higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

CHEMISTRY N4

26 JULY 2019

This marking guideline consists of 4 pages.

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QUESTION 1: CHEMICAL BONDING

1.1
1.1.1 D
1.1.2 B
1.1.3 C
1.1.4 A
1.1.5 A

(5 × 2) (10)

1.2
1.2.1 H_2O or SO_2
1.2.2 $CC\ell_4$
1.2.3 H_2O
1.2.4 MgO
1.2.5 O_2
1.2.6 I_2 or N_2
1.2.7 N_2
1.2.8 H_2O
1.2.9 Ne
1.2.10 MgO

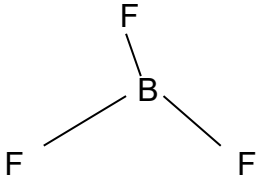
(10 × 1) (10)

1.3
- Sublimation energy
- First ionisation energy
- Dissociation energy
- Electron affinity
- Lattice energy

(5)
[25]

QUESTION 2: CHEMICAL GEOMETRY

2.1
2.1.1 Boron trifluoride (1)
2.1.2 Three/3 (1)
2.1.3 120^0 (1)
2.1.4 Trigonal planar (1)
2.1.5 Zero/0 (1)
2.1.6 Six/6 (1)
2.1.7 No (1)
2.1.8



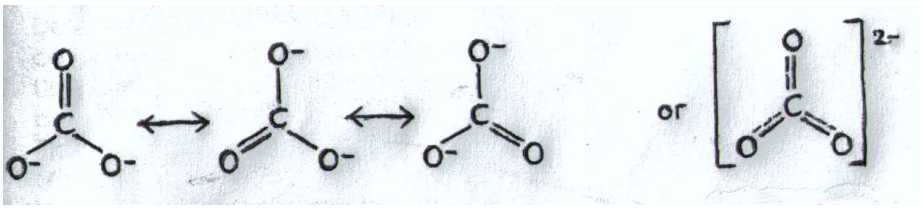
(2)

2.2
- Smaller
- The positive nuclear charge is bigger
- Electrons are attracted stronger and closer

(3 x 1) (3)

2.3
- Be^{+2}
- Isoelectronic
- Be has more protons (nuclear charge) contracting the atom. (3)

2.4



(4)

2.5
- H_2O or water
- $C\ell F_3$ or chlorine trifluoride (2)

2.6 2.6.1 CO_2 or $BeC\ell_2$ or C_2H_2
2.6.2 CH_4 or H_2O or NH_3 or NH_4^+ or SO_4^{-2} or SO_3^{-2}
2.6.3 PF_5 or SF_4 or $C\ell F_3$
2.6.4 SF_6 or IF_5

(4 × 1) (4)
[25]

QUESTION 3: ACIDS AND BASES

3.1 3.1.1 $H_3O^+_{(aq)} + OH^-_{(aq)}$ (2)

3.1.2 Because it acts as both acid and base (1)

3.2 3.2.1 $H_2CO_{3(aq)} + H_2O_{(\ell)} \rightarrow HCO^-_{3\,(aq)} + H_3O^+_{(aq)}$ (3)

3.2.2 $K_a = \dfrac{[H_3O^+][HCO_3^-]}{[H_2CO_3]}$ (2)

3.2.3
- H_2CO_3 is a weak acid.
- Its ionisation is not complete. (2 x 1) (2)

[10]

QUESTION 4: CHEMISTRY OF CARBON

4.1
- Charcoal
- Animal charcoal
- Carbon black (3)

4.2 $2H_2O + 4NO_2 + CO_2$ (3)

4.3 4.3.1 Graphite
4.3.2 Dry ice
4.3.3 Carbon monoxide or carbon (II) oxide or CO
4.3.4 Carbon suboxide (C_3O_2)

(4 × 1) (4)
[10]

QUESTION 5: CHEMISTRY OF HYDROGEN

5.1 5.1.1 CH_4 or NH_3 or H_2S or $HC\ell$
5.1.2 CaH_2
5.1.3 ZrH or TiH
(3 × 1) (3)

5.2 5.2.1 Tracer for elucidating a wide range of reaction mechanisms
5.2.2 As radioactive
(2 × 1) (2)

5.3
- Colourless without taste or smell
- Liquefied by compression
- Boils at -253˚C
- Freezes at -259 ˚C (Any 1 x 1) (1)

5.4 $Mg + H_2O \rightarrow MgO + H_2$ (2)

5.5 $CaH_2 + 2H_2O \rightarrow Ca(OH)_2 + H_2$ (2)
[10]

QUESTION 6: CHEMISTRY OF NITROGEN

6.1 $CaC\ell_2 + 2H_2O + 2NH_3$ (3)
6.2 $N_2 + 3H_2 \rightarrow 2NH_3$ (2)
6.3 Ostwald process (1)
6.4 $4NH_3 + 3O_2 \rightarrow 2N_2 + 6H_2O$ (4)
[10]

QUESTION 7: CHEMISTRY OF OXYGEN

7.1 By sending dry oxygen through a silent electrical discharger (2)

7.2
- Thermal decomposition of the oxides of metals in the electrode potential
- Thermal decomposition of higher oxides
- Decomposition of peroxides
- By electrolysis (4)

7.3 $C + 4HNO_3 \rightarrow CO_2 + 4NO_2 + 2H_2O$ (3)

7.4 Hydrogen peroxide (1)
[10]

TOTAL: 100

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