CBSE | DEPARTMENT OF SKILL EDUCATION

Air Conditioning and Refrigeration (SUBJECT CODE - 827)

MARKING SCHEME FOR CLASS XI (SESSION 2023-2024)

Max. Time: 3 Hours **Max. Marks: 60**

General Instructions:

1. Please read the instructions carefully.
2. This Question Paper consists of **24 questions** in two sections – Section A & Section B.
3. Section A has Objective type questions whereas Section B contains Subjective type questions.
4. **Out of the given (6 + 18 =) 24 questions, a candidate has to answer (6 + 11 =) 17 questions in the allotted (maximum) time of 3 hours.**
5. All questions of a particular section must be attempted in the correct order.
6. **SECTION A - OBJECTIVE TYPE QUESTIONS (30 MARKS):**
   - **i.** This section has 06 questions.
   - **ii.** There is no negative marking.
   - **iii.** Do as per the instructions given.
   - **iv.** Marks allotted are mentioned against each question/part.
7. **SECTION B – SUBJECTIVE TYPE QUESTIONS (30 MARKS):**
   - **i.** This section contains 18 questions.
   - **ii.** A candidate has to do 11 questions.
   - **iii.** Do as per the instructions given.
   - **iv.** Marks allotted are mentioned against each question/part.

SECTION A: OBJECTIVE TYPE QUESTIONS

Q. No.	QUESTION	Source Material (NCERT/PSSCIVE/ CBSE Study Material)	Unit/ Chap. No.	Page no. of source material	Marks
Q. 1	**Answer any 4 out of the given 6 questions on Employability Skills (1 x 4 = 4 marks)**				
i.	1. What is the purpose of communication? (a) Inform (tell someone about something) (b) Influence (get someone to do something you want) (c) Share thoughts, ideas, feelings (d) All of the above **Answer:-D**	NCERT Employability Skills	Unit-1	05	1
ii.	What makes you complete your work or studies without others cheering you? (a) Self-confidence (b) Communication (c) Self-motivation (d) Self-esteem **Answer:-C**	NCERT Employability Skills	Unit-2	95	1
iii.	Ravi works hard to get the best student award at the end of the year. What type of motivation is this? (a) Internal (b) External (c) Both internal and external (d) Not any specific type of motivation **Answer :-C**	NCERT Employability Skills	Unit-2	95	1

iv.	Which shortcut key is used to create a new document? (a) Ctrl+ c (b) Ctrl + n (c) Ctrl + m (d) Ctrl + d **Answer-:b**	NCERT ICT	Unit-3	109	1
v.	Which of the following actions would not help a green agriculture sector? (a) Using chemical fertilisers (b) Using organic manure (c) Growing vegetables using vermi-compost (d) Buying or selling organic potatoes **Answer:-a**	NCERT Employability Skills	Unit -5	175	1
vi.	_____is a process of developing a business plan, launching and running a business using innovation to meet customer needs and to make a profit. (a) ownership (b) Entrepreneurship (c) leadership (d) non of above **Answer:-b**	CBSE Employability Skills Study Material	Unit -4	53	1
Q. 2	**Answer any 5 out of the given 7 questions (1 x 5 = 5 marks)**				
i	Branch of physics that deals with the relationship between heat and other forms of energy. (a) Thermodynamics (b) Sociology (c) Psychology (d) Non of above **Answer:-a**	CBSE Study Material AC & Refrigeration-827	Unit-1	6	1
ii	When a substance is heated and the temperature rises as the heat is added, the increase in heat is called……. (a) Hidden Heat (b) latent Heat (c) sensible heat (d) Non of above **Answer:-C**	CBSE Study Material AC & Refrigeration-827	Unit-1	12	1
iii	_____ may be defined as the process of removing heat from a substance under controlled conditions. (a) Refrigeration (b) Air-Conditioning (c) Freezing (d) Non of above **Answer:-a**	CBSE Study Material AC & Refrigeration-827	Unit-1	10	1
iv	The process of cooling the refrigerant below the condensing temperature for a given pressure is known as. (a) Pressure cooling (b) Sub- Cooling (c) Freezing	CBSE Study Material AC & Refrigeration-827	Unit-2	38	1

	(d) Non of above **Answer:-b**				
V	Use of compressor in Mechanical refrigeration system. (a) for Refrigeration (b) for Air-Conditioning (c) for compression of gas (d) Non of above **Answer:-C**	CBSE Study Material AC & Refrigeration-827	Unit-3	53	1
vi	Effects of Heat. (a) Change in temperature. (b) Change in shape & size (c) change in color (d) all above **Answer:-d**	CBSE Study Material AC & Refrigeration-827	Unit-1	13	1
vii	The heat which brings about a change of state with no change in temperature is called_____ (a) Hidden Heat (b) latent Heat (c) sensible heat (d) None of above **Answer:-b**	CBSE Study Material AC & Refrigeration-827	Unit-1	13	1
Q. 3	**Answer any 6 out of the given 7 questions (1 x 6 = 6 marks)**				
i	Unit of Refrigeration. (a) TR (b) Watt (c) Ampere (d) Non of above **Answer:-a**	CBSE Study Material AC & Refrigeration-827	Unit-1	11	1
ii	The expansion device used in domestic refrigerator is (A) Expansion valve (B) Thermostatic expansion valve (C) Open type expansion valve (D) Capillary tube. **Answer;-d**	CBSE Study Material AC & Refrigeration-827	Unit-3	68	1
iii	The major parts of a domestic refrigerator are (a) Insulated cabinet (b) Refrigerating system (c) Both (a) and (b) (d) None of the above **Answer -c**	CBSE Study Material AC & Refrigeration-827	Unit-2	43	1
iv	The simple Vapour compression Refrigeration system is made up of four fundamental processes (a) (i) expansion (ii) vaporization (iii) compression (iv) condensation (b) (i) Heating (ii) compression (iii) condensation (iv) contraction (c) (i) Heating (ii) expansion (iii) compression	CBSE Study Material AC & Refrigeration-827	Unit-2	33	1

	(iv) contraction (d) (i) expansion (ii) vaporization (iii) condensation (iv) contraction **Answer;-a**				
v	Ohm's law is related to (a) current, voltage and resistance (b) Power, energy and resistance (c) watt, voltage and Resistance (d) All Above **Answer-a**	CBSE Study Material AC & Refrigeration-827	Unit-4	72	1
vi	Voltmeter is used for measuring the a) current (b) Power (c) voltage (d) All Above **Answer-c**	CBSE Study Material AC & Refrigeration-827	Unit-4	72	1
vii	P-H chart means (a) Pressure – Heat chart (b) Performance – Enthalpy chart (c) Pressure- Enthalpy chart (d) Performance- Heat chart **Answer-c**	CBSE Study Material AC & Refrigeration-827	Unit-2	37	1
Q. 4	**Answer any 5 out of the given 6 questions (1 x 5 = 5 marks)**				
i	_____is that branch of engineering science, which deals with the study of air. a) Psychrometry (b) Quantum Physics (c) Organic Chemistry (d) All Above **Answer-a**	CBSE Study Material AC & Refrigeration-827	Unit-5	87	1
ii	The evaporator in a refrigeration system is also known as (A) heating coil (B) cooling coil (C) electric coil (D) magnetic coil **Answer;-b**	CBSE Study Material AC & Refrigeration-827	Unit-3	68	1
iii	The types of Copper tubing used in air conditioning and Refrigeration are (a) Hard drawn copper tubing (b) Soft copper tubing (c) Both (a) and (b) (d) None of the above **Answer;-c**	CBSE Study Material AC & Refrigeration-827	Unit-2	49	1
iv	OLP stands for A) over land pilot (B) over load protector (C) over load parameter (D) None of the above **Answer;-b**	CBSE Study Material AC & Refrigeration-827	Unit-4	85	1
v	Full form of EMF	CBSE Study Material	Unit-4	71	1

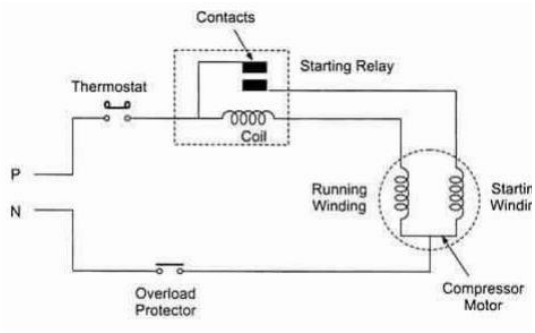
	A) Electromotive Force (B) Electro Magnetic Force (C) Electro metric Force (D) None of the above **Answer;-a**	AC & Refrigeration-827			
vi	The property of a substance which opposes the flow of electric current through it. A) power (B) watt (C) Resistance (D) None of the above **Answer;-c**	CBSE Study Material AC & Refrigeration-827	Unit-4	71	1
Q. 5	**Answer any 5 out of the given 6 questions (1 x 5 = 5 marks)**				
i	Unit of Power (a) Joule/second (b) watt (c) Kw (d) All above **Answer-d**	CBSE Study Material AC & Refrigeration-827	Unit-4	72	1
ii	The condenser used in a conventional domestic refrigerator is (A) Natural type air cooled condenser (B) Forced draft type air cooled condenser (C) Water cooled condenser (D) None of the above. **Answer;-a**	CBSE Study Material AC & Refrigeration-827	Unit-3	68	1
iii	What is the cooling capacity of normal windows AC. (A) 1.5 ton (B) 2 ton (C) 5 ton (D) 7 ton. **Answer;-a**	CBSE Study Material AC & Refrigeration-827	Unit-6	107	1
iv	In a Centralised air conditioner plant which type of condenser is used A) water cooled (B) air cooled (C) both (a) and (b) (D) non of above **Answer;-a**	CBSE Study Material AC & Refrigeration-827	Unit-6	107	1
v	Dry bulb temperature lines shown on Psychrometric chart are (A) Vertical lines (B) Curved lines (C) horizontal lines (D) Zig- Zag lines. **Answer;-a**	CBSE Study Material AC & Refrigeration-827	Unit-5	91	1
vi	What type of air conditioners used for small commercial establishments? (A) Packaged air conditioners (B) Windows air conditioners (C) Centralised air conditioners (D) None of the above.	CBSE Study Material AC & Refrigeration-827	Unit-6	107	1

	Answer;-a				
Q. 6	**Answer any 5 out of the given 6 questions (1 x 5 = 5 marks)**				
i	A Centralised air conditioner plant is used (A) Year round (B) only in summer (C) only in winter (D) None of the above. **Answer;-a**	CBSE Study Material AC & Refrigeration-827	Unit-6	107	1
ii	For cooling of circulating water in a water cooled condenser, the device used is (A) Fan (B) Cooling tower (C) Geyser (D) None of the above. **Answer;-b**	CBSE Study Material AC & Refrigeration-827	Unit-3	68	1
iii	It is the temperature of air recorded by a thermometer, when its bulb is surrounded by a wet cloth exposed to the air. (A) Air temperature (B) wet Bulb temperature (C) Surrounding Temperature (D) None of the above. **Answer;-b**	CBSE Study Material AC & Refrigeration-827	Unit-5	89	1
iv	It is the difference between the dry bulb temperature and dew point temperature of air. (A) Dry bulb depression (B) Dew point depression (C) Wet bulb depression. (D) None of the above. **Answer;-b**	CBSE Study Material AC & Refrigeration-827	Unit-5	89	1
v	How much temperature and Relative humidity is required for human Comfort. It is the difference between the dry bulb temperature and dew point temperature of air. (A) 24 °C and 40% Humidity (B) 21 °C and 50% Humidity (C) 24 °C and 50% Humidity (D) None of the above. **Answer;-b**	CBSE Study Material AC & Refrigeration-827	Unit-6	103	1
vi	Wet bulb temperature lines shown on Psychrometric chart are (A) Vertical lines (B) Curved lines (C) inclined straight lines (D) Zig- Zag lines. **Answer;-c**	CBSE Study Material AC & Refrigeration-827	Unit-5	93	1

SECTION B: SUBJECTIVE TYPE QUESTIONS

Q. No.	QUESTION	Source Material (NCERT/PSSCIVE/ CBSE Study Material)	Unit/ Chap. No.	Page no. of source material	Marks
Answer any 3 out of the given 5 questions on Employability Skills in 20 – 30 words each (2 x 3 = 6 marks)					
Q. 7	What is Communication? Give its type also. **Ans**:- Communication is the act of conveying meanings from one entity or group to another through the use of mutually understood signs, symbols, and semiotic rules. 1. Verbal 2. Non- Verbal	CBSE Study Material Employability Skills	Unit-1	1	2
Q. 8	**What is time Management?** **Ans:** Time management is the process of planning and exercising control of time spent on various activities to increase efficiency and effectiveness. Time as a resource is the same for everyone. It is up-to us to make the best use of this resource.	CBSE Study Material Employability Skills	Unit-2	21	2
Q. 9	What are the steps to change the alignment of text in word processing? Ans:- 1. Select the text. 2. Select Paragraph option from the Format menu. 3. The Paragraph dialog box appears. 4. Select the desired alignment option. 5. Click OK.	CBSE Study Material Employability Skills	Unit-3	34	2
Q. 10	**Define Values. Also write their types.** **Ans :-** Values are basically the beliefs about what matters the most, how to behave and which goals are important to achieve. Personal • Professional • Social	CBSE Study Material Employability Skills	Unit-4	53	2
Q. 11	What are five basic components of a Green Economy? Ans: 1. Renewable Energy 2. Green Buildings 3. Green Transport 4. Water Management 5. Waste Management	CBSE study material Employability Skills	Unit-5	63 and 64	2

Answer any 3 out of the given 5 questions in 20 – 30 words each (2 x 3 = 6 marks)					
Q. 12	Define the Meaning of Refrigeration. **Ans :-** The term 'REFRIGERATION' may be defined as the process of removing heat from a substance under controlled conditions. It also includes the process of reducing and maintaining the temperature of a body below the general temperature of its surroundings.	CBSE Study Material AC & Refrigeration-827	Unit-1	9	2
Q. 13	Define vapour compression refrigeration system. Ans :-- In the vapour compression system, the refrigerant vapour is sucked into the compressor and is compressed adding the energy in the form of work to increase its thermal level above atmosphere	CBSE Study Material AC & Refrigeration-827	Unit-2	32	2
Q. 14	**Define** Compressor. Ans :- A compressor is considered to be the heart of the compression refrigeration system. It pumps the refrigerant the train the system and circulates it again and again in cycles	CBSE Study Material AC & Refrigeration-827	Unit-3	53	2
Q. 15	What is Ohm's Law? This law states that the amount of current in any given circuit is directly proportional to voltage and inversely proportional to resistance. Physical conditions remain same (Like Temperature, Humidity Etc.) i.e. $Current = \frac{Voltage}{Resistance}$ $I = \frac{E}{R}$ I =Current ,E =Voltage, R= Resistance	CBSE Study Material AC & Refrigeration-827	Unit-4	72	2
Q. 16	Define wet-bulb temperature. Ans :- It is the temperature of air recorded by a thermometer, when its bulb is surrounded by a wet cloth exposed to the air. Such a thermometer is called wet bulb thermometer. The wet bulb temperature is generally denoted by tw or twb..	CBSE Study Material AC & Refrigeration-827	Unit-5	89	2
Answer any 2 out of the given 3 questions in 30– 50 words each (3 x 2 = 6 marks)					
Q. 17	**How does a reciprocating compressor work?** **Ans :-** When the compressor is driven with	CBSE Study Material AC & Refrigeration-827	Unit-3	54	3

	prime mover, the piston moves in reciprocating motion in an enclosed cylinder. On the downward stroke, it sucks the gas through the suction valve. While on the upward stroke, it compresses the gas into lower volume and discharge the gas through the discharge valve.				
Q. 18	**Write down effect of heat.** **Ans:-** On heating any substance the following effects may take place. 1. Rise in temperature of the substance. 2. The substance may melt or vaporise i.e. change in state of substance, solid becomes liquid and liquid becomes gas. 3. Change in colour of a substance. 4. Change in size and shape of a substance. 5. Increase in pressure of the substance.	CBSE Study Material AC & Refrigeration-827	Unit-1	13	3
Q. 19	Write down types of Cooper Tubes and their use. Ans :-. (i) Soft copper tubing: Soft copper tubing is used in domestic work and in some commercial refrigeration and air conditioning applications. It is annealed (First heated and then cooled) in order to make it flexible so that it may be easily bent and flared. (ii) Hard drawn copper tubing: Hard drawn copper tubing is used in commercial refrigeration and air conditioning applications. Hard tubing is used in straight length as these cannot be bent. These are available in 20 ft. lengths.	CBSE Study Material AC & Refrigeration-827	Unit-2	49	3
Answer any 3 out of the given 5 questions in 50– 80 words each (4 x 3 = 12 marks)					
Q. 20	Wiring Circuit Diagram of Domestic Refrigerator.  	CBSE Study Material AC & Refrigeration-827	Unit-4	81	4
Q. 21	**Write down some safety Precautions while handling refrigerant cylinders.** **Ans:-**	CBSE Study Material AC & Refrigeration-827	Unit-1	31	4

	1. Store the refrigerant cylinder in an airy room. 2. Don't over fill cylinder. 3. Keep full and empty cylinder separately. 4. Never tamper the safety devices fitted on refrigerant cylinder. 5. Use line valve and pressure guage while working for pressure leak test. 6. Use gas masks while working on refrigerant cylinder. 7. Never mix different gases in a cylinder. 8. Always charge refrigerant into the low side of the system to avoid damaging the compressor, or causing the system to rupture. 9. Inspect refrigerant cylinders regularly. Do not use the cylinders if they show signs of rust, distortion, denting, or corrosion. 10. Keep first aid box in workshop				
Q. 22	Define simple vapour- compression refrigeration cycle. And also explain it four main processes. Ans:- As the refrigerant circulates through the system, it passes through a number of changes in state or condition, each of which is called a process. The refrigerant starts at some initial state or condition, passes through a series of processes in a definite sequence, and returns to the initial-condition. This series of processes is called a cycle. The simple vapour- compression, refrigeration cycle is made up of four fundamental processes: (1) expansion, (2) vaporization, (3) compression, and (4) condensation. To under-stand properly the refrigeration cycle it is necessary to consider each process in the cycle both separately and in relation to the complete cycle. Any changes in any one process in the cycle will bring about changes in all the other processes in the cycle.	CBSE Study Material AC & Refrigeration-827	Unit-2	33	4
Q. 23	draw block diagram of any compressor. Ans:- (Student can draw any type of compressor according to choice unit -3 of CBSE study martial having all type of compressors figs.)	CBSE Study Material AC & Refrigeration-827	Unit-3	53	4
Q. 24	Explain Packaged air conditioner. Ans:-These are factory assembled units having a complete system mounted in a cabinet. The system is usually water cooled and is used in small commercial or other establishments such	CBSE Study Material AC & Refrigeration-827	Unit-6	107	4

	as restaurants, stores, banks and laboratories, etc. In early days, the capacities of such units ranged from 2 to 10 ton with 2, 3 and 5 ton sizes predominating. Now the units are available in capacities up to 100 ton. The equipment may be located in the conditioned space or outside the conditioned space, with or without ducts. In the conditioned space, they may be floor mounted, ceiling mounted or window mounted. Outside the conditioned space, they may be located in the basement, garage or attic. These units are divided into two groups depending upon the location of components as: (i) Remote type (ii) Console type. Remote type: In this type of system, the air handling unit is separated from the condensing unit. They may be of horizontal or vertical type depending the position of drain pan and filter. Console type: The console is placed in the room below the window sill and has suitable fresh air inlet opening, provided in the walls.				