higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

REFRIGERATION PRACTICE
NQF LEVEL 3

(6030053)

21 November 2018 (X-Paper)
09:00–12:00

This question paper consists of 6 pages.

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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 Define the specific heat capacity of a substance. (2)

1.2 The three-phase in which matter can exist are solid, liquid, vapour or gas. Choose a description from COLUMN B that matches a description in COLUMN A. Write only the letter (A–E) next to the question number (1.2.1–1.2.5) in the ANSWER BOOK.

COLUMN A		COLUMN B	
1.2.1	Heat of condensation	A	solid to liquid
1.2.2	Latent heat of ice	B	liquid to solid
1.2.3	Heat of fusion	C	vapour to liquid
1.2.4	Heat of vaporisation	D	solid (e.g. dry ice)change direction from a solid to a vapour
1.2.5	Heat of sublimation	E	liquid to vapour

(5 × 1) (5)

1.3 2 630 J is supplied to condense 1,8 kg of refrigerant (R22) vapour. The specific heat of R22 refrigerant is 1,03 kj/kg and the initial temperature is 322 K.

Calculate the following:

1.3.1 Increase in temperature.

1.3.2 Final temperature in degrees Celsius.

(2 × 3) (6)

1.4 What is *energy*? (2)

1.5 A refrigerant cylinder with a mass of 35 kg is lifted through a vertical height of 32 m by a light cable in 8s at a constant velocity.

Calculate the following:

1.5.1 The work done to lift the mass/cylinder

1.5.2 The power generated

(2 × 2) (4)

1.6 Compare the following terms, *work* and *energy* and indicate their similarities. (2)

1.7 A gauge on a vessel reads 302 Kpa. If the atmospheric pressure is 88 Kpa, calculate the absolute pressure inside the vessel. (2)

1.8 Calculate the mass flow through the compressor if the volume flow is $0,8^3$/s and the specific volume of the gas is 0,06 m^3/kg. (2)

[25]

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QUESTION 2

2.1 What is *fusible plug*? (2)

2.2 As a refrigeration mechanic, you become aware that a compressor of a refrigeration plant does not stop (runs continuously).

Give THREE possible causes of such condition. (3)

2.3 Give THREE corrective actions to be taken in order to overcome the problem in QUESTION 2.2. (3)

2.4 Give the specific term of the following:

2.4.1 A unit where the components of a refrigeration system are packaged together in a factory.

2.4.2 Pressure-responsible mechanism that is designed to automatically stop the compressor before the design pressure is reached.

(2 × 1) (2)

QUESTION 3

3.1 Refrigerants are categorised into groups in accordance with their dominant characteristics.

Give each group and their dominant characteristic/s. (8)

3.2 What is the objective of SANS 10147? (6)

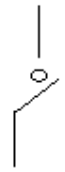
3.3 In which group does ammonia refrigerant belong? (1)

[15]

QUESTION 4

4.1 Identify the following symbols and write the correct name next to the question number (4.1.1–4.1.3) in the ANSWER BOOK.

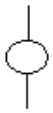
4.1.1



4.1.2



4.1.3



(3 × 1) (3)

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4.2 Name THREE main components which form part of a condensing unit of a refrigeration system. (3)

4.3 Draw a complete load diagram of the above condensing unit by indicating the load and other accessories such as: Current type starting with relay, overload, compressor terminals, fan motor, voltmeter and ammeter across the compressor motor. (6)

4.4 What kind of load is the fan motor? (1)

4.5 Motivate your answer in QUESTION 4.4. (2)

4.6 Your supervisor has requested you to test the compressor motor and your findings are as follows:

Common (C) and the body of the compressor = 0
Running winding (R) and the body of the compressor = 34
Starting winding (S) and the body of the compressor = 25

In your own word state TWO pieces of advice that you would give to your supervisor with regard to the compressor motor. (2)

4.7 List FOUR tools you would use if the compressor motor must be removed from the system/plant due to its failure. (4)

4.8 List FOUR factors that must be considered when selecting a cable for any specific application. (4)
[25]

QUESTION 5

5.1 List FOUR types of expansion devices/valves that are used in refrigeration systems. (4)

5.2 State the name of a device which senses the temperature within the cabinet of a refrigerator/freezer and in turn acts to control the refrigeration circuit. (1)

5.3 It is important to obtain as much information as possible when one enters into a refrigeration plant.

State TWO reasons why service records for the plant should be inspected prior to work. (2)

5.4 Rearrange the following procedure in the correct alphabetical order (A–E) for dismantling the refrigeration system.

A Remove the refrigerant
B Carefully clean all surfaces
C Disconnect the electrical circuit
D Cut the tubing and remove the part to be replaced
E Install service valve and gauge manifold (5)

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5.5 The following fault is diagnosed during fault finding on site. The entire plant fails to start.

5.5.1 Give FOUR possible causes of the fault.

5.5.2 Give FOUR remedies of the problem given in QUESTION 5.5.1 above.

(2 × 4) (8)
[20]

QUESTION 6

6.1 Name the THREE water-related problems that appear in the system when water in an air conditioning is not treated. (3)

6.2 When metals are destroyed by chemicals or electrochemical means, what would you call this process? (2)
[5]

TOTAL: 100

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