higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

CHEMISTRY N4

1 April 2021

This marking guideline consists of 5 pages.

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QUESTION 1

1.1 1.1.1 Occurs when the valence orbitals of an atom overlap and share an electron pair between the nuclei✓✓
E.g., H_2, Cl_2, HCl, H_2O, HOCl, NH_3 and N_2 ✓

1.1.2 An atom tends to form bonds until it is surrounded by eight valence electrons✓✓
E.g., BF_3, BCl_3, H_2O or any other valid example✓

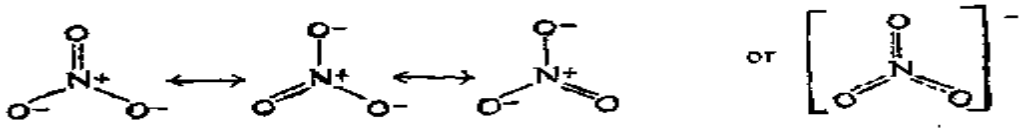
1.1.3 Occurs when one atom supplies both electrons which they share between their nuclei✓✓
E.g., H_3O^+, NH_4, N_2✓

1.1.4 Is formed by the transfer of one or more electrons from one atom to another so that the ions formed have the electron configuration of one of the noble gases✓✓
E.g., Cl_2, O_2, N_2, HCl, H_2O, CO_2 and NH_3✓

1.1.5 The bond that exists between the dipoles of the same substance or between dipoles of different substances✓✓
E.g., H_2O; NH_3, HF, HCl; HBr✓

(5 × 3) (15)

1.2



(4)

1.3
- Sublimation energy
- First ionisation energy
- Dissociation energy
- Electron affinity
- Lattice energy (5)

1.4 Yb (1)

[25]

QUESTION 2

2.1 2.1.1 It is a substance that acts as an acid as well as a base. (2)

2.1.2 $H_2O_{(aq)} + H_2O_{(l)} \rightarrow H_3O^+_{(aq)} + OH^-_{(aq)}$ ✓✓✓✓

H_2O and H_3O^+ ✓

H_2O and OH^- ✓ (6)

2.2 2.2.1 A = H_3O^+ ✓ and B = Cl^- ✓ (2)

2.2.2 $K_c = \frac{[H_3O^+][Cl^-]}{[HCl]}$ (4)

2.2.3 Big✓ HCL is a strong acid. / HCL ionises completely.✓ (2)

2.3
- Tastes bitter
- Feels soapy in water
- Corrosive and caustic
- Dissociate in water and conduct electricity
- Change the colour of an indicator (Red turns blue)
- Neutralise acid to form salt and water (Any 3 × 1) (3)

2.4 The arrangement in space of the covalent bonds in multi covalent atoms are simply related to the number of electrons in the valence shells. (3)

2.5 2.5.1 N ≡ N (2)

2.5.2 Yes (1)

[25]

QUESTION 3

3.1 3.1.1 Phosphorus pentafluoride ✓ (2)
3.1.2 Trigonal pyramid (2)
3.1.3 No✓ It contains 10 electrons around phosphorus. ✓ (2)
3.1.4 None (1)
3.1.5 Five (1)

3.2 CS_2✓ + Cl_2✓ → CCl_4✓ + S_2Cl_2✓ (4)

3.3 3.3.1 Covalent carbide
3.3.2 Interstitial carbide
(2 × 1) (2)

3.4 Carbon black (1)

3.5
- CH_4
- NH_3
- H_2S
- HCl

(Any 2 × 1) (2)

3.6 $2Na + 2H_2O \rightarrow 2NaOH✓ + H_2✓$ (2)

3.7
3.7.1 Hydrogen sulphide
3.7.2 Ethene
3.7.3 Calcium hydride
3.7.4 Ethanol
3.7.5 Carbon suboxide

(5 × 1) (5)

3.8 Deuterium (1)
[25]

QUESTION 4

4.1
- Calcium chloride
- Water
- Ammonia

(3)

4.2 4.2.1 $NO✓ + NO_2✓$ (2)

4.2.2 $2Pb(NO_3)_2✓ + 4NO_2✓ + O_2✓$ (3)

4.3 **By thermal decomposition of oxides of metals✓**

$2Ag_2O \xrightarrow{\Delta} 4Ag + O_2✓✓✓$

Or

$2HgO \xrightarrow{\Delta} 2Hg + O_2✓✓✓$

By thermal decomposition of higher oxides✓

$2Pb_3O_4 \xrightarrow{\Delta} 6PbO + O_2✓✓✓$

Or

$2PbO_2 \xrightarrow{\Delta} 2PbO + O_2✓✓✓$

By decomposition of peroxide✓

$2H_2O_2 \rightarrow 2H_2O_2 + O_2✓✓✓$

Or

$2Na_2O_2 + 2H_2O \rightarrow 4NaOH + O_2✓✓✓$

By thermal decomposition of salts containing anions (rich in O_2) ✓

$2KNO_3 \xrightarrow{\Delta} 2KNO_2 + O_2$✓✓✓

Or

$2KMnO_4 \xrightarrow{\Delta} K_2MnO_4 + MnO_2 + O_2$✓✓✓

Or

$2KClO_3 \xrightarrow{\Delta} 2KCl + 3O_2$✓✓✓

By electrolysis✓

$2H_2O + 2e \rightarrow H_2 + 2OH^-$✓✓

$2H_2O \rightarrow 4H^+ + O_2 + 4e$✓

ONE mark for the type of reaction
THREE marks for the balanced reaction (4 × 4) (16)

4.4 O_3 (1)
[25]

TOTAL: 100

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