



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

CHEMISTRY N4

(15040004)

1 April 2021 (X-paper)
09:00–12:00

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

001Q1A2101

**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. Start each section on a new page.
 5. Use only black or blue pen.
 6. Write neatly and legibly.
-

QUESTION 1

- 1.1 Define the following terms and give ONE example of each:
- 1.1.1 Covalent bonding
 - 1.1.2 Octet rule 
 - 1.1.3 Dative covalent bond
 - 1.1.4 Electrovalent bond
 - 1.1.5 Hydrogen bond
- (5 × 3) (15)
- 1.2 Draw a Cooper structure of a nitrate ion in the resonance and indicate the limiting structure. (4)
- 1.3 List FIVE types of energy that occur during the formation of sodium chloride. (5)
- 1.4 Which ONE of the following is not a noble gas: Ne, Ar, Kr, Yb (1)
- [25]**

**QUESTION 2**

- 2.1 Water is regarded as the universal solvent. In chemistry, it also acts as an amphoteric substance.
- 2.1.1 Define *amphoteric*. (2)
 - 2.1.2 Write down a balanced reaction to illustrate your answer in QUESTION 2.1.1 and clearly indicate the conjugate acid-base pair. (6)
- 2.2 Given: $\text{HCl}_{(\text{aq})} + \text{H}_2\text{O}_{(\text{l})} \rightarrow \text{A} + \text{B}$
- 2.2.1 Write down products A and B. (2)
 - 2.2.2 Write down the K_c of the expression. (4)
 - 2.2.3 Is the K_c for the expression big or small? Explain your answer. (2)
- 2.3 List THREE properties of a base. (3)
- 2.4 State the Sidgwick Powell theory.  (3)
- 2.5.1 Explain the concept of a *triple bond* by making use of a Cooper structure. (2)
 - 2.5.2 Does nitrogen gas have a triple bond? (1)
- [25]**

QUESTION 3

3.1 Given: PF₅

3.1.1 Name this compound. (2)

3.1.2 What is the shape of the PF₅ molecule? (2)

3.1.3 Does PF₅ obey the octet rule? Explain your answer. (2)

3.1.4 How many ion pairs of electrons does PF₅ have? (1)

3.1.5 How many bonding pairs does PF₅ have? (1)

3.2 Write down the balanced chemical reaction of carbon disulphide with chlorine. (4)

3.3 Indicate the following as IONIC, COVALENT or INTERSTITIAL carbide by writing only 'Ionic', 'Covalent' or 'Interstitial carbide' next to the question number (3.3.1–3.3.2) in the ANSWER BOOK.

3.3.1 SiC

3.3.2 Fe₃C (2 × 1) (2)

3.4 Industrially, this type of carbon is incorporated into rubber to make tyres.

Name the impurity of this carbon. (1)

3.5 List TWO examples of a covalent hydride. (2)

3.6 Complete the following: 2Na + 2H₂O → (2)

3.7 Write down the names of the following:

3.7.1 H₂S

3.7.2 H₂C = CH₂

3.7.3 CaH₂

3.7.4 C₂H₅OH

3.7.5 C₃O₂ (5 × 1) (5)

3.8 Name an isotope of hydrogen that has one neutron. (1)
[25]

QUESTION 4

- 4.1 Name THREE products that occur when calcium hydroxide reacts with ammonium chloride. (3)
- 4.2 Complete the following reactions:
- 4.2.1 $\text{N}_2\text{O}_3 \rightarrow$ (2)
- 4.2.2 $2\text{Pb}(\text{NO}_3)_2 \xrightarrow{\Delta}$ (3)
- 4.3 Briefly discuss FOUR ways of preparing oxygen and give ONE balanced reaction to support each. (4 × 4) (16)
- 4.4 Write down the balanced formula of ozone. (1)
- [25]**

TOTAL: 100

- 1
- 2 (II)
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13 (III)
- 14 (IV)
- 15 (V)
- 16 (VI)
- 17 (VII)
- 18 (VIII)

Atomic number
Atoomgetal

[illegible]