


Government of Karnataka
Department of Technical Education
Board of Technical Examinations, Bangalore

	Course Title: REFRIGERATION AND AIR CONDITIONING		
	Scheme (L:T:P) : 4:0:0	Total Contact Hours: 52	Course Code: 15ME63F
	Type of Course: Lectures, Self Study & Quiz	Credit : 04	Core/ Elective: Elective
CIE: 25 Marks		SEE:100 Marks	

Prerequisites: Knowledge of Applied science, Engineering Mathematics, Thermal engineering

Course Objectives:

Apply knowledge of mechanical engineering related to Refrigeration and Air conditioning equipments and expose the importance of refrigeration equipments, their control and repair and overhauling of these systems.

Course Outcomes:

On successful completion of the course, the students will be able to attain CO:

Course Outcome		CL	Linked PO	Teaching Hrs
CO1	Understand the principle of refrigeration and Know the types of refrigeration	<i>R/U/A</i>	1,2	07
CO2	Explain the concept of various refrigeration systems and familiar with their advantages and disadvantages	<i>R/U/A</i>	1,2	10
CO3	Know the constructional and working of refrigeration equipments such as Compressor, condensers and Evaporators and the refrigerant flow controls	<i>R/U</i>	2	12
CO4	Know the different types of refrigerants and Application of refrigeration to various areas	<i>R/U/A</i>	2	07
CO5	Appreciate the concept of Air Conditioning and know their types	<i>R/U/A</i>	2	08
CO6	Familiarize the different tools used to install refrigeration system and Air Conditioner	<i>U</i>	2	08
		Total sessions		52

Legend: R: Remember U: understand A: Application An: Analysis



COURSE-PO ATTAINMENT MATRIX

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
REFRIGERATION & AIR CONDITIONING	1	3	0	0	0	0	0	0	0	0
Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed. Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO. If $\geq 40\%$ of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3 If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2 If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1 If $< 5\%$ of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed										

COURSE CONTENT AND BLUE PRINT OF MARKS FOR SEE

Unit No	Unit Name	Hour	Questions to be set for SEE/Marks			Marks weightage	weightage (%)
			R	U	A		
1	INTRODUCTION TO REFRIGERATION	07	5	5	5	15	10.34
2	REFRIGERATION CYCLES	10	5	5	20	30	20.68
3	REFRIGERANTS, SYSTEM COMPONENTS	12	5	10	20	35	24.13
4	APPLICATION OF REFRIGERATION	07	-	5	10	15	10.34
5	AIR CONDITIONING	08	5	5	10	20	17.24
6	REFRIGERATION AND AIR-CONDITIONING TOOLS	08	5	10	5	20	17.24
	Total	52	15	40	80	145	100

Legend: R; Remember, U: Understand A: Application

UNIT I: INTRODUCTION TO REFRIGERATION

07Hrs

Refrigeration-Definition-Refrigerating effect-unit of refrigeration- Coefficient of performance-Types of Refrigeration-Ice, dry ice, Steam jet, Throttling, Liquid nitrogen refrigeration-Carnot refrigeration Cycle-Air refrigeration/Bell Coleman cycle, PV& TS diagram,(without derivation)-Advantage and disadvantages in air refrigeration-Simple problems.

UNIT II: REFRIGERATION CYCLES

10Hrs

Vapour compression refrigeration cycle - Basic Components,-Flow diagram of working of Vapour compression cycle - Representation of the vapour compression cycle on P-H, T-S & P-V Diagram - Expression for Refrigerating effect, work done and power required - Types of Vapour Compression cycle - Effects of super heating and under cooling, its advantages and disadvantages - Vapour Absorption refrigeration cycle- Flow diagram of working of Vapour Absorption cycle- Comparison of Vapour absorption and vapour compression system- Simple Electrolux system for domestic units-Simple problems on simple vapour compression cycle only



UNIT III: REFRIGERATION COMPONENTS & FLOW CONTROLS**12Hrs**

Compressors - types of compressors, -Reciprocating compressor-Centrifugal compressor-Hermetically sealed compressor-- condensers - Air Cooled, water cooled -evaporators – natural convection, forced convection types –Flow controls- Capillary tube- Automatic Expansion valve-Solenoid valve.

UNIT IV: REFRIGERENTS & APPLICATION OF REFRIGERATION**07Hrs**

Refrigerants - properties - selection of refrigerants- Detection of refrigerants leakage- Alternate Refrigerants- testing and charging of refrigeration units –Applications of refrigeration- Cold storage - Dairy refrigeration-Icemaking industry-Transport refrigeration. Introduction to cryogenic engineering-concept.

UNIT V: AIR CONDITIONING**08 Hrs**

Air conditioning –Definition- Factors affecting Air conditioning-Psychrometric processes- sensible heating and cooling-Humidifying and dehumidifying-Air conditioning types-List-Summer-Winter-use of psychometric charts- Equipments used in air conditioning cycle-air filter-dry air filter-humidifier-Types-Steam injection type humidifier-Dehumidifier-Spray type dehumidifier-Fans and blowers-Axial flow and centrifugal flow.

UNIT VI: REFRIGERATION & AIRCONDITIONING TOOLS**08Hrs**

Tools used in refrigeration system- Tools used in Air conditioner installation- Installation procedure of refrigeration systems, charging ,testing, adding the oil to compressor , - Faults in refrigeration and air conditioning system- Servicing procedure of Refrigeration system

**TEXT BOOKS**

Sl.No.	Title of Books	Author	Publication
1.	Refrigeration and Air Conditioning	Domkundwar- Arora C P	Dhanpat rai and co.
2.	Refrigeration and Air Conditioning	Arora C P	Tata McGraw-Hill New Delhi, 3rd Edition, 2010
3	Basic Refrigeration And air – conditioning	P N Anathanarayan	-
4.	Principles of Refrigeration	Roy.J Dossat,	Pearson Education, 4th Edition , 2006
5	Refrigeration and Air Conditioning	Jordon and Prister,	Prentice Hall of India PVT Ltd., New Delhi, 1985.
6	Refrigeration and Air Conditioning	Stoecker N.F and Jones,	TMH NewDelhi,2nd Edition 1982.



1. LIST OF SOFTWARES/ LEARNING WEBSITES:

- i. <http://nptel.ac.in/courses/112105051/>
- ii download other power plant related videos from youtube.com for study purpose.

SPECIAL INSTRUCTIONAL STRATEGIES

UNIT NO	UNIT NAME	STARATEGIES
1	Introduction to refrigeration	lectures and Power point presentations/ Video/ Video movies
2	Refrigeration cycles	Lectures/Presentations, Showing charts,
3	Refrigerants, system components	Lectures/Presentations, Showing charts, Industrial visits to refrigerator repair shops
4	Application of refrigeration	Lectures/Presentations, Showing charts, Industrial visits to Cold storage
5	Air conditioning	Lectures/Presentations, Showing chart, Video/ Video movies
6	Refrigeration and air-conditioning tools	Lectures/Presentations, Showing charts, Industrial visits to Refrigerator/Air conditioner repair work shops

SUGGESTED LIST OF STUDENT ACTIVITIES

Note: the following activities or similar activities for assessing CIE (IA) for 5 marks (Any one)

- Each student should do any one of the following type activity or similar activity related to the course and before take up, get it approved from concerned Teacher and HOD.
- Each student should conduct different activity and no repeating should occur

1	Prepare list of various major power plants installed in Karnataka along with their total capacity.
2	Prepare charts of different high pressure boilers, gas turbine cycles, steam turbine power plant, wind turbine power plant, solar power plant, etc. on half imperial drawing sheet. Attach the same with term work.
3	Visit websites of NTPC, BHEL,, NHPC, NPCIL, GEDA, SUZLON, GE, SIEMENS, ENERCON and KPC etc and find out the technical information about their machineries or Plants.
4	Download technical specifications/ catalogues, videos or any other suitable presentations on gas turbine power plant
5	Download technical specifications/ catalogues, videos or any other suitable presentations on gas turbine power plant.
6	Visit diesel power plant available in your institute/ nearer to your institute and understand different elements, working, circuits, and specifications.



Course Assessment and Evaluation Scheme:

	What		To whom	When/Where (Frequency in the course)	Max Marks	Evidence collected	Course outcomes
Direct Assessment	CIE	IA	Students	Three IA tests(Average of three tests will be computed)	20	Blue books	1,2,3,4,5,6
		SEE		End Exam	Student activities	05	Activity sheets
				End of the course	100	Answer scripts at BTE	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	Middle of the course		Feedback forms	1,2,3 Delivery of course
	End of Course Survey			End of the course		Questionnaires	1,2,3,4,5,6 Effectiveness of Delivery of instructions & Assessment Methods

CIE- Continuous Internal Evaluation SEE- Semester End Examination

Note: I.A. test shall be conducted for 20 marks. Average marks of three tests shall be rounded off to the next higher digit.

Note to IA verifier: The following documents to be verified by CIE verifier at the end of semester

1. Blue books (20 marks)
2. Student suggested activities report for 5 marks evaluated through appropriate rubrics.
3. Student feedback on course regarding Effectiveness of Delivery of instructions & Assessment Methods

• MODEL OF RUBRICS /CRITERIA FOR ASSESSING STUDENT ACTIVITY

RUBRICS FOR ACTIVITY(5 Marks)						
Dimension	Unsatisfactory	Developing	Satisfactory	Good	Exemplary	Student Score
	1	2	3	4	5	
Collection of data	Does not collect any information relating to the topic	Collects very limited information; some relate to the topic	Collect much information; but very limited relate to the topic	Collects some basic information; most refer to the topic	Collects a great deal of information; all refer to the topic	Ex: 4
Fulfill team's roles & duties	Does not perform any duties assigned to the team role	Performs very little duties but unreliable.	Performs very little duties	Performs nearly all duties	Performs all duties of assigned team roles	5



Shares work equally	Always relies on others to do the work	Rarely does the assigned work; often needs reminding	Usually does the assigned work; rarely needs reminding	Normally does the assigned work	Always does the assigned work without having to be reminded.	3
Listen to other Team mates	Is always talking; never allows anyone else to speak	Usually does most of the talking; rarely allows others to speak	Talks good; but never show interest in listening others	Listens, but sometimes talk too much	Listens and speaks a fair amount	2
Average / Total marks=(4+5+3+2)/4=14/4=3.5=4						

Note: This is only an example. Appropriate rubrics/criteria may be devised by the concerned faculty (Course Coordinator) for assessing the given activity.

MODEL QUESTION PAPER (CIE)

Test/Date and Time	Semester/year	Course/Course Code	Max Marks																						
Ex: I test/6 th week of sem 10-11 Am	IVSEM	REFRIGERATION AND AIR CONDITIONING	20																						
	Year: 2016-17	Course code:15ME63F																							
Name of Course coordinator :		Units:1,2 Co: 1,2																							
Note: Answer all questions																									
Question no	Question		MARKS	CL	CO	PO																			
1	Define 1 ton of refrigeration. Show how one ton refrigeration is expressed in kW. OR Or Explain refrigeration by throttling process with temperature -pressure diagram		05	U	1	2																			
2	List the advantages and disadvantages of vapour refrigeration over air refrigeration system.		05	R	2	2																			
3	An ammonia refrigerator produces 20 tones of ice at 0°C in 24 hours. The temperature range of the system is -15°C. The vapour leaving the compressor's dry-saturated. Assuming actual COP is 75% of theoretical, calculate the power required to run the compressor. Take latent heat of ice as 335 kJ/kg. Use the following properties of ammonia.		10	A	2	1,2																			
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Saturation temp in °C</th> <th colspan="2">Enthalpy(kJ/kg)</th> <th colspan="2">Entropy(kJ/kg-K)</th> </tr> <tr> <th>h_r</th> <th>h_g</th> <th>s_r</th> <th>s_g</th> </tr> </thead> <tbody> <tr> <td>25</td> <td>99.94</td> <td>1317.95</td> <td>0.3469</td> <td>4.4816</td> </tr> <tr> <td>-15</td> <td>-54.50</td> <td>1303.74</td> <td>-0.2132</td> <td>5.0536</td> </tr> </tbody> </table>		Saturation temp in °C	Enthalpy(kJ/kg)		Entropy(kJ/kg-K)		h _r	h _g	s _r	s _g	25	99.94	1317.95	0.3469	4.4816	-15	-54.50	1303.74	-0.2132	5.0536				
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	h _r	h _g	s _r	s _g																					
25	99.94	1317.95	0.3469	4.4816																					
-15	-54.50	1303.74	-0.2132	5.0536																					



MODEL QUESTION PAPER

VI- Semester Diploma Examination

Course Title: **REFRIGERATION AND AIR CONDITIONING**

Time: **3 Hours**]

[Max Marks: **100**

Note: Answer any **SIX from Part A** and any **SEVEN from Part B**

PART-A

6x5=30 marks

1. Define the following terms:
 - i. Refrigeration
 - ii. Refrigerating effect
2. List the advantages and disadvantages of under cooling in the VCR system.
3. Define compressor, condenser.
4. Define refrigerant. List the types of refrigerant leak detector
5. Define following psychrometric properties
 - a. WBT
 - b. DBT
 - c. Humidity
 - d. Relative humidity
 - e. Dew point temp.
6. Explain the procedure of adding the oil to compressor
7. Explain hermetically sealed compressors.
8. Explain the effect of under cooling on the COP of a vapour compression refrigeration cycle with T-S diagram
9. Build the expression for volumetric efficiency of reciprocating compressor with P-V diagram.

PART-B

7x10=70 marks

- 1) a. Explain refrigeration by throttling process with temperature -pressure diagram. 05
b. Ice is formed at 0°C from water at 20°C . The temperature of brine solution is -10°C reversible carnot cycle. Latent heat of ice is $= 336\text{kJ/kg}$. find the Kg of ice formed per 1kWhr . Assume the refrigeration cycle is perfect. 05
- 2) Develop an expression for work done and COP of a vapour compression refrigeration cycle(dry saturated) with T-S diagram.
- 3) 1An ammonia refrigerator produces 20 tones of ice at 0°C in 24 hours. The temperature range of the system is -15°C . The vapour leaving the compressor's dry-saturated. Assuming actual COP is 75% of theoretical, calculate the power required to run the compressor. Take latent heat of ice as 335 kJ/kg . Use the following properties of ammonia.

Saturation temp	Enthalpy(kJ/kg)	Entropy(kJ/kg-K)
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7



in °C	h _f	h _g	s _f	s _g
25	99.94	1317.95	0.3469	4.4816
-15	-54.50	1303.74	-0.2132	5.0536

10

- 4) Explain with sketch the natural convection evaporator(with and without baffle). 10
- 5) A. Write a note on automatic expansion valve with neat sketch. 05
 B. Explain with sketch the operation of solenoid valve for variable refrigerant flow control. 05
- 6) a. Explain on transport refrigeration. 05
 b. List any five essential properties of good refrigerants. 05
- 7) a. List any four different types of air filters used in air conditioning 04
 b. Explain bag type dry air filter with sketch. 06
- 8) Explain the causes for faults in refrigeration system 10
- 9) Select the procedure should be adopted for replacing the evaporator(with and without valves) from the system 10
- 10) a. Explain with sketch the winter air conditioning system for mild and cold weather. 07
 b. Classify refrigerants. 03



MODEL QUESTION BANK

Diploma in Mechanical Engineering VI Semester

CO1: Understand the principle of refrigeration and know the types of refrigeration

REMEMBERING

- 1) Define the following terms:
 - i. Refrigeration
 - ii. Refrigerating effect
 - iii. Ton of refrigerator
 - iv. Heat pump
 - v. Refrigerator
 - vi. COP
- 2) Define 1 ton of refrigeration. Show how one ton refrigeration is expressed in kW.
- 3) Name five means of producing refrigeration.
- 4) List the advantages and disadvantages liquid nitrogen refrigeration with Specific field of application.
- 5) List the advantages and disadvantages Air refrigeration with specific field of application.

UNDERSTANDING

- 1) Explain how a refrigerant produces cooling effect?
- 2) Explain how the ice can be used for refrigeration? Is it possible to produce the temperature below zero degree with the help of ice?
- 3) Compare the direct and indirect refrigeration system with advantages and disadvantages.
- 4) Explain refrigeration by throttling process with temperature -pressure diagram.

APPLICATION

- 5) Make use of sketch explain dry ice refrigeration
- 6) Make use of sketch explain Steam jet refrigeration
- 7) Make use of sketch Explain liquid nitrogen refrigeration



- 8) Make use of sketch Explain Carnot refrigeration Cycle with with PV and TS diagram.
- 9) Make use of sketch Explain Air refrigeration/ Bell-Coleman refrigeration Cycle with with PV and TS diagram.
- 10) Ice is formed at 0°C from water at 20°C . The temperature of brine solution is -10°C reversible carnot cycle. Latent heat of ice is $= 336\text{kJ/kg}$.
find the Kg of ice formed per 1kWhr . Assume the refrigeration cycle is perfect
- 11) A Carnot refrigerator extracts 400 kJ of heat per minute from a cold room which is maintained at -15°C and it is discharged to atmosphere which is at 30°C . Find an ideal kW-capacity of motor required to run the unit.
- 12) A reversed Carnot cycle is used to deliver 1680kJ/sec to heat the conditional space. The heat is taken from atmosphere at 100C and supplied to the conditional space at 25°C . Find the followings: If the same quantity of heat is supplied by electric heaters, find the
- kW required to run the system
 - consumption of electric energy in kW.

CO2: Explain the concept of various refrigeration systems and familiar with their advantages and disadvantages

REMEMBERING

- List the advantages and disadvantages of vapour refrigeration over air refrigeration system.
- List the advantages and disadvantages of superheating in the VCR system.
- List the advantages and disadvantages of under cooling in the VCR system.

UNDERSTANDING

- Compare vapour compression refrigeration system over vapour absorption refrigeration system.

APPLICATION

- Make use of a flow diagram Explain the working principle of vapour compression refrigeration cycle.
- Make use of P-v and T-S diagram explain the working of vapour compression refrigeration cycle.



- 4) Develop an expression for work done and COP of a vapour compression refrigeration cycle (dry saturated) with T-S diagram.
- 5) Develop an expression for work done and COP of a vapour compression refrigeration cycle (superheated) with T-S diagram.
- 6) Make use of T-S diagram explain the effect of under cooling on the COP of a vapour compression refrigeration cycle
- 7) Make use of T-S diagram Explain the effect of superheating on the COP of a vapour compression refrigeration cycle .
- 8) Make use of a flow diagram Explain the working principle of simple vapour absorption refrigeration cycle.
- 9) Make use of a flow diagram Explain the working principle of ammonia absorption refrigeration cycle.
- 10) Make use of a flow diagram Explain the working principle of Domestic Electrolux refrigeration cycle.
- 11) An ammonia refrigerator produces 20 tones of ice at 0°C in 24 hours. The temperature range of the system is -15°C . The vapour leaving the compressor's dry-saturated. Assuming actual COP is 75% of theoretical, calculate the power required to run the compressor. Take latent heat of ice as 335 kJ/kg. Use the following properties of ammonia.

Saturation temp in $^{\circ}\text{C}$	Enthalpy(kJ/kg)		Entropy(kJ/kg-K)	
	h_f	h_g	s_f	s_g
25	99.94	1317.95	0.3469	4.4816
-15	-54.50	1303.74	-0.2132	5.0536

- 12) An ammonia refrigerator works between -6.7°C and 26°C . The vapour is dry saturated at the end of compression. Calculate
 - a. Theoretical COP
 - b. Power required to drive the compressor.
 If the cooling capacity of the refrigerant is 5 tons. Use the following properties of ammonia(NH_3)

Saturation temp in $^{\circ}\text{C}$	Specific Enthalpy(kJ/kg)		Specific Entropy(kJ/kg-K)	
	Liquid h_f	Saturated vapour h_g	Liquid s_f	Saturated vapour s_g
-6.7	-29.26	1262.36	0.1087	4.7401
26.7	124.56	1291.62	0.4264	4.3263



CO3: Know the constructional and working of refrigeration equipments such as Compressor, condensers and Evaporators and the refrigerant flow controls

REMEMBER

- 1) Define compressor.
- 2) List the different types of compressors.
- 3) Define volumetric efficiency of a compressor.
- 4) Define condenser.
- 5) List the different types of condensers.
- 6) Define evaporator.
- 7) List the different types of evaporators.
- 8) List the different types of expansion devices.
- 9) List the advantages and disadvantages of capillary tube.

UNDERSTANDING

- 1) Explain hermetically sealed compressors.
- 2) Explain with reasons the fields of applications of each type of compressor in refrigeration system.
- 3) Outline the advantages and disadvantages of centrifugal compressor over reciprocating compressor.
- 4) Compare air cooled and water cooled condensers.
- 5) Explain the functions of expansion devices.

APPLICATION

- 1) Make use of P-V diagram Explain the cycle of working of reciprocating compressor
- 2) Make use of flow and P-H diagram Explain the working of centrifugal compressor
- 3) Make use of sketch Explain the working of air cooled condenser
- 4) Make use of sketch Explain the working of water cooled condenser
- 5) Make use of sketch Explain the natural convection evaporator(with and without baffle).
- 6) Make use of sketch Explain the forced convection evaporator.
- 7) Make use of sketch explain automatic expansion valve with neat sketch.
- 8) Make use of sketch Explain the operation of solenoid valve for high temperature in evaporators.



- 9) Make use of sketch Explain the operation of solenoid valve for low temperature in evaporators.
- 10) Make use of sketch Explain the operation of solenoid valve for variable refrigerant flow control.

CO4: Know the different types of refrigerants and Application of refrigeration to various areas

REMEMBER

- 1) Define refrigerant.
- 2) List the types of leak detector.

UNDERSTANDING

- 1) Classify refrigerants.
- 2) Explain the factors affecting the choice of refrigerants commonly used in refrigerating plants.
- 3) Outline the essential properties of good refrigerants.
- 4) Outline the factors are considered in selecting refrigerants in the following system and name the refrigerant in each system
 - a. House hold refrigerator.
 - b. Ice producing plant.
 - c. Air conditioning plant.
- 5) Explain electronic leak detector.

APPLICATION

- 1) Choose the various factors to be considered to design cold storage
- 2) Choose the various factors to be considered to design quick freezing.

CO5: Appreciate the concept of Air Conditioning and know their types

REMEMBERING

1. Define Air conditioning.
2. List different factors affecting air conditioning.
3. Define psychrometry.
4. List and define psychrometric properties.
5. List different air conditioning equipments.
6. List different types of air filters used in air conditioning.
7. List different types of humidifiers used in air conditioning.



8. List different types of dehumidifiers used in air conditioning.
9. List different types of blowers used in air conditioning.
10. List the major difference between fans and blowers.

UNDERSTANDING

1. Explain briefly different factors affecting air conditioning.

APPLICATION

1. Make use of sketch Explain psychrometric chart
2. Make use of sketch Explain sensible heating
3. Make use of sketch Explain sensible Cooling
4. Make use of sketch Explain the summer air conditioning system for hot and dry outdoor conditions.
5. Make use of sketch Explain the summer air conditioning system for hot and humid outdoor conditions.
6. Make use of sketch Explain the winter air conditioning system for mild and cold weather.
7. Make use of sketch explain the following
 - a. Cooling with dehumidification
 - b. Cooling with adiabatic humidification of air
 - c. Cooling with dehumidification.
8. Make use of sketch Explain Steam injection type humidifier.
9. Make use of sketch Explain Spray type dehumidifier.
10. Make use of sketch Explain Axial flow fans.
11. Make use of sketch Explain centrifugal flow fans.

CO6: Familiarize the different tools used to install refrigeration system and Air Conditioner

UNDERSTANDING

- 1) Explain the different instruments used for the measurement of temperature, pressure, electricity, velocity of air and flow of air (Ref. Basic Refrigeration and Air Conditioning-P N Ananthanarayanan)
- 2) Explain the installation procedure for refrigerating units.
- 3) Explain the charging of refrigerating unit with neat sketch.
- 4) Explain the procedure of adding the oil to compressor.
- 5) Explain the different tests for refrigerants leakage.



- 6) Explain the procedure of removing the compressor from refrigeration non sealed unit.
- 7) Explain the procedure of removing the compressor from refrigeration sealed unit.
- 8) Explain the steps to be followed before disconnecting the condenser from the refrigeration system.
- 9) Explain the procedure should be adopted for replacing the evaporator(with and without valves) from the system.
- 10) Outline the points should be remembered for the maintenance of household refrigerator
- 11) Explain the causes for faults in refrigeration system.

