education

Department:
Education
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PROVINCIAL ASSESSMENT
PROVINSIALE ASSESSERING

GRADE/*GRAAD 11*

PHYSICAL SCIENCES P2
FISIESE WETENSKAPPE V2
MARKING GUIDELINES/*NASIENRIGLYNE*
NOVEMBER 2024

MARKS/*PUNTE*: 150

These marking guidelines consists of 10 pages.
Hierdie nasienriglyne bestaan uit 10 bladsye.

QUESTION 1/*VRAAG 1*

1.1	D ✓✓	(2)
1.2	D ✓✓	(2)
1.3	B ✓✓	(2)
1.4	B ✓✓	(2)
1.5	A ✓✓	(2)
1.6	C ✓✓	(2)
1.7	B ✓✓	(2)
1.8	A ✓✓	(2)
1.9	A ✓✓	(2)
1.10	D ✓✓	(2)
		[20]

QUESTION 2/*VRAAG 2*

2.1 Electronegativity as a measure of the tendency of an atom in a molecule to attract bonding electrons. ✓✓
Elektronegatiwiteit is ‘n maatstaf van die neiging van ‘n atoom in ‘n molekuul om bindingselektrone aan te trek. ✓✓ (2)

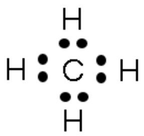
2.2.1 $\Delta E = 4 - 1 = 3$;✓ Ionic bond/*ioniese binding*.✓ (2)

2.2.2 $\Delta E = 3 - 3 = 0$;✓ non polar/*nie polêr*.✓ (2)

2.3.1 Valence electrons are the electrons in the highest energy level of an atom in which there are electrons. ✓✓
Valenselektrone is die elektrone in die hoogste energievlak van ‘n atoom waarin daar elektrone is. ✓✓ (2)

2.3.2 4✓ (1)

2.3.3  ✓✓ (2)

2.3.4  ✓✓ (2)

2.4.1 Linear/*Liniêr*✓ (1)

2.4.2 Tetrahedral/T*etrahedries*✓ (1)

2.5.1 Bond length is the average distance between the nuclei of two bonded atoms.✓✓
Bindingslengte is die gemiddelde afstand tussen die kerne van twee gebonde atome. ✓✓ (2)

2.5.2 C_2H_4 have double bonds between carbon atoms ✓ while C_2H_6 have single bonds between carbon atoms.✓
Bond length decreases with the number of bonds between the atoms. ✓
C_2H_4 het dubbelbindings tussen koolstofatome ✓terwyl C_2H_6 enkelbindings tussen koolstofatome het.✓
Bindingslengte neem af met die aantal bindings tussen die atome. ✓ (3)

2.5.3 The shorter the bond length the higher the bond energy. OR The longer the bond length the smaller the bond energy.✓✓
Hoe korter die bindingslengte hoe hoër is die bindingsenergie. OF Hoe langer die bindingslengte hoe kleiner die bindingsenergie. (2)

2.5.4 SMALLER THAN/*KLEINER AS*✓ (1)

2.6 Both $CHC\ell_3$ and $CC\ell_4$ molecules have polar bonds✓ and both have a tetrahedral shape. $CHC\ell_3$ molecule is asymmetrical/have uneven distribution of electrons✓ while $CC\ell_4$ molecule is symmetrical/ have even distribution of electrons✓. This difference in the charge distribution makes $CHC\ell_3$ to be a polar molecule and $CC\ell_4$ to be a non-polar molecule.✓
Beide $CHC\ell_3$ en $CC\ell_4$ molekules het polêre bindings✓ en beide het 'n tetraëdriese vorm. $CHC\ell_3$ molekule is asimmetries/het oneweredige verspreiding van elektrone✓ terwyl $CC\ell_4$ molekule simmetries is/ het eweredige verspreiding van elektrone✓. Die verskil in die lading verspreiding veroorsaak dat $CHC\ell_3$ 'n meer polêre molekule en $CC\ell_4$ 'n nie-polêre molekule is.✓ (4)

[27]

QUESTION 3/*VRAAG 3*

3.1 Melting point is temperature at which the solid and liquid phases of a substance are at equilibrium.✓✓
Smeltpunt is die temperatuur waarby die vaste- en vloeistoffases van 'n stof in ewewig is. (2)

3.2.1 The stronger the intermolecular forces the higher the melting point.✓✓ (2)
Hoe sterker die intermolekulêre kragte, hoe hoër die smeltpunt.

3.2.2 The molecular mass of HBr is larger than that of $HC\ell$.✓
The intermolecular (London) forces between molecules of HBr are stronger than the intermolecular force between the molecules of $HC\ell$. ✓
More energy is required to overcome the intermolecular forces between the molecules of HBr than of $HC\ell$.✓
Die molekulêre massa van HBr is groter as die van $HC\ell$.✓
Die intermolekulêre (London) kragte tussen molekules van HBr is sterker as die intermolekulêre kragte tussen die molekules van $HC\ell$. ✓
Meer energie benodig om die intermolekulêre kragte tussen molekules van HBr te oorkom as van $HC\ell$.✓ (3)

3.3 HI ✓ (1)

3.4 $CC\ell_4$ molecules have London forces only while H_2O has (London forces) and hydrogen bond.✓
Intermolecular forces are not of comparable strength.✓ (2)
$CC\ell_4$ molekules het slegs Londonkragte terwyl H_2O waterstofbindings het.✓
Intermolekulêre kragte is nie van vergelykbare sterkte.✓

[10]

QUESTION 4/*VRAAG 4*

4.1 Boyle's law: the pressure of an enclosed gas is inversely proportional to the volume it occupies at constant temperature.✓✓
Boyle se wet: die druk van 'n ingeslote gas is omgekeerd eweredig aan die volume wat dit by konstante temperatuur beslaan. ✓✓ (2)

4.2.1 Pressure/*Druk* ✓ (1)

4.2.2 Mass (of gas)✓ and temperature. ✓
Massa (gas) ✓ en temperatuur. ✓ (2)

4.2 $p_1V_1 = p_2V_2$✓

$\underline{128{,}5 \times 55 = 201{,}93 \times V_2}$✓

$V_2 = 35\ cm^3$✓ (3)

4.3.1
- Particles are in continual motion in all directions.
- Particles do not contribute to the volume of the gas.
- There are no forces between the particles, or the particles and the wall of the container, except during collisions.
- Collisions are perfectly elastic with no loss of total energy of the molecules.
- All molecules are identical.
- Collisions of particles on the surface cause pressure.

(Any two)

- *Deeltjies in voortdurende beweging in alle rigtings.*
- *Deeltjies dra nie by tot die volume van die gas nie.*
- *Daar is geen kragte tussen die deeltjies, of die deeltjies en die kant van die houer, behalwe tydens botsings.*
- *Botsings tussen die molekules is volkome elasties met geen verlies van kinetiese energie van die molekules.*
- *Al die molekules is identies.*
- *Botsings van deeltjies teen die oppervlak veroorsaak druk.*

(Enige twee) (2)

4.3.2 High temperature✓ and low pressure. ✓
Hoë temperatuur ✓ *en lae druk.*✓ (2)

4.4 As the temperature increases the average kinetic energy of the molecules increases.✓ pressure of the molecules on each other and on the sides of the container increases as there will be more collisions.✓
As die temperatuur verhoog, verhoog die gemiddelde kinetiese energie van die molekules.✓ *druk uitgeoefen deur die molekules op mekaar en die kante van die houer verhoog en daar is meer botsings.* ✓ (2)

[14]

QUESTION 5/*VRAAG 5*

5.1 EXOTHERMIC.✓ Energy is released OR $\Delta H < 0$ OR more energy is released than absorbed. ✓
EKSOTERMIES.✓ Energie word vrygestel OF $\Delta H < 0$ OF meer energie word vrygestel as geabsorbeer. ✓ (2)

5.2 $\Delta H = H_P - H_R$
$= \underline{-86-25}$✓
$= -111\ k\cdot J\cdot mol^{-1}$✓ (2)

5.3.1 Decreases/*Afneem*✓ (1)

5.3.2 Remain the same/*Bly dieselfde*.✓ (1)

5.4.1 Activated complex is the unstable transition state from reactants to products.✓ (2)
Geaktiveerde kompleks is die onstabiele oorgangstoestand van reaktanse na produkte.

5.4.2 154 $k\cdot J\cdot mol^{-1}$✓ (2)

5.5 V SO_3 : V SO_2
2 : 2✓
V SO_3 = V SO_2 = 50 cm^3✓ (2)
[12]

QUESTION 6/*VRAAG 6*

6.1 Empirical formula is the simplest whole-number ratio of atoms in a compound.✓✓
Empiriese formule is die eenvoudigste heelgetal verhouding in 'n verbinding. (2)

6.2 $n_C:n_H:n_N$

$n = \frac{m}{M}$

$\frac{74.02}{12}$✓ : $\frac{8.71}{1}$✓ : $\frac{17.27}{14}$✓

6.17 : 8.71 : 1.23

5 : 7 : 1✓

Empirical formula/*Empiriese formule*: C_5H_7N✓ (5)

6.3 $n = \frac{m}{M}$

$0{,}25 = \frac{40{,}57}{M}$ ✓

$M = 162{,}28$ g ✓

Empirical formula mass/*Empiriese formule massa* = 5 ×12 + 7 × 1 + 14 = 81✓

Ratio of the empirical formula mass: molecular formula mass
Verhouding van empiriese formule massa : molekulêre formule massa
81 : 162,28
1 : 2✓
∴ Molecular formula/*molekulêre formule*: $C_{10}H_{14}N_2$ ✓ (5)

[12]

QUESTION 7/*VRAAG 7*

7.1 Limiting reagent is a substance that is completely used up in a chemical reaction.✓✓
Beperkte reaktans is 'n stof wat volledig opgebruik word in 'n chemiese reaksie. ✓✓ (2)

7.2 Calcium carbonate/*Kalsiumkarbonaat*/$CaCO_3$✓ (1)

7.3.1 $n_{CO_2} = \frac{m}{M}$

$= \frac{4{,}4}{44}$ ✓

$= 0{,}1$ mol

$n_{CO_2} = \frac{V}{V_m}$

Any one/Enige een

$0{,}1 = \frac{V_{CO_2}}{22{,}4}$ ✓

$V_{CO_2} = 2{,}24$ dm^3 ✓ (4)

7.3.2 $n(CaCO_3)$: $n(CO_2)$

1:1

$n(CaCO_3)$ reacted/*gereageer* = $n(CO_2)$ formed/*gevorm* = 0,1 mol✓

$n_{(CaCO_3)} = \frac{m_{CaCO_3}}{M}$ ✓

$0,1 = \frac{m_{CaCO_3}}{100}$ ✓

$m_{(CaCO_3)} = 10$ g ✓

$\% \text{ purity} = \frac{\text{mass of } CaCO_3 \text{reacted}}{\text{mass of IMPURE } CaCO_3} \times 100\%$

$= \frac{10}{12} \times 100\%$ ✓

= 83 ,33% ✓ (6)

7.3.3 $c = \frac{n}{V}$ ✓

$2 = \frac{n}{0,15}$ ✓

n = 0,15 mol

n(HCℓ) reacted/*gereageer* : $n(CO_2)$ formed/*gevorm*

2 : 1

n(HCℓ) reacted/*gereageer* = $\frac{1}{2}$ x 0,1 = 0.05 mol✓

n(HCℓ) in excess/*oormaat* = n(HCℓ) initial/*begin* - n(HCℓ) reacted/*gereageer*

= 0,15 – 0,05 ✓

= 0,1 mol ✓ (5)

[18]

QUESTION 8/*VRAAG 8*

8.1 Base is a proton/H^+ ion acceptor. ✓✓
Basis is 'n proton/ H^+- ioon ontvanger. ✓✓ (2)

8.2 pH = - log[H_3O^+] ✓
= - log(0,1)✓
= 1✓ (3)

8.3 $C\ell^-$.✓ (1)

8.4 It is a substance that can act as either acid or base.✓✓ (2)
Dit is 'n stof wat as 'n suur of 'n basis kan optree. ✓✓

8.5 $HSO_4^- + H_2O$ ✓ $\rightleftharpoons H_3O^+ + SO_4^{2-}$ ✓✓ (3)

8.6.1 $c = \frac{m}{MV}$ ✓
$= \frac{7,9}{56(0,25)}$ ✓
= 0,56 mol·dm^{-3}✓ (3)

8.6.2 $\frac{c_aV_a}{c_bV_b} = \frac{n_a}{n_b}$ ✓
$\frac{c_a x40}{0,56 \times 25}$ ✓ $= \frac{1}{2}$ ✓
c_a = 0,175 mol·dm^{-3} ✓ (4)

8.6.3 $c_1V_1 = c_2V_2$ ✓

$\underline{c_1 \times 10}$✓ = $\underline{0,175 \times 500}$✓

c_1 = 8,75 mol·dm^{-3}✓ (4)

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QUESTION 9/*VRAAG 9*

9.1 Reduction is a decrease in oxidation number.✓✓
Reduksie is 'n afname in oksidasiegetal. ✓✓ (2)

9.2.1 +2 ✓ (1)

9.2.2 +3✓ (1)

9.3 Mn^{2+}/ MnO ✓. (3)
Oxidation number of Mn^{2+} decreases.✓✓
Oksidasiegetal van Mn^{2+} neem af. ✓✓

9.4.1 $Cu \longrightarrow Cu^{2+} + 2e^-$ ✓✓ (2)

9.4.2 $NO_3^- + 4H^+ + 3e^- \longrightarrow NO + 2H_2O$ ✓✓ (2)

9.4.3 $Cu \longrightarrow Cu^{2+} + 2e^-$ $\underline{\times 3}$ ✓
$NO_3^- + 4H^+ + 3e^- \longrightarrow NO + 2H_2O$ $\underline{\times 2}$ ✓
$3Cu + 2NO_3^- + 8H^+$ ✓$\longrightarrow 3Cu^{2+} + 2NO + 4H_2O$✓ (4)

[15]

TOTAL/*TOTAAL*: 150