basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE/*GRAAD* 10

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

NOVEMBER 2017

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE*: 150

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

approved
Dayrangi
Int-Mod - DBE
2017:11:14

Chief examiner
14/11/2017.

QUESTION 1/*VRAAG 1*

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

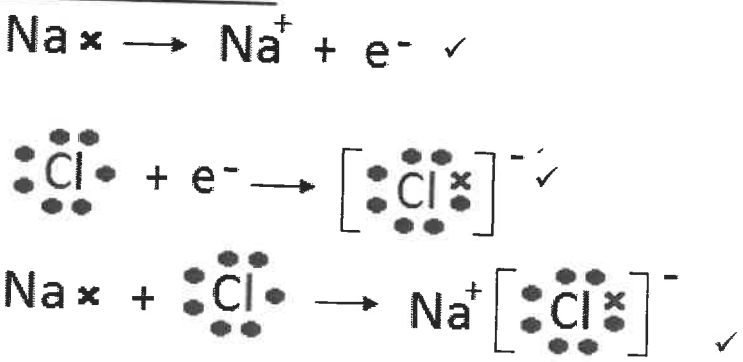
QUESTION 2/*VRAAG 2*

2.1.1 CO_2✓ **OR/*OF*** H_2O✓ (1)
2.1.2 Fe ✓ (1)
2.1.3 C_{90} ✓ (1)
2.1.4 NaCl✓ (1)

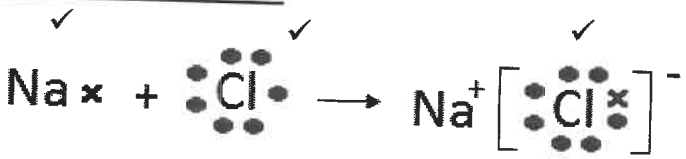
2.2  ✓ ✓ (2)

2.3 Covalent bond✓/*Kovalente binding*✓ (1)

2.4 **OPTION 1/*OPSIE 1*:**



OPTION 2/*OPSIE 2*:



(3)

2.5.1 Potassium iodide ✓/*Kaliumjodied*✓ (1)

2.5.2 CH_4 ✓ (1)

2.5.3 Ammonia ✓/*Ammoniak* ✓ (1)

2.6.1 Physical ✓/*Fisies* ✓ (1)

2.6.2 Boiling point ✓/*Kookpunt* ✓ (1)

2.6.3 Nitrogen✓; it has the lowest boiling point. ✓/*Stikstof* ✓.*Laagste kookpunt* ✓ (2)

2.7.1 INCREASE. ✓/*TOENEEM*✓ (1)

2.7.2 DECREASE. ✓/*AFNEEM*✓ (1)

2.7.3 INCREASE.✓/*TOENEEM*✓ (1)

[20]

QUESTION 3/*VRAAG 3*

3.1 Energy needed per mole to remove an electron from an atom in a gaseous phase. ✓✓
Energie benodig per mol om 'n elektron uit 'n atoom in die gasfase te verwyder. ✓✓
(2)

3.2 Ionisation energy increases from left to right, across a period. ✓✓
Ionisasie energie neem toe van links na regs oor 'n periode. ✓✓
(2)

3.3.1 Be:$1s^2\ 2s^2$✓✓
B:$1s^2\ 2s^2\ 2p^1$✓✓
(4)

3.3.2 B has a 2p energy level; 2p has a higher energy than 2s. ✓
Therefore less energy is needed to remove the valence electrons from B as from Be✓✓.
B het 'n 2p energievlak; 2p het meer energie as 2s ✓
Dus minder energie word benodig om 'n valenselektron van B te verwyder in vergelyking met Be. ✓✓

OR/*OF*

2s electrons are paired and 2p electron is unpaired. ✓ Therefore, less energy needed to remove 2p electron. ✓✓
Die 2s elektrone is gepaard teenoor die ongepaarde 2p elektrone. ✓ *Daarom word minder energie benodig om 'n 2p elektron te verwyder.* ✓✓

OR/OF

The 2p electron is further away from the nucleus ✓. Therefore, the electrostatic force weaker and requires less energy. ✓✓
Die 2p electron is verder van die kern✓, *dus is die elektrostatiese krag swakker en daarom word minder energie benodig om die elektron te verwyder.* ✓✓
(3)

3.4 False✓ The energy is high because of filled s and p-orbitals. ✓/
Vals✓ *Die energie is hoog agv die gevulde s- en p-orbitale.*✓
(2)

3.5.1 Alkali-metals✓
Alkali-metale✓
(1)

3.5.2 Reactivity increases from top to bottom✓✓
Reaktiwiteit verhoog van bo na onder in die groep.✓✓
(2)

3.5.3 Ionisation energy decreases, ✓ thus less energy to remove an electron. Therefore, reactivity increases. ✓
Ionisasie-energie neem af✓, *daarom word minder energie benodig om 'n elektron te verwyder. Reaktiwiteit neem dus toe.* ✓
(2)
[18]

QUESTION 4/*VRAAG 4*

4.1.1 Isotope: atoms of the same element having the same number of protons, but different number of neutrons. **OR** Same atomic number, but different mass numbers.✓✓
Isotoop: Atome van dieselfde element wat dieselfde getal protone het, maar verskillende getalle neutrone. ✓✓ ***OF*** *Dieselfde atoomgetalle, maar verskillende massagetalle.*
(2)

4.1.2 $50\% = 106{,}9\ \text{amu}$
$50\% = 109{,}1\ \text{amu}$ ✓

$$A_r = \frac{(50 \times 106{,}9) + (50 \times 109{,}1)}{100} \quad \text{(✓ ✓ ✓)}$$
$$= 108 \ ✓$$
(5)

4.1.3 Ag/Silver ✓✓
Ag/Silwer ✓✓
(2)

4.2.1 13 ✓
4.2.2 14 ✓
4.2.3 13 ✓
4.2.4 39 ✓
4.2.5 19 ✓
4.2.6 20 ✓
4.2.7 18 ✓
(7)
[16]

QUESTION 5/*VRAAG 5*

5.1 An aqueous solution. ✓/A solution in water ✓/*'n Waterige oplossing.*✓ (1)

5.2 Redox. ✓ Electron transfer took place. ✓/
Redoks. ✓ *Elektron oordrag het plaasgevind.* ✓

Accept/*Aanvaar*: Change in oxidation number/ *Verandering in oksidasiegetal.*
(2)

5.3 Chemical change. ✓/*Chemiese verandering.* ✓ (1)

5.4 The amount of substance having the same number of particles as there are atoms in 12g C-12.✓✓
Die stofhoeveelheid wat dieselfde getal deeltjies het as wat daar atome in 12g koolstof-12 is. ✓✓
(2)

5.5 $H_2O_2 : O_2$

$2 : 1$

$\therefore n(O_2) = 2 \text{ mol}$ ✓

$n = \frac{V}{V_m}$ ✓

$2 = \frac{V}{22,4}$ ✓

$V = 44,8 dm^3$ ✓

(4)

5.6 $n(H_2O_2) = \frac{m}{M}$

$= \frac{17}{34}$ ✓

$= 0,5 \text{ mol}$

$n = \frac{N}{N_A}$ ✓

✓

$(0,5)(2) = \frac{N}{6,02 \times 10^{23}}$

$N = 6,02 \times 10^{23}$ atoms/atome ✓

NOTE/*NOTA*:
If molar mass of H_2O_2 is incorrect, mark positively. Max 2/4
Positiewe nasien indien molêre massa van H_2O_2 verkeerd is. Maksimum punte 2/4

(4)
[14]

QUESTION 6/*VRAAG 6*

6.1.1 Gas forming ✓/*Gasvormende reaksie* ✓ (1)

6.2.1 $M(Na_2CO_3) = 2(23) + 12 + 3(16)$

$= 106$ ✓ $g \cdot mol^{-1}$ ✓ (2)

6.2.2 **POSITIVE MARKING FROM QUESTION 6.2.1**
POSITIEWE NASIEN VANAF VRAAG 6.2.1

$n(Na_2CO_3) = \frac{m}{M}$

$= \frac{10,6}{106}$ ✓

$= 0,1 \text{ mol}$ ✓

(2)

6.2.3 **POSITIVE MARKING FROM QUESTION 6.2.2**
POSITIEWE NASIEN VANAF VRAAG 6.2.2

OPTION 1/*OPSIE 1*:

$n(Na_2CO_3) : n(CO_2)$
1 : 1 ✓
Thus: $n(CO_2)=0,1$ mol

$n(CO_2) = \frac{m}{M}$ ✓

$0,1 = \frac{m}{44}$ ✓

$m = 4,4\ g$ ✓

OPTION 2/ OPSIE 2:

106 g of Na_2CO_3 : 44 g of CO_2 ✓✓

10,6 g : 4,4 g CO_2 ✓✓

(4)

6.2.4

$n(CO_2) = \frac{V_{CO_2}}{V_m}$

$= \frac{4,87}{22,4}$ ✓

$= 0,217$ mol

NOTE/ *NOTA*:
One mark for any one formula
Een punt vir enige een formule

$n(CO_2) : n(NaCl)$
1 : 2 ✓
$n(NaCl) = 0,434$ mol

$n(NaCl) = \frac{m}{M}$ ✓

✓ $0,434 = \frac{m}{58,5}$ ✓

$m = 25,16\ g$ ✓

NOTE/ *NOTA*:
If ratio 1:2 is not given, allocate two marks for 0,434 in the substitution.
Indien verhouding 1:2 nie gewys word nie, gee twee punte vir 0,434 vir die invervanging.

(6)

6.3

OPTION1/*OPSIE 1*:

Mass of H_2O = 14.2 – 5,3
= 8,9 g ✓

$n(Na_2CO_3) = \frac{m}{M}$ $n(H_2O) = \frac{m}{M}$

$= \frac{5,3}{106}$ ✓ $= \frac{8,9}{18}$ ✓

= 0,05 mol = 0,5 mol

$Na_2CO_3 : H_2O$

$\frac{0,05}{0,05} : \frac{0,5}{0,05}$ ✓ Divide by smallest number

1 : 10

Thus x = 10 ✓

OPTION 2/*OPSIE 2*:

Mass of H_2O = 14,2 – 5,3

= 8,9g ✓

$M(Na_2CO_3)$ = 160 g·mol^{-1} $M(H_2O)$ = 18 g·mol^{-1}

$n(Na_2CO_3) : n(H_2O)$

$\frac{m(Na_2CO_3)}{M(Na_2CO_3)} : \frac{m(H_2O)}{M(H_2O)}$ ✓

$\frac{5,3}{160} : \frac{8,9}{18}$ ✓

$0,05 : 0,5$

$\frac{0,05}{0,05} : \frac{0,5}{0,05}$ ✓ Divide by smallest number

1 : 10

Thus x =10 ✓

(5)
[20]

QUESTION 7/*VRAAG 7*

7.1 Distilled water does not contain free ions. ✓
Gedistilleerde water bevat geen vrye ione nie. ✓ (1)

7.2 Electrolyte ✓✓/*Elektroliet* ✓✓ (2)

7.3 $AgNO_3(s) \rightarrow Ag^+(aq)$ ✓ + $NO_3^-(aq)$ ✓
NOTE/*NOTA*: Phases need not be shown/ *Fases kan uitgelaat word.* (2)

7.4.1 The conductivity of $AgNO_3$ solution will increase with an increase in the concentration of the $AgNO_3$ solution at a constant temperature. ✓✓
Die geleidingsvermoë van die $AgNO_3$ oplossing sal toeneem met 'n toename in die konsentrasie van die oplossing, mits die temperatuur konstant bly.✓✓ (2)

7.4.2 Conductivity ✓/*Geleidingsvermoë* ✓
Accept/*Aanvaar*: Ammeter reading/ *Ammeter lesing* (1)

7.4.3 Concentration (of the $AgNO_3$ solution) ✓
Konsentrasie (van die $AgNO_3$ oplossing) ✓
Accept/*Aanvaar*: Spoons of $AgNO_3$ in distilled water/ *Lepels $AgNO_3$ in gedistilleerde water.* (1)

7.4.4 Temperature ✓/*Temperatuur* ✓ (1)

7.5 Without water ✓/*Sonder water/Watervry.* ✓ (1)

7.6 Mass of $AgNO_3 = (5,3)(2)$
$= 10,6$ g ✓

$$c = \frac{m}{MV} \quad ✓$$

$$= \frac{10,6}{170(0,2)} \quad ✓$$

$$= 0,31 \text{ mol} \cdot \text{dm}^{-3} \quad ✓$$

(4)

7.7 No. ✓ Tap water contains ions and it will affect the conductivity of the $AgNO_3$ solution. ✓
Nee, ✓ *Die kraanwater sal die geleidingsvermoë van die $AgNO_3$ oplossing beïnvloed.* ✓ (2)

7.8 An increase in concentration of ions in a solution increases conductivity of a solution. ✓✓
Met 'n toename in konsentrasie van ione, neem die geleidingsvermoë toe. ✓✓ (2)

7.9.1 DECREASE ✓/*AFNEEM* ✓ (1)

7.9.2 Silver chloride precipitate forms/ a reaction takes place ✓, thus decreasing the concentration of the ions in the solution.✓
Daar vorm 'n silwerchloried neerslag/'n chemiese reaksie vind plaas ✓ wat die konsentrasie van die ione in oplossing laat afneem.✓ (2)
[22]

QUESTION 8/*VRAAG 8*

8.1 $BaCl_2$✓ (1)

8.2 $CO_3^{-2}(aq) + BaCl_2(aq)$ ✓ → $BaCO_3(s)$✓ + $2Cl^-(aq)$ ✓ Bal ✓
NOTE/*NOTA*: Phases need not be shown/ *Fases kan uitgelaat word* (4)

8.3 $BaCO_3(s) + HNO_3(aq)$ ✓ → $Ba(NO_3)_2(aq) + CO_2(g)$✓ + $H_2O(l)$✓
NOTE/*NOTA*: Phases need not be shown/ *Fases kan uitgelaat word* (4)

8.4 Barium carbonate ✓✓/*Bariumkarbonaat.* ✓✓ (2)
[11]

QUESTION 9/*VRAAG 9*

9.1.1 Condensation ✓/*Kondensasie* ✓ (1)

9.1.2 Precipitation ✓/*Presipitasie* ✓ (1)

9.1.3 Transpiration ✓/*Transpirasie* ✓ (1)

9.2 Released✓, energy is released to the surrounding/cooling takes place/particles moves closer together. ✓
Vrygestel✓, *energie is vrygestel na die omgewing toe/afkoeling vind plaas/deeltjies beweeg nader aan mekaar.* ✓ (2)

9.3 Water absorbs the infrared energy from the sun and re-emits it therefore regulating the climate. ✓✓
Water absorber die infrarooi energie van die son en stel dit weer vry om klimaat te reguleer. ✓✓ (2)

9.4 Drilling of boreholes/Building of dams✓✓
Boorgate te sink/Damme te bou ✓✓
Accept/*Aanvaar*: Any applicable answer/ *Enige toepaslike antwoord word aanvaar.* (2)
[9]

TOTAL/*TOTAAL*: 150