UNIT-1

LOW TEMPERATURE OF PHYSICS

① Method to produces of low temperature of physics

freezing mixture:-

① freezing mixture is a mixture of salt and ice
It is used to lower the temperature

② A freezing mixture components of two (or) more elements.

③ It is used to obtain the low temperature. the principle behind it is the Dispersion in freezing point

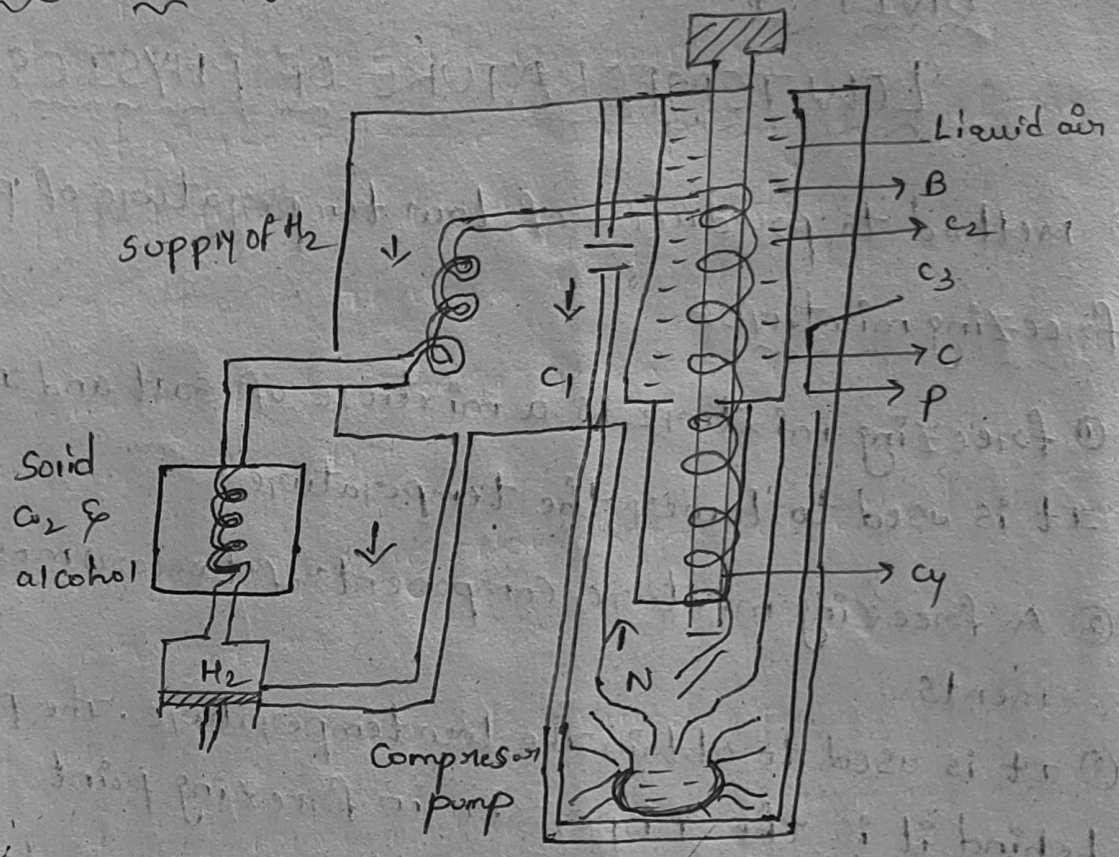
④ the temperature lower than 0°c can be produced by mixing salt with ice.

⑤ Now, the salt get dissolve in the water produced by the melting of ice.

⑥ the heat required this process
i) the heat which salt absorb while dissolving and the heat of fussion. which is ice absorb while melting is Exten-ded to form mixture of salt and ice it's below the tempo-ature of mixture

S.No	salt	lowest temperature
1	NaCl (Ice+NaCl)	-21.2°c
2.	KOH (Ice+KOH)	-65°c

production of Liquid H_2 :



1) the hydrogen gas is made free form of carbondioxide, Dust, water evoporation and other impurities.

2) this pure form of hydrogen gas is compressed to 20 atm to 200atm By compressing pump

3) Now the compressed gas is passing through a coil is cooled by the carbon dioxide solid Co_2 and alcohol.

4) Now the cooled gas passes through the coil C_1 in the chamber A.

5) the cooled hydrogen gas is passes through the regenerative coil C_2.

6) the coil C_2. is surrounded in the liquid air placed in the chamber B. No

7) Now the gas is attains at temperature "-170°c"

8) this cooled gas passes through the coil C_3 where it is placed chamber C.

9) Here the gas Reduced the pressure under Liquid air boil

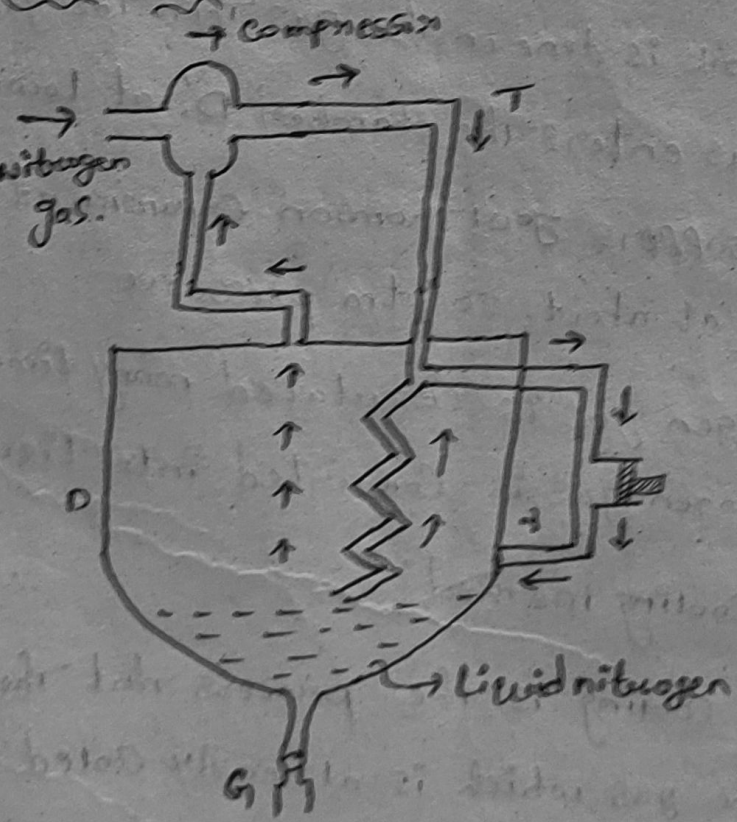
10) This gas is cooled to "-200°c" in chamber "C".

11) this Cooled of gas passes through the Coil C_3 and C_4.

12) It suffers the Joul thamson Expansion at nozzle "N"

Now the Hydrogen gas cooled here, after few cycles like this the Hydrogen gas is reaches at critical temperature "-250°C and its Converts gaseous to Liquid state. the Liquid is collected in Dewar flask

* Production of Liquid nitrogen:-



Principle:- this process is based upon the when a gas Expanse adiabatically against the piston in an engine

Procedure:-

1. The purified nitrogen gas is filled in a Compressor
2. the Compressed nitrogen gas is about 20-200 atm pressure by the Compression.

3. The Compress of nitrogen gas is passes through the tube (T) which is divided the incoming nitrogen gas.
4. one part of the nitrogen gas is passing through the cyiin-der fitted with air tight piston and the rest of the nitrogen gas passes through the another tube
5. the remaining part of the gas is passes through the coil C. as shown in the fig
6. Now the gas is passing through the coil "C" which is ends in a Jet (J)
7. the nitrogen gas goes into cyiinder passes the piston and Some external work is done on the gas then the gas is cooled
8. Now the cooled gas enters the chamber "D" at lower end
9. then the gas is suffers joul thomson Expansion at lower pressure region at about 50 atm pressure
10. the cold nitrogen gas is circulated many times then the incoming nitrogen gas is Converted into liquid state

Regenerative Cooling method :-

1. Regenerative Cooling is the process that the incoming gas Cooled by the gas which is already cooled by joul thomson effect
2. Joul thomson effect shown that very small cooling effect in most of the gases. this drawbag is removed by principle of regenerative cooling
3. the gas already suffers joul thomson cooling is make to flow back over the tube Containing the incom-ing gas

4) the incoming gas further cooled by Joul thomsan Expansion

5) this cooling process the gas is reached at critical temperature

6) In this process the gas passes through the under pressure then the gas is Converted into Liquid state this process is called Regenerative Cooling method.

7) the Regenerative Cooling is the process incoming gas Cooled by the which is already Cooled by Joul thomsan effect.

UNIT-2

MEASUREMENT OF LOW TEMPERATURES

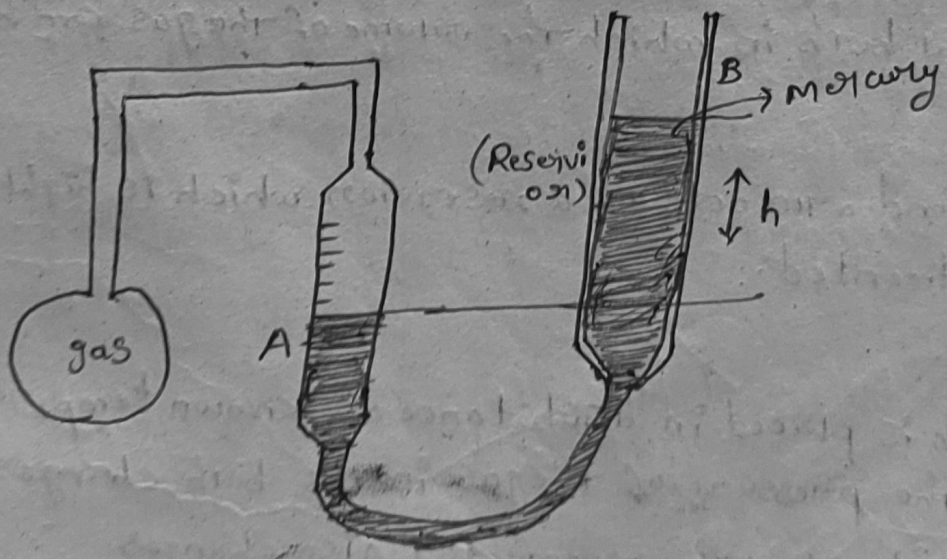
Temperature is measured by the thermometers

Thermometers:-

1) Thermometer is a devices which is measure the heat energy or temperature of the body.

2) Thermometers are designed in different substances li as gas, solid, Liquid states, thermocouples, electrica couples, pyrometer etc.

* To explain Gas thermometers construction working principle?



principle:-

1) A thermometers contains a fixed quantity of gas as the enclosed thermometric substance.

2) The change in pressure with temperature at constant volume (or) change in volume with temperature at constant pressure is called gas thermometers.

V = constant

$$P \propto T$$

3) Gas thermometers is better than the standard therm-meters for to measure the Low temperatures.

4) This thermometers is depends upon the Liquification point of the gas

5) the pressure at which it is operates is below the vapour pressure of the Liquid helium.

construction:-

1) A spherical glass bulb filled with the hydrogen or helium gas is Connected to a mercury manometer.

2) this manometer is Connected through the narrow glass tube to spherical glass bulb.

3) the manometer has two arms one of the arm is a glass cylindrical bulb in which the volume of the gas can be measured.

4) the second arm acts as a reservior which is right can be adjustmented.

working:-

1) The bulb is placed in a substance of known temperature T_1 then the pressure of the gas in the bulb changes and the mercury Level in the manometer also changes.

2) the reservior height is adjusted until the change in mercury level in the left arm of the manometer fixed point A.

3) the height difference AB = h_1.

4) the pressure of the gas in the bulb is calculated

$$P_1 = (H \pm h_1)\, dg.$$

Here H = is the atmosphere pressure in mercury Column height

d = is the density of mercury

g = acceleration due to gravity

5) the experiment is repeated by placing the bulb in unknown substances of temperature is "T_2"

6) the experiment is repeated now the Height difference $AB = h_2$

7) Now the pressure is calculated $P_2 = (H \pm h_2)dg$

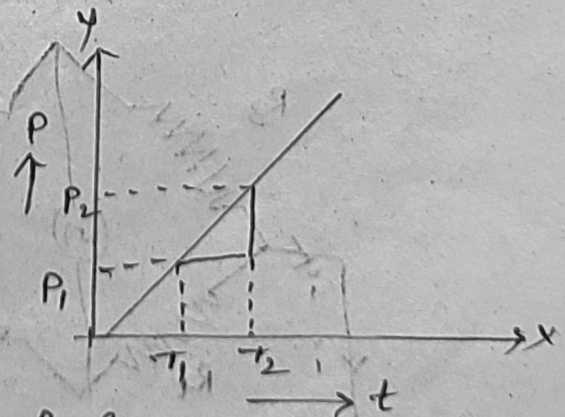
Now unknown temperature T_2 is calculated as follows

$$\frac{P_1}{T_1} = \frac{P_2}{T_2}$$

$$T_2 = \frac{P_2 \cdot T_1}{P_1}$$

8) the unknown temperature can be calculated by using of the graph. Now we can draw a graph between pressure and Temperature at constant volume for known values.

9) the resultant graph is gives a straight line passing through the origin.



Slope of graph

$$= \frac{P_2 - P_1}{T_2 - T_1}$$

$$m = \frac{(P_2 - P_1)}{(T_2 - T_1)} = T_2 - T_1 = \frac{P_2 - P_1}{m}$$

$$T_2 = T_1 + \left(\frac{P_2 - P_1}{m}\right)$$

Advantages:-

① Gas thermometers are very sensitive

② the gases have regular expansion

③ gas thermometers have wide range of temperature scale

④ gases have low thermal capacities.

Dis-advantages:-

1) It's works slowly
2) It is not direct reading thermometers
3) It is not periodic.
4) It can't measured rapidly change in temperatures.

* To Explain working, Construction and principle of resistance thermometers.

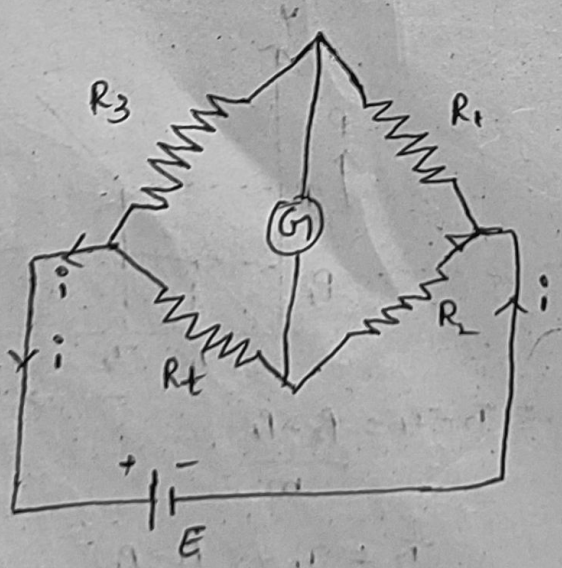
Resistance thermometers:-

① Resistance thermometer is a device which is measured the temperature By the variation in the resistance of conductor.

② It is Commonly known as resistance temperature detector

③ The resistance is directly proportional to the temperature of the Conductor. this is the Basic ideology of two design the Resistance thermometers.

Construction and working:-



① the temperature of the metal is increase there is an increasing the vibrational amplitude of the atomic molecules of the materials.

② the increasing the inter Collisions of the molecules

with the bonding of ions, electrons, causes the resistance

③ Resistance temperatures detector is a type of thermometer which is made up of Nickel, platinum, copper, tungsten..etc

circuit:-

① Resistance thermometer circuit is basically the wheatstone bridge circuit.

② It is not exactly but a small modification of the circuit

③ It is connected to one arm of the wheatstone bridge as shown in the fig

④ the resistance R_1 and R_2 are the fixed Resistance and R_3 is the variable resistance

⑤ In this circuit R_T is the detector resistance

⑥ According to wheatstone balance equation

$$\boxed{\frac{Rt}{R_3} = \frac{R_1}{R_2}}$$

$$Rt = \frac{R_1}{R_2} \cdot R_3$$

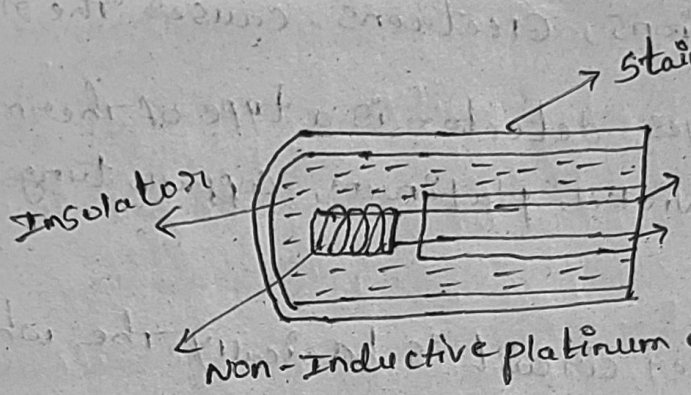
⑦ In this case $R_1 = R_2$

$\therefore$ then $Rt = \frac{R_1}{R_1} \times R_3$

$$\boxed{Rt = R_3}$$

⑧ The variable resistance "R_3" used is nothing but an adjustable potentiometer

* Construction of detection Resistance :-



① A platinum resistance thermometer is consists of a platin -um wire with a coil

② the inside the coil is filled with a electrical and thermal Insulators

③ the Entair system is arrangement in evaculated tube

④ the tube is made up of stainless steel

⑤ the tube is inside fixed the coil Arrangement and generates electrical energy and it's creates rise in the temperature

⑥ the pure platinum wire must be used in the system

⑦ the purity of the platinum can be calculated by this formula $\frac{R_{100}}{R_{Pt}}$

⑧ the relation between of resistance w.r.t temperature can be calculated this formula

$$R_t = R_o(1 + \alpha t + \beta t^2)$$

Advantages:

① It gives accuracy value

② It is used in various industry appilications

③ this temp ranges between -20°c to -200°c

④ It has endless applications.

Dis-Advantages of (RTD)

① These thermometers are very sensitive

② These thermometers are to respond very slowly

③ these thermometers are can not be measure variation of temperature in rapidly

* To Explain the thermo couples (or) thermo electronic thermometer Construction and working principle.

① thermocouple thermometers are to measure the temperature

principle:-

① It is depends upon the seabeck effect

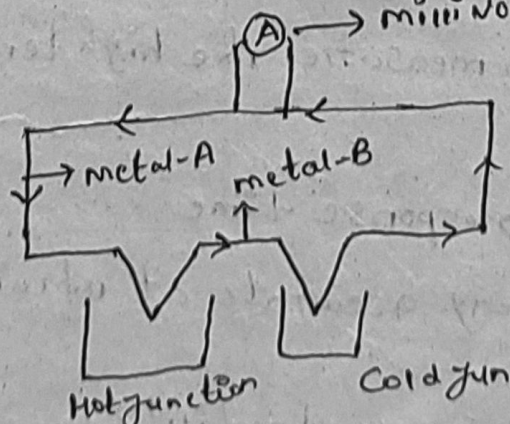
② It is consists of two different metals A and B. is joined together to formation two junctions.

③ one junction is heated. Second junction is cooled.

④ A small electric current generated in the circuit of thermo couple

⑤ this thermocouple which can be measured the equivalent of electrical energy to temperature. This effect is known as thermo couple thermometers

working:-



① one junction is placed in a the element on surface where we measure the temperature this junction is known as Hot junction.

(2) the second junction is kept at a lower temperature. This junction is known as cold junction.

(3) According to the "seabeck" effect the temperature difference between the two different metals and produce the potential difference between two junctions.

(4) If the circuit is closed a small amount of current will flow through the circuit and measure the corresponding voltage in the circuit

(5) the measuring voltage we can calculate the temperature of the hot junction. can be

the equation can be used to measure the temperature

$t_{emp} = AT + BT^2$

E_{emp} = the voltage across the junction

A, B are constants depends on the pair of thermo couple junction.

T = temperature difference between Hot body and cold body junction.

Advantages of thermo couples:-

(1) It is used to measure the high temperatures of the body

(2) It has fast response time

(3) It is high very accurate at wide operating ranges.

(4) they have extremely durability

(5) they are self powered

Dis-Advantages:-

① thermocouples are not as accurated as RTD

② they are signals are not perfectly

③ they are susceptability to over time

* what is the difference between thermo couple thermometers and RTD?

Thermocouple	R.T.D.
① Thermo couple thermometers is a device which is measured temperature of the body	① Resistance thermometer is a device which is measures the temperature by the variation in the resistance of conductor
② thermo couple is a suitable for measuring higher range of the temperature is -180°c to +232°c.	② RTD is a extensive suitable for measuring less Range temperature is -20°c to -200°c.
③ It has less accuracy than R.T.D.	③ It has more accuracy then thermo couple
④ The sensitivity range less than R.T.D.	④ The sensitivity Range more than thermo couple
⑤ Thermo couple provide a quick response time.	⑤ R.T.D devices have good response time
⑥ It has the output non-linear shape	⑥ It has the output linear in shape

10m * what is vapour pressure thermometers explain its working, construction and principle

① vapour pressure thermometer is a device which is measures the temperature of the body

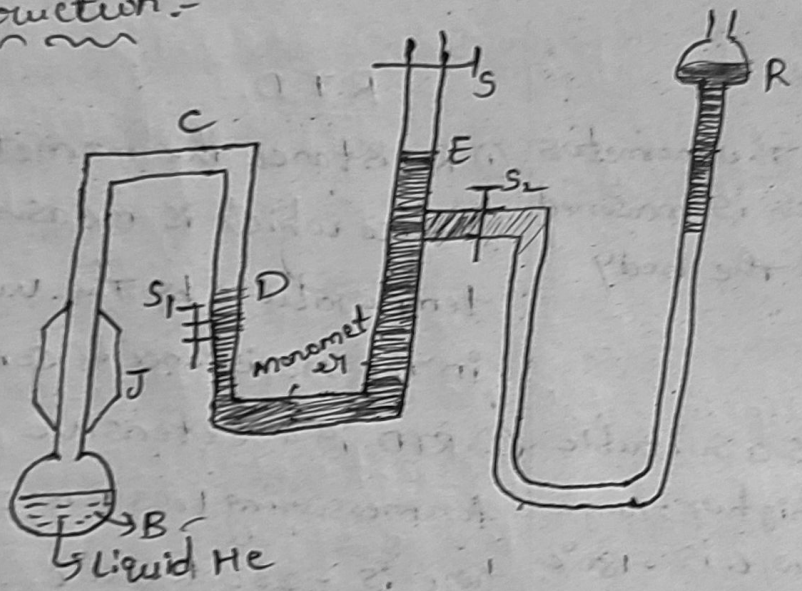
② vapour pressure thermometers is contains of constant

volume of a liquid is in vapour pressure condition.

Principle:-

① Vapour pressure thermometers is Based on the principle that the vapour pressure of the liquid is increase the temperature of the body is also increases at constant volume.

Construction:-



① Helium vapour pressure thermometer is consists of a glass bulb containing liquid Helium at vapour pressure state.

② This glass tube is connected to one mercury manometer as shown in the fig.

③ the glass bulb is covered by an Evaculated glass jacket is attached to the a tube "C" as shown in the fig.

④ the level of the mercury is adjusted existed in the manometer By changing the height of the mercury reservior

⑤ the reservior are connected to a two tubes Limb "E and D" of the manometer as shown in the fig.

⑥ the stop clock S_1 is open and connected to the vaccum pump to remove the air from the bulb "B" and Tube "C"

⑦ now the bulb is put in the path of low temperature to be measured.

(8) the difference of mercury levels of heights to be measured
(9) the limbs "D and E" gives the changing pressure w.r.to temperature.

Now, the calculation of temperature(t) by given formula

$$\log_{10} P = \frac{a}{T} + bT + cT^2 + d$$

Here $\frac{P_1}{T_1} = \frac{P_2}{T_2}$

$$T_2 = \frac{P_2}{P_1/T_1}$$

$$\boxed{T_2 = \frac{P_2}{P_1} \times T_1}$$

(10) Here "p" is the Helium vapour pressure and "T" is the temperature.

(11) . A, B, C, D are the onbitary Constants.

Advantages:-

(1) This thermometers are very sensitive
(2) these are cheap cost
(3) these are good time respond
(4) these are maintainance are very low.
(5) no electric power.

Dis-advantages:-

(1) this thermometers are can be used only small range
(2) Not Repeated.
(3) span of temperature is very low

3. Principle of Refrigerators

Introduction to refrigerator

① The Refrigerator is related to the cooling of air(or) Liquids.

② the Refrigerator providing of low temperature to preser -ve the ice cream, food, and other materials.

③ the chainish were the first to store the Natural Ice. and snow

④ Asiant people of india and Egypt cooled Liquids.

⑤ In 1834 Jacob perkins and American scientist develo -ped a closed refrigerator. He used as a refrigerant in Hand operated Compressor.

⑥ the refrigerators is defined as the process of achievement and maintaining the temperature Below that of the Surroundings is called refrigerators.

* Explain the methods of refrigeration system. (or) types of Refrigeration system.

The Refrigeration systems are two types. (or) two types of metho

A) Natural refrigeration system

B) Artificial Refregiration system

① Natural refrigeration system:

Natural refrigeration system including the civilization of Ice(or) Snow produced by naturally in cold climate

① ART of Icemaking by Nocturnal (Night) Cooling effect:-

In this method ice was made by keeping a thin layer of water shallow earthern jar. Then exposed the

night sky.

2) the water loses of heat radiation to the stratosphere which is around -55°c

(2) Evaporative Cooling method:-

the water permitt's through the process of earth-ern jar to it's outer surface where it is Evaporates to the surround by absorbing the Latent heat from the water

(3) Cooling by salt solutions:-

1) Certain substances such as salt (NaCl), $CaCl_2$.. etc these salts added to the water and dissolved in water and absorb its heat of solution from water

2) Sodium chloride salt can give the temperature upto -20°c

3) calcium chloride upto -50°c

(2) Artificial refregration system:-

(1) vapour compression of refregration system:-

(1) The refrigerant used in this does not leave the system the system' But is circulated throughout the system in Evaporating system

(2) the refrigerant absorbs it's Latent heat from the solution which is used to circulating

(2) vapour Absorbation Refrugration system.

(1) Vapour absorbation system compress is replaced by generators, Absorbers and pump

(2) In this system NH_3 ('Ammonia) is used to refrigerant and NH_3 + water is used by absorb-

-ant

⑤ Solar energy Based refrigerant system:-

① It is made to run the vapour absorbation system by solar energy.

② The absorbation mission is designed with a cylinder parabolic mirror of $20m^2$

④ gas cycle refregiration system

① The gas is fixed very high pressures to low pressure Values is circulated.

② The temperature Reduce Suddenly while its Enthalphy Remains Constant

⑤ steam jet refregination system

① If the pressure on the surface of the water is reduced bekow the atmosphere pressure

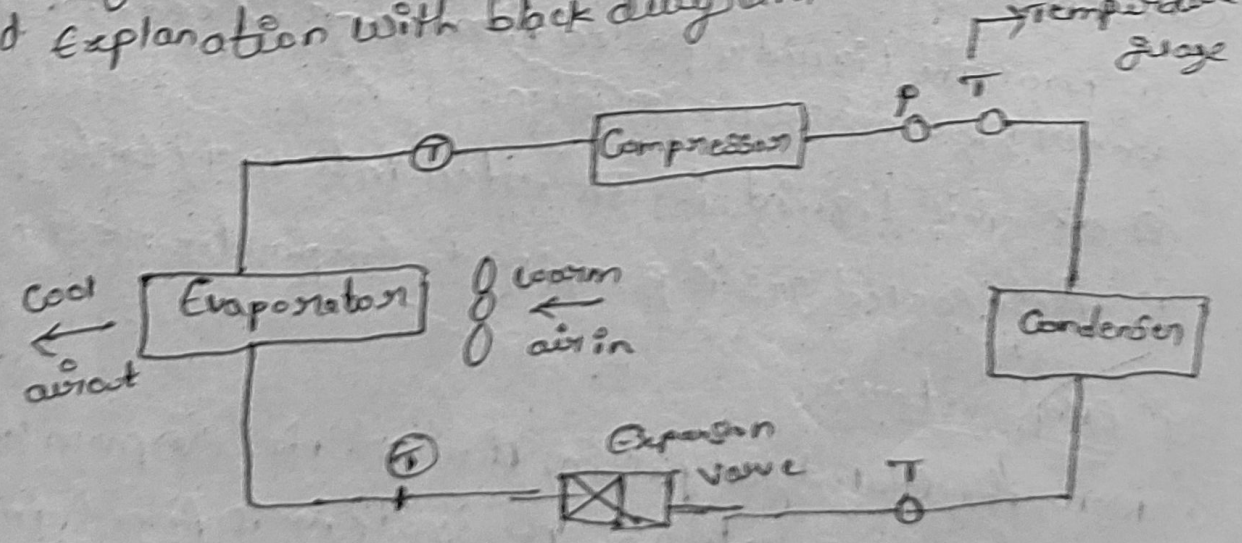
② that water can be Converted on low temperature.

③ the Evaporation of water at low temperature takes heat steam.

④ this low heat steam is circulated throughout the system

①

* Working of Air Conditioner (or) Refrigerator cycle and Explanation with block diagram



① Air conditioner is consists of a chemical fluid. It is easily Convert from the gas to Liquid and again Back

② the air conditioner is used to transfer of heat from the air inside the house to the outside the air

③ the air conditioner is consists of mainly 4 parts

① Compressor ② Condenser

③ Expansion valve ④ evaporator.

① Compressor :-

① It is consists of working fluid at low pressure at low temperature

② the compressor of the gas is compressed at low pressure

③ the compressed gas is circulate throughout the condenser state at low temperatures

② Condenser :-

① the air conditioner part is fixed part at the out side of the house.

② the working fluid leads the condenser is temperature is decreases.

③ It has changed from the gas to liquid under high pressure regions.

③ Expansion value

① Now the Liquid is passed through the Expansion valve under high pressure regions.

② In this Liquid is converted into very cool

③ these cooled gas is pumping to Evaporator region

④ Evaporator :

① Now the cooled gas passing through the evaporator. Now the Evaporator of the system is fixed inside the house

② In this system the gas is evaporation at very

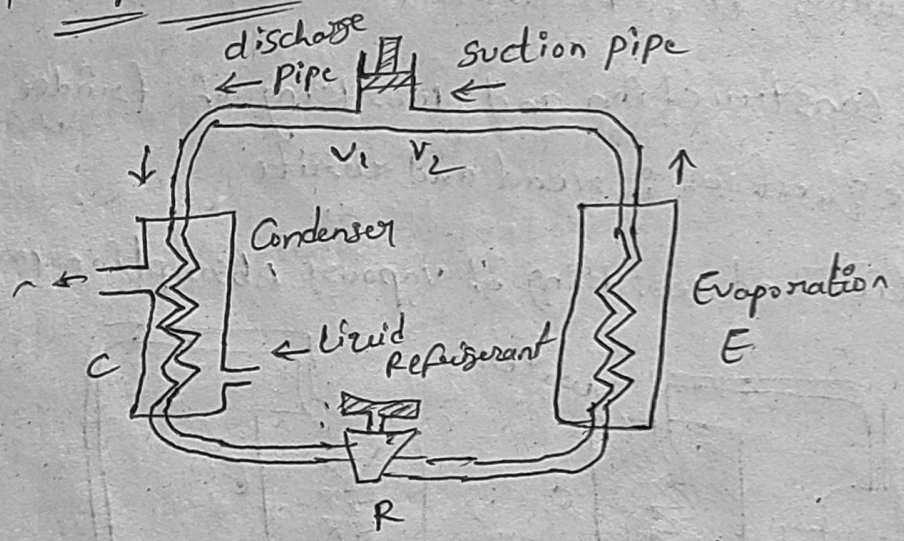
cooled temperature

③ It extracts the heat from the air surrounding regions.

④ the evaporator of the gas is passing through the metalic fan

⑤ the metalic fan is rotating to circulate the cooled gas in inside the room.

Vapour Compression machine:-



① The Refrigerator maintains an adiabatic process enclosure at low temperature

② the principle is involved producing low temperature is Evaporating the Liquid under reduced pressure.

③ the Evaporating Liquid around the enclosure the gas is circulates through the system.

Construction and working:-

① the vapour pressure Compressor is Consists of a Compression pump "P" in which the refrigerant is Compress.

② There are two valves V_1 and V_2 Below this pump as shown in the fig.

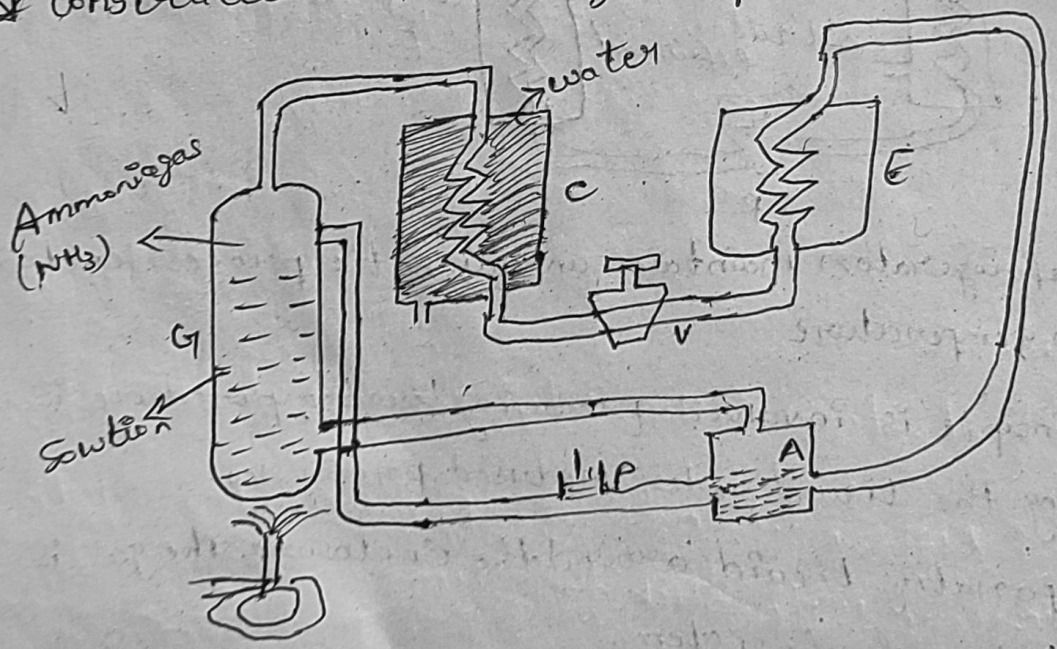
③ the piston moves valves V_1 is closed and the valve V_2 is opened at low pressure vapour at "E"

④ If the piston is pushed down the valve "V_1" opens and valve "V_2" is closed

⑤ the vapour under high pressure enters the coil "C".
⑥ the coil 'C' is enclosed with a Cold Bath
⑦ Now the vapour gas refrigerant is liquified in the coil
⑧ the liquified refrigerant is passing through the regulator "R"
⑨ the liquid refrigerator Evaporated in the Condenser room this process is repeated again and again the temperature of the cold storage to falls down the temperature.

* Explain Construction and working of fridge daire!
The above Question is read and write

* Construction and working of vapour Absorption machine?



① In a vapour absorption system Compress is replaced By generator, absorber, pump.
② In this system Ammonia is used as a refrigerant and water + Ammonia ($H_2O + NH_3$) is used as absorbant Solution
③ the vapour absorbation machine as shown in the fig this mission is works in low pressure only
④ the fig G is consists of water + Ammonia Solution at maintain low pressures only
⑤ This is heated By a Bunsen Burner

(6) the Ammonia gas is Escaped from the water and it's state is Condensation.

(7) the Condensation state of Ammonia is passing through the spiral tube of Coil "C" as shown in the fig.

(8) the Condensation of Ammonia is Evaporated "E" Through the Valve "V"

(9) when the Ammonia Evaporates under reduced pressure the latent heat of of Evaporation is takes place In this way the chamber "E" is Cooled. the Evaporated Ammonia Now Becomes very Cooled state to passing through the chamber it

(10) where it is absorbed By water The solution is pumped to Generator "G"

*1st what is refrigerant?

Refrigerant is a working substance in a refrigeration system

(or)

the refrigerant substance which will absorb the heat energy from the source at low temperature and the gains of heat energy & circulates throughout the refrigeration system.

*5th what are the properties of ideal refrigerant?

(1) The refrigerant should have low boiling point and low freezing point.

(2) It should be vapourisation at normal temperature (room temperature) it should be non-flamable and non Explosives

(3) It should have not bad effects of the substances

(4) It should have high thermal Conductivity

(5) It should have the vapourisation of latent heat.

(6) It should have the specific volume should be very small in a particular size of the Compressor

* Classification of refrigerators:-

Refrigerators are two types they are:-

① primary Refrigerators ② Secondary refrigerators

① The primary Refrigerators are mainly Based on the fluids which are used directly working fluids. for example, vapour Compression refrigerators, vapour Absorption refrigerators. the primary refrigerators are classified as follows.

Halo Carbon Compounds:-

① these groups Contains one or more Halogen Compound to formation of Halogen carbon compound. these Compounds is used in working fluid in refrigerator system.

Ex this type of refrigerators are used in Domestic purpose

Hydro carbon Compound:-

Most of the primary refrigerators is Contains of Hydro Carbon Compound as a working fluid.

Ex:- methane(CH_4), Ethane C_2H_5.

these Hydro carbons Compounds are used in industrial purpose.

Inorganic carbon compounds:-

① most of the primary refrigerators are used in inorganic Compounds. Ammonia (NH_3), water + NH_3, ...etc

② these refrigerators systems are used in universal refrigeration system

Unsaturated Inorganic Compound:-

In this refrigerator system Hydro carbon groups with Ethylene, propylene, Bases and mixed Hydro carbons for example tri chloro Ethylene, Dichloro Ethylene-el

Secondary refrigeration system:-

① Secondary refrigeration system the Liquid and Heat energy (Thermal energy) Both are transfers to one place to another place this type of systems are secondary refrigeration system.

② second refrigerations system are classified as follows

1. If it is not diserable to carry the Heat from Heat generating source directly by refrigerant.

water:-

1. The required temperature to be maintain is the above of the freezing point of water.
2. water is the universal used as secondary refrigerant

Brine's solution:-

1. Brine's solution containing the salt and water.
2. the freezing temperature of the Brines solution is lower than the latent heat of the Brine's solution

③ Commonly used secondary refrigerant are water with Sodium Chloride, calcium chloride with water, propyline with glycol

* write about Commonly used Refrigerators

① Air was used as Refrigerations in many refrigerations in old days.
② Ammonia, carbon dioxide, Sulphur dioxide are the used in refrigerant in refrigeration system
③ methyl Chloride is used as domestic and Commercial purpose (CCH_3Cl Freon gas)
④ CFC including R_{12} this is known as to contribute to causes the green house effect
⑤ HCFC including R_{22} in a refrigerant system
⑥ HCFC including R_{410} in a refrigeration in a refrigerant system

⑦ Nowadays the refrigerant system is Hydro flouro carbons are used in refrigerant, A.C.--etc

* Environment friendly (or) Ecofriendly refrigerants?

the Ecofriendly refrigerants can be measured by this ozone depletion layer and global warming programme

① Air was used as refrigerators in many refrigerators in old days

② Ammonia, carbon dioxides sulphur dioxide are the used in refrigerant in refrigeration system

③ methyl chloride is domestic and commercial purpose

④ HCFC including R_{22} in a refrigerant system

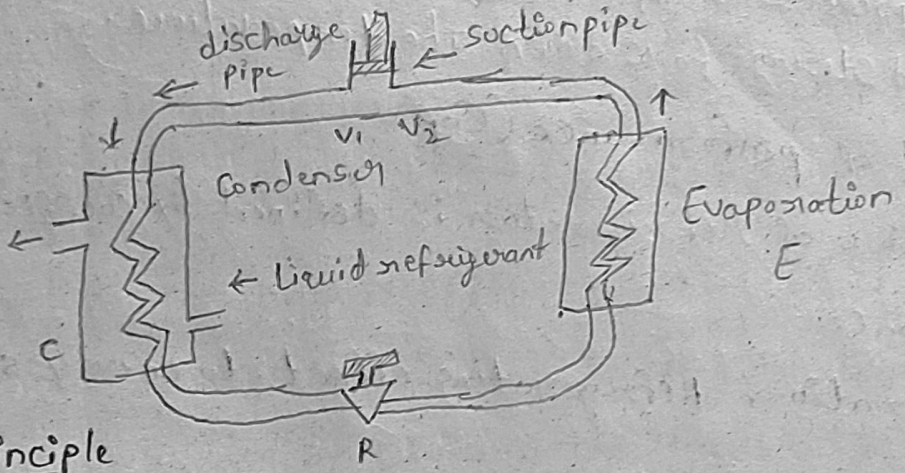
⑤ HCFC including R410 in a refrigerant in refrigeration system

⑥ Nowdays the refrigerant system is Hydro flouro carbons are used in refrigerant, A.C.--etc

Unit-4 Components of Refrigerators

① what are the Components of refrigerators?

Vapour Compression machine and working principle



principle

① the Refrigeration maintains an adiabatic process enclosure at low temperature

② the principle is involved producing low temperature is Evaporating the Liquid under reduced pressure

③ the Evaporating Liquid around the enclosure the gas is circulates through the system

Construction and working:-

① the vapour pressure Compressor is consists of a compression pump "P" in which the refrigerant is compress

② there are two valves V_1 and V_2 Below this pump as shown in the fig

③ The piston moves valve V_1 is closed and the valve V_2 is, opened at low pressure vapour at "E"

④ If the piston is pushed down the valve "V_1" opens and valve "V_2" is closed.

⑤ the vapour under high pressure enters the coil "C"

⑥ the coil "C" is enclosed with a cold bath

⑦ now the vapour gas refrigerant is Liquified in the coil

(8) the Liquified refrigerant is passing through the Regulator "R"

(9) The liquid refrigerator evaporated in the Condenser room. This process is repeated again and again the temperature of cold storage falls down the temperature.

* Coefficient of performance (Cop)

(1) the effective of refrigerator is defined by coefficient of performance

(2) It is the ratio of Refrigerating effect to energy sent in the cycle

(3) the coefficient of performance of an ideal absorption system is given as Coefficient of performance =

$$\frac{\text{Net refrigerating effect}}{\text{Heat supplied in the generator}}$$

(4) the refrigerant effect is the amount of Heat absorbed In the evaporator (or) the amount of Heat removed from the cool temperature

$$\text{Coefficient of performance} = \frac{\text{Heat Absorbed in Evaporator}}{\text{Heat supplied in the generator}}$$

Cop = efficience by Carnot · Cop Refrigerator

* Explain TONS of refrigeration.

(1) A tons Refers to the amount of Heat is takes to Completely melt a ton of Ice

(2) A ton of Refrigerator is called a refrigeration ton

(3) which is a unit of power - used in some Countrys Especially in north - America generally ton

[TR (1 TON Refrigerator)
TOR (a TON of Refrigeration)

④ The defined as the amount of Heat transfered to freeze (or) melt one 1 ton of Ice at 0°C In 24 hours.

⑤ A ton of refrigeration is rate of heat transfer not an amount of heat.

one ton = 12,000 BTU (British thermal unit)

one ton = 12,000 BTU of heat removed per hour

The unit Conversions is 1TR = 210 kJ/min = 3.5 kW

* what is the energy efficiency ratio [EER]?

① The energy efficiency ratio of heating are Cooling system is usually calculated by Dividing the Heat output of the system By the power input

$$EER = \frac{\text{Heat output}}{\text{power input}}$$

② The EER is the ratio of the Cooling Capacity to the power inpot

③ The higher the EER rating, the more efficient the air Conditioner.

④ For examples, depending on your room size, a standard window air Conditioner might have a 10,000 BTU Rating.

⑤ A good EER rating for an A/C unit is 8.5 and above

⑥ The higher rating the more efficient in the A.C unit

* write about different types of compressors?

① Reciprocating Compressor:

① In this compressors is Consists of piston Compressor

② In piston Compressor is a positive displacement Compressor that uses derive in to delivers high pressure gases.

③ These are used in chemical, oil, gas industries

② Rotary vane Compressor

① Rotary vane Compressors Consists of cylindrical with piston cylinders. type of Compressors.

② these are Consists of two sections :-

① open ② Discharge sections

③ these are used in Refrigerators, air Conditioners ... etc

④ these are used in Agricultural industries, ~~screw Compressors~~

③ screw Compressors:

① the screw Compressors is a one type of air Compressor which is Rotary type Compressors

② A screw Compressors Can Commonly very large volume of high pressure air.

③ these are used in natural gas industries.

④ Centrifugal Compressors:

① A centrifugal Compressor is a importants of kinetic energy into the air stream. By increasing the velocity of air.

② these are used in gas processing plants, Shopping malls, etc

* Explain Defrosting Refrigerators.

① During the Running of Compressor the Evaporator remains at Constant temp about -7°c to -6°c

② At this temp the first form on the surface of the coil this is known as Defrosting in refrigerator.

③ when this happens the ice accumulates at lower parts of the Evaporators.

④ this is Ice accumulation of the Evaporator finds block the free air circulations of the around the coil.

Methods of defrosting:-

① Manual defrosting:-

① This is the simplest method.

② In this method the unit is shut down and wight to start until the Evaporator warms up.

③ The Defrosting is melting

② Automatic Periodic system:-

① Nowadays mostly this system is used in Refrigerators

② In this system the stopping and starting of the system is carried automatically.

③ In this system the change in pressure and temperature in the Evaporator system.

③ Solid Absorbant System:-

① In this system most of the moisture in the gas is removed By cooling Coil.

② This is avoids the formation of defrosting

③ In this system we can use silica Jell (or) Ammonia, Allumina, Carbon are used in De-humidity (De moisturisation) of the gas.

④ Water Defrosting:-

① water spray on the Coil (Cooling Coil) is the simplest Technique

② In this method water is warm up at 30°c

⑤ Electric Defrosting:-

① Electrical Defrosting system is Commonly used in Refriger-ator system.

② In this system A Bank of electrical heater is Located near the cooling Coils.

③ To avoid the Defrosting system By using of electrical heaters

⑥ ① Nowadays the refrigerators to provide a push button Defrostation. Thermostart.

② this thermostart provide this centre of the thermostat knob.

③ this thermostat knob to avoid the defrosting takes place

* com what is types of Evaporators and Explain?

① Bare tube Evaporators:-

① Bare tube Evaporators are the simplest type of Evaporator. this type of Evaporators are generally just refrigerant tube. these are made up of Copper are aluminium materials

② these materials are used in Heat Absorbant from the surrounding air. these are used for domestic purpose of refrigerators.

② plate surface Evaporators:-

① Plate surface evaporators is a type of Evaporator which is a thin film of liquid passes.

② the plate surface evaporators are generally used in a small applications Like as Household refrigerators.

③ Finned tube Evaporators:-

① Finned Evaporiators are Bare tube Evaporators that have been coated with finned. these are used in window, split, package and central air Conditioner system

④ the shell and tube Evaporators:-

① The shell and tube Evaporators the fluid is Located outside the tube

② the tube bundle is immersed in the saturated fluid Contained on the shell.

③ these are used in the industrial refrigerations.

UNIT-5 APPLICATIONS OF LOW TEMPERATURE REFrigeration

5m

① what is FreeZing food?

① when the food products to be preserved are in its original Fresh state for longer periods. they should be FreeZen and stored at -15°c. are below. such storages are known as FreeZing storages.

② the vegetables and fruits requires Considering process it maintains low temperatures.

③ many Bacterias, virus, some other Bacterias to kill the at low temperatures.

④ these Bacterias to spoil the food materials.

⑤ to avoid this effects to protect in low temperatures.

② what is Domestic refrigerator? and How it is works?

① the main purpose of domestic refrigerator to provide the low temperatu for storage systems.

② It has been to protection of the food materials at tempe rature of 10°c to 4°c.

③ the refrigerators are used in Enclosed in one chamber and is located At Base of the Cabinet.

④ the refrigerators used should be non-toxic

⑤ the refrigerants generally used methyl chloride (CH_3Cl) R_1

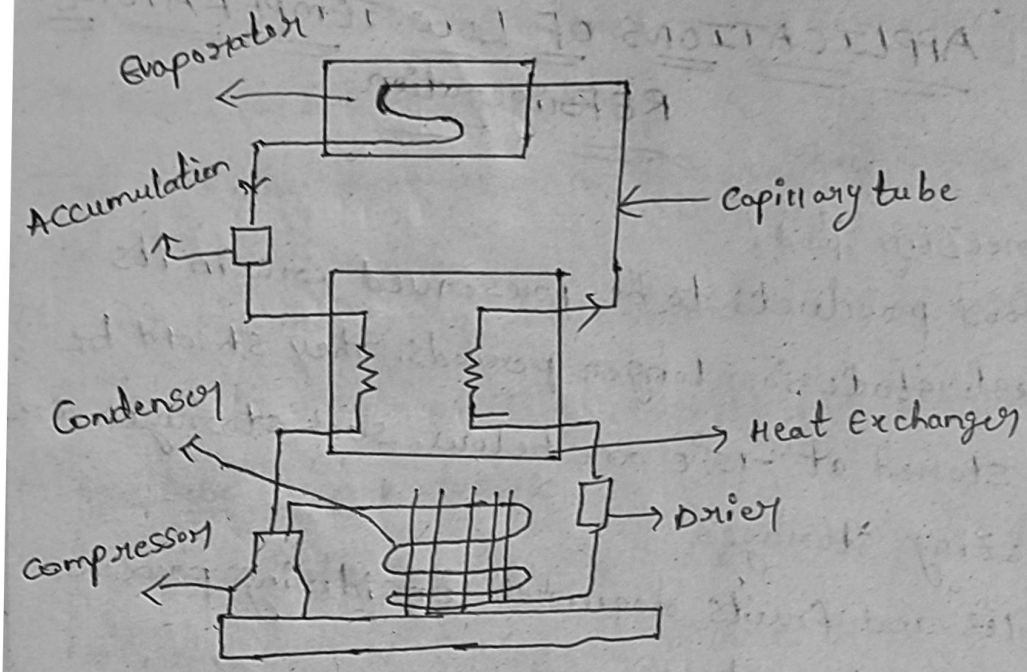
⑥ Freon gases

working:

① the main Components of refrigerators

① Compressor ② Condenser

③ drier ④ Capillary tube ⑤ Aparatus



① In this machiene Consists of Compressor is used to Compress the refrigerant.

② the refrigerant vapour from the Evaporator is Compre-ssed in the Compressor to delievery the Condenser

③ the gas is passing through the Capillary tube and passed thrugh Evaporator and to reduce the low pressure.

④ the Low pressure Liquid refrigerant Evaporates By its Latent heat And this processing to produce Freezing.

⑤ the Evaporator produce a low temperature up to -15°c to -7°c.

⑥ the temperature around 10°c to 7°c can be maintained.

Division of storages in refrigerators:-

① the freezer is a mini Cold storages. in which icecubes, Ice creams, meat, chicken, fish..... etc.

② A thermostat is provided to Control the De-foresting.

③ Refrigerator section below the storages. which is to prevents the fruits, vegetagables.-- etc.

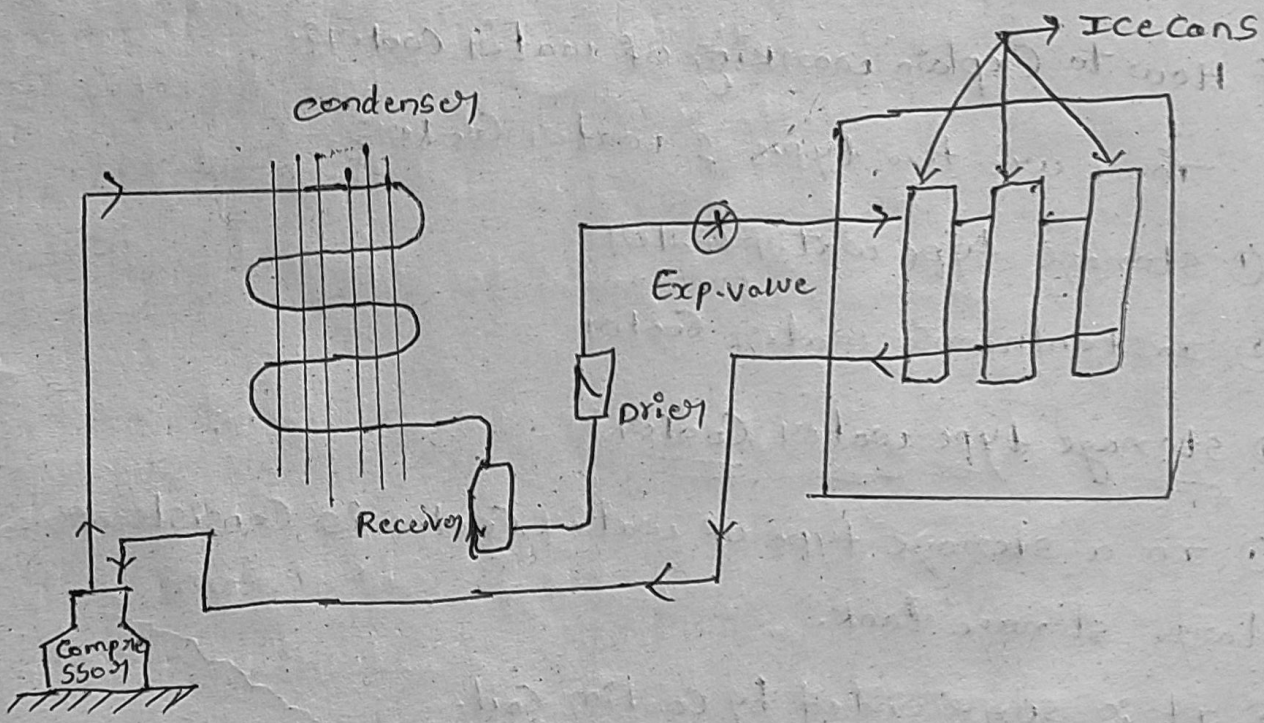
* Explain Construction and working of Ice plant?

Ice-plant :- This made by filling metal Cans with

water and lower temperature into the Bath of Sodium Chlori-de (NaCl) and calcium chloride ($CaCl_2$).

② this NaCl solution Refrigerator to below the freezing point of water.

③ the water becomes and converted Ice-blocks.



Construction:-

① Ice making plants consists of a vapour Compression system with Ammonia gas NH_3 as a Refrigerant It has brine tank made up of metal plates and thickness

② the metal plate is Completely covered by Insulating Stands

③ A clean water is taken it Ice-cans which are made of Galvanized Seats of thickness 2mm.

④ the water level in the Ice-can should be below the 20mm brine level

⑤ the cooling Coil is wrapped Around the cans good Contacts.

⑥ the brine is Cooled to $-10^{\circ}c$ by Ammonia evaporating at $15^{\circ}c$

⑦ This Refrigerant flows through the coil, where it is evaporated by taking Heat from the brine.

⑧ the Ice-blocks can be removed from the Cans just by shaking in the Cans

* How to Explain working of water coolers?

there are two types of water Coolers

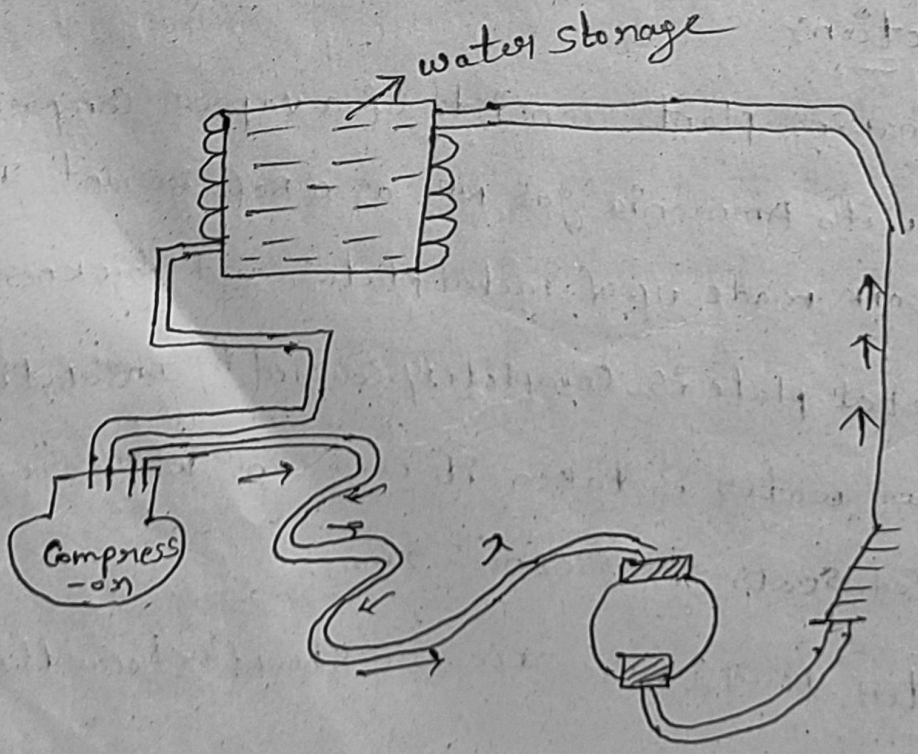
① storage type water Cooler

② Instantneous water Cooler

① storage type water Cooler:

① In a storage type of water Cooler. is Consists of large storage tank.

② It is surrounded by Cooling Coil.



③ In this water Cooler is Consists of metal sheet of Cabinet (a small size room)

④ the Cooler Consists of a sheet Compressor, Condenser capillary tube / Refrigerant Coil, water Cooling Coil

thermostart ... etc

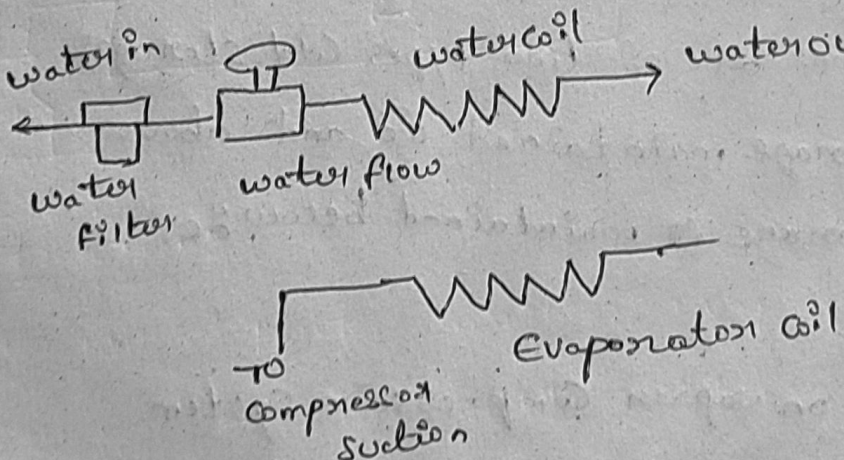
⑤ the Compressor starts to work, the Heat of the water is taken by Refrigerant following through the Evaporator Coil.

⑥ the Liquid Refrigerant passes through the capillary tube to the Evaporating Coil

⑦ this cycle is Repeated No. of times until the Cooling of water

⑧ In this suction the Compressor is stopped by thermostat

② Instantneous type of water Coolers:-



① Instantneous type of water Coolers is gives the cooled water

② the coil is directly (wounded) on the tap water

③ Instantneous type of water Coolers Consists of evaporator Coil and to separate cylindrically wounded Coils is made up of Copper materials

④ one Coil is Cooled and second Coil is water Coil

⑤ the liquid refrigerant received from the Heat energy to the Evaporator Coil

⑥ the Evaporator Coil where it is circulated water Coil

⑦ the liquid refrigerant Absorbs the Heat from the water by Conduction method and Reduce the temperature below the atmosphere temperature

* what is Cold storage?

① Cold storage is building design to store the certain food grains, vegetable, seeds, vegetables, dairy products with in the well particular different temperatures

② the Cold storage is Also one of the Application. to store the food materials. etc..

③ In a cold storage the vegetables and fruits are to store 0.5°C to 1°C

④ the conditions are of two types Cold storages

① Cold storage maintained 0°C and above

② Cold storage is maintained below 0°C

working :-

① It works on vapour Compression System

② Here NH_3 is used as Refrigerant

③ Small amount of NH_3 is sufficient to get a large Reduction in temperature

* Applications of low temperature of physics

① O_2 is used in Hospital.

② Liquid O_2 with charcoal is used in Explosive

③ Ammonia sulphur dioxide free on gas gains liquid state is used in Refrigerator

④ the paramagnetic characteristic of O_2 increases

⑤ the Conductor low temperature becomes Super Conductor

⑥ low temperature is Based on the design the Oxy-acetylene engine