higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

REFRIGERATION TRADE THEORY N2

(11041572)

28 November 2022 (X-paper)
09:00–12:00

Nonprogrammable calculators may be used.

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

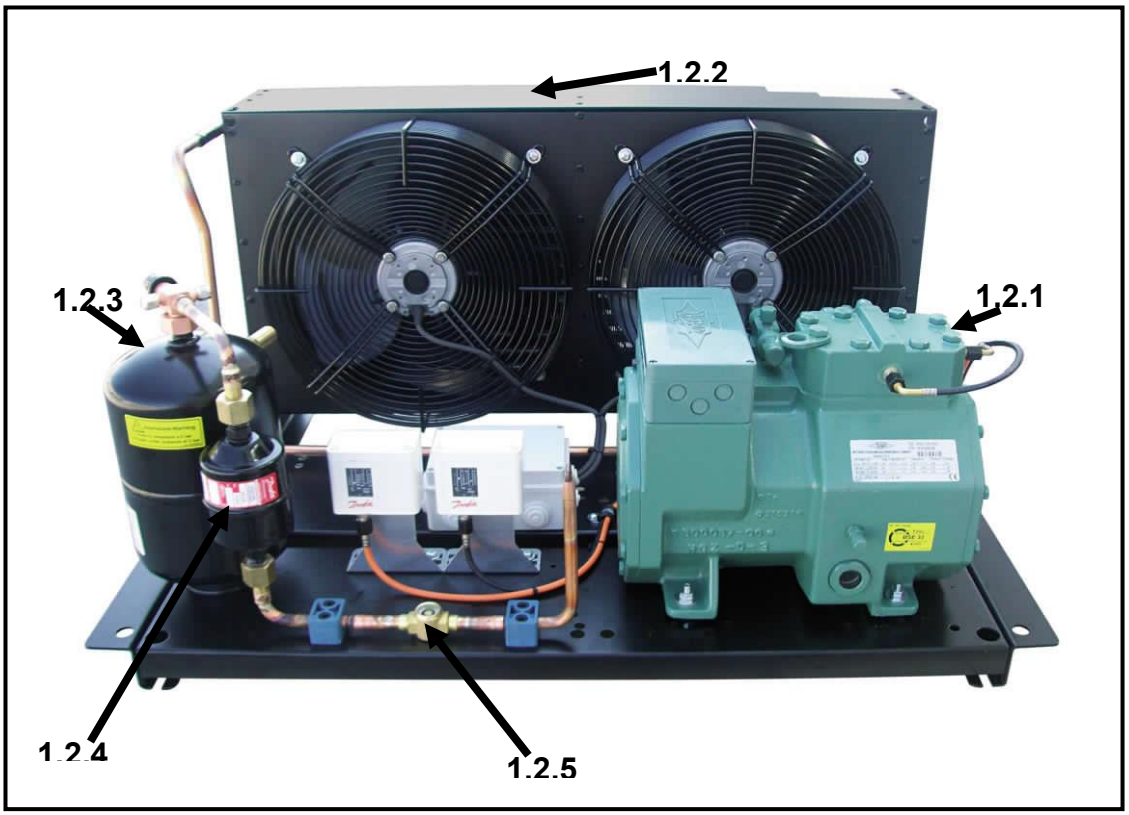
1. Answer all the questions.
2. Read all the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. Start each question on a new page.
5. Use only a blue or black pen.
6. Write neatly and legibly.

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QUESTION 1

1.1 Briefly describe the term *open compressor*. (2)

1.2 Study the condensing unit below and identify the components numbered 1.2.1–1.2.5. Write only the correct answer next to the number (1.2.1–1.2.5) in the ANSWER BOOK.



(5)

1.3 State the purpose of the components numbered 1.2.2, 1.2.4 and 1.2.5 in QUESTION 1.2. (6)

1.4 Briefly explain why it is necessary to protect component 1.2.1 of the condensing unit in QUESTION 1.2 above. (2)

1.5 State FIVE protective devices of component 1.2.1 of the condensing unit in QUESTION 1.2 above. (5)

[20]

QUESTION 2

2.1 Choose a description from COLUMN B that matches an item in COLUMN A. Write only the letter (A–E) next the question number (2.1.1–2.1.5) in the ANSWER BOOK.

COLUMN A		COLUMN B	
2.1.1	Evaporative condenser	A	designed to have a constant level of liquid refrigerant within the evaporator
2.1.2	Liquid over-feed evaporators	B	the amount of liquid refrigerant supplied is the amount which is actually demanded by the load
2.1.3	Flooded evaporator	C	the amount of forced refrigerant supplied to the coil which is more than the amount required to remove the heat
2.1.4	Water-cooled condenser	D	reject heat whilst using minimum quantities of water
2.1.5	Direct expansion evaporator	E	the heat transferred to water

(5 × 1) (5)

2.2 Describe the purpose of the following components:

2.2.1 Vibration eliminator (2)

2.2.2 Oil separator (2)

2.3 What is the phase of the refrigerant at the inlet and outlet of the following components?

2.3.1 Expansion valve (2)

2.3.2 Evaporator (2)

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

2.5 Draw a neat, labelled sketch of a shell-and-coil condenser. (4)

[20]

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QUESTION 3

3.1 Explain what you understand by the term *constant pressure expansion valve*. (2)

3.2 What is another name for the constant pressure expansion valve? (1)

3.3 Explain the operation of the constant pressure expansion valve. (6)

3.4 FIGURE 1 shows gauge manifolds as used in refrigeration systems.

Identify the parts or components as indicated by arrows in the figure below. Write the correct answer next to the number (3.4.1–3.4.7) in the ANSWER BOOK.

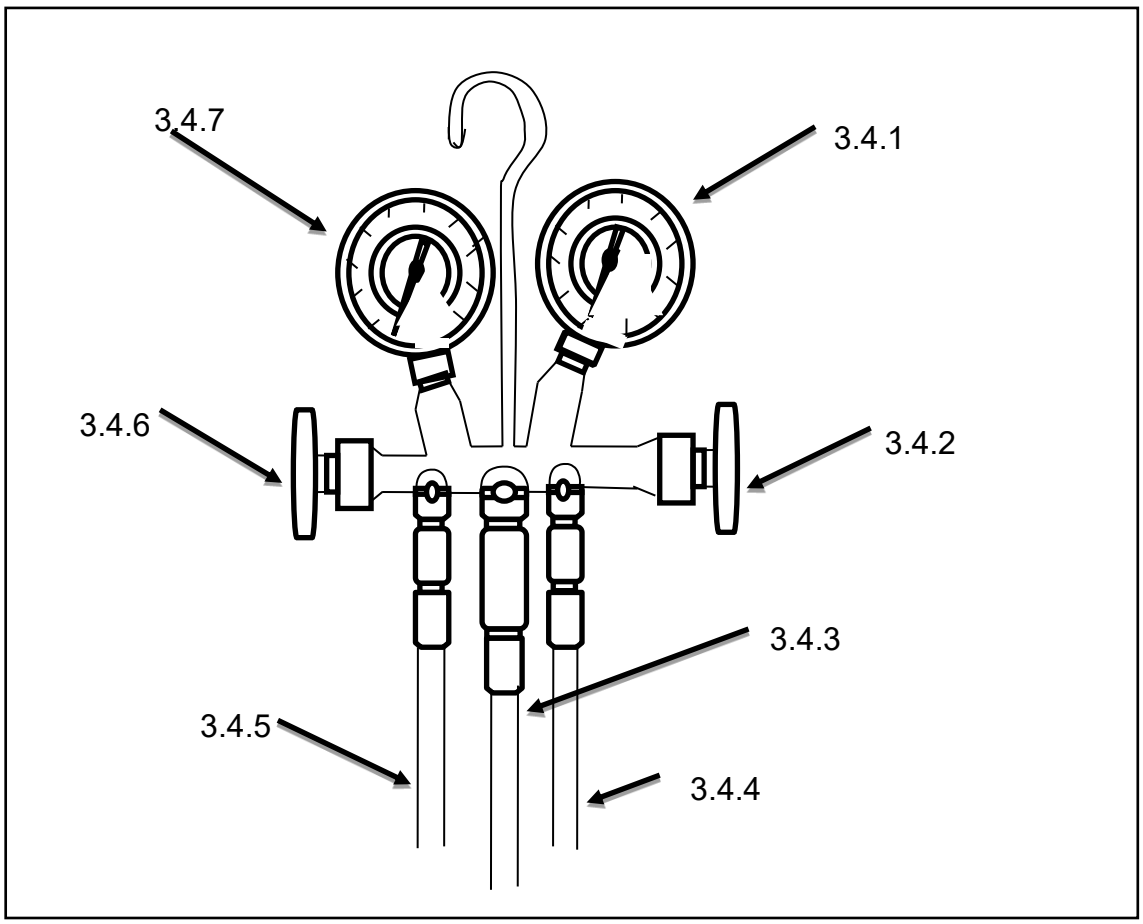


FIGURE 1 (7)

3.5 State the FOUR most important properties of refrigeration lubrication oils. (4)

[20]

QUESTION 4

4.1 FIGURE 2 below shows a cross section of a typical centrifugal fan. Identify the components as indicated by arrows by writing only the answer next to the number (4.1.1–4.1.5) in the ANSWER BOOK.

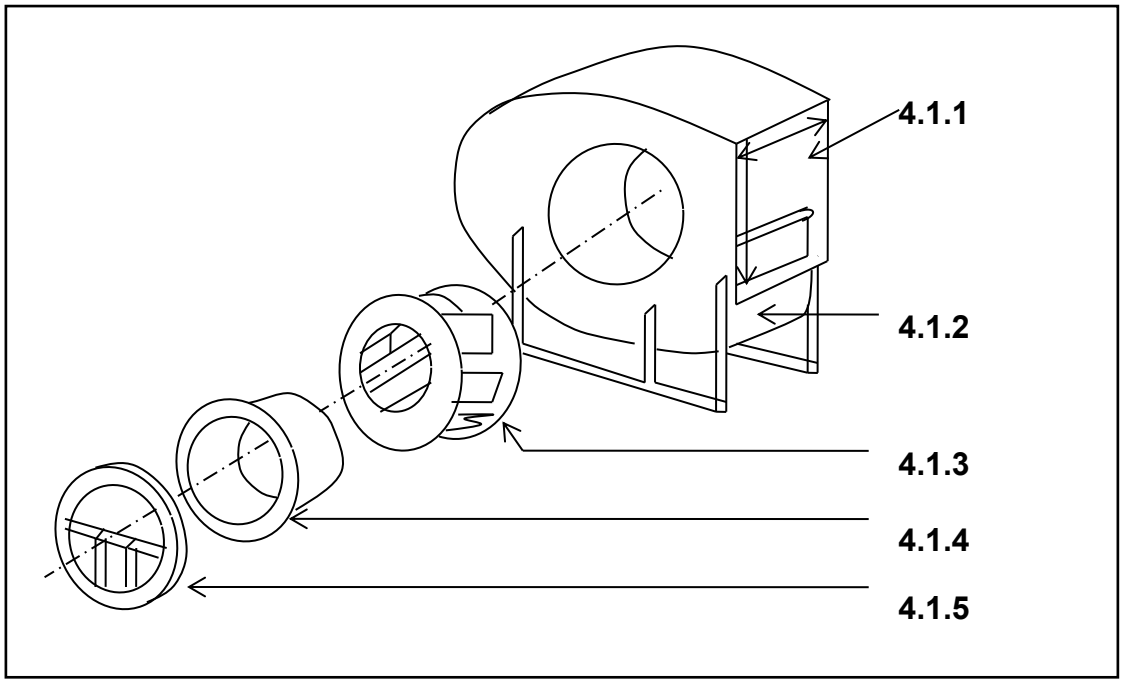


FIGURE 2 (5)

4.2 Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'True' or 'False' next to the question number (4.2.1–4.2.5) in the ANSWER BOOK.

4.2.1 A swaging tool is a tool used to enlarge copper tubing on one side to be joined together. (1)

4.2.2 A multimeter is an instrument used to measure the refrigerant. (1)

4.2.3 A pressure gauge is used to measure the pressure in a closed vessel or system. (1)

4.2.4 A check valve is used to allow the flow of liquid or vapour in one direction only. (1)

4.2.5 The main purpose of the refrigerant/oil sight glass is to observe the condition of the refrigerant/ oil and the level. (1)

4.3 Define the purpose of a fan. (2)

4.4 State FOUR general classifications of fans. (4)

4.5 Give TWO indications of when oil in a vacuum pump should be changed. (4)

[20]

QUESTION 5

5.1 Give FOUR types of refrigerants that are used in refrigeration systems. (4)

5.2 Explain how you would charge a refrigeration system through its low side (vapour charging). (6)

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

5.4 Where is the indicator in QUESTION 5.3 recommended to be used? (1)

5.5 What are the likely corrective actions for the following malfunctions on a condensing unit? (The compressor starts and runs, but short cycles.)

5.5.1 Evaporator fan not running (1)

5.5.2 Low refrigerant charge (1)

5.5.3 Low evaporator load (1)

5.5.4 High temperature drop across the filter drier (1)

[20]

TOTAL: 100

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REFRIGERATION TRADE THEORY N2

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

$P = V \times 1$

$P = I^2R$

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

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

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

$A = L \times B$

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