

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO

23-0006-AB

TEST BOOKLET

Time Allowed: 1 hr

PAPER-II
MECHANIC REFRIGERATION &
AIR CONDITIONING

Maximum Marks: 50

INSTRUCTIONS TO CANDIDATES

Read the instructions carefully before answering the questions: -

1. This Test Booklet consists of 08 (eight) pages and has 50 (fifty) questions.
2. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS BOOKLET DOES NOT HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
3. Please note that it is the candidate's responsibility to fill in the Roll Number and other required details carefully and without any omission or discrepancy at the appropriate places in the OMR Answer Sheet. Any omission/discrepancy will render the OMR Answer Sheet liable for rejection.
4. Do not write anything else on the OMR Answer Sheet except the required information. Before you proceed to mark in the OMR Answer Sheet, please ensure that you have filled in the required particulars as per given instructions.
5. Use only Black Ball Point Pen to fill the OMR Answer Sheet.
6. Each question comprises of 04 (four) responses (answers). You are required to select the response which you want to mark on the OMR Answer Sheet. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose *ONLY ONE* response for each item.
7. After you have completed filling in all your responses on the OMR Answer Sheet and the examination has concluded, you should hand over to the Invigilator *only the OMR Answer Sheet*. You are permitted to take the Test Booklet with you.
8. Penalty for wrong answers in case of Multiple Choice based Questions:
THERE WIL BE PENALTY FOR WRONG ANSWERS MARKED BY A CANDIDATE.
 - (i) There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, one-third of the marks assigned to the question will be deducted as penalty.
 - (ii) If a candidate gives more than one answer, it will be treated as a wrong answer even if one of the given answers happens to be correct and there will be same penalty as above to the question.
 - (iii) If a question is left blank. i.e., no answer is given by the candidate; there will be no penalty for that question.

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MECHANIC REFRIGERATION & AIR CONDITIONING

Choose the correct answer for the following questions:

1. The refrigerant used for absorption refrigerant working heat from solar collectors is mixture of water and

- (a.) Carbon dioxide
(b.) Sulphur dioxide
- (c) Lithium bromide
(d) Freon 12

2. Consider the following statements: A decrease in evaporator temperature of a vapour compression machine leads to

1. an increase in refrigerating effect.
2. an increase in specific volume of vapour.
3. a decrease in volumetric efficiency of compressor.
4. an increase in compressor work.

Which of these statements are correct?

- (a) 1, 3 and 4
(b) 1, 2 and 3
- (c) 2, 3 and 4
(d) 2 and 4

3. Consider the following statements: Moisture should be removed from refrigerants to avoid

1. Compressor seal failure.
2. Freezing at the expansion valve.
3. Restriction to refrigerant flow.
4. Corrosion of steel parts.

Which of these statements are correct?

- (a) 1, 2, 3 and 4
(b) 1 and 2
- (c) 2, 3 and 4
(d) 1, 3 and 4

4. Solar energy can be directly used in

- (a) Vapour compression refrigeration system
(b) Vapour absorption refrigeration system
- (c) Air refrigeration system
(d) Jet refrigeration system

5. The maximum COP for the absorption cycle is given by (T_G = generator temperature, T_c = environment temperature, T_E = refrigerated space temperature)

- (a) $\frac{T_E (T_G - T_C)}{T_G (T_C - T_E)}$
(b) $\frac{T_C (T_G - T_E)}{T_G (T_C - T_E)}$
- (c) $\frac{T_G (T_C - T_E)}{T_E (T_G - T_C)}$
(d) $\frac{T_G (T_C - T_E)}{T_C (T_G - T_E)}$

6. Sub cooling heat exchanger is used in a refrigeration cycle. The enthalpies at condenser outlet and evaporator outlet are 78 and 182 kJ/kg respectively. The enthalpy at outlet of isentropic compressor is 230 kJ/kg and enthalpy of subcooled liquid is 68 kJ/kg. The COP of the cycle is

- (a) 3.25
(b) 2.16
- (c) 3.0
(d) 3.5

7. Ozone depletion by CFCs occurs by breakdown of
- Chlorine atoms from refrigerant by UV radiation and reaction with ozone in troposphere
 - Fluorine atoms from refrigerant by UV radiation and reaction with ozone in troposphere
 - Chlorine atoms from refrigerant by UV radiation and reaction with ozone in stratosphere
 - Fluorine atoms from refrigerant by UV radiation and reaction with ozone in stratosphere
8. A good refrigerant should have
- Large latent heat of vaporisation and low operating pressures
 - Small latent heat of vaporisation and high operating pressures
 - Large latent heat of vaporisation and large operating pressures
 - Small latent heat of vaporisation and low operating pressures
9. Maximum possible COP of a solar absorption refrigeration system with generator temperature of 360 K, absorber temperature of 300 K, condenser temperature of 300 K and evaporator temperature of 270 K is
- 9
 - 6
 - 3
 - 1.5
10. A Carnot refrigerator requires 1.5 kW/ton of refrigeration to maintain a region at a temperature of -30°C . The COP of the Carnot refrigerator is
- 1.42
 - 2.33
 - 2.87
 - 3.26
11. In a vapour compressor refrigeration system, the refrigeration capacity is 2100 kJ/min and heat rejection factor is 1.2. What will respectively be the heat rejected from the condenser and COP?
- 5040 kJ/min and 5
 - 2520 kJ/min and 5
 - 2520 kJ/min and 4
 - 5040 kJ/min and 4
12. In a vapour compression refrigeration system, throttle valve is used in place of an expander because
- it considerably reduces the system weight
 - it improves the COP, as the condenser is small
 - the positive work in isentropic expansion of liquid is very small
 - it leads to significant cost reduction
13. Which one of the following statements regarding COP of ammonia absorption system is correct?
- a function of the temperature and pressure of the solution
 - a function of the pressure of the solution irrespective of the temperature
 - a function of the temperature of the solution alone
 - Independent of the temperature and pressure of the solution
14. Consider the following statements: In the case of a vapour compression machine, if the condensing temperature of the refrigerants closer to the critical temperature, then there will be
- Excessive power consumption
 - High compression
 - Large volume flow
- Which of these statements are correct?
- 1, 2 and 3
 - 1 and 2
 - 2 and 3
 - 1 and 3

15. In milk chilling plants, the usual secondary refrigerant is

- (a) Ammonia solution
- (b) Sodium Silicate
- (c) Glycol
- (d) Brine

16. Match List-1 (Refrigerant) with List-II (Chemical constituent) and select the correct answer using the codes given below the lists:

- | | |
|----------|---|
| List-1 | List-II |
| A. R-12 | 1. Trichloro-trifluoro-ethane (CClF-CClF ₂) |
| B. R-22 | 2. Difluoro-monochloro-methane (CHF ₂ Cl) |
| C. R-717 | 3. Ammonia (NH ₃) |
| D. R-113 | 4. Difluoro-dichloro-methane (CCl ₂ F ₂) |

Codes:

	A	B	C	D
(a)	3	2	4	1
(b)	4	2	3	1
(c)	3	1	4	2
(d)	4	1	3	2

17. Consider the following statements:

1. Practically all common refrigerants have approximately the same COP and power requirement.
2. Ammonia mixes freely with lubricating oil and this helps lubrication of compressors.
3. Dielectric strength of refrigerants is an important property in hermetically sealed compressor units.
4. Leakage of ammonia can be detected by halide torch method.

Which of these statements are correct?

- (a) 1, 2 and 4
- (b) 2 and 4
- (c) 1, 3 and 4
- (d) 1 and 3

18. A single-stage vapour compression refrigeration system cannot be used to produce ultra low temperatures because

- (a) refrigerants for ultra-low temperatures are not available
- (b) lubricants for ultra-low temperatures are not available
- (c) volumetric efficiency will decrease considerably
- (d) heat leakage into the system will be excessive

19. Vapour absorption refrigeration system works using the

- (a) ability of a substance to get easily condensed or evaporated
- (b) ability of a vapour to get compressed or expanded
- (c) affinity of a substance for another substance
- (d) absorptivity of a substance

20. Air refrigeration cycle is used in

- (a) Commercial refrigerators
- (b) Domestic refrigerators
- (c) Gas liquefaction
- (d) Air-conditioning

21. Consider the following statements:

In a vapour compression system, a thermometer placed in the liquid line can indicate whether
The

- 1. Refrigerant flow is too low
- 2. Water circulation is adequate
- 3. Condenser is fouled
- 4. Pump is functioning properly

Which of these statements are correct?

- (a) 1, 2 and 3
- (b) 1, 2 and 4
- (c) 1, 3 and 4
- (d) 2, 3 and 4

22. The coefficient of performance of a refrigerator working on a reversed Carnot cycle is 4. The ratio
Of the highest absolute temperature to the lowest absolute temperature

- (a) 1.2
- (b) 1.25
- (c) 3.33
- (d) 4

23. The correct sequence of the given components of a vapour compression refrigerator is

- (a) Evaporator, compressor, condenser and throttle valve
- (b) Condenser, throttle valve, evaporator and compressor
- (c) Compressor, condenser, throttle valve and evaporator
- (d) Throttle valve, evaporator, compressor and condenser

24. The most common type of absorption system used in industrial applications is based on the
Refrigerant-absorbent combination of

- (a) Air-water
- (b) Lithium bromide-air
- (c) Carbon dioxide-water
- (d) Ammonia-water

25. The discharge pressure of the compressor in the refrigeration system goes up due to the

- (a) lower volumetric efficiency of the compressor
- (b) formation of scale in the condenser
- (c) large size of the condenser
- (d) undercharge of the refrigerant

26. The leakage in a Freon based refrigeration system can be detected by using a/an

- (a) oxyacetylene torch
- (b) halide torch
- (c) sulphur torch
- (d) blue litmus paper

27. Consider the following statements:

Subcooling in the condenser of a refrigeration system is advisable when

1. expansion valve is at a higher elevation than condenser.
2. there is a large pressure drop in the line connecting condenser to the expansion valve.
3. the refrigeration effect is to be increased.
4. the compressor work is to be reduced.

Which of these statements are correct?

- | | |
|----------------|----------------|
| (a) 1 and 2 | (b) 1, 3 and 4 |
| (c) 2, 3 and 4 | (d) 1, 2 and 3 |

28. A standard vapour compression refrigeration cycle consists of the following four thermodynamic processes in sequence

- (a) isothermal expansion, isentropic compression, isothermal compression and isentropic expansion
- (b) constant pressure heat addition, isentropic compression, constant pressure heat rejection and isentropic expansion
- (c) constant pressure heat addition, isentropic compression, constant temperature heat rejection and isentropic expansion
- (d) isothermal expansion, constant pressure heat addition, isothermal compression and constant pressure heat rejection

29. Oil separator is not required in refrigeration system if

- (a) refrigerant and oil are immiscible at all the pressures and temperatures
- (b) refrigerant and oil are immiscible at condensation pressure and temperature
- (c) refrigerant and oil are miscible at all pressures and temperatures
- (d) refrigerant and oil are miscible at condensation pressures and temperatures

30. The working fluid in refrigeration cycle is

- | | |
|------------------|---------------|
| (a) Refrigerator | (c) Absorbent |
| (b) Refrigerant | (d) Lubricant |

31. The domestic refrigerator uses the following type of compressor:

- | | |
|-----------------|-------------------|
| (a) Centrifugal | (c) Reciprocating |
| (b) Axial | (d) Screw |

32. In a refrigerating cycle the heat is rejected by refrigerant at

- | | |
|----------------|---------------------|
| (a) Condenser | (c) Expansion valve |
| (b) Evaporator | (d) Compressor |

33. In which of the following refrigeration system, waste heat can be effectively used?

- | | |
|------------------------------|-----------------------------|
| (a) Vapour compression cycle | (c) Air refrigeration cycle |
| (b) Vapour absorption cycle | (d) none of these |

34. The difference between Wet Bulb temperature and Dry Bulb Temperature

- (a) Wet Bulb Depression
- (b) Dew Point Temperature
- (c) Saturation Temperature
- (d) Adiabatic Saturation Temperature

35. In a desert cooler, the main process is

- (a) Sensible cooling
- (b) Dehumidification
- (c) Adiabatic saturation
- (d) Cooling and dehumidification

36. A humidification process means-

- (a) decrease in relative humidity
- (b) an increase in specific humidity
- (c) a decrease in temperature
- (d) an increase in temperature

37. The amount of moisture in air can be measured by

- (a) Sling Psychrometer
- (b) Mass spectrometer
- (c) Photometer
- (d) Thermistor

38. Which of the following processes is generally used in winter air conditioning?

- (a) Dehumidification
- (b) Humidification
- (c) Cooling and dehumidification
- (d) Heating and humidification

39. Dry ice is

- (a) Ice free from water
- (b) Ice free from dissolved air or gases
- (c) Ice prepared from filtered water
- (d) Solid carbon dioxide

40. In a refrigeration cycle, the flow of refrigerant is controlled by

- (a) Condenser
- (b) Expansion valve
- (c) Evaporator
- (d) Compressor

41. For air conditioning the operation theatre in a hospital, the percentage of outside air in the air supplied is

- (a) 0 %
- (b) 50 %
- (c) 20 %
- (d) 100 %

42. The moisture in a refrigerant is removed by

- (a) Dehumidifier
- (b) Driers
- (c) Safety relief valve
- (d) Evaporator

43. The dry bulb temperature during sensible heating of air

- (a) remains constant
- (b) Increases
- (c) Decreases
- (d) None of these

44. The higher temperature in vapour compression cycle occurs at
- (a) Receiver
 - (b) Expansion valve
 - (c) Evaporator
 - (d) Compressor discharge
45. The capillary tube, as an expansion device, is used in
- (a) Domestic refrigerators
 - (b) Water coolers
 - (c) Room air conditioners
 - (d) All of these
46. An evaporator is also known as
- (a) Freezing coil
 - (b) Cooling coil
 - (c) Chilling coil
 - (d) All of these
47. Which of the following is the material of tubes used for shell and tube condenser in ammonia refrigeration system?
- (a) Copper
 - (b) Steel
 - (c) Brass
 - (d) Aluminium
48. Why is the evaporator used?
- (a) To absorb heat
 - (b) To decrease the refrigeration effect
 - (c) To reject heat
 - (d) To improve C.O.P
49. Air conditioning means
- (a) Cooling
 - (b) Heating
 - (c) Dehumidifying
 - (d) All of these
50. What is refrigerant used in house hold refrigerator?
- (a) Freon-22
 - (b) Freon-11
 - (c) Freon-12
 - (d) NH₃
-