

higher education & training

Department: Higher Education and Training REPUBLIC OF SOUTH AFRICA

T1550**(E)**(A6)T

NATIONAL CERTIFICATE

REFRIGERATION TRADE THEORY N2

(11041572)

6 April 2018 (X-Paper) 09:00–12:00

This question paper consists of 7 pages and 1 formula sheet.

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. Write neatly and legibly.

QUESTION 1

- 1.1 Name THREE types of rotary compressors used in the refrigeration field. (3)
- 1.2 Briefly explain the *cylinder construction* in a reciprocating compressor. (3)
- 1.3 State the purpose of the following components of a reciprocating compressor:
 - 1.3.1 Oil sight glass
 - 1.3.2 Oil pump
 - 1.3.3 Cylinder head
 - 1.3.4 Shaft seal (4×2)

1.4	What is meant by the term <i>positive displacement machine</i> when referring to a reciprocating compressor?	(2)
1.5	State FOUR different points of failure that result in the inefficient pumping of a compressor.	(4) [20]
QUESTION 2		
2.1	Name THREE types of general evaporators.	(3)

- 2.2 Make a neat, labelled sketch of an evaporative condenser. (7)
 2.3 Briefly describe the operating principle of an evaporative condenser. (4)
- 2.4 State THREE factors that should be considered when selecting an evaporator. (3)
- 2.5 Give THREE general design and installation considerations for refrigeration piping. (3)

[20]

(8)

QUESTION 3

- 3.1 Describe the purpose of the following auxiliary components, and state where they are usually installed in the system (i.e. in the discharge line, suction line or liquid line).
 - 3.1.1 Heat exchanger
 - 3.1.2 Crankcase heater
 - 3.1.3 Strainer
 - 3.1.4 Filter dryer
 - 3.1.5 Vibration eliminator

(5 × 2) (10)

3.2 FIGURE 3.2 shows gauge manifolds as used in the refrigeration system.

Identify the parts and components as indicated by the arrows in the figure. Write only the answer next to the question number (3.2.1–3.2.7) in the ANSWER BOOK.



3.3 What do you understand by the term *control mode*? Also give ONE example of a control mode. (2 + 1)

(3) **[20]**

 (3×2)

 (4×1)

(6)

(4)

(4)

(3) [**20]**

QUESTION 4

- 4.1 Define the following terms:
 - 4.1.1 Cycle
 - 4.1.2 Operating differential
 - 4.1.3 Deviation
- 4.2 Give FOUR general classifications of fans.
- 4.3 What type of fan would you install in a large air-conditioning plant? Give TWO reasons for your selection. (3)
- 4.4 State the purpose of each item given below.
 - 4.4.1 Electronic leak detector
 - 4.4.2 Barometer
 - 4.4.3 Pipe wrench
 - 4.4.4 Manometer
- 4.5 The display cases used in merchandising fall into four categories.

Name any THREE of these categories.

QUESTION 5

- 5.1 Re-arrange the steps below in the correct sequence to show the procedure for the evacuation of a refrigeration system. Write each step next to the letter (A–H) in the ANSWER BOOK.
 - A Close valve to vacuum pump and indicator.
 - B Open both valves on the service manifold and mid-seat both equipment service valves.
 - C Connect centre hose to vacuum manifold assembly.
 - D Install service manifold.
 - E Disconnect pump and indicator.
 - F Open the valves to the pump and indicator.
 - G Start vacuum pump and evaluate system until a vacuum of at least 500 microns is achieved.
 - H Close pump valve and isolate the system.

 (8×1) (8)

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5.2 The following fault is diagnosed during fault-finding on site:

The entire plant fails to start.

- 5.2.1 Give TWO possible causes of the fault.
- 5.2.2 Give the remedies for the problem given in QUESTION 5.2.1.

 (2×2) (4)

5.3 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)

5.4 Give any FIVE refrigerants that are used in refrigeration systems.

(5) **[20]**

TOTAL: 100

REFRIGERATION TRADE THEORY N2

FORMULA SHEET

1. OHM'S LAW

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

$$R_T = R_1 + R_2 + R_3$$

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

2. **POWER**

$$\mathbf{P} = \mathbf{V} \times \mathbf{I}$$

$$P = I^2 F$$

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

3. **HEAT**

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

$$^{\circ}C = (^{\circ}F - 32) \times \frac{5}{9}$$

 $K = 273 + {}^{\circ}C$

4. AREAS AND VOLUMES

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

 $\mathbf{A} = \mathbf{L} \times \mathbf{B}$