higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T1550**(E)**(A8)T

NATIONAL CERTIFICATE

REFRIGERATION TRADE THEORY N2

(11041572)

8 August 2019 (X-Paper)
09:00–12:00

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

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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.

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QUESTION 1

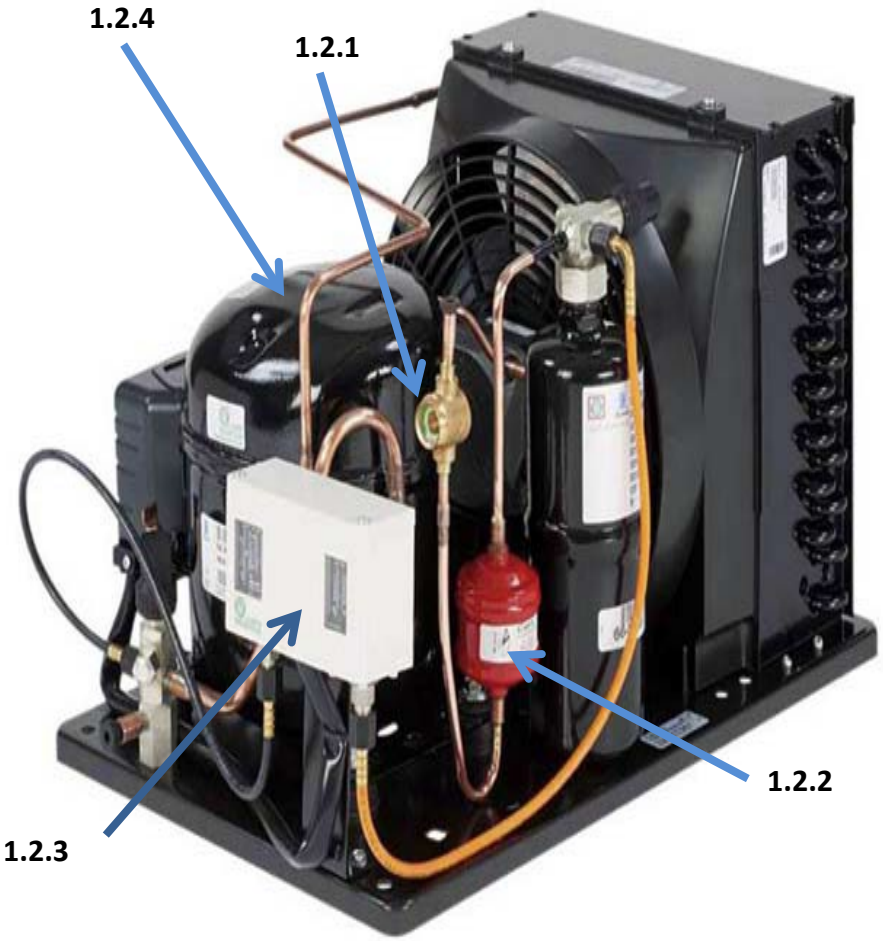
1.1 Briefly explain each of the following:

1.1.1 A positive-displacement machine

1.1.2 A dynamic machine

(2 × 2) (4)

1.2 FIGURE 1 shows a condensing unit. Name the components that are indicated by writing only the answer next to question number (1.2.1–1.2.4) in the ANSWER BOOK.



(4)

FIGURE 1

1.3 Briefly explain the function and operation of the component numbered 1.2.3. (3)

1.4 Describe the TWO systems of lubrication normally used to lubricate industrial and commercial systems. (2 × 2) (4)

1.5 State THREE types of suction valves or delivery valves used in reciprocating compressors. (3)

1.6 Explain why it is difficult to locate a shaft seal leak in reciprocating compressors. (2)

[20]

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QUESTION 2

2.1 Draw a simple block diagram of a vapour compression system indicating the position of the compressor, gas cooler, evaporator and expansion valve. (4)

2.2 Explain the operation of the vapour compression system mentioned in QUESTION 2.1, starting with the compressor. (4)

2.3 State FOUR general considerations for the installation and design of refrigeration piping. (4)

2.4 FIGURE 2 and FIGURE 3 show air-cooled condenser coils.

Name each type of coil and flow condenser.

2.4.1

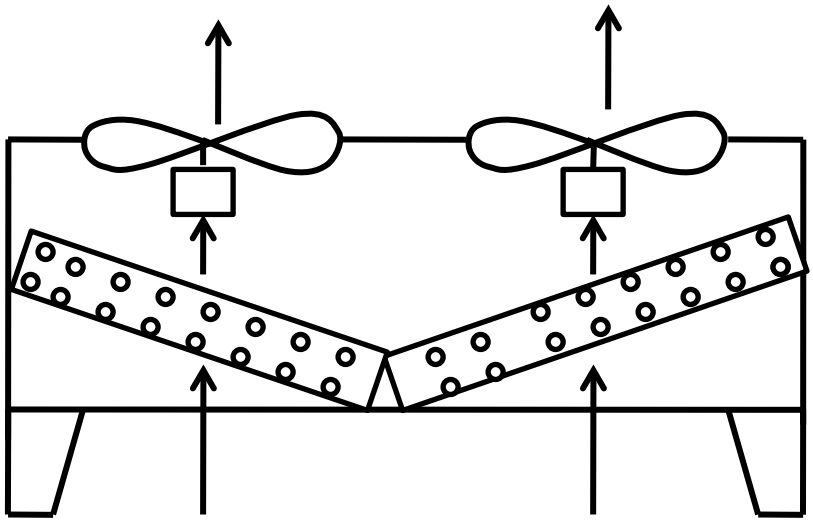


FIGURE 2

2.4.2

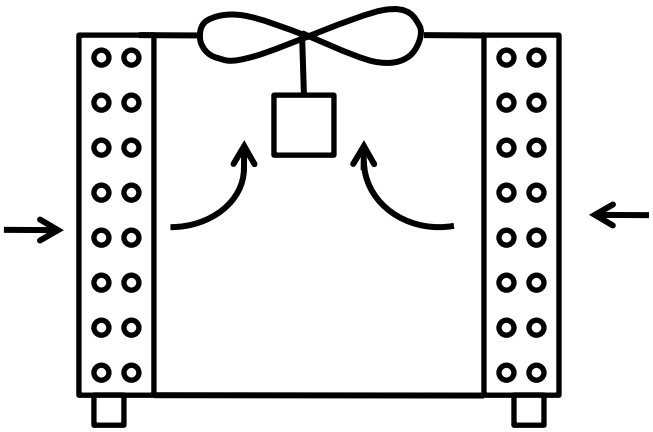


FIGURE 3

(2 × 1) (2)

2.5 State the disadvantages of the air-cooled condenser coil in FIGURE 3. (2)

2.6 State FOUR factors affecting evaporator performance. (4)

[20]

QUESTION 3

3.1 Explain the TWO main functions of an expansion valve. (2 × 2) (4)

3.2 State THREE advantages of the thermostatic expansion valve. (3 × 2) (6)

3.3 Describe the purpose of the following auxiliary components and state where they are usually installed in the system (for example in the suction, discharge or liquid line).

3.3.1 Muffler

3.3.2 Suction accumulator

3.3.3 The vibration eliminator

(3 × 2) (6)

3.4 Explain the function of suction pressure as used in the suction function in the compressor in a refrigeration system. (2)

3.5 State TWO control actions used to indicate the way in which the controller acts on the signal it receives. (2)

[20]

QUESTION 4

4.1 Choose a description from COLUMN B that matches an item in COLUMN A. Write only the letter (A–D) next to the question number (4.1.1–4.1.4) in the ANSWER BOOK.

COLUMN A		COLUMN B	
4.1.1	Axial-flow fan	A	the air enters the impeller axially, turns 90° and is discharged radically into the scroll or casing
4.1.2	Centrifugal fan	B	a device used to produce a continuous flow of air
4.1.3	Propeller fan	C	the air flows through the impeller at a constant distance from the axis
4.1.4	A fan	D	for large volumes of air where noise is of secondary importance

(4 × 1) (4)

4.2 FIGURE 4 shows a pipe cutter as used in the refrigeration system. Name the parts or components indicated by writing only the answer next to the question number (4.2.1–4.2.5) in the ANSWER BOOK.

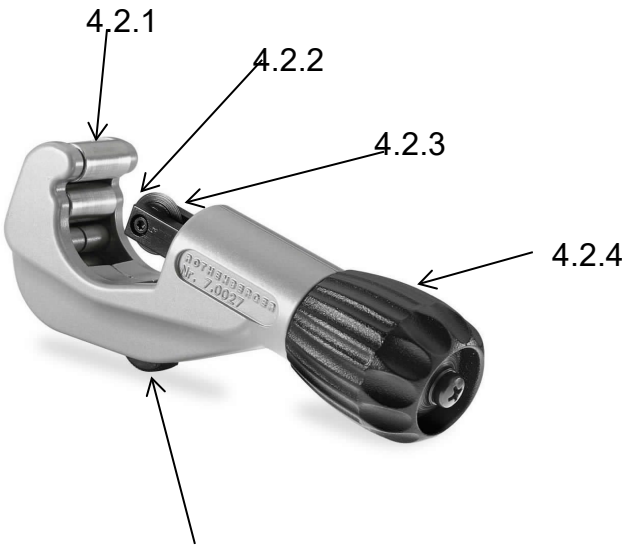


FIGURE 4

(5)

4.3 Name the tools that you will use for each of the following actions:

4.3.1 Cause a vacuum in a system to remove moisture, et cetera

4.3.2 To prepare the ends of tubing that must be joined

4.3.3 To measure resistance, current and voltage

4.3.4 To check operating pressures/add or recover refrigerants/add oil and necessary operations

4.3.5 To measure atmospheric pressure

4.3.6 Turning, clamping, twisting and locking refrigeration pipes

4.3.7 To detect a leak in refrigeration systems

(7 × 1) (7)

4.4 Meat, fruit and vegetables dry out or lose weight and spoil more quickly if not stored correctly in a cold room.

State TWO conditions that must be considered in the correct storage application. (2 × 2) (4)

[20]

QUESTION 5

5.1 Explain the following terms:

5.1.1 Chilling

5.1.2 Blanching

(2 × 2) (4)

5.2 When should oil in a vacuum pump be changed? (2 × 2) (4)

5.3 Make a neat, labelled sketch of a wet-bulb indicator. (5)

5.4 Where should the wet-bulb indicator,+++ mentioned in QUESTION 5.3, be used? (1)

5.5 A client complains that a refrigerator runs continuously.

5.5.1 State THREE possible causes of this problem.

5.5.2 Give THREE possible solutions to this problem.

(2 × 3) (6)
[20]

TOTAL: 100

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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

$P = V \times 1$

$P = I^2 R$

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

3. HEAT/HITTE

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

$℃ = (℉ - 32) \times \frac{5}{9}$

$K = 273 + ℃$

4. AREAS AND VOLUMES/OPPERVLAKES EN VOLUMES

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

$A = L \times B$

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