higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T320**(E)**(A1)T

NATIONAL CERTIFICATE

CHEMICAL PLANT OPERATION N5

(8050015)

1 August 2018 (X-Paper)
09:00–12:00

Calculators may be used.

This question paper consists of 5 pages.

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
CHEMICAL PLANT OPERATION N5
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

Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'true' or 'false' next to the question number (1.1–1.5) in the ANSWER BOOK.

1.1 Saturation temperature is the temperature at which water will change to steam.

1.2 Specific heat capacity is the sensible heat which increases the temperature to produce superheated steam.

1.3 Ribbon mixers are used for batches of heavy solids and pastes.

1.4 SO_2 is produced by the burning of sulphur.

1.5 A steady state operation is the one in which conditions within the process or system change with time, which is one moment to another.

(5 × 1) **[5]**

QUESTION 2

2.1 Calculate the mol percentage composition of the following mixture:

Na_2SO_4 = 18% (m/m); NaOH = 36,5% (m/m); Na_2CO_3 = 22,5% (m/m) and NaCl = 23% (m/m)

Given: Na = 23 g/mol ; S = 32 g/mol ; O = 16 g/mol ; H = 1 g/mol;
C = 12 g/mol and Cl = 35,5 g/mol. (10)

2.2 Describe the operation of the following:

2.2.1 Cyclone

2.2.2 Ribbon mixer

(2 × 5) (10)

2.3 Draw a labelled diagram of the horizontal rotating-cup atomising oil burner. (5)
[25]

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QUESTION 3

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

COLUMN A		COLUMN B	
3.1	Energy due to motion	A	internal screw mixer
3.2	Mixer for heavy, stiff or gummy materials	B	impact wheels
3.3	Mixer for free-flowing grains and light solids	C	kinetic energy
3.4	Mixer used for fine light powders such as insecticides	D	potential energy
3.5	Mixer used for dry powders and thin pastes	E	change can mixer
		F	ribbon mixer
		G	two-arm kneader
		H	banbury mixer

(5 × 1) **[5]**

QUESTION 4

4.1 Write brief, clarifying notes on each of the following:

4.1.1 Radial flow turbine

4.1.2 Axial flow turbine

(2 × 4) (8)

4.2 A solution of common salt in water is prepared by adding 20 kgs of salt to 100 kgs of water to make a liquid density of 1 323 kg/m^3.

Calculate the concentration of salt in this solution as each of the following:

4.2.1 % weight fraction

4.2.2 Mole fraction

(2 × 4) (8)

4.3 Write brief, clarifying notes on the operation of a disk centrifuge. (8)

[24]

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QUESTION 5

5.1 State THREE disadvantages of a closed-circuit gas turbine. (3)

5.2 Sketch a labelled diagram of a premix burner. (11)

5.3 Write brief, explanatory notes on the vapourising burner. (4)

5.4 List THREE methods used in the preparation of nitric acid. (3)
[21]

QUESTION 6

6.1 Write brief, clarifying notes to distinguish between a kneader, a dispenser and a masticator. (6)

6.2 Draw a neat, labelled diagram of the salt process for the production of hydrochloric acid and give a chronological description of the process. (14)
[20]

TOTAL: 100

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