higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

PROCESS CHEMISTRY
NQF LEVEL 3

(6050433)

3 March 2020 (X-paper)
09:00–12:00

This question paper consists of 5 pages.

237Q1S2003

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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. Use only a black or blue pen.
5. Write neatly and legibly.

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QUESTION 1

1.1 Different fertilisers have different properties and applications, but in most agricultural applications a combination of both types is used.

1.1.1 Give FOUR examples of processed organic fertilisers. (4)

1.1.2 Give THREE advantages of inorganic fertilisers. (3)

1.1.3 Briefly explain the application of soil fertilisers. (3)

1.1.4 Briefly explain the problems associated with using dry fertilisers. (2)

1.2 Give ONE example of each of the following:

1.2.1 Micronutrients

1.2.2 Secondary nutrients

1.2.3 Macronutrients

(3 × 1) (3)

1.3 Complete and balance each of the following reactions:

1.3.1 $SO_2(s) + O_2(g) \rightarrow$

1.3.2 $NO(g) + O_2(g) \rightarrow$

(2 × 2) (4)

1.4 Sketch a labelled diagram of a fluid-bed reactor used during the production of sulphuric acid. (6)

[25]

QUESTION 2

2.1 Cement raw materials are crushed, ground and mixed before the manufacturing process.

Describe each of the following cement raw materials:

2.1.1 Limestone

2.1.2 Clay

2.1.3 Ash

2.1.4 Gypsum

2.1.5 Shale

(5 × 1) (5)

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2.2 Slagment is produced as a by-product of the iron-smelting process.

2.2.1 List, in sequence, the FIVE steps involved in the production of slagment. (5)

2.2.2 Briefly explain *open-pit mining*. (4)

2.3 List THREE industrial applications of each of the following calcium compounds:

2.3.1 CaO

2.3.2 $CaCO_3$

(2 × 3) (6)

[20]

QUESTION 3

Sodium carbonate and sodium hydrogen carbonate are produced through the Solvay process and the raw materials used are brine and limestone.

$$2NaC\ell\,(aq) + CaCO_3\,(s) \rightarrow Na_2CO_3\,(s) + CaC\ell_2\,(aq)$$

Draw a labelled flow diagram of the Solvay process. **[15]**

QUESTION 4

4.1 Give the names of each of the following raw materials used in soap production:

4.1.1 $C_{18}H_{34}O_2$

4.1.2 $C_{12}H_{24}O_2$

4.1.3 $C_{16}H_{32}O_2$

(3 × 1) (3)

4.2 Additives have a wide range of uses in detergents.

4.2.1 What is the main purpose of additives in detergents? (2)

4.2.2 Give THREE uses of additives in detergents. (3)

4.2.3 Give FOUR examples of additives that are normally added in detergents. (4)

4.3 Give THREE primary benefits of pesticides. (3)

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4.4 Explain the operation principle of each of the following insecticides:

4.4.1 Boric acid

4.4.2 Carbamates

4.4.3 Paris green

4.4.4 Organophosphates

4.4.5 Organochlorides

(5 × 1) (5)
[20]

QUESTION 5

5.1 List FOUR manufacturers of pulp and paper products in South Africa. (4)

5.2 A number of raw materials are used in the production of pulp.

5.2.1 Differentiate between *softwood* and *hardwood*. (2)

5.2.2 Name TWO types of fibres. (2)

5.2.3 Name TWO main components of black liquor. (2)

5.3 Give the THREE main steps in the Kraft pulp-production process. (3)

5.4 Give FIVE examples of coated paper. (5)

5.5 Define the term *lamination*. (2)
[20]

TOTAL: 100

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