



education

Department:
Education
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PROVINCIAL ASSESSMENT *PROVINSIALE ASSESSERING*

GRADE/GRAAD 11

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

MARKS/PUNTE: 150

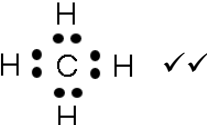


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QUESTION 1/VRAAG 1

- | | | |
|------|------|-------------|
| 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 molekule 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/Tetrahedries ✓ (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 C₂H₄ have double bonds between carbon atoms ✓ while C₂H₆ have single bonds between carbon atoms. ✓
Bond length decreases with the number of bonds between the atoms. ✓
C₂H₄ het dubbelbindings tussen koolstofatome ✓ terwyl C₂H₆ 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 CHCl_3 and CCl_4 molecules have polar bonds✓ and both have a tetrahedral shape. CHCl_3 molecule is asymmetrical/have uneven distribution of electrons✓ while CCl_4 molecule is symmetrical/ have even distribution of electrons✓. This difference in the charge distribution makes CHCl_3 to be a polar molecule and CCl_4 to be a non-polar molecule.✓
Beide CHCl_3 en CCl_4 molekules het polêre bindings✓ en beide het 'n tetraëdriese vorm. CHCl_3 molekule is asimmetries/het oneweredige verspreiding van elektrone✓ terwyl CCl_4 molekule simmetries is/ het eweredige verspreiding van elektrone✓. Die verskil in die lading verspreiding veroorsaak dat CHCl_3 'n meer polêre molekule en CCl_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 HCl.✓
 The intermolecular (London) forces between molecules of HBr are stronger than the intermolecular force between the molecules of HCl. ✓
 More energy is required to overcome the intermolecular forces between the molecules of HBr than of HCl.✓
Die molekulêre massa van HBr is groter as die van HCl.✓
Die intermolekulêre (London) kragte tussen molekules van HBr is sterker as die intermolekulêre kragte tussen die molekules van HCl. ✓
Meer energie benodig om die intermolekulêre kragte tussen molekules van HBr te oorkom as van HCl.✓ (3)
- 3.3 HI ✓ (1)
- 3.4 CCl_4 molecules have London forces only while H_2O has (London forces) and hydrogen bond.✓
 Intermolecular forces are not of comparable strength.✓ (2)
 CCl_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 $p_1V_1 = p_2V_2$ ✓

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

$$V_2 = 35 \text{ cm}^3 \checkmark$$

(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 $\Delta H = H_P - H_R$
 $= -86 - 25$ ✓
 $= -111 \text{ k} \cdot \text{J} \cdot \text{mol}^{-1}$ ✓ (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. ✓
Geaktiveerde kompleks is die onstabiele oorgangstoestand van reaktanse na produkte. (2)
- 5.4.2 $154 \text{ k} \cdot \text{J} \cdot \text{mol}^{-1}$ ✓ (2)
- 5.5 $V \text{ SO}_3 : V \text{ SO}_2$
 $2 : 2$ ✓
 $V \text{ SO}_3 = V \text{ SO}_2 = 50 \text{ cm}^3$ ✓ (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 $n_C : n_H : n_N$
 $n = \frac{m}{M}$
 $\frac{74.02}{12} \checkmark : \frac{8.71}{1} \checkmark : \frac{17.27}{14} \checkmark$
 $6.17 : 8.71 : 1.23$
 $5 : 7 : 1$ ✓
Empirical formula/Empiriese formule: $\text{C}_5\text{H}_7\text{N}$ ✓ (5)

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

$0,25 = \frac{40,57}{M} \checkmark$

$M = 162,28 \text{ g} \checkmark$

Empirical formula mass/*Empiriese formule massa* = $5 \times 12 + 7 \times 1 + 14 = 81 \checkmark$

Ratio of the empirical formula mass: molecular formula mass

Verhouding van empiriese formule massa : molekulêre formule massa

$81 : 162,28$

$1 : 2 \checkmark$

$\therefore$ Molecular formula/*molekulêre formule*: $\text{C}_{10}\text{H}_{14}\text{N}_2 \checkmark$

(5)

[12]

QUESTION 7/VRAAG 7

7.1 Limiting reagent is a substance that is completely used up in a chemical reaction. $\checkmark \checkmark$

Beperkte reaktans is 'n stof wat volledig opgebruik word in 'n chemiese reaksie.
 $\checkmark \checkmark$

(2)

7.2 Calcium carbonate/*Kalsiumkarbonaat*/ $\text{CaCO}_3 \checkmark$

(1)

7.3.1 $n_{\text{CO}_2} = \frac{m}{M}$

$= \frac{4,4}{44} \checkmark$

$= 0,1 \text{ mol}$

$n_{\text{CO}_2} = \frac{V}{V_m}$

$0,1 = \frac{V_{\text{CO}_2}}{22,4} \checkmark$

$V_{\text{CO}_2} = 2,24 \text{ dm}^3 \checkmark$

Any one/Enige een

(4)

7.3.2 $n(\text{CaCO}_3) : n(\text{CO}_2)$

$$1:1$$

$$n(\text{CaCO}_3) \text{ reacted/} \textit{gereageer} = n(\text{CO}_2) \text{ formed/} \textit{gevorm} = 0,1 \text{ mol} \checkmark$$

$$n(\text{CaCO}_3) = \frac{m_{\text{CaCO}_3}}{M} \checkmark$$

$$0,1 = \frac{m_{\text{CaCO}_3}}{100} \checkmark$$

$$m(\text{CaCO}_3) = 10 \text{ g} \checkmark$$

$$\% \text{ purity} = \frac{\text{mass of CaCO}_3 \text{ reacted}}{\text{mass of IMPURE CaCO}_3} \times 100\%$$

$$= \frac{10}{12} \times 100\% \checkmark$$

$$= 83,33\% \checkmark$$

(6)

7.3.3 $c = \frac{n}{V} \checkmark$

$$2 = \frac{n}{0,15} \checkmark$$

$$n = 0,15 \text{ mol}$$

$$n(\text{HCl}) \text{ reacted/} \textit{gereageer} : n(\text{CO}_2) \text{ formed/} \textit{gevorm}$$

$$2 : 1$$

$$n(\text{HCl}) \text{ reacted/} \textit{gereageer} = \frac{1}{2} \times 0,1 = 0,05 \text{ mol} \checkmark$$

$$n(\text{HCl}) \text{ in excess/} \textit{oormaat} = n(\text{HCl}) \text{ initial/} \textit{begin} - n(\text{HCl}) \text{ reacted/} \textit{gereageer}$$

$$= 0,15 - 0,05 \checkmark$$

$$= 0,1 \text{ mol} \checkmark$$

(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 Cl^- . ✓ (1)

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

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

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

8.6.2 $\frac{c_a V_a}{c_b V_b} = \frac{n_a}{n_b}$ ✓
 $\frac{c_a \times 40}{0,56 \times 25} = \frac{1}{2}$ ✓
 $c_a = 0,175 \text{ mol} \cdot \text{dm}^{-3}$ ✓ (4)

8.6.3 $c_1 V_1 = c_2 V_2$ ✓
 $c_1 \times 10 = 0,175 \times 500$ ✓
 $c_1 = 8,75 \text{ mol} \cdot \text{dm}^{-3}$ ✓ (4)

[22]

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

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

9.4.2 $\text{NO}_3^- + 4\text{H}^+ + 3\text{e}^- \rightarrow \text{NO} + 2\text{H}_2\text{O}$ ✓✓ (2)

9.4.3 $\text{Cu} \rightarrow \text{Cu}^{2+} + 2\text{e}^- \times 3$ ✓
 $\text{NO}_3^- + 4\text{H}^+ + 3\text{e}^- \rightarrow \text{NO} + 2\text{H}_2\text{O} \times 2$ ✓
 $3\text{Cu} + 2\text{NO}_3^- + 8\text{H}^+ \rightarrow 3\text{Cu}^{2+} + 2\text{NO} + 4\text{H}_2\text{O}$ ✓ (4)
[15]

TOTAL/TOTAAL: 150