higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

PROCESS TECHNOLOGY
NQF LEVEL 4

(6050364)

8 November 2018 (Y-Paper)
13:00–16:00

Scientific calculators may be used.

This question paper consists of 5 pages and 1 periodic table.

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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 3,14 for the value of π
5. Start each section on a NEW page.
6. Write neatly and legibly.

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QUESTION 1

1.1 What is the other name that a rising film evaporator is also known as? (2)

1.2 Name the TWO very important components that the agitated film evaporator consists of. (2)

1.3 Name TWO applications of a flash evaporator. (2)

1.4 What are the TWO advantages of using jacketed vessels in evaporator systems? (2)

1.5 Describe the operation of a tray-type condenser. (5)

1.6 The setup of indirect condensers is almost exactly the same as that of the heat exchanger that is used in evaporation processes.

Why are indirect condensers referred to as surface condensers? (2)

1.7 Leakages can occur in all types of condensers.

1.7.1 Define the term *leakage*. (2)

1.7.2 How can these leakages be prevented from damaging the condensers? (4)

1.8 Explain the function of each of the following components in a distillation process:

1.8.1 Reboiler (2)

1.8.2 Distillation column (2)

1.9 Strippers and coolers are some of the absorption equipment used in industries.

Give a brief description of these strippers and coolers. (5)

[30]

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QUESTION 2

2.1 State the main advantage of using composites in the material construction processes. (2)

2.2 Differentiate between electrical conduction and resistivity of a material. (4)

2.3 Casting is another metalworking process by which molten metal is poured into closed dies and then left to cool down and solidify.

Name TWO applications where the casting process is used for the manufacturing of industrial appliance. (2)

2.4 Name TWO different types of adhesive fasteners. (2)
[10]

QUESTION 3

3.1 Energy within a system can be in the form of internal-, kinetic- and potential energy.

Name THREE methods / forms in which energy can be introduced into a system. (3)

3.2 Enthalpy is obtained from the thermodynamic tables based on the substance's temperature, pressure and phase.

Write down the equation that is used to calculate enthalpy and also give the unit in which enthalpy is expressed. (4)

3.3 Convert 444 °C to °F. (4)

3.4 Name the components of heat loss that occurs in a horizontal tube heat exchanger. (6)

3.5 A cylindrical shaped container filled with water and having a heating coil inside, heats the water to its boiling point of 100 °C. The dimensions of the container are (diameter = 8 cm, and the height = 6 cm).

Calculate how much energy must be absorbed by the water to change from one phase to another. Density of water at 100 °C = 958 kg/m^3, Lv = 2257 kJ/kg and Lf = 333,7 kJ/kg. (11)

3.6 Heat is defined as the process of the transfer of energy between two systems. Heat losses arise in this process.

Explain why heat is lost in this process. (2)
[30]

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QUESTION 4

4.1 Define the following terms and give their SI units:

4.1.1 Volume (2)

4.1.2 Density (3)

4.1.3 Weight (3)

4.2 Calculate the volume of a cube with a height of 3 m. The cube has a spherical hole in the middle with a radius of 4 m. (9)

4.3 What will be the weight of an object with a mass of 2,4 kg? (3)

4.4 Calculate the molar concentration of carbon dioxide (CO_2) in a 0,8 m^3 sample of air if the mass of CO_2 is 2,2 g. (5)

4.5 Complete and balance the following reactions:

4.5.1 $N_2 + H_2 \rightarrow$ … (2)

4.5.2 $CaCO_{3(s)} + 2HCl_{(aq)} \rightarrow$ … + … + … (3)

[30]

TOTAL: 100

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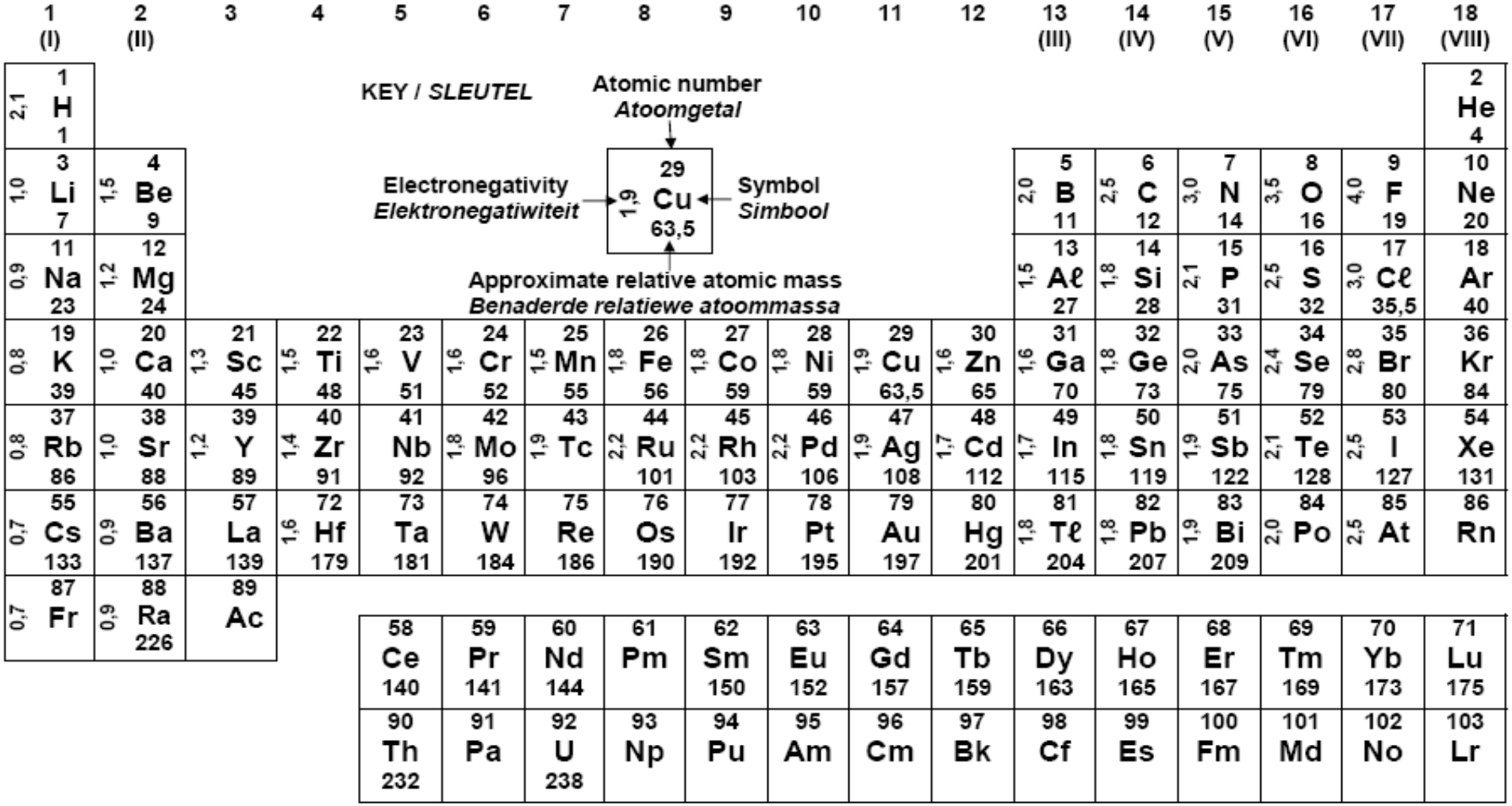
THE PERIODIC TABLE OF ELEMENTS
DIE PERIODIEKE TABEL VAN ELEMENTE



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