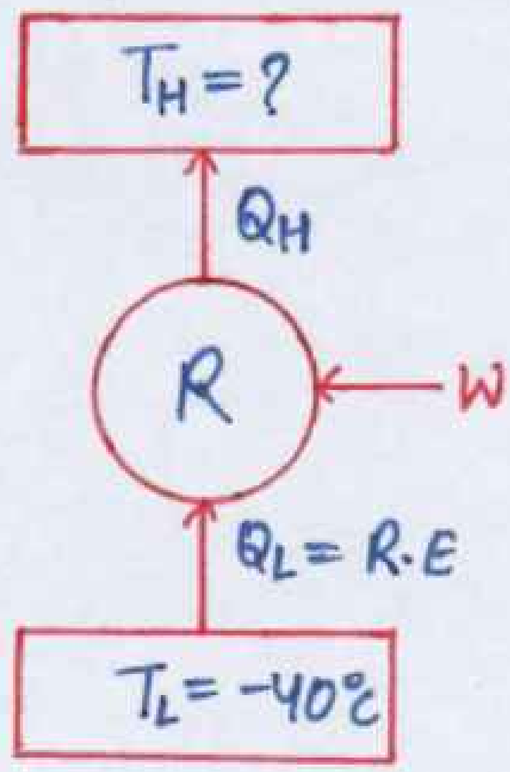
$T_L = -40 + 273 = 233$

(1) $(COP)_R = ?$

(2) $T_H = ?$

(3) $Q_H = ?$

(4) $(COP)_{HP} = ?$



$Q_H = ?$

(1) $(COP)_R = \frac{Q_L}{W}$

$= \frac{3.5}{1.5}$

$(COP)_R = 2.33$

(2) $(COP)_R = \frac{T_L}{T_H - T_L}$

$2.33 = \frac{233}{T_H - 233}$

$T_H = 333K$

$T_H = 60°C$

(3) $W = Q_H - Q_L$

$1.5 = Q_H - 3.5$

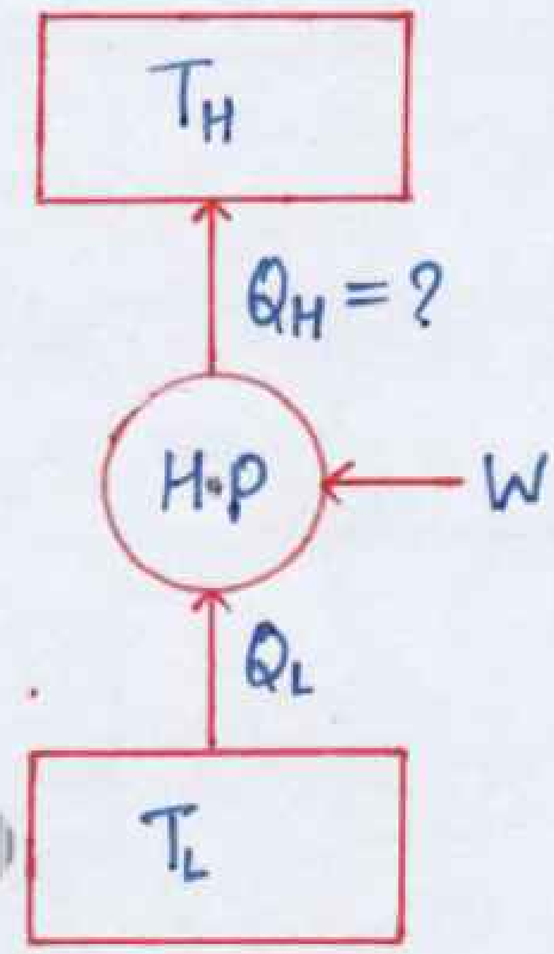
$Q_H = 5\ kJ/s$

(4) $(COP)_{HP} = 1 + (COP)_R$

$= 1 + 2.33$

$(COP)_{HP} = 3.33$

$Q_H = 5\ kJ/s$



Q.4 A domestic food freezer maintains a temperature of -15°C. The ambient air temperature is 30°C. If heat leaks into the freezer at the continuous rate of 1.75 KJ/s what is the least power necessary to pump this heat out continuously?

Given:

$T_L = -15°C + 273 = 258K$

$T_H = 30°C + 273 = 303K$

$Q_L = 1.75\ KJ/s$

To determine least

Power $= W_{min} = ?$

$(COP)_R = \frac{Q_L}{W}$

$W_{min} = \frac{Q_L}{[(COP)_R]_{max}}$

$W_{min} = \frac{1.75}{5.73}$

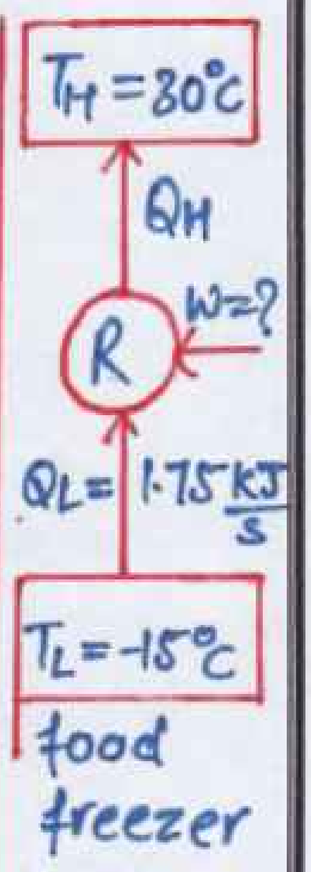
$W_{min} = 0.305\ kJ/s$

$W_{min} = 0.305\ kW$

$(COP)_{max} = \frac{T_L}{T_H - T_L}$

$(COP)_{max} = \frac{258}{303 - 258}$

$(COP)_{max} = 5.73$



Q.5 Find the co-efficient of performance and heat transfer rate in the condenser of a refrigerator in KJ/h which has a refri-gerator capacity of 12000 KJ/h when power input is 0.75 kW.

Given:

$Q_L = 12000\ kJ/h$

$Q_L = 12000/3600\ kJ/s$

$= 3.33\ kJ/s$

$W = 0.75\ kW\ (kJ/s)$

$(COP)_R = ?$

$Q_H = ?$

$(COP)_R = \frac{Q_L}{W}$

$(COP)_R = \frac{3.33\ kJ/s}{0.75\ kJ/s}$

$(COP)_R = 4.44$

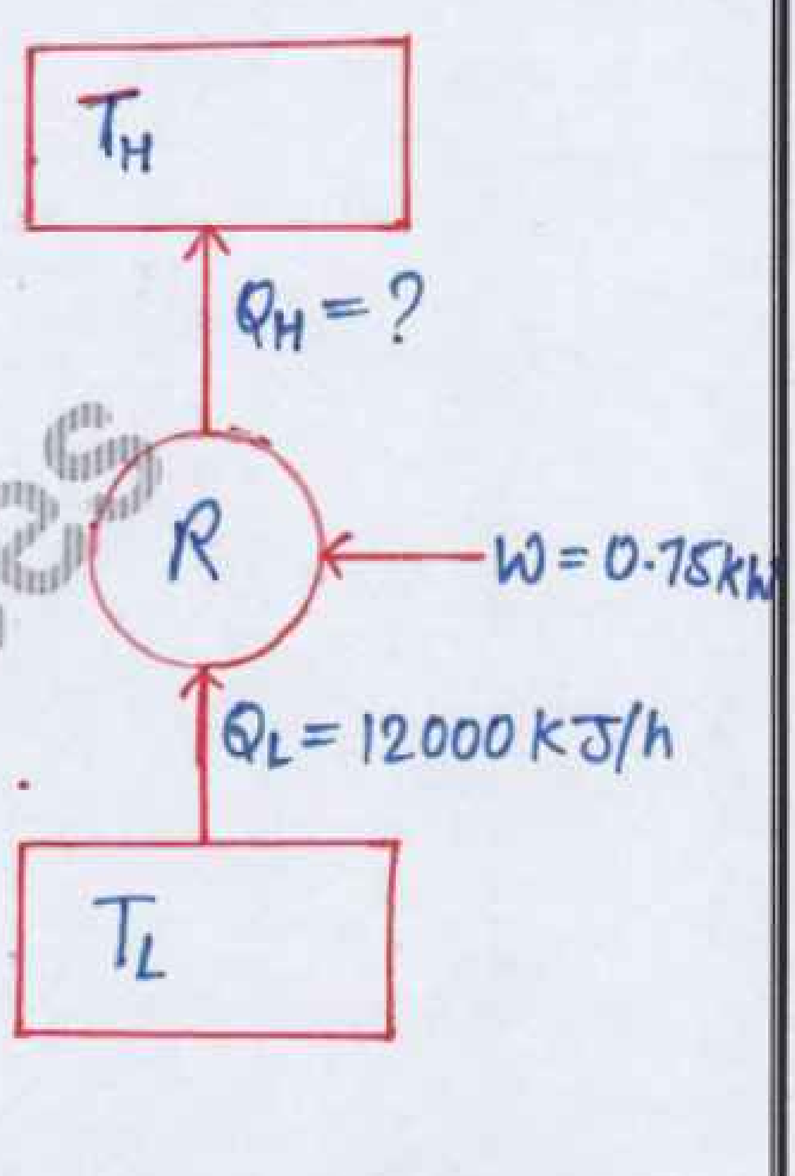
$W = Q_H - Q_L$

$0.75 = Q_H - 3.33$

$Q_H = 4.08\ kJ/s$ or

$Q_H = 4.08 \times 3600$

$Q_H = 14688\ kJ/h$



Q.6 A fish freezing plant requires 40 tons of refrigeration. The freezing temperature is -35°C while the ambient temperature is 30°C. If the performance of the plant is 20% of the theoretical cycle working within the same temperature limits, calculate the power required.

Given:

$Q_L = 40\ tons\ [1\ T.R = 3.5\ kJ/s]$

$Q_L = 40 \times 3.5$

$Q_L = 140\ kJ/s\ (kW)$

$T_L = -35°C = 238K$

$T_H = 30°C = 303K$

$(COP)_{act} = 20\% \left[\frac{T_L}{T_H - T_L}\right]$

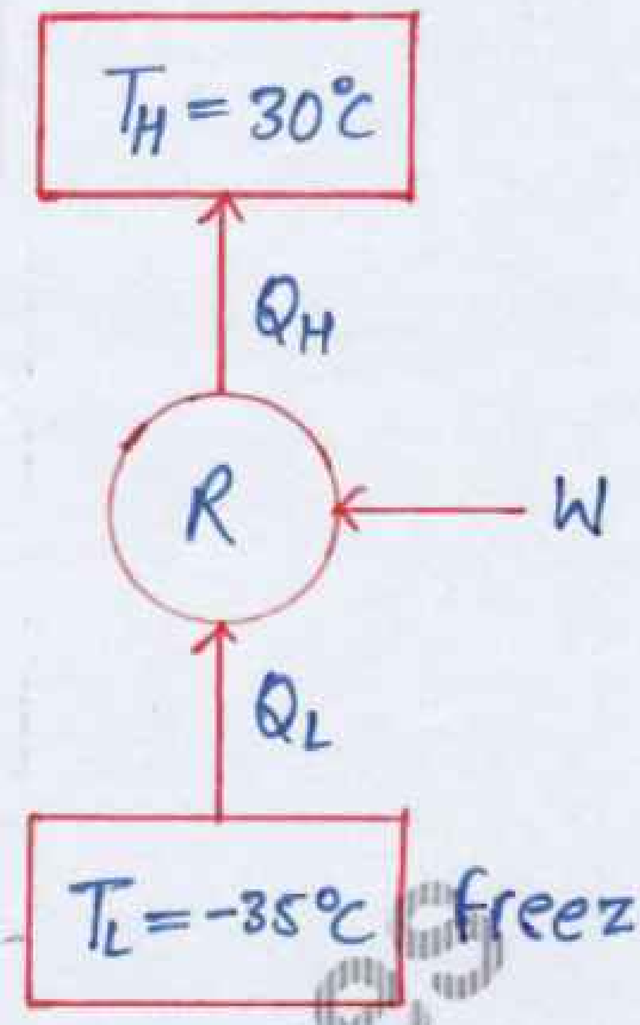
$$(COP)_{act} = 0.2\left[\frac{T_L}{T_H - T_L}\right]$$

$$(COP)_{act} = 0.2\left[\frac{238}{303-238}\right]$$

$$(COP)_{act} = 0.732$$

$$(COP)_R = Q_L/W \Rightarrow 0.732 = \frac{140}{W}$$

$$W = 191.25\ kJ/s\ (kW)$$



Q.7 A cold storage is to maintained at $-5°C$ while the surrounding are at $35°C$. The heat leakage from the surroundings into the cold storage is estimated to be 29 kW. The actual C.O.P. of the refrigeration plants is one-third of an ideal plant working between some temperatures. Find the power required to derive the plant. [AKTU 2023-24]

Given: $T_L = -5°C = 268K$

$T_H = 35°C = 308\ K$

$Q_L = 29KW$

$W = ?$

$$(COP)_{act} = \frac{1}{3}\left[\frac{T_L}{T_H - T_L}\right]$$

$$(COP)_{act} = \frac{1}{3}\left[\frac{268}{308-268}\right]$$

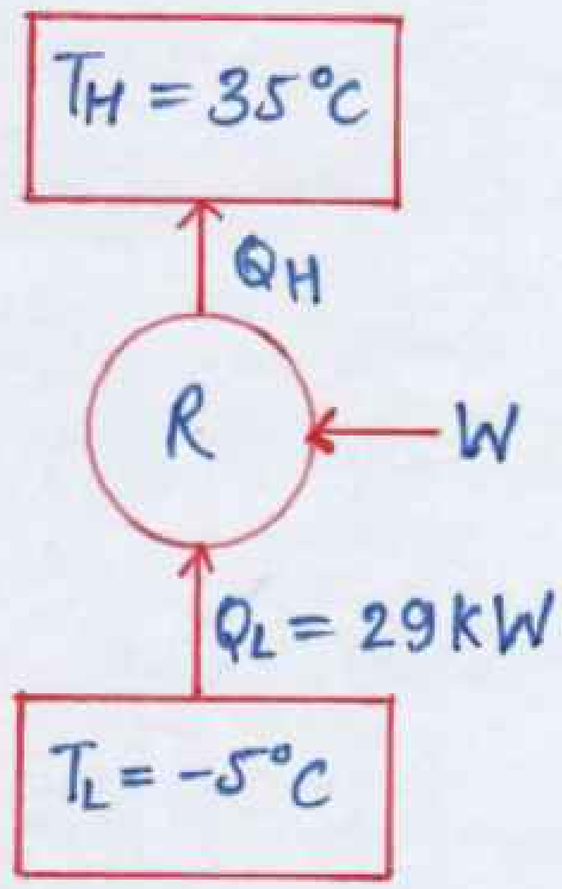
$$(COP)_{act} = 2.233$$

$$(COP)_{act} = 2.233$$

$$(COP)_R = \frac{Q_L}{W} \Rightarrow W = \frac{Q_L}{(COP)_{act}}$$

$$W = 29/2.233$$

$$\boxed{W = 12.98\ kW}$$



Gateway Classes

Fundamentals of Mech. Engg. **By M. S. Tomer Sir**

Topic : Introduction to Refrigeration and Air-Conditioning

Lecture-3

Today's Target

- Methods for Refrigeration
- Construction and working of domestic refrigerator
- AKTU PYQs

Methods for Refrigeration

- There are several methods used for refrigeration, each based on different principles and technologies.

Here are some of the most common methods for refrigeration

- Vapour Compression Refrigeration
- Absorption Refrigeration
- Thermoelectric Refrigeration
- Evaporative Cooling
- Magnetic Refrigeration
- Air cycle Refrigeration
- Steam Ejector Refrigeration

- Each of these refrigeration methods has its advantages and specific applications.

- The choice of method depends on factors like cooling requirements, energy efficiency, space limitations and the specific industry or application involved.

- Advances in technology continue to improve these methods and open up new possibilities for efficient and sustainable refrigeration solutions.

Vapour Compression Refrigeration System [AKTU]

➤ The Vapour Compression Refrigeration System (VCRS) is a widely used method for refrige-ration, air conditioning, and heat pumping.

➤ Phase change of a refrigerant takes place to absorb and release heat, providing a cooling effect.

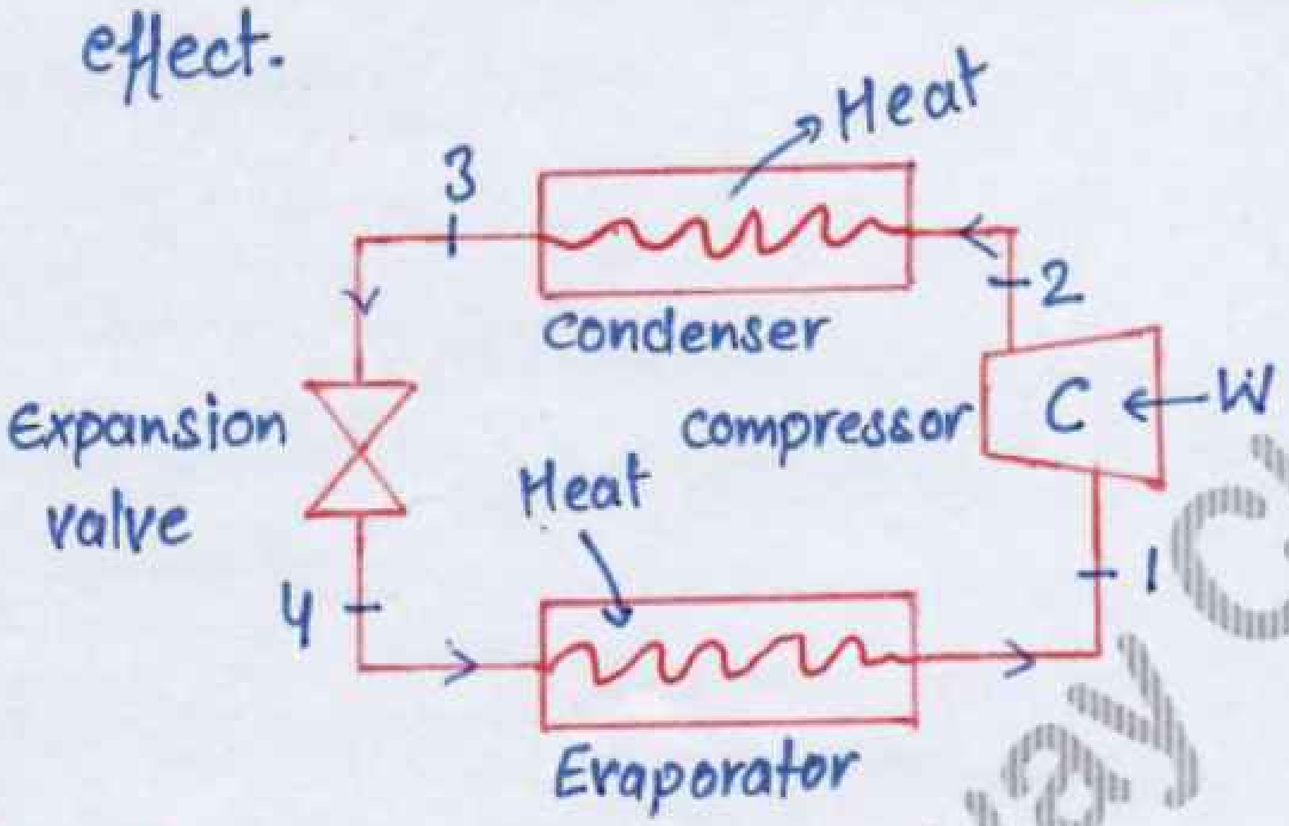


Fig: Schematic diagram of vapour compression cycle

Process 1-2
Isentropic Compression

Process 2-3
Isobaric Heat Rejection

Process 3-4
Isenthalpic Expansion

Process 4-1
Isobaric Heat Addition

Vapour Compression Refrigeration Cycle

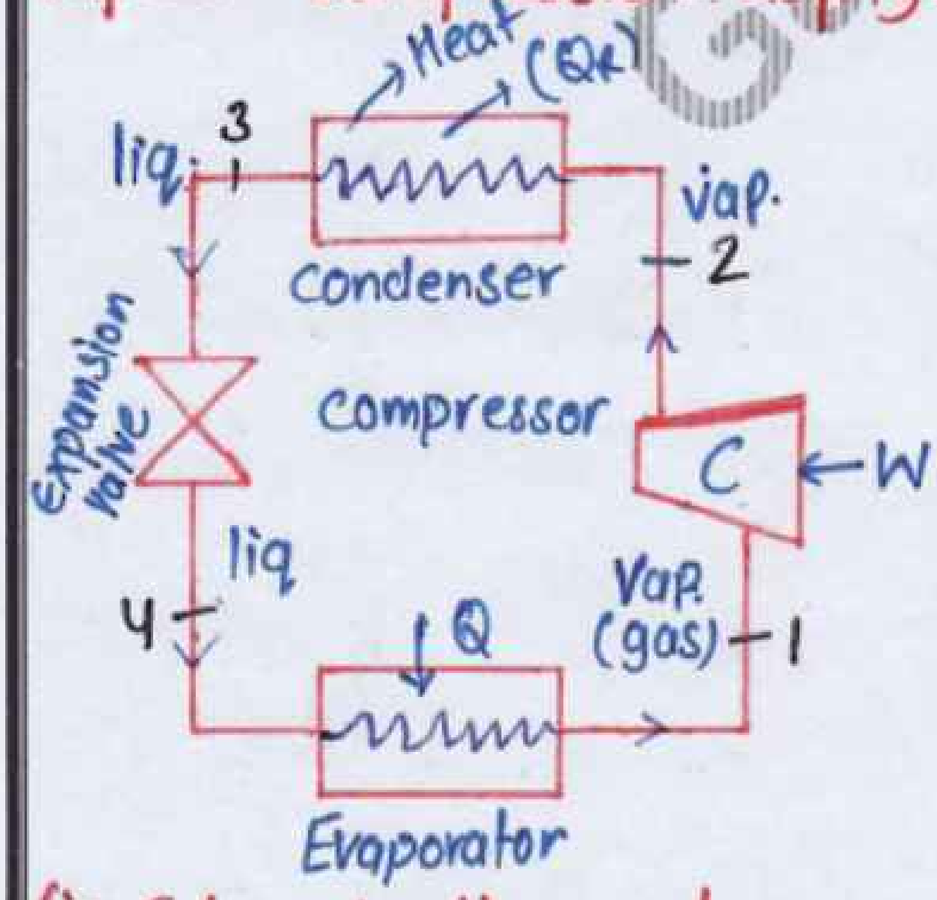
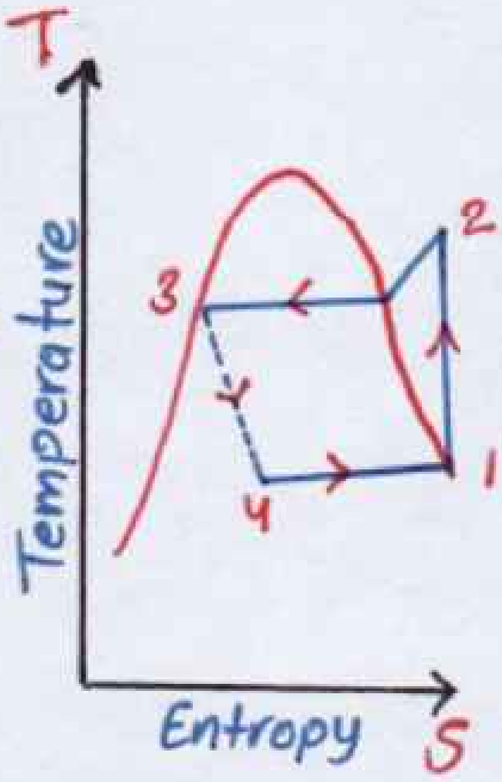
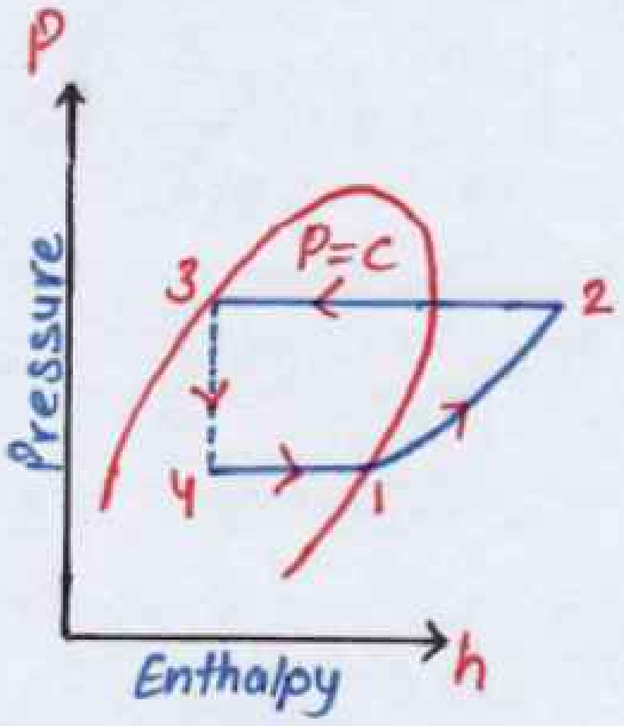


Fig: Schematic diagram of vapour compression cycle



T-s diagram



P-v diagram

Process 1-2 (s=c)

Isentropic Compression

Process 2-3 (P=c)

Isobaric Heat Rejection

Process 3-4 (h=c)

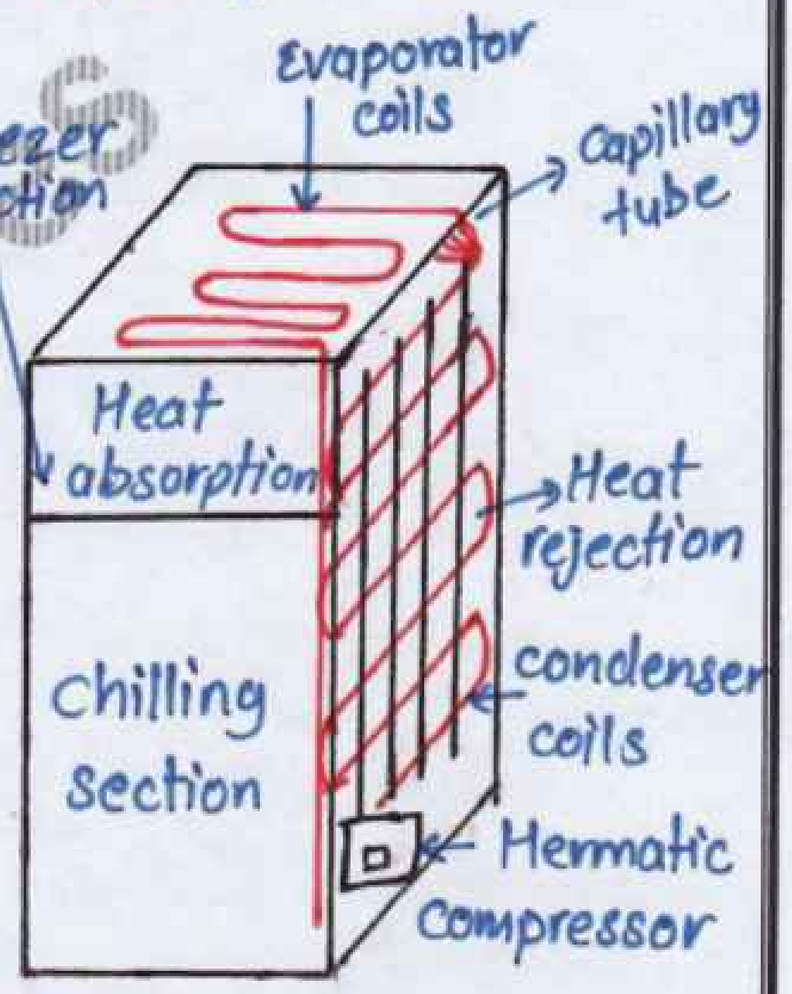
Isenthalpic Expansion

Process 4-1 (P=c)

Isobaric Heat Addition

Construction and Working of domestic refrigerator [AKTU]

- Refrigerator is a cyclic device which is used to maintain lower temperature as compared to surrounding temperature.
- The construction and working of a domestic refrigerator are based on the principles of vapour compression refrigeration.



Main Components of refrigerator are

Compressor (1-2)

Condenser (2-3)

Thermal Expansion valve or
Capillary Tube (3-4)

Evaporator (4-1)

Compressor (1-2):

- The compressor is the heart of the refrigeration system.

- It is an electric motor-driven pump that compresses the low-pressure, low-temperature refrigerant gas into a high-pressure, high temperature gas.

Condenser (2-3):

- The condenser is a coil or set of coils located at the back or bottom of the refrigerator.
- The high-pressure refrigerant gas from the compressor flows through the condenser, and as it releases heat to the surroundings, it condenses into a high-pressure liquid.

Expansion Valve (Thermal Expansion Valve or capillary Tube) (3-4):

- The expansion valve is a small device that creates a pressure drop, allowing the high-pressure liquid refrigerant to expand and turn into a low-pressure, low temperature mixture of liquid and vapour.
- The capillary tube is a fixed-length narrow tube that serves as an expansion device in some refrigerators.

Evaporator (4-1):

- The evaporator is a coil or set of coils located inside the refrigerator's main compartment, usually in the freezer section.
- The low-pressure refrigement from the expansion valve absorbs heat from the refrigerator's interior, causing it to evaporate into a low-pressure vapour.

Working Process:

The refrigeration cycle starts when the compressor starts running. The entire process involves four stages:

Stage 1 - Compression (1-2): The compressor sucks in low-pressure refrigerant vapour from the evaporator and compresses it to a high-pressure, high-temperature gas.

Stage 2 - Condensation (2-3): The high-pressure refrigerant gas flows through the condenser coils where it releases heat to the surr--oundings air or water, causing it to condense into a high-pressure liquid.

Stage-3 - Expansion (3-4): The high-pressure liquid refrigerant then passes through the expansion valve or capillary tube, where it undergoes a sudden pressure drop, resulting in its expansion into a low-pressure mixture of liquid and vapour.

Stage 4 - Evaporation (4-1): The low-pressure refrigerant mixture enters the evaporator coils inside the refrigerator's main compartment. As it absorbs heat from the interior of the refrigerator, it evapor--ates into a low-pressure vapour.

The cycle then repeats as the low-pressure vapour returns to the compressor, and the process continues to maintain a cool tempera--ture inside the refrigerator.

Good practices to minimize the amount of energy consumed by refrigerator

(1). Open the refrigerator door the fewest times possible for the shortest duration possible.

(2). Cool the hot foods to room temperature first before putting them into the refrigerator.

(3). Check the door gasket for leaks.

(4) Avoid unnecessarily low temperature settings.

(5) Avoid excessive ice build-up on the interior surfaces of the evaporator.

Gateway Classes

Fundamentals of Mech. Engg. **By M. S. Tomer Sir**

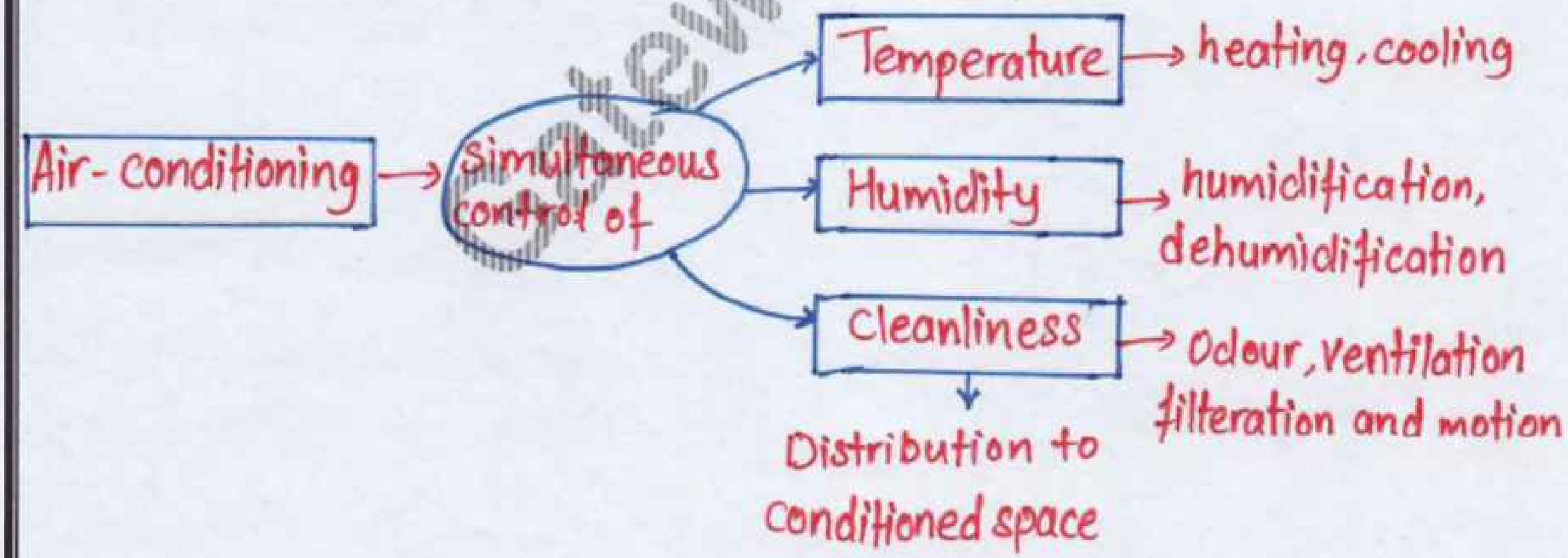
Topic: Introduction to Air-Conditioning

Lecture-4

Today's Target

- 'Air-Conditioning' and its applications
- Specific humidity and Relative humidity
- Dry Bulb Temperature, Wet Bulb Temperature, Dew point Temperature
- Human comfort and conditions for comfort air conditioning?
- Working of window type air-conditioner
- AKTU PYQs

'Air-Conditioning' and its applications [AKTU]



- Air conditioning is a process of controlling and modifying the tempe-rature, humidity, and air quality of an indoor space.
- It is used to create a comfortable and controlled environment for occupants, regardless of the external weather conditions.

Air conditioning has a wide range of applications across various sectors

- Residential
- Commercial Buildings
- Hospitals and Healthcare Facilities
- Educational Institutions
- Transportation
- Server Rooms and data centres
- Sports Facilities
- Theatres and Auditoriums
- Museums and Art Galleries

(i) Dry Air (ii) Atmospheric air (iii) Saturated air

(i) **Dry air:** It is a mixture of nitrogen, oxygen, and small amounts of some other gases.

dry air + water vap. + Pollutants

↳ fixed ↳ vary

(ii) **Atmospheric air:** Air in the atmosphere normally contains some water vapour (or moisture), number of pollutants and reffered as atmospheric air.

(iii) **Saturated air:** Saturated air is air holds water vapour at its highest level i.e. just about to condense.

Psychrometry ?

- Moist air is the mixture of water vapour and dry air.
  - → dry air + water vap.

- The properties of moist air are called Psychrometric properties.
- The science in which we deal with Psychrometric properties is known as psychrometry.

(i) Specific humidity [AKTU] (ii) Relative humidity [AKTU]

(i) Specific humidity:

- Specific humidity can be defined as the mass of water vapor present in a unit mass of dry air.
- It is also known as absolute humidity or humidity ratio and denoted by ω.

$$\omega = \frac{\text{mass of w.v}}{\text{mass of d.a.}}$$

da + wv

$m_a = 1\,kg$

$m_v = 0.006\,kg$

$$\omega = \frac{m_v}{m_a} = \frac{0.006\,kg}{1\,kg}$$

$$\Rightarrow \omega = \frac{m_v}{m_a}$$

$$\Rightarrow \omega = \frac{V/v_v}{V/v_a}$$

$$\Rightarrow \omega = \frac{v_a}{v_v}$$

Unit

kg of water vapour / kg of dry air

(ii) Relative Humidity (ϕ) [AKTU]

- Relative humidity (RH) is the ratio of actual amount of moisture in the air to the maximum amount of moisture that the air can hold at a given temperature and pressure.

- It is expressed as a percentage. Relative humidity indicates how close the air is to its saturation point.

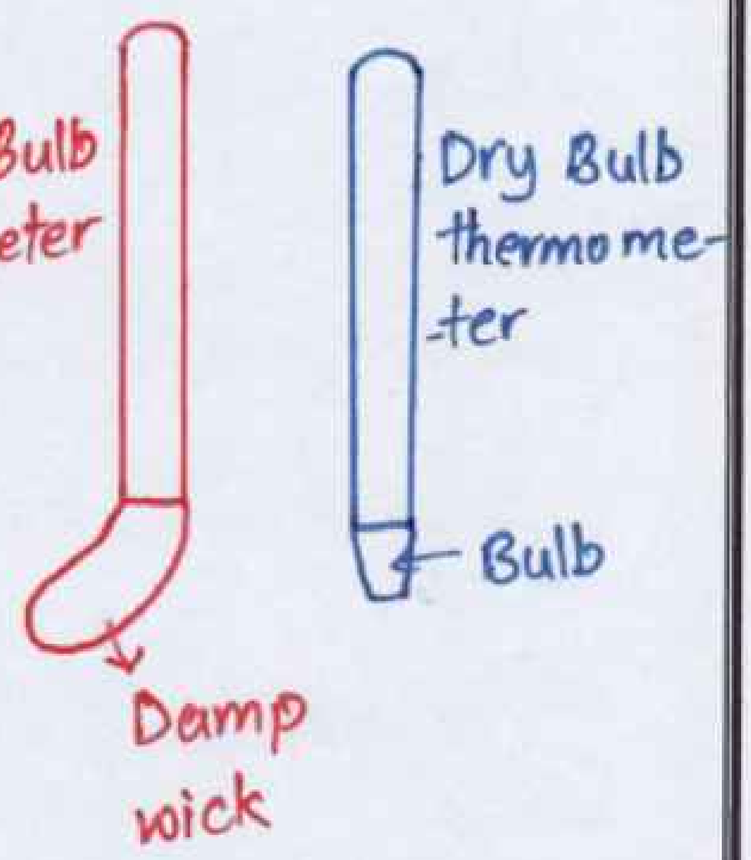
- When the relative humidity is 100%, the air is saturated, and it can not hold any more moisture at that temperature and pressure.

- If the relative humidity is less than 100%, the air is not saturated, and there is potential for more water vapour to be added before reaching saturation.

(i) Dry Bulb Temperature [AKTU]

- It refers to the temperature of the air measured by a standard thermometer that is not affected by moisture.

- In other words, it is the ambient air temperature that we commonly refer to when discussing the weather or indoor climate.



- The dry Bulb temperature is measured in degrees Celcius (°C) or Fahrenheit (°F).

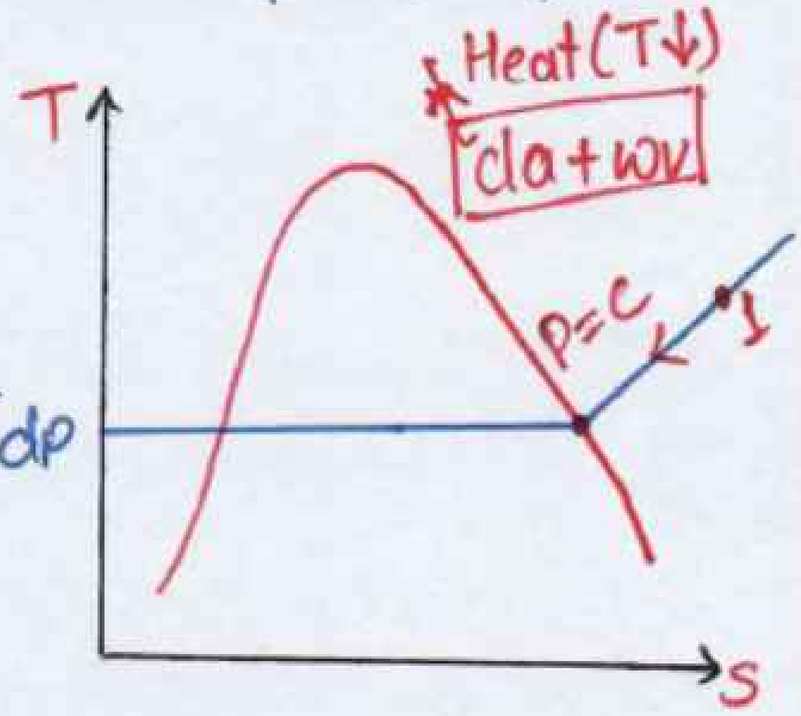
(ii) Wet Bulb Temperature [AKTU]

- The wet bulb temperature is another important parameter used to measure air temperature, particularly in the context of humidity and cooling processes.
- It is the temperature recorded by a thermometer covered with a water-soaked cloth or wick, exposed to the airflow.
- As water evaporates from the cloth, it cools the temperature, and the wet bulb temperature is lower than the dry bulb temperature.

$t_{wb} < t_{db}$

(iii) Dew point Temperature [AKTU]

- The air in atmosphere contain moisture (water vapour).
- If we reduce the temperature of air at constant pressure, moisture get condense.
- The temperature at which first drop of dew is formed or condensation begins when the air is cooled at constant pressure is known as dew point temperature.
- Denoted by Tdp.



Human comfort and conditions for comfort air conditioning ?

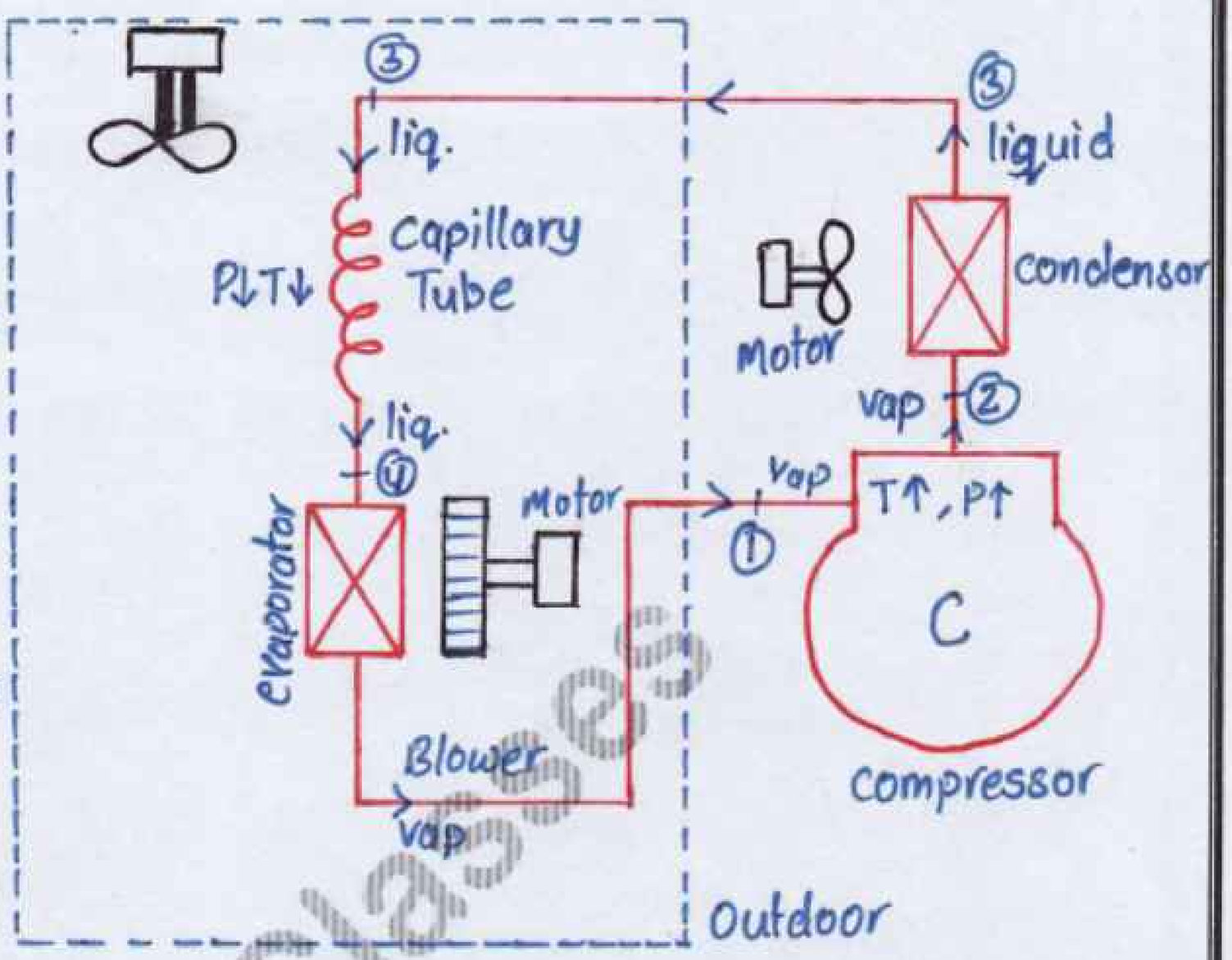
- Human Comfort refers to the control of the temperature and humidity of air and its circulation.
- So that the resulting environment becomes human-friendly.
- General human comfort conditions are to maintained in the range of
  - Temperatures 22°C to 27°C
  - Relative humidity 40% to 60%
  - Air velocity 5m/min to 8m/min.

Working of window type air-conditioner [AKTU]

- Air-Conditioning is a process of controlling air temperature, humidity equality and ventilation in a space (Building or vehicle).
- Air conditioning can be used in both domestic and commercial environments.
- This process is most commonly used to achieve a more comfortable interior environment, typically for humans and other ~~am~~ animals.

Window Air Conditioner

- Window air conditioner is sometimes reffered to as room air conditioner
- It is the simplest form of an air containing conditioning system and is mounted on windows or walls.
- It is a single unit that is assembled in a casing where all the components are located.



Construction of Window Air conditioner

It consists of various components

(1.) Compressor:

- The compressor is the main component of the window air conditioner.
- It compresses the low-pressure, low-temperature refrigerant gas and turns it into a high-pressure, high-temperature gas.

2. Condenser:

- The condenser is a coil located on the back or bottom of the air conditioner.
- The high-pressure refrigerant gas flows through the condenser, releases heat to the outside air, and condenses into a high-pressure liquid.

3. Expansion Valve: (capillary tube)

- The high-pressure liquid refrigerant then passes through an expan-sion valve, which is a small device that causes a pressure drop.
- This leads to the expansion of the refrigerant into a low-pressure, low-temperature mixture of liquid and vapor.

4. Evaporator:

- The low-pressure refrigerant mixture enters the evaporator coil located inside the front part of the air conditioner, behind the air intake grille.
- As the warm indoor air is drawn over the evaporator coil by the blower fan, the refrigerant absorbs heat from the air, causing it to evaporate into a low-pressure vapour.

5. Blower Fan:

The blower fan is located inside the air conditioner and is respon-sible for drawing indoor air over the evaporator coil and then blowing the cooled air back into the room.

Working of Window Air Conditioner

The working of a window air conditioner involves a process called vapour compression refrigeration, which consists of four stages:

1. Compression: The compressor sucks in the low-pressure, low-temperature refrigerant vapor from the evaporater and compresses it into a high-pressure, high temperature gas.

2. Condensation: The high-pressure refrigerant gas flows through the condenser coils, where it releases heat to the outdoor air and condenses into a high-pressure liquid.

3. Expansion: The high-pressure liquid refrigerant then passes through the expansion valve, causing it to expand rapidly and turn into a low-pressure, low-temperature mixture of liquid and vapor.

4. Evaporation: The low-pressure refrigerant mixture enters the evaporator coil, where it absorbs heat from the indoor air. The warm air becomes cooler as it passes over the cold evaporator coil, and the refrigerator evaporates into a low-pressure vapor.

The process repeats continuously as long as the air conditioner is running, removing heat and humidity from the indoor air and providing a cooling effect. The cooled air is then blown back into the room by the blower fan, while the heat extracted from the indoor air is expelled outside through the condenser.

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Specification of window Air Conditioner

A window air-conditioner is normally specified by the following parameters:

- Cooling Capacity: 1, 1.5 and 2 ton etc
- Overall dimensions: length x width x height
- Voltage and Power Consumption: AC, 220-240 volts
- Control: site or remote
- Fan Speeds
- Dehumidification
- Airflow Direction
- Noise level

Thank You

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