higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

# NATIONAL CERTIFICATE (VOCATIONAL)

## PROCESS CHEMISTRY
### NQF LEVEL 3

(6050433)

**2 March 2018 (X-Paper)**
**09:00–12:00**

**This question paper consists of 6 pages.**

NCV

**TIME: 3 HOURS**
**MARKS: 100**

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**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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NCV

## QUESTION 1

1.1 Nutrients are important for plant growth and categorised according to the specific amount required by plants.

1.1.1 Name TWO types of micronutrients normally found in fertilisers. (2)

1.1.2 What is the main function of nitrogen in plants? (2)

1.1.3 Briefly discuss the importance of calcium in plants. (3)

1.2 Give the chemical formula of mono-ammonium phosphate. (2)

1.3 Briefly explain how the following fertilisers are applied:

1.3.1 Foliar fertilisers

1.3.2 Soil fertilisers

1.3.3 Water-soluble fertilisers

(3 × 1) (3)

1.4 Name THREE types of secondary nutrients. (3)
**[15]**

## QUESTION 2

2.1 The mining industry uses sulphuric acid for the separation and purification of minerals, but the fertiliser industry uses it for the production of fertilisers.

2.1.1 Name TWO types of fertilisers based on sulphuric acid. (2)

2.1.2 Pyrite is commonly known as fool's gold because of its shiny golden appearance.

Write down the chemical formula of pyrite. (1)

2.1.3 List FIVE stages in sequence that is involved in the production of sulphuric acid. (5)

2.1.4 Complete and balance the following reaction equation:

$SO_2(g) + O_2(g) \rightarrow$ (2)
**[10]**

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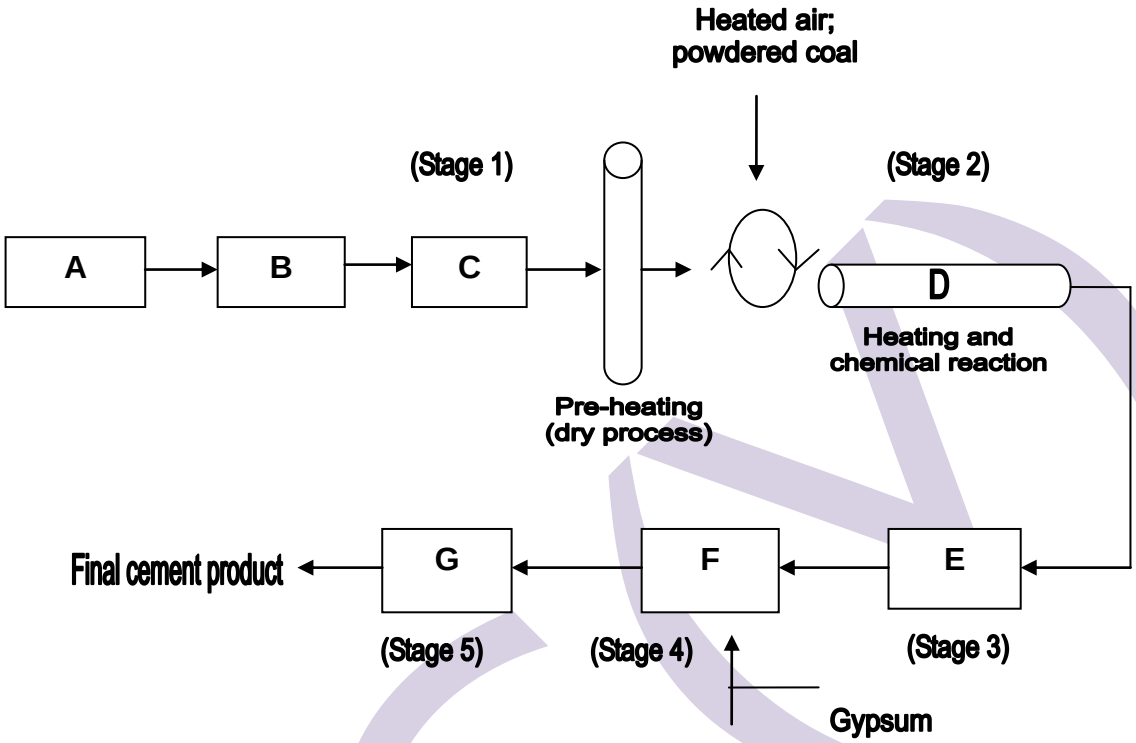
## QUESTION 3

3.1 Complete the following process flow diagram of a typical cement production. Write only the answer next to the letter (A–G) in the ANSWER BOOK.




(7)

3.2 Calcium is one of the most common elements on the earth's crust. It is important to living things and its compounds have a lot of industrial applications.

3.2.1 List THREE applications of calcium carbonate. (3)

3.2.2 Which compound of calcium is commonly known as quicklime? (1)

3.2.3 Name TWO uses of gypsum. (2)

3.2.4 Write a balanced reaction equation for the production of calcium anhydrite from gypsum. (3)

3.3 Name the calcium compounds used for each of the following purposes:

3.3.1 Used by building industries to whitewash walls

3.3.2 Used in the production of fertilises through the wet process

3.3.3 Used by the water treatment industry as a flocculent

3.3.4 Used by the pulp and paper industry to improve the printing properties of papers

(4 × 1) (4)

**[20]**

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## QUESTION 4

4.1 Both sodium carbonate and sodium hydrogen carbonate are produced through Solvay's process and the raw materials used are sodium chloride and calcium carbonate.

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

Draw a labelled process flow diagram of Solvay's process. (10)

4.2 Write the formula of each of the following sodium compounds:

4.2.1 Soda ash

4.2.2 Table salt

4.2.3 Baking soda

4.2.4 Caustic soda

4.2.5 Glauber's salt

(5 × 1) (5)

**[15]**

## QUESTION 5

5.1 The biggest shortcoming of soap is that it forms insoluble salt in hard water. To solve this problem, manufacturers developed detergents.

5.1.1 List THREE types of detergents. (3)

5.1.2 Name TWO products produced by Unilever. (2)

5.1.3 Briefly discuss the operation principle of additives in detergents. (3)

5.1.4 Which compound is normally added to detergents to absorb ultraviolet light and prevent yellowing in fabrics? (1)

5.2 Fillers are cheap substances that are added to detergents to increase the quantity of the detergents.

Give the functions of each of the following fillers:

5.2.1 Sodium triphosphate (NATTP)

5.2.2 Sodium silicate

(2 × 1) (2)

5.3 List SIX steps in sequence that is involved during the production of soap through the continuous process. (6)

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5.4 State ONE way in which herbicides kill plants. (1)

5.5 Write the full names of each of the following insecticides:

5.5.1 DDT

5.5.2 HCN

(2 × 1) (2)
**[20]**

**QUESTION 6**

6.1 The wood-yard process is the first process in the pulp and paper production and it involves a series of operations.

List EIGHT operations in sequence to be followed in the wood-yard process. (8)

6.2 Name TWO divisions of Sappi. (2)

6.3 Wood is the main source of plant fibre in pulp production and trees are the main source of wood.

6.3.1 Differentiate between *virgin fibre* and *secondary fibre*. (2 + 2) (4)

6.3.2 Name TWO types of wood. (2)

6.3.3 Explain the term *cooking liquor.* (2)

6.3.4 Briefly discuss lamination of papers and boards. (2)
**[20]**

**TOTAL: 100**

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