higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

REFRIGERATION TRADE THEORY N2

(11041572)

15 April 2020 (X-paper)
09:00–12:00

This question paper consists of 5 pages and 1 formula sheet.

260Q1A2015

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. Write neatly and legibly.

Copyright reserved

QUESTION 1

1.1 Briefly explain TWO functions of a compressor as used in a refrigeration system. (2 × 2) (4)

1.2 List FIVE methods of controlling the capacity of a compressor. (5)

1.3 Make a neat, labelled sketch of a rotating-vane compressor. (8)

1.4 Briefly explain why a check or reed valve is installed in the discharge port of a rotating-vane compressor. (1)

1.5 Why is dryness a desirable property of refrigerant oil? (2)

[20]

QUESTION 2

2.1 Draw a block diagram of a refrigeration cycle and indicate the following:

- Compressor
- Condenser
- Liquid receiver
- Filter dryer
- Expansion valve
- Evaporator
- Accumulator (7)

2.2 What is the phase of the refrigerant at the inlet and outlet of an evaporator? (2)

2.3 State FIVE requirements of a good refrigerant. (5)

2.4 Make a neat, labelled sketch of a shell-and-tube condenser. (6)

[20]

QUESTION 3

3.1 Explain the purpose of each of the following and indicate where it is usually installed in systems:

3.1.1 Vibration eliminator

3.1.2 Crankcase heater

3.1.3 Strainer

(3 × 3) (9)

Copyright reserved

3.2 Make a neat, labelled sketch of a system analyser (manifold gauge set) and indicate the following:

- High-pressure gauge
- High-pressure valve stem
- Service hose
- High-pressure side hose
- Low-pressure side hose
- Low-pressure valve stem
- Low-pressure gauge (7)

3.3 State the purpose of each of the following tools:

3.3.1 Pipe bender

3.3.2 Pipe cutter

(2 × 1) (2)

3.4 Give ONE disadvantage of a constant-pressure valve. (2)
[20]

QUESTION 4

4.1 State FOUR precautions to follow when using a swaging tool. (4)

4.2 State FIVE safety precautions to apply when working with refrigerants. (5)

4.3 Define each of the following refrigeration-control terms:

4.3.1 Hunting

4.3.2 Cycling

(2 × 2) (4)

4.4 What is the result of liquid slugging in refrigeration systems? (2)

4.5 Name TWO types of oil used in refrigeration systems. (2)

4.6 Which type of fan would be installed in a large air-conditioning plant? Give TWO reasons for the answer. (3)
[20]

Copyright reserved

QUESTION 5

5.1 Which THREE facts should be kept in mind when designing refrigeration piping? (3)

5.2 Briefly explain why a muffler would be installed in a refrigeration system. (3)

5.3 Where is the muffler in a refrigeration system installed? (1)

5.4 Briefly explain the cause of each of the following malfunctions on a hermetically sealed unit:

5.4.1 Motor humming when switched on

5.4.2 Suction line frosted or sweating

5.4.3 Thermostat switches on but motor fails to start

(3 × 2) (6)

5.5 Briefly explain FIVE possible reasons why the suction superheat reading will be too high. (5)

5.6 Give TWO uses of a service manifold. (2)

[20]

TOTAL: 100

Copyright reserved

FORMULA SHEET

1. OHM'S LAW

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

$$V = R \times I$$

$$R_T = R_1 + R_2 + R_3$$

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

2. POWER

$$P = V \times I$$

$$P = I^2R$$

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

3. HEAT

$$Q = m \times c \times \Delta t$$

$$Q_T = Q_1 + Q_2$$

$$℃ = (℉ - 32) \times \frac{5}{9}$$

$$K = 273 + ℃$$

4. AREAS AND VOLUMES

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

$$V = A \times L$$

$$A = L \times B$$

Copyright reserved