LIMPOPO
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DEPARTMENT OF
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NATIONAL SENIOR CERTIFICATE

GRADE 11

PHYSICAL SCIENCES: CHEMISTRY (P2)/ *FISIESE WETENSKAPPE: CHEMIE (V2)*

MARKING GUIDELINES/*NASIENRIGLYNE*

JUNE 2026/*JUNIE 2026*

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MARKS/*PUNTE*: 100

This marking guideline consists of 8 pages/*Hierdie nasienriglyne bestaan uit 8 bladsye*

QUESTION 1/*VRAAG 1*

1.1	D ✓✓	(2)
1.2	D ✓✓	(2)
1.3	A ✓✓	(2)
1.4	D ✓✓	(2)
1.5	C ✓✓	(2)
1.6	C ✓✓	(2)
1.7	D ✓✓	(2)
1.8	D ✓✓	(2)
1.9	A ✓✓	(2)
1.10	B ✓✓	(2)

[20]

QUESTION 2/*VRAAG 2*

2.1 Sharing of electrons between two atoms to form a molecule/shared pair of electrons ✓✓/ *Deling van elektrone tussen twee atome om 'n molekule/gedeelde elektronpaar te vorm.* (2)

2.2  ✓✓ (2)

Marking Criteria/*Nasienriglyne*

Criteria/*Kriteria*	**Marks/*Punte***
Correct sharing of electrons between Hydrogen (H) and Carbon (C) to form a single covalent bond./ *Korrekte deling van elektrone tussen waterstof (H) en koolstof (C) om 'n enkele kovalente binding te vorm*	**1**
Correct sharing of electrons between Carbon (C) and Nitrogen (N) to form a triple covalent bond, AND showing the lone pair on the Nitrogen atom, ensuring both Cand N achieve a stable octet (8 valence electrons)./ *Korrekte deling van elektrone tussen Koolstof (C) en Stikstof (N) om 'n drievoudige kovalente binding te vorm, EN wat die alleenpaar op die stikstofatoom toon, wat verseker dat beide C en N 'n stabiele oktet (8 valenselektrone) bereik*.	**1**

2.3 Two (2) ✓/*Twee* (2) (1)

2.4

2.4.1 Tetrahedral ✓/*Tetraëdries* (2)

2.4.2 (Trigonal) Pyramidal ✓/(*Trigonaal) Piramidaal* (2)

2.5 2.5.1



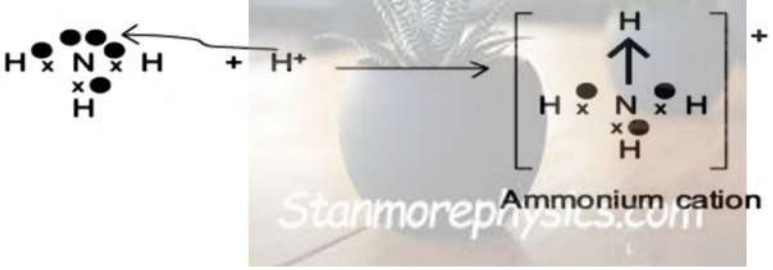
Ammonium cation ✓✓

Marking criteria/*nasienriglyne*:

Criteria/*Kriteria:*	Marks/ *Punte*
Showing three standard shared electron pairs (each consisting of one dot and one cross between the central Nitrogen (N) atom and three Hydrogen (H) atoms./ *Toon drie standaard gedeelde elektronpare (elk bestaande uit een kolletjie en een kruising tussen die sentrale stikstofatoom (N) en drie waterstofatome (H).*	1
Correctly identifying the dative covalent bond—indicated either by the arrow pointing from Nitrogen's lone pair to the fourth Hydrogen (H^+ ion), AND enclosing the entire structure in square brackets with a positive sign (+) outside to indicate the overall charge/*Die korrekte identifisering van die datief kovalente binding—aangedui deur die pyl wat van stikstof se alleenpaar na die vierde waterstof (H+) ioon wys, EN die hele struktuur tussen vierkantige hakies met 'n positiewe teken (+) buite omsluit om die algehele lading aan te dui.*	1

(2)

2.5.2



- Nitrogen in NH_3 has a lone pair of electrons. ✓/ *Stikstof in NH_3 het 'n alleenstaande elektronpaar*
- H^+ has no electrons. ✓/ *H^+ het geen elektrone nie*

- Nitrogen donates its lone pair to H^+. ✓/ *Stikstof skenk sy alleenpaar aan H^+.*
- A dative covalent bond forms to produce NH_4^+. ✓/ *'n Datief kovalente binding vorm om NH_4^+ te produseer.*

(4)

2.5.3 One atom must have an empty valence shell/ orbital. ✓✓/ *Een atoom moet 'n leë valensskil/orbitaal hê.*
The other atom must have a lone pair of electrons. ✓✓/ *Die ander atoom moet 'n alleenstaande elektronpaar hê*

(4)
[19]

QUESTION 3/*VRAAG 3*

3.1

3.1.1 Measure of the tendency of an atom in a molecule to attract bonding electrons/shared pairs of electrons. ✓✓/ *Maatstaf van die neiging van 'n atoom in 'n molekule om bindingselektrone/gedeelde elektronpare aan te trek.*

(2)

3.1.2 $\Delta EN_{C-O} = 3,5 - 2,5$ ✓
$= 1,0$ ✓ (2)

3.1.3 CO is linear with <u>O being more electronegative than C</u>, ✓ therefore the O end of the molecule will be slightly negative/The charge distribution in CO is asymmetrical ✓and thus it is a polar molecule.
CO_2 is also linear with the central C atom such that there is an O atom on either side. ✓ The two O ends will be slightly negative and the central C atom will be slightly positive/The charge distribution is symmetrical ✓ and thus the molecule is non-polar. /
CO is lineêr met O wat meer elektronegatief is as C, daarom sal die O-punt van die molekule effens negatief wees/Die ladingsverspreiding in CO is asimmetries en dus is dit 'n polêre molekule.
CO2 is ook lineêr met die sentrale C-atoom sodat daar 'n O-atoom aan weerskante is. Die twee O-punte sal effens negatief wees en die sentrale C-atoom sal effens positief wees/Die ladingsverspreiding is simmetries en dus is die molekule nie-polêr.

(4)

3.2.1 The Pauling electronegativity scale is a scale between 0 and 4,0 which compares the electronegativity differences between atoms within a chemical bond. It is useful to see the degree of polarity within a covalent bond which can then give us an idea of the degree of polarity of the molecule. ✓✓ /

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Die Pauling-elektronegatiwiteitskaal is 'n skaal tussen 0 en 4,0 wat die elektronegatiwiteitsverskille tussen atome binne 'n chemiese binding vergelyk. Dit is nuttig om die graad van polariteit binne 'n kovalente binding te sien, wat ons dan 'n idee kan gee van die graad van polariteit van die molekule. (2)

3.2.2 In both cases, the bonding electrons are in the 2-level and screened from the nucleus by the 1s electrons. But oxygen has 8 protons in the nucleus whereas nitrogen only has 7✓. A bonding pair will experience more attraction from the oxygen's nucleus than from nitrogen's, and so the electronegativity of oxygen is greater✓/
In beide gevalle is die bindingselektrone in die 2-vlak en word dit van die kern afgeskerm deur die 1s-elektrone. Maar suurstof het 8 protone in die kern, terwyl stikstof slegs 7 het. 'n Bindingspaar sal meer aantrekkingskrag van die suurstof se kern ervaar as van stikstof s'n, en dus is die elektronegatiwiteit van suurstof groter. (2)

3.3 **Lowest** Caesium Barium, Calcium, Aluminium, Boron, Carbon, Fluorine **Biggest** ✓✓/ ***Laagste*** *Sesium Barium, Kalsium, Aluminium, Boor, Koolstof, Fluoor* ***grootste*** (2)

3.4

3.4.1 Cl_2 will have non-polar bonds because the bond has identical atoms at each end. the electron pair will be on average held half-way between the two. There is no net pull one way or the other ✓✓ / *Cl_2 sal nie-polêre bindings hê omdat die binding identiese atome aan elke kant het. Die elektronpaar sal gemiddeld halfpad tussen die twee gehou word. Daar is geen netto aantrekkingskrag in die een of ander rigting nie.* (2)

3.4.2 CsCl. Caesium has the lowest electronegativity of any of the atoms in the list joined to one or more chlorine atoms. ✓✓/ *CsCl. Sesium het die laagste elektronegatiwiteit van enige van die atome in die lys wat aan een of meer chlooratome verbind is.* (2)

3.4.3 PCl_3 or SCl_2 are also polar covalent, because there isn't enough electronegativity difference here either to make it ionic ✓✓/ *PCl_3 of SCl_2 is ook polêr kovalent, want daar is ook nie genoeg elektronegatiwiteitsverskil hier om dit ionies te maak nie.* (2)

3.5 A polar bond is one between two atoms of different electronegativity. An electron pair will be pulled towards the more electronegative atom making that slightly ✓✓. For example, in CCl_4, all the bonds are polar because the chlorine is more electronegative than carbon. A polar molecule is one which has an overall charge separation – in the sense that one side or end of the molecule is slightly negative and the other slightly positive✓✓/
'n Polêre binding is een tussen twee atome van verskillende elektronegatiwiteit. 'n Elektronpaar sal na die meer elektronegatiewe atoom getrek word, wat dit effens

maak. Byvoorbeeld, in CCl_4, is al die bindings polêr omdat die chloor meer elektronegatief is as koolstof. 'n Polêre molekule is een wat 'n algehele ladingskeiding het – in die sin dat een kant of punt van die molekule effens negatief is en die ander effens positief.

(4)

[24]

QUESTION 4/*VRAAG 4*

4.1 As the atoms approach each other/come close to each other, ✓ the forces of attraction between the nuclei and electron clouds become stronger. ✓/ *Soos die atome mekaar nader/nader aan mekaar kom, word die aantrekkingskragte tussen die kerne en elektronwolke sterker.* (2)

4.2

4.2.1 A ✓
The potential energy is closest to zero/more positive. ✓/ *Die potensiële energie is die naaste aan nul/meer positief*

(2)

4.2.2 B. ✓

Lowest potential energy ✓/ *Laagste potensiële energie* (2)

4.3

4.3.1 140 pm ✓✓ (2)

4.3.2 334 kJ. mol^{-1} ✓✓ (2)

4.4 From B to C atoms move very close to each other and the forces of repulsion between the atomic nuclei increase. ✓/ *Van B na C beweeg atome baie naby aan mekaar en die afstotingskragte tussen die atoomkerne neem toe.*

The potential energy of the system of atoms increases. ✓/ *Die potensiële energie van die atoomstelsel neem toe.* (2)

[12]

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QUESTION 5/*VRAAG 5*

5.1 **Boiling point**: the temperature at which the vapour pressure of a substance equals the atmospheric pressure. ✓✓/ ***Kookpunt****: die temperatuur waarby die dampdruk van 'n stof gelyk is aan die atmosferiese druk.* (2)

5.2

5.2.1 In addition, London forces/dispersion forces/induced dipole forces HBr has dipole-dipole forces between the molecules. ✓

In addition, London forces/dispersion forces/induced dipole forces H_2O has hydrogen bonds between the molecules. ✓

The intermolecular forces of H_2O are stronger than those of HBr since hydrogen bonds are stronger than dipole-dipole forces. ✓

More energy is required to overcome the intermolecular forces in H_2O than in HBr. ✓/

Daarbenewens het Londense kragte/dispersiekragte/geïnduseerde dipoolkragte HBr dipool-dipoolkragte tussen die molekules.

Daarbenewens het Londense kragte/dispersiekragte/geïnduseerde dipoolkragte H_2O waterstofbindings tussen die molekules.

Die intermolekulêre kragte van H_2O is sterker as dié van HBr, aangesien waterstofbindings sterker is as dipool-dipoolkragte.

Meer energie word benodig om die intermolekulêre kragte in H_2O te oorkom as in HBr. (4)

5.2.2 Between the molecules of both iodine and bromine there are London forces/dispersion forces/induced dipole forces. ✓

The molecular mass of iodine is greater than that of bromine. ✓

The intermolecular forces of iodine are stronger than those of bromine. ✓

More energy is required to overcome the intermolecular forces in iodine than in bromine. ✓/

Tussen die molekules van beide jodium en broom is daar Londense kragte/dispersiekragte/geïnduseerde dipoolkragte.

Die molekulêre massa van jodium is groter as dié van broom.

Die intermolekulêre kragte van jodium is sterker as dié van broom.

Meer energie word benodig om die intermolekulêre kragte in jodium te oorkom as in broom. (4)

5.3 Yes ✓/*Ja* (1)

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5.4 **NEGATIVE MARKING FROM 5.3/ NEGATIEWE NASIEN VANAF 5.3**

In addition, London forces/dispersion forces/induced dipole forces ✓both ethanol and water have hydrogen bonds ✓between the molecules and hence they have intermolecular forces of comparable strength. ✓/

Daarbenewens het Londense kragte/dispersiekragte/geïnduseerde dipoolkragte beide etanol en water waterstofbindings tussen die molekules en daarom het hulle intermolekulêre kragte van vergelykbare sterkte. (3)

5.5

5.5.1 The pressure exerted by a vapour at equilibrium with its liquid in a closed system. ✓✓/ *Die druk wat deur 'n damp in ewewig met sy vloeistof in 'n geslote sisteem uitgeoefen word.* (2)

5.5.2 The lower the boiling point, the higher the vapour pressure/hydrogen bromide has the lowest boiling point. ✓/ *Hoe laer die kookpunt, hoe hoër die dampdruk/waterstofbromied het die laagste kookpunt.* (1)

5.6

5.6.1 Interatomic bond: a bond that exists within a molecule between the atoms in that molecule. ✓✓/ Interatomiese *binding: 'n binding wat binne 'n molekule tussen die atome in daardie molekule bestaan.* (2)

5.6.2 Interatomic forces are forces that act **within** a molecule or compound and it is these forces that hold the atoms or ions together ✓. All of these are within the compounds and hence are called interatomic forces or chemical bonds. Intermolecular forces are the forces that exist between molecules e.g. in a compound, and particles e.g. ions in aqueous solutions ✓/ *Interatomiese kragte is kragte wat binne 'n molekule of verbinding inwerk en dit is hierdie kragte wat die atome of ione bymekaar hou. Al hierdie is binne die verbindings en word dus interatomiese kragte of chemiese bindings genoem. Intermolekulêre kragte is die kragte wat bestaan tussen molekules, bv. in 'n verbinding, en deeltjies, bv. ione in waterige oplossings.* (2)

5.6.3 Hydrogen bonding intermolecular force. ✓ / *Waterstofbinding intermolekulêre krag* (1)

5.6.4 δ^+✓✓

(H will not have any electron near its nucleus as the high electronegativity of O will pull the shared electron pair away from the H atoms and towards itself, leaving the H atoms δ^+)/*(H sal geen elektron naby sy kern hê nie, aangesien die hoë elektronegatiwiteit van O die gedeelde elektronpaar weg van die H-atome en na homself sal trek, wat die H-atome δ+ sal laat.)* (2)

[25]

TOTAL/*TOTAAL*: [100]