higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

REFRIGERATION TRADE THEORY N2

(11041572)

5 December 2023 (X-paper)
09:00–12:00

Nonprogrammable calculators may be used.

This question paper consists of 6 pages and 1 formula sheet.

264Q1G2305

Copyright reserved

DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
REFRIGERATION TRADE THEORY N2
TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer all the questions.
2. Read all the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. Use only a black or blue pen.
5. Write neatly and legibly.

Copyright reserved

QUESTION 1

1.1 Give the specific term for each of the following statements. Write only the answer next to the question number (1.1.1–1.1.6) in the ANSWER BOOK.

1.1.1 Stops the compressor, usually of the automatic resetting type, when suction pressure is too low.

1.1.2 The maximum temperature at which a substance may be liquefied, regardless of the pressure applied.

1.1.3 A gaseous substance in the condition where if some heat were removed from it, the volume of the vapour would decrease and there would be condensation.

1.1.4 A tool used to enlarge copper tubing on one end so that another piece can be inserted and the two ends can be joined together.

1.1.5 A single instrument used to measure electrical current, voltage and resistance in a circuit.

1.1.6 Senses the temperature of a fluid (air, water, et cetera), compares it with the required set point, and takes the appropriate action (such as switching cooling on or off).

(6 × 1) (6)

1.2 State TWO main types of compressors used in refrigeration. (2)

1.3 Draw a neatly labelled sketch of a muffler and indicate where each of the following parts are connected:

- Discharge pipe
- Baffle plate
- Valve assembly
- Piston

(4 × 1) (4)

1.4 Briefly explain the purpose of a muffler as used in reciprocating compressors. (2)

1.5 Explain the term *positive displacement machine* when referring to a reciprocating compressor. (2)

1.6 Explain the purpose of each of the following components of a reciprocating compressor:

1.6.1 Oil pump

1.6.2 Oil sight glass

(2 × 2) (4)

[20]

QUESTION 2

2.1 Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (2.1.1–2.1.5) in the ANSWER BOOK.

2.1.1 An evaporative condenser rejects heat while using minimal quantities of water.

2.1.2 In liquid overfeed evaporators, the amount of refrigerant supplied to the coil is the amount required to remove the heat.

2.1.3 A flooded evaporator is designed to have a constant level of liquid refrigerant within the evaporator.

2.1.4 In water-cooled condensers, the amount of liquid refrigerant supplied is the amount actually demanded by the load.

2.1.5 In a direct-expansion evaporator, the heat is transferred to water.

(5 × 1) (5)

2.2 Draw a neatly labeled sketch of a shell-and-tube condenser. (6)

2.3 Explain the purpose of each of the following components:

2.3.1 Thermostatic expansion valve

2.3.2 Evaporator

(2 × 2) (4)

2.4 What is the phase of the refrigerant at the outlet of the thermostatic expansion valve and the evaporator respectively? (2)

2.5 State THREE ways in which heat can be transferred. (3)

[20]

QUESTION 3

3.1 Name FIVE requirements of a good refrigeration oil. (5)

3.2 Give TWO examples of chlorine-free long-term refrigerant. (2)

3.3 Draw a neatly labeled sketch of a constant pressure expansion valve. (7)

3.4 State TWO advantages of a thermostatic expansion valve. (4)

3.5 Give TWO instances where oil in a vacuum pump should be changed. (2)

[20]

Copyright reserved

QUESTION 4

4.1 Give FOUR methods to detect a leak in a refrigeration plant. (4)

4.2 Identify and state the purpose of each tool given below as used in the refrigeration industry:

4.2.1



(3)

4.2.2



(3)

4.3 Draw a free-hand, labelled diagram of a gauge manifold. (7)

4.4 State THREE precautions to observe when using a swaging tool kit. (3)

[20]

QUESTION 5

5.1 State the colours of each of the following refrigerant cylinders:

5.1.1 R22

5.1.2 R134a

5.1.3 R404A

5.1.4 R410A

(4 × 1) (4)

5.2 During fault finding on site, the entire plant fails to start.

☆ 5.2.1 Give TWO possible causes for the fault.

5.2.2 Give TWO remedies for the fault mentioned in QUESTION 5.2.1.
(2 × 2) (4)

5.3 5.3.1 What is the purpose of the accumulator in a refrigeration system? (2)

5.3.2 What is the purpose of the receiver in the refrigeration system and where can it be located? (4)

5.4 If there is a little moisture in the refrigeration system, it should be absorbed by the drier. The drier can only absorb a limited volume of moisture before it becomes saturated. ☆

Explain what will happen if any further moisture passes through the drier.
(3 × 2) (6)
[20]

TOTAL: 100

☆

Copyright reserved

(11041572)

REFRIGERATION TRADE THEORY N2

FORMULA SHEET

1. OHM'S LAW/OHM SE WET

$I=\frac{V}{R}$ $V=R\times I$

$R_T = R_1 + R_2 + R_3$

$\frac{1}{R_T}=\frac{1}{R_1}+\frac{1}{R_2}+\frac{1}{R_3}$

2. POWER/DRYWING

$P = V \times 1$

$P = I^2R$

$P = \frac{V^2}{R}$

3. HEAT/WARMTE

$Q = m \times c \times \Delta t$ $Q_T = Q_1 + Q_2$

$℃ = (℉ - 32) \times \frac{5}{9}$

$K= 273+℃$

4. AREAS AND VOLUMES/OPPERVLAKTE EN VOLUME

$A = \frac{\pi}{4}D^2$ $V = A \times L$

$A = L \times B$

Copyright reserved