higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T350**(E)**(J24)T

NATIONAL CERTIFICATE

CHEMISTRY N4

(15040004)

24 July 2018 (X-Paper)
09:00–12:00

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

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
CHEMISTRY N4
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. Sketches must be large, neat and fully labelled.
5. Keep the subsections of questions together.
6. Start each question with the formula and the substituted values.
7. Each final answer must be rounded off to THREE decimal numbers.
8. Write neatly and legibly.

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QUESTION 1

1.1 Write brief notes on covalent compounds with reference to:

1.1.1 structure (4)

1.1.2 conduction of electricity (2)

1.1.3 solubility (2)

1.2 Name TWO examples of covalent compounds. (2)

1.3 Name THREE conditions under which an electrovalent compound is likely to be formed. (3)

1.4 Identify the type of bonding that occurred in each of the following:

1.4.1 Fe

1.4.2 HNO_3

1.4.3 CaO

1.4.4 NH_3

1.4.5 HF

(5 × 1) (5)

1.5 Define *Sidwick* and *Powell's* theory. (3)

1.6 During the formation of sodium chloride five steps occur.

With the aid of chemical reactions differentiate between sublimation and first ionisation energy. (4)

[25]

QUESTION 2

2.1 Study the given chemical compound with the formula ClF_3

2.1.1 Write down the general formula for this compound. (2)

2.1.2 Name this compound. (2)

2.1.3 Draw a line structure for this compound and indicate the lone pairs of electrons. (4)

2.1.4 What is the shape of the ClF_3 molecule? (1)

2.1.5 How many bonding pairs does a ClF_3 molecule have? (1)

2.1.6 Does this compound obey the Octet rule? Motivate your answer. (2)

2.1.7 How many valence electrons does a ClF_3 molecule have? (1)

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2.2 Given : $HCl_{(aq)} + H_2O_{(l)} \rightarrow H_3O^+_{(aq)} + Cl^-_{(aq)}$

2.2.1 Provide the chemical name of Cl^-. (1)

2.2.2 Is HCl an ionic, covalent or interstitional hydride? (1)

2.2.3 Explain why HCl is regarded as an Arrhenius acid in the above reaction? (2)

2.2.4 Write down the K_a for this expression. (3)

2.2.5 Is the K_a-value big or small? Explain your answer. (2)

2.2.6 Indicate the conjugate acid-base pairs. (2)

2.2.7 Which acid is the strongest between HCl or HNO_3? (1)

[25]

QUESTION 3

3.1 Oxygen can be prepared by the thermal decomposition of peroxide.

Write down the balanced equation for this reaction. (3)

3.2 Name TWO properties of oxygen. (2)

3.3 Briefly explain how you would prepare ozone (O_3) in the laboratory. (2)

3.4 Name ONE example of each of the following oxides:

3.4.1 acidic oxide

3.4.2 neutral oxide

3.4.3 amphoteric oxide

3.4.4 very basic oxide

(4 × 1) (4)

3.5 Ammonia (NH_3) is prepared in the laboratory by reacting calcium hydroxide and ammonium chloride.

Write down the balanced chemical reaction. (5)

3.6 Name TWO properties of nitrogen. (2)

3.7 Name THREE methods which can be used to remove permanent hardness in water. (3)

3.8 Ammonia (NH_3) is prepared in the industry using nitrogen and hydrogen.

Name the process and write down the balanced chemical equation. (4)

[25]

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QUESTION 4

4.1 Write down the balanced reaction that occurs during the production of carbon tetrachloride (CCl_4). (4)

4.2 List THREE isotopes of hydrogen. (3)

4.3 Write down the balanced reaction of carbon with fluoride and name the product formed. (4)

4.4 Provide the correct hydride/carbide of each of the following :

4.4.1 CaC_2

4.4.2 Ni_3C

4.4.3 TiH

4.4.4 B_4C

(4 × 1) (4)

4.5 Name TWO examples of covalent hydrides that are electron deficient. (2)

4.6 Give the chemical name of each of the following:

4.6.1 D_2O

4.6.2 C_2H_5OH

4.6.3 CO

(3 × 1) (3)

4.7 Complete the following reactions :

4.7.1 $C + 2H_2SO_4 \rightarrow$ (3)

4.7.2 $NiO + CO \rightarrow$ (2)

[25]

TOTAL : 100

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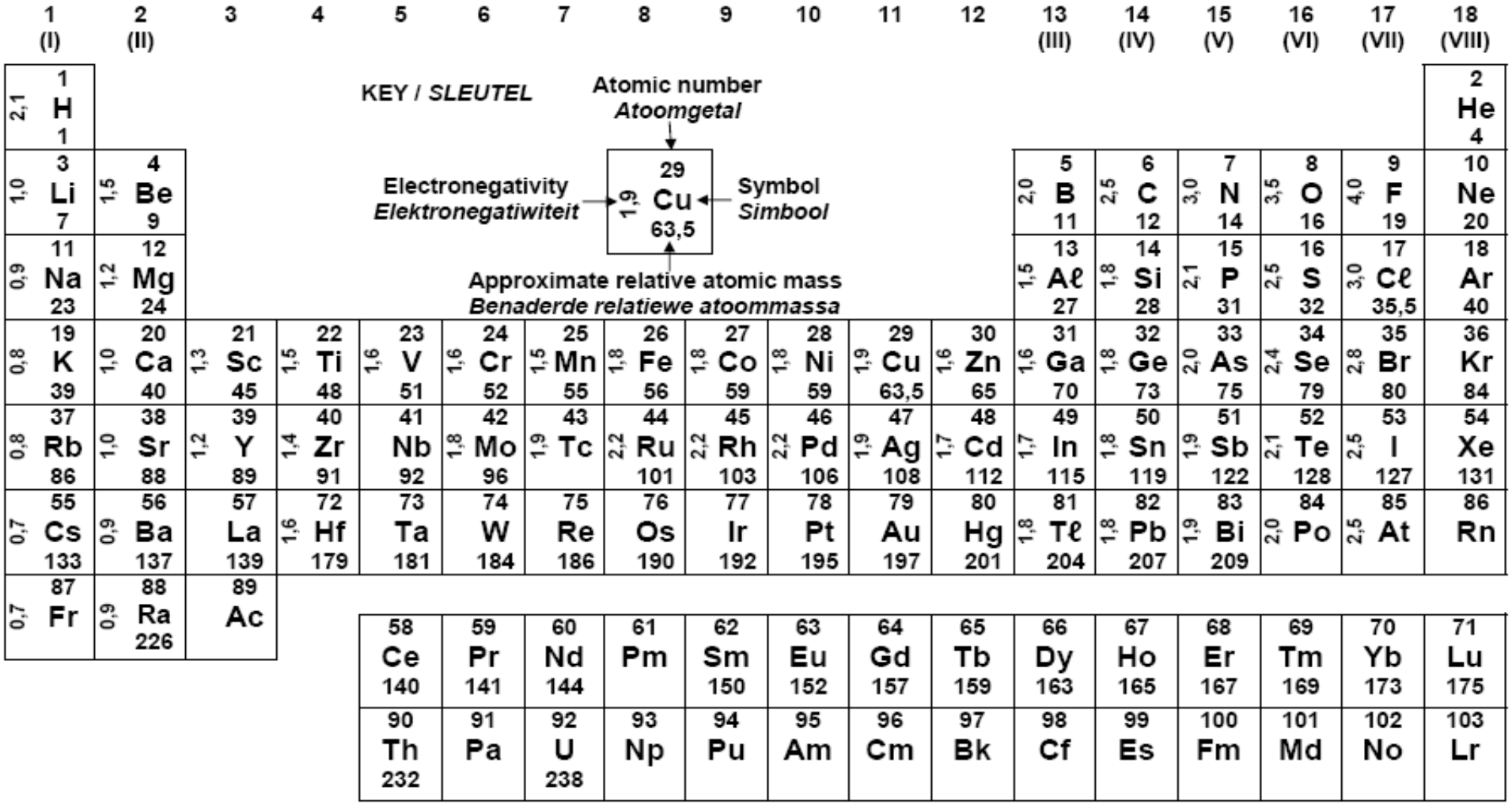
(15040004)

THE PERIODIC TABLE OF ELEMENTS
DIE PERIODIEKE TABEL VAN ELEMENTE



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