higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

PROCESS TECHNOLOGY
NQF LEVEL 3

(6050353)

18 February 2025 (X-paper)
09:00–12:00

Calculators may be used.

This question paper consists of 6 pages.

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)
PROCESS TECHNOLOGY
NQF LEVEL 3
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. Use only a black or blue pen.
5. Write neatly and legibly.

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SECTION A

QUESTION 1

Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question number (1.1–1.5) in the ANSWER BOOK.

1.1 A mixture of naturally occurring hydrocarbons that is refined into diesel, petrol, heating oil, jet fuel.

A Zeolite
B Soluble
C Diluted acids
D Crude oil

1.2 Substance that dissolves in other substances.

A Solute
B Solvent
C Solution
D None of the above

1.3 It is not one of the sections of the MSDS.

A Control measures
B Time
C Health hazards
D Chemical identity

1.4 … is to soak, fill, or load to capacity.

A Desorption
B Peat
C Saturate
D repulsion

1.5 It attracts and holds water.

A Affinity
B Hydroscopic substances
C Polymeric
D Purge

(5 × 1) **[5]**

QUESTION 2

Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (2.1–2.5) in the ANSWER BOOK.

2.1 Tray dryer machines uses a direct contacting drying method.

2.2 Dispersion is a process of mixing by breaking solid materials apart in a bulk liquid using a high speed.

2.3 Tangential flow streams are streams that flow in a linear motion around in the tank.

2.4 A fan is a machine used to create flow within a fluid, typically a gas such as air in this case.

2.5 The vertical air cooler consists of vertically stacked bundles with a vertical fan and intake airflow from a horizontal direction.

(5 × 1) **[5]**

QUESTION 3

Choose a/an term/item from COLUMN B that matches a description in COLUMN A. Write only the letter (A–J) next to the question number (3.1–3.5) in the ANSWER BOOK.

COLUMN A		COLUMN B	
3.1	The rubbing away or wearing down by friction an air-cooled heat exchanger	A	cryogenic
3.2	A material that consists of fine dirt particles that blows into the tower system, or enters in the water supply	B	colloids
3.3	A term given to very low temperature processes which involves processes below -150 °C.	C	adhesion
3.4	The component in which the flotation operation takes place	D	stable
3.5	Particles that do not settle inside the water	E	attrition
		F	filter
		G	silt
		H	sedimentation
		I	thermophylic
		J	floatation unit

(5 × 1) **[5]**

TOTAL SECTION A: 15

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SECTION B

QUESTION 4

4.1 Define the term *absorption*. (1)

4.2 Name FIVE common uses of mechanically stirred vessels. (5)

4.3 Calculate the total mass of a mixture that has a salt mass fraction of 0.6, using 700 ℓ of water. (9)

[15]

QUESTION 5

5.1 Name the FOUR inspection processes to be followed during the re-assembling of a small-scale cooling tower. (4)

5.2 Explain SEVEN factors which can affect the life of the splash and tower. (7)

5.3 Inspecting and fault-finding is a skill that is primarily based on experience. People develop a 'feel' for where the problems lie and how they can be solved. Some of the problems that may occur in air cooling tower are fouling, debris build-up and etc.



5.3.1 What is *fouling*? (2)

5.3.2 Give THREE reasons for fouling in air cooling tower. (3)

5.4 After the parts have been cleaned, they have to be marked according to the SOP.

List FIVE most common methods used to mark dismantled components in the workshops. (5)

5.5 Draw a labelled diagram of a closed cycle wet cooling water. (10)

5.6 Write FOUR benefits of an air-cooled heat exchanger (ACHE). (4)



[35]

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QUESTION 6

6.1 List THREE instruments which are used to monitor the operation of ion exchange. (3)

6.2 What is the difference between *single bed* and *mixed bed exchangers*? (4)

6.3 Define the following terms:

6.3.1 Fuller's earth

6.3.2 Polar molecules

(2 × 2) (4)

6.4 List TWO typical applications of filter dryers. (2)

6.5 Draw a freehand drawing of a drum dryer showing its most important components. (5)

6.6 Briefly discuss the basic working principles drum dryers. (9)

6.7 To control the effects of ageing, manufacturers of the adsorbent will usually provide recommended replacement intervals for the adsorbers.

What are the FIVE things that the lifetime of the adsorbers is based on? (5)

6.8 Name TWO main system configurations used to get the service water mixed with the ion-exchange resins. (2)

6.9 Write ONE cause of chemical damage to resins. (1)

[35]

TOTAL SECTION B: 85
GRAND TOTAL: 100

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