higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

REFRIGERATION PRINCIPLES
NQF LEVEL 2

(6030052)

12 March 2018 (X-Paper)
09:00–12:00

This question paper consists of 7 pages.

Copyright reserved

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 Explain the term *refrigeration*. (1)

1.2 What happens to the refrigerant in the following components:

1.2.1 Evaporator

1.2.2 Condenser

(2 × 1) (2)

1.3 Pressure is directly proportional to temperature.

What is the meaning of this statement? (2)

1.4 What is the phase of the refrigerant at the *inlet* and the *outlet* of the evaporator? (2 × 1) (2)

1.5 What is the *refrigerant liquid saturation temperature*? (2)

1.6 State the function of a capillary tube. (2)

1.7 Define the following refrigeration systems terms:

1.7.1 Temperature

1.7.2 Pressure

1.7.3 Heat

(3 × 1) (3)

1.8 What is the main function of the oil separator in a refrigeration system? (2)

1.9 Draw a block diagram of a vapour compression system. Indicate the following clearly on the drawing:

- Compressor
- Condenser
- Liquid receiver
- Expansion valve
- Evaporator
- Accumulator

(8)

1.10 State ONE function of a filter-drier. (1)

[25]

NCV

QUESTION 2

2.1 Name FIVE types of conductors. (5)

2.2 Two resistors of 2 ohms and 5 ohms are connected in parallel. The supply voltage is 230 V.

Draw a fully labelled electrical circuit showing the supply, the switch and the resistors. (3)

2.3 Give the definition of *power.* (2)

2.4 Calculate the resistance of the circuit in QUESTION 2.2. above. (2)

2.5 Give FOUR factors which affect the resistance of a wire. (4)

2.6 SI units and symbols are used for electrical measurements. Redraw and complete the table below in the ANSWER BOOK.

COMPONENT	SI UNIT	SYMBOL
Pressure		
Temperature		
Voltage		
Current		

(4)
[20]

QUESTION 3

3.1 Name THREE types of pressure gauges that are used in refrigeration service work. (3)

3.2 State the purpose of each tool given below:

3.2.1 Pipe bender

3.2.2 Multimeter

3.2.3 Manifold gauges

3.2.4 Pipe cutter

3.2.5 Swaging kit

(5 × 1) (5)

Copyright reserved

3.3 Where would you connect each of the following colour-coded refrigerant hoses on the service manifold:

3.3.1 Red

3.3.2 Yellow

3.3.3 Blue

(3 × 1) (3)

3.4 Make a freehand drawing of a pipe cutter and label its parts. (9)

[20]

QUESTION 4

4.1 Give TWO methods of moving refrigerant cylinders safely from one area to another. (2)

4.2 Explain the term *coefficient of performance* (C.O.P). (2)

4.3 Choose a description from COLUMN B that matches a refrigerant commonly used in South Africa in COLUMN A. Write only the letter (A–E) next to the question number (4.3.1–4.3.5) in the ANSWER BOOK.

COLUMN A		COLUMN B	
4.3.1	R717	A	traditional refrigerant
4.3.2	HCs	B	chlorine-free long-term alternative
4.3.3	HFCs	C	transitional alternative
4.3.4	CFCs	D	halogen-free long-term alternative
4.3.5	HCFs	E	ammonia

(5 × 1) (5)

4.4 Identify in each case below the type of refrigerant, given the colour of the container:

4.4.1 Light purple

4.4.2 Light maroon

4.4.3 Orange

4.4.4 Light blue

4.4.5 Light green or green

(5 × 1) (5)

[14]

QUESTION 5

5.1 What is the purpose of the *flux* when soldering/brazing? (2)

5.2 Indicate the metals that can be joined when using each of the following joining materials:

5.2.1 Copper

5.2.2 Bronze

5.2.3 Silver

(3 × 1) (3)

5.3 Choose an application from COLUMN B that matches the type of material used in the refrigeration industry in COLUMN A. Write only the letter (A–D) next to the question number (5.3.1–5.3.4) in the ANSWER BOOK.

COLUMN A		COLUMN B	
5.3.1	Plastic tubing	A	ammonia refrigeration
5.3.2	Stainless steel	B	commercial refrigeration
5.3.3	Steel tubing	C	cold water lines
5.3.4	Copper tubing	D	food processing

(4 × 1) (4)

5.4 The compressor of a system is installed above the evaporator.

How would you prevent oil from running down when the system is switched off? (1)

[10]

QUESTION 6

6.1 Identify the following diagrams, and give the function of each.

6.1.1



6.1.2



(2 × 2) (4)

6.2 Name any THREE types of keys used in the refrigeration industry. (3)

6.3 Give the ONE most common cause of a tap breaking. (1)

6.4 Name THREE classes into which fittings are divided. (3)

[11]

TOTAL: 100

Copyright reserved