

<p style="text-align: center;">Marking Scheme Strictly Confidential (For Internal and Restricted use only) Senior Secondary School Examination, 2026 (XIIth) SUBJECT NAME : Air Conditioning and Refrigeration (Q.P. CODE 827/315)</p>	
<u>General Instructions: -</u>	
1	The CBSE has decided to introduce On Screen Marking (OSM) for the evaluation of Class XII answer Book with the 2026 Examination.
2	You are aware that evaluation is the most important process in the actual and correct assessment of the candidates. A small mistake in evaluation may lead to serious problems which may affect the future of the candidates, education system and teaching profession. To avoid mistakes, it is requested that before starting evaluation, you must read and understand the spot evaluation guidelines carefully.
3	“Evaluation policy is a confidential policy as it is related to the confidentiality of the examinations conducted, evaluation done and several other aspects. Its leakage to public in any manner could lead to derailment of the examination system and affect the life and future of millions of candidates. Sharing this policy/document to anyone, publishing in any magazine and printing in Newspaper/Website, etc. may invite action under various rules of the Board and IPC.”
4	Evaluation is to be done as per instructions provided in the Marking Scheme. It should not be done according to one's own interpretation or any other consideration. Marking Scheme should be strictly adhered to and religiously followed. However, while evaluating, answers which are based on latest information or knowledge and/or are innovative, they may be assessed for their correctness otherwise and due marks be awarded to them. In Class-XII, while evaluating two competency-based questions, please try to understand given answer and even if reply is not from marking scheme but correct competency is enumerated by the candidate, due marks should be awarded.
5	The Marking scheme carries only suggested value points for the answers. These are in the nature of Guidelines only and do not constitute the complete answer. The students can have their own expression and if the expression is correct, the due marks should be awarded accordingly.
6	The Head-Examiner must go through the first five answer books evaluated by each evaluator on the first day, to ensure that evaluation has been carried out as per the instructions given in the Marking Scheme. If there is any variation, the same should be zero after deliberation and discussion. The remaining answer books meant for evaluation shall be given only after ensuring that there is no significant variation in the marking of individual evaluators.
7	Evaluators will mark (✓) wherever answer is correct. For wrong answer CROSS 'X' be marked. Evaluators will not put right (✓) while evaluating which gives an impression that answer is correct and no marks are awarded. This is most common mistake which evaluators are committing.
8	If a question has parts, please award marks on the right-hand side for each part in the OSM Portal. Marks awarded for different parts of the question will be totaled up by the OSM System.
9	If a question does not have any parts, marks must be awarded in the left-hand margin in the OSM Portal. This may also be followed strictly.

10	No marks to be deducted for the cumulative effect of an error. It should be penalized only once.
11	A full scale of marks _____ (example 0 to 80/70/60/50/40/30 marks as given in Question Paper) has to be used. Please do not hesitate to award full marks if the answer deserves it.
12	Every examiner has to necessarily do evaluation work for full working hours i.e., 8 hours every day and evaluate 20 answer books per day in main subjects and 25 answer books per day in other subjects (Details are given in Spot Guidelines). This is in view of the reduced syllabus and number of questions in question paper.
13	Ensure that you do not make the following common types of errors committed by the Examiner in the past :- <ul style="list-style-type: none"> • Answers marked as correct, but marks not awarded. (Ensure that the right tick mark is correctly and clearly indicated. It should merely be a line. Same is with the X for incorrect answer.) • Half or a part of answer marked correct and the rest as wrong, but no marks awarded.
14	While evaluating the answer books if the answer is found to be totally incorrect, it should be marked as cross (X) and awarded zero (0) Marks.
15	The Examiners should acquaint themselves with the guidelines given in the “Guidelines for Spot Evaluation” before starting the actual evaluation.
16	The candidates are entitled to obtain photocopy of the Answer Book on request on payment of the prescribed processing fee. All Examiners/Additional Head Examiners/Head Examiners are once again reminded that they must ensure that evaluation is carried out strictly as per value points for each answer as given in the Marking Scheme.
17	If a candidate attempts both alternatives/options in a question where only one option/ alternative is required to be attempted, the Evaluator shall award marks in both the options. The system will take the higher of two scores and disregard the other response.
18	In a question having two options/alternatives, if a candidate has attempted only one, then the evaluator shall mark “NA” (Not attempted) against the option that has not been attempted by the candidate.

MARKING SCHEME
Air Conditioning and Refrigeration (Subject Code- 827)
(PAPER CODE: 315) (P3150827)

Q. No.	EXPECTED OUTCOMES/VALUE POINTS	Unit	Marks
	SECTION – A (Objective Type Questions)		
1.	Answer any 4 out of given 6 questions on employability skills.		4x1=4
(i)	Noun, Pronoun, Adjective, Verb, Adverb are the basic parts of speech.	(Unit-1, Page No.11)	1
(ii)	(B) Self Confidence.	(Unit-2, Page No.38)	1
(iii)	(D) Graphic.	(Unit-3, Page No.45)	1
(iv)	(B) Yoga.	(Unit-4, Page No.)	1
(v)	(C) Recycle bank.	(Unit-5, Page No.117)	1
(vi)	Motivation is derived from the word 'motive'. It indicates a directing behaviour towards a certain goal.	(Unit-2, Page No.24)	1
2.	Answer any 5 out of the given 7 questions.		5x1=5
(i)	Answer : (D) Cooling with adiabatic humidification	UNIT-1	1
(ii)	Answer : (A) Convection	UNIT-2	1
(iii)	Answer : (A) Condenser	UNIT-3	1
(iv)	Answer : (A) By shutting off the compressor	UNIT-4	1
(v)	Answer : (D) Liquidizer	UNIT-5	1
(vi)	Answer : (A) Waster	UNIT-6	1
(vii)	Answer : (B) Forced convection air cooled	UNIT-3	1
3.	Answer any 6 out of the given 7 questions.		6x1=6
(i)	Answer : (B) Expansion valve	UNIT-3	1
(ii)	Answer : (A) Centrifugal	UNIT-6	1
(iii)	Answer : (A) air	UNIT-5	1
(iv)	Answer : (D) Overheating and burn out of motor winding	UNIT-4	1
(v)	Answer : (A) Finned evaporator	UNIT-3	1
(vi)	Answer : (B) Humidification	UNIT-1	1
(vii)	Answer : (B) to maximise temperature fluctuations.	UNIT-2	1

4.	Answer any 5 out of the given 6 questions.		5x1=5
(i)	Answer : (B) Sensible heating	UNIT-1	1
(ii)	Answer : (D) PUF	UNIT-2	1
(iii)	Answer : (B) Trichloro monofluoro methane	UNIT-3	1
(iv)	Answer : (A) Water cooled condenser	UNIT-4	1
(v)	Answer : (C) Dipping ice in hot water	UNIT-5	1
(vi)	Answer : (D) Register	UNIT-6	1
5.	Answer any 5 out of the given 6 questions.		5x1=5
(i)	Answer : (D) Chilling and Freezing	UNIT-5	1
(ii)	Answer : (B) AHU	UNIT-6	1
(iii)	Answer : (C) Refrigerant	UNIT-4	1
(iv)	Answer : (A) R-134a	UNIT-3	1
(v)	Answer : (D) Conduction	UNIT-2	1
(vi)	Answer : (B) Ventilation of air	UNIT-1	1
6.	Answer any 5 out of the given 6 questions.		5x1=5
(i)	Answer : (B) halocarbon refrigerants	UNIT-3	1
(ii)	Answer : (A) Reduced plenum duct system	UNIT-2	1
(iii)	Answer : (A) Hot wire relay	UNIT-4	1
(iv)	Answer : (D) –24°C to –40°C	UNIT-5	1
(v)	Answer : (D) Ceiling fan	UNIT-6	1
(vi)	Answer : (D) to absorb moisture from the refrigerant	UNIT-3	1
	SECTION-B (Subjective Type Questions)		
	Answer any 3 out of the given 5 questions on employability skills. Answer each question in 20-30 words.		3x2=6
7.	The four skills are – Listening, Speaking, Reading, Supporting parts of speech :- Writing. (i) Articles – the words ‘a’, ‘an’ and ‘the’ are known as articles. (ii) Conjunction – These are words that join two nouns, phrases or sentences (iii) Prepositions – It connect one word with another to show the relationship between them. (iv) Interjection – These words express strong emotions. They have an exclamation mark at the end.	Unit-1 Page no. 12,13	

8.	<p>The 4 ways to manage stress :-</p> <ul style="list-style-type: none"> • Keep your thoughts in present. • Talk to friends and family for comfort. • Practice meditation and yoga • Stay positive and analyse what is going wrong in a certain situation. Resolving the situation is easy once understood. 	(Unit-2, Page No.26)	$\frac{1}{2} \times 4 = 2$
9.	<p>Text formatting necessary in a spreadsheet are –</p> <ul style="list-style-type: none"> • They are easy to read and understand. • Important points are clearly highlighted. <p>Two ways to formatting content –</p> <p>(i) Change text style and font size</p> <p>(ii) Align (arrange) text in a cell</p> <p>(iii) Highlight text</p>	(Unit-3, Page No.54)	1+1=2
10.	<p>The 4 government schemes that help small scale entrepreneurs gain capital –</p> <p>(i) Government Mudra Yojana</p> <p>(ii) Credit Guarantee Scheme</p> <p>(iii) Stand-up India Scheme</p> <p>(iv) P.M. employment Generation Programs.</p>	(Unit-4, Page No.92)	2 $\frac{1}{2} \times 4 = 2$
11.	<p>These are some plants, which are used to make our home toxin Free – Areca palm, Rubber plant, Snake plant, Aloe vera plant, Spider plant etc.</p>	(Unit-5, Page No.114)	$\frac{1}{2} \times 4 = 2$
	Answer any 3 out of the given 5 questions in 20-30 words each.		3x2=6
12.	The heating of air, without any change in its specific humidity is known as sensible heating. In this process, D.B.T of air increases, enthalpy increases but specific humidity remains constant.	UNIT-1	2
13.	These are the substances that resist the flow of heat helping to maintain a desired temperature by reducing the heat transfer.	UNIT-2	2
14.	<p>To manufacture transparent good quality ice, following steps should be taken :</p> <ol style="list-style-type: none"> 1. Water should be given preliminary chemical treatment, and filtered before filling in cans. 2. To remove the dissolved gases from the freezing water and to take out solid impurities, air agitation is done in the cans. 	UNIT-5	1+1=2

15.	The air supplied to the conditioned spaces must be free from all foreign matter such as dirt, fumes, smoke and harmful bacteria. In order to clean the contaminated air we use filters.	UNIT-6	2
16.	The function of a condenser is to remove heat of the hot vapour refrigerant discharged from the compressor. This heat is removed through the walls of the condenser tubes to the cooling medium.	UNIT-3	2
	Answer any 2 out of the given 3 questions in 30-50 words each.		2x3=6
17.	<p><u>Conduction</u> :</p> <p>Heat is transferred between objects or within an object through direct contact. The particles in the hotter region vibrate more vigorously, and this energy is passed on to neighbouring particles, leading to a transfer of heat from the hotter to the cooler region. Conduction is most effective in solids.</p> <p><u>Convection</u> :</p> <p>Heat is transferred through the movement of fluids (liquid and gases). When a fluid is heated, It expands, becomes less dense, and rises. Cooler, dense fluid then moves in to replace it, creating a continuous cycle of movement and heat transfer.</p> <p><u>Radiation</u> :</p> <p>In radiation, heat is transferred in the form of electromagnetic waves. For radiative heat transfer, therefore, the presence of a medium is not necessary.</p>	UNIT-2	1+1+1=3
18.	<p>When two quantities of air having different enthalpies and different specific humidities are mixed, the final condition of the air mixture depends upon the masses involved, on the enthalpy and specific humidities of each of the constituent masses which enter the mixture.</p> <p>The adiabatic mixing process is represented on the psychrometric chart by a point which lies on the straight line joining the points of two constituents masses. The final condition of the mixture lies on this straight line and this point divides the line in the inverse ratio of mixture masses.</p>	UNIT-1	3
19.	<ol style="list-style-type: none"> 1. The refrigerant is stable and is non-toxic, non-corrosive and non-flammable 2. The boiling point of R-22 is -41°C at atmospheric pressure 3. It has a latent heat of 216.5 kJ/kg at -15°C 4. The refrigerant has good solubility in oil. 5. It is used with reciprocating and centrifugal compressors 6. The cylinder colour code for R-22 is green. <p>etc.</p>	UNIT-3	$\frac{1}{2} \times 6 = 3$

	Answer any 3 out of the given 5 questions in 50-80 words each.		3x4=12
20.	<p>A well labelled appropriate diagram.</p> <p>In this system, conditioned air is introduced through the openings located in the ceiling and removed through the openings made in floor or in walls near the floor. The downward system should endeavour to spread the incoming air uniformly above the occupied space.</p>	UNIT-2	2+2=4
21.	<p>The capillary tube is the simplest of the refrigerant flow controls, consisting merely of a fixed length of small diameter tubing installed between the condenser and the evaporator. Because of the high frictional resistance resulting from its length and small bore (diameter) and because of the throttling effect resulting from the gradual formation of flash gas in the tube as the pressure of the liquid is reduced below its saturation pressure the capillary tube acts to restrict or meter the flow of liquid from the condenser to evaporator and also to maintain the required operating pressure differential between those two units.</p> <p><u>Advantages of capillary tube :</u></p> <ol style="list-style-type: none"> 1. It is simple in construction and no maintenance is required. 2. System using this device doesn't require receiver. <p>etc.</p> <p><u>Disadvantages of capillary tube :</u></p> <ol style="list-style-type: none"> 1. The refrigerant must be free from moisture and dirt otherwise it will choke the tube and stop the flow of refrigerant. 2. It cannot be used with high fluctuating load conditions. <p>etc.</p>	UNIT-3	2+2=4
22.	<p>A well labelled appropriate diagram.</p> <p>This control is used as a safety control. The compressor is stopped by cutting off the power supply given to the motor of compressor whenever the discharge pressure of the compressor becomes excessive. This is necessary to prevent the possible damages of the equipments. When the pressure returns to the normal, the control acts to close the power supply and starts the compressor.</p>	UNIT-4	2+2=4
23.	A well labelled appropriate diagram.	UNIT-5	4

24.	<p>In a central station air conditioning system, all the components of the system are grouped together in one central room and conditioned air is distributed from the central room to the required places through extensive duct work. It is generally used for the load above 25TR and 2500 cubic meter/min. of conditioned air. The central plants require the following components and all the components are assembled on the site :</p> <ol style="list-style-type: none"> 1. cooling and dehumidifying coils 2. heating coils 3. blower with motor 4. sprays for cooling, dehumidifying or washing. 5. air cleaning equipments 6. a control device. 	UNIT-6	4
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