DEPARTEMENT CHEMIE
DEPARTMENT OF CHEMISTRY

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CMY 117
SEMESTERTOETS 3 / SEMESTER TEST 3

DATUM / DATE:	10 Mei / May 2010	**EKSAMINATORE:**	Prof. S Lotz
TYD / TIME:	2½ ure / hours	**EXAMINERS:**	Mr. D Molefe
PUNTE / MARKS:	100		Prof. WJ Schoeman

INSTRUKSIES	INSTRUCTIONS
1. Beantwoord die volgende vrae op die rekenaar- antwoordblad.	1. Answer the following questions on the computer answer sheet.
2. **Gebruik slegs kant 2 van die antwoordblad.**	2. **Use only side 2 of the answer sheet.**
3. Slegs een antwoord per vraag is toelaatbaar.	3. Only one answer per question is allowed.
4. Geen punte word oorweeg vir onduidelike antwoorde nie. Dit is u verantwoordelikheid op te sorg dat die antwoordblad leesbaar is vir die optiese merkleser. Alle instruksies is op die antwoordvorm aangebring.	4. No marks are considered for unclear answers. It is your responsibility to ensure that the answer sheet is readable by the optical mark reader. All instructions are provided on the answer sheet.
5. Die puntetoekenning per vraag mag varieer en word by elke vraag aangedui.	5. The allocation of marks per question may vary, but is indicated at each question.
6. Antwoorde word nie negatief nagesien nie.	6. Answers are not marked negatively.
7. Vir berekeninge moet die numeriese inligting van die aangehegte Periodieke tabel gebruik word.	7. The numerical information from the attached Periodic Table must be used for calculations.

Vraag 1 [3]

Beskou die volgende stellings oor 'n deeltjie met elektronstruktuur $1s^2\ 2s^2\ 2p^6$. Die deeltjie

I het vyf elektronpare
II het ses valenselektrone
III kan 'n suurstofioon wees
IV moet neutraal wees
V het leë 2d-orbitale in die valensvlak

Watter van die stellings is waar?

A Slegs I
B Slegs I en II
C Slegs I en V
D Slegs I en III
E Slegs II en IV
F Slegs II en III
G Slegs I, III en V
H Slegs IV en V
I I, II, III en V
J Nie een van bogenoemde nie.

Question 1 [3]

Consider the following statements about a particle with electronic structure: $1s^2\ 2s^2\ 2p^6$. The particle …

I has five pairs of electrons
II has six valence electrons
III could be an oxygen ion
IV must be a neutral atom
V has empty 2d orbitals in the valence shell

Which of the statements is/are true?

A I only
B I and II only
C I and V only
D I and III only
E II and IV only
F II and III only
G I, III and V only
H IV and V only
I I, II, III and V
J None of the above

Vraag 2 [3]

Die gedeelde elektronpaar in 'n kovalente binding

A bestaan altyd uit een elektron van elke atoom
B kan 'n alleenpaar wees wat van slegs een atoom kom
C word altyd gelyk aangetrek deur elke atoom
D voltooi altyd die oktet van elke atoom
E moet van twee atome kom met verskillende

Question 2 [3]

The shared pair of electrons in a covalent bond …

A always consists of one electron from each atom
B may be an electron pair coming from one atom only
C is always attracted equally by the two atoms
D always completes the octet of each atom
E must come from two atoms of different

elektronegatiwiteit

F hoef nie van die valensvlak van die atome te wees nie
G behoort altyd aan atome in dieselfde groep van die Periodieke Tabel
H behoort altyd aan atome van dieselfde periode van die Periodieke Tabel
I moet kom van 'n katioon en anioon
J Nie een van bogenoemde nie.

electronegativity

F need not be from the valence shells of the atoms
G always belong to atoms of the same group in the Periodic Table
H always belong to atoms in the same period in the Periodic Table
I must come from a cation and anion
J None of the above.

Vraag 3 [3]

Watter lys van verbindings is gerangskik volgens afnemende grootte van die bindingshoek?

A CO_2, CH_4, NH_3, H_2O
B CO_2, H_2O, NH_3, CH_4
C CO_2, CH_4, H_2O, NH_3
D $NH_3, CH_4, CO_2, H_2O.$
E CH_4, CO_2, H_2O, NH_3
F CH_4, CO_2, NH_3, H_2O
G CH_4, NH_3, H_2O, CO_2
H H_2O, NH_3, CH_4, CO_2
I H_2O, CH_4, NH_3, CO_2
J nie een van die bogenoemde nie

Question 3 [3]

Which list of compounds is arranged in order of decreasing bond angle size?

A CO_2, CH_4, NH_3, H_2O
B CO_2, H_2O, NH_3, CH_4
C CO_2, CH_4, H_2O, NH_3
D $NH_3, CH_4, CO_2, H_2O.$
E CH_4, CO_2, H_2O, NH_3
F CH_4, CO_2, NH_3, H_2O
G CH_4, NH_3, H_2O, CO_2
H H_2O, NH_3, CH_4, CO_2
I H_2O, CH_4, NH_3, CO_2
J none of the above

Vraag 4 [3]

Watter een van die volgende is 'n geldige ewewigsuitdrukking vir die volgende reaksie by 300°C? Reaksie:

$Fe(s) + H_2O(g) \rightleftharpoons Fe_3O_4(s) + H_2(g)$

A $K_c = [Fe]^3[H_2O]^4$
B $K_c = [Fe]^3$
C $K_p = P_{Fe}^3$
D $K_c = \{[Fe_3O_4][H_2]^4\}/\{[Fe]^3[H_2O]^4\}$
E $K_p = \{P_{Fe3O4}P_{H2}^4\}/\{P_{Fe}^3P_{H2O}^4\}$
F $K_p = \{P_{H2}^4\}/\{P_{H2O}^4\}$
G $K_p = \{P_{H2}\}/\{P_{H2O}\}$
H $K_c = \{[Fe_3O_4][H_2]\}/\{[Fe][H_2O]\}$
I $K_p = \{P_{H2}^4\}$
J Nie een van bogenoemde nie.

Question 4 [3]

Which of the following is a valid equilibrium expression for the following reaction at 300°C?

Reaction:

$Fe(s) + H_2O(g) \rightleftharpoons Fe_3O_4(s) + H_2(g)$

A $K_c = [Fe]^3[H_2O]^4$
B $K_c = [Fe]^3$
C $K_p = P_{Fe}^3$
D $K_c = \{[Fe_3O_4][H_2]^4\}/\{[Fe]^3[H_2O]^4\}$
E $K_p = \{P_{Fe3O4}P_{H2}^4\}/\{P_{Fe}^3P_{H2O}^4\}$
F $K_p = \{P_{H2}^4\}/\{P_{H2O}^4\}$
G $K_p = \{P_{H2}\}/\{P_{H2O}\}$
H $K_c = \{[Fe_3O_4][H_2]\}/\{[Fe][H_2O]\}$
I $K_p = \{P_{H2}^4\}$
J none of the above

Vraag 5 [3]

'n Molekule is slegs polêr as dit

A polêre bindings het
B onsimmetries is
C polêre bindings het en onsimmetries is
D simmetries is
E polêre bindings het en simmetries is
F alleenpare het
G alleenpare het en ook bindingspare het
H 'n lading het
I al die bogenoemde
J nie een van die bogenoemde nie.

Question 5 [3]

A molecule will be polar only if it

A has polar bonds.
B is unsymmetrical.
C has polar bonds and is unsymmetrical.
D is symmetrical.
E has polar bonds and is symmetrical.
F has lone pair electrons
G has lone pair as well as bonding pair electrons
H has a charge
I all of the above
J none of the above

VRAAG 6 [3]

Vir die volgende ewewig

$2\ SO_3(g) \rightleftharpoons 2\ SO_2(g) + O_2(g)$

is $K_c = 1.32$ by 627°C. Die ewewigskonstante van die volgende ewewig by dieselfde temperatuur is:

$SO_2(g) + ½\ O_2(g) \rightleftharpoons SO_3(g)$

A 0.660
B 1.15
C 0.870
D 1.52
E Nie een van bogenoemde nie.

QUESTION 6 [3]

For the following equilibrium

$2\ SO_3(g) \rightleftharpoons 2\ SO_2(g) + O_2(g)$

$K_c = 1.32$ at 627°C. What is the equilibrium constant for the following equilibrium at the same temperature?

$SO_2(g) + ½\ O_2(g) \rightleftharpoons SO_3(g)$

A 0.660
B 1.15
C 0.870
D 1.52
E None of the above.

Vrae 7 tot 12 verwys na die volgende kovalente molekules:	**Question 7 to 12 refer to the following covalent molecules:**
O_3, HIO_2, $XeOF_4$	O_3, HIO_2, $XeOF_4$

Vraag 7 [3]

Die aantal alleenpare in die Lewisstruktuur van O_3 is:

A 0
B 1
C 2
D 3
E 4
F 5
G 6
H 7
I 8
J 9

Question 7 [3]

The number of lone pairs in the Lewis structure of O_3 are:

A 0
B 1
C 2
D 3
E 4
F 5
G 6
H 7
I 8
J 9

Vraag 8 [3]

Die <u>som</u> van die aantal bindingspare in die Lewisstrukture van O_3 en $XeOF_4$ is

A 0
B 1
C 2
D 3
E 4
F 5
G 6
H 7
I 8
J 9

Question 8 [3]

The <u>sum</u> of the number of bonding pairs in the Lewis structures of O_3 and $XeOF_4$ are:

A 0
B 1
C 2
D 3
E 4
F 5
G 6
H 7
I 8
J 9

Vraag 9 [3]

Die elektrondomein struktuur van HIO_2 is

A lineêr
B gebuig

Question 9 [3]

The electron domain structure of HIO_2 is

A linear
B bent

C trigonaal vlakkig
D tetrahedraal
E trigonaal piramidaal
F trigonaal bipiramidaal
G T-vormig
H oktahedraal
I vierkantig piramidaal
J vierkantig vlakkig

C trigonal planar
D tetrahedral
E trigonal pyramidal
F trigonal bipyramidal
G T-form
H octahedron
I square pyramid
J square planar

Vraag 10 [3]

Die molekulêre striktuur van $XeOF_4$ is

A lineêr
B gebuig
C trigonaal vlakkig
D tetrahedraal
E trigonaal piramidaal
F trigonaal bipiramidaal
G wipplank
H oktahedraal
I vierkantig piramidaal
J vierkantig vlakkig

Question 10 [3]

The molecular structure of $XeOF_4$ is

A linear
B bent
C trigonal planar
D tetrahedral
E trigonal pyramidal
F trigonal bipyramidal
G see-saw
H octahedron
I square pyramid
J square planar

Vraag 11 [3]

Die O-O-O, O-I-O en O-Xe-F bindingshoeke (in grade) in die molekules is ongeveer:

A 90, 90, 90
B 90, 90, 109.5
C 90, 109.5, 109.5
D 109.5, 109.5, 180
E 60, 109.5, 90
F 120, 120, 120
G 120, 120, 90
H 120, 109.5, 90
I 120, 109.5, 109.5
J 120, 109.5, 180

Question 11 [3]

The O-O-O, O-I-O and O-Xe-F angles (in degrees) in the molecules are approximately:

A 90, 90, 90
B 90, 90, 109.5
C 90, 109.5, 109.5
D 109.5, 109.5, 180
E 60, 109.5, 90
F 120, 120, 120
G 120, 120, 90
H 120, 109.5, 90
I 120, 109.5, 109.5
J 120, 109.5, 180

Vraag 12 [3]

Slegs die volgende molekules het dipoolmomente:

A O_3
B HIO_2
C $XeOF_4$
D O_3 en HIO_2
E O_3 en $XeOF_4$
F HIO_2 en $XeOF_4$
G O_3 en HIO_2 en $XeOF_4$
H Nie een van bogenoemde nie.

Question 12 [3]

Only the following molecules have dipole moments:

A O_3
B HIO_2
C $XeOF_4$
D O_3 and HIO_2
E O_3 and $XeOF_4$
F HIO_2 and $XeOF_4$
G O_3 and HIO_2 and $XeOF_4$
H None of the above.

Vraag 13 [3]

Die volgende stelling is van toepassing op die NO_2^+ en NO_2^- molekules

A hulle het dieselfde Lewisstrukture maar verskillende molekulêre strukture.

Question 13 [3]

The following statement will apply for the NO_2^+ and NO_2^- molecules:

A they have the same Lewis structure but different molecular structures

B hulle het dieselfde aantal alleenpare op die sentrale element
C hulle het dieselfde aantal kovalente bindings
D beide sal swak sure vorm wanneer hulle geprotoneer word.
E beide het lineêre molekulêre strukture
F beide het gebuigde strukture
G beide molekules het dipoolmomente
H slegs NO_2^+ het 'n dipoolmoment
I die ONO hoek in NO_2^+ is groter as die hoek in NO_2^-
J die ONO hoek in NO_2^+ is 109.5°

B they have the same number of lone pair electrons on the central element
C they have the same number of covalent bonds
D both will form weak acids when protonated
E both have linear molecular structures
F both have bent structures
G both molecules have dipole moments
H only NO_2^+ has a dipole moment
I the ONO angle for NO_2^+ is larger than that for NO_2^-
J the ONO angle for NO_2^+ is 109.5°

Vraag 14 [3]
Die molekulêre struktuur van IF_4^+ is
A lineêr
B gebuig
C trigonaal vlakkig
D tetrahedraal
E trigonaal piramidaal
F trigonaal bipiramidaal
G wipplank
H T-vormig
I vierkantig piramidaal
J vierkantig vlakkig

Question 14 [3]
The molecular structure of IF_4^+ is
A linear
B bent
C trigonal planar
D tetrahedral
E trigonal piramidaal
F trigonal bipyramidal
G see-saw
H T-form
I square pyramid
J square planar

Vraag 15 [4]
'n Molekule AXY_2 het **A** as sentrale element, 'n dipoolmoment en die elektronegatiwiteit van die atome neem toe in die orde **A<X<Y**. Die atome **A** en **X** behoort tot dieselfde groep in die Periodieke Tabel. Die struktuur van die molekule is trigonaal piramidaal. Die molekule is waarskynlik
A IFO_2
B $COCl_2$
C PNO_2
D $POCl_2$
E SOF_2
F PNF_2
G $IBrF_2$
H $SiCO_2$
I $XeOF_2$
J Nie een van bogenoemde nie.

Question 15 [4]
A molecule AXY_2 has **A** as central element, a dipole moment and the electronegativity of atoms increases in the order **A<X<Y**. The atoms **A** and **X** belong to the same group in the Periodic Table and the structure of the molecule is a trigonal pyramid. The molecule is most likely
A IFO_2
B $COCl_2$
C PNO_2
D $POCl_2$
E SOF_2
F PNF_2
G $IBrF_2$
H $SiCO_2$
I $XeOF_2$
J None of the above.

BELANGRIK	IMPORTANT
In die volgende berekeninge moet slegs in die laaste stap afgerond word. Moet nooit tussen-antwoorde afrond nie. In gevalle waar 'n antwoord oorgedra word na 'n volgende vraag, moet die volle, onafgeronde antwoord in die tweede berekening gebruik word.	In the following calculations, you should round off only in the last step. Never round off the intermediate answers. In cases where an answer is carried over to a next question, the full, unrounded answer must be used in the second calculation.

Vrae 16 tot 18 verwys na die volgende chemiese reaksie:

Questions 16 to 18 refer to the following chemical reaction:

$$S_2O_8^{2-}(aq) + 3I^-(aq) \rightarrow 2SO_4^{2-}(aq) + I_3^-(aq)$$

Ses eksperimente was uitgevoer by 250°C, waarin die aanvanklike tempo van die reaksie gemeet was met verskillende konsentrasies van die reagense:

Six experiments were carried out at 250°C, where the initial reaction rate was measured with various initial concentrations of the reactants:

Experiment number Eksperiment nommer	$[S_2O_8^{2-}(aq)]$ ($mol.dm^{-3}$)	$[I^-(aq)]$ ($mol.dm^{-3}$)	Initial reaction rate Aanvanklike reaksietempo ($mol.dm^{-3}.s^{-1}$)
1	0.018	0.036	8.32×10^{-6}
2	0.029	0.036	2.16×10^{-5}
3	0.051	0.036	6.68×10^{-5}
4	0.027	0.012	6.24×10^{-6}
5	0.027	0.048	2.49×10^{-5}
6	0.027	0.069	3.59×10^{-5}

Vraag 16 [3]

Bereken die reaksieorde van hierdie reaksie in terme van $S_2O_8^{2-}(aq)$.

A 0
B 1
C 2
D 3
E 4
F 5
G 6

Question 16 [3]

Calculate the reaction order of this reaction with respect to $S_2O_8^{2-}(aq)$.

A 0
B 1
C 2
D 3
E 4
F 5
G 6

Vraag 17 [3]

Bereken die totale reaksieorde van hierdie reaksie.

A 0
B 1
C 2
D 3
E 4
F 5
G 6
H 7
I 8
J 9

Question 17 [3]

Calculate the overall reaction order of this reaction.

A 0
B 1
C 2
D 3
E 4
F 5
G 6
H 7
I 8
J 9

Vraag 18 [3]

Bereken die tempokonstante van hierdie reaksie.
Skryf die antwoord as 'n normale desimale getal.
Die eerste desimale syfer is die volgende:

Voorbeeld:
0.123

A 0
B 1
C 2
D 3
E 4
F 5
G 6
H 7
I 8
J 9

Question 18 [3]

Calculate the rate constant of this reaction.
Write the answer as a normal decimal number.
The first decimal digit is the following:

Example:
0.123

A 0
B 1
C 2
D 3
E 4
F 5
G 6
H 7
I 8
J 9

Vrae 19 tot 21 verwys na die volgende chemiese reaksie:

$$2NO(g) + 2H_2(g) \rightarrow N_2(g) + 2H_2O(g)$$

Die tempowet en aktiveringsenergie van hierdie reaksie was eksperimenteel bepaal as volg:

Tempo = $0.578[NO(g)][H_2(g)]^2$ by 150.°C
$E_a = 3.59 \times 10^3$ J.

Questions 19 to 21 refer to the following chemical reaction:

$$2NO(g) + 2H_2(g) \rightarrow N_2(g) + 2H_2O(g)$$

The rate law and activation energy of this reaction was experimentally determined to be as follows:

Rate = $0.578[NO(g)][H_2(g)]^2$ at 150.°C
$E_a = 3.59 \times 10^3$ J.

Vraag 19 [3]

Bereken die reaksietempo by 150.°C wanneer
$[NO(g)] = 0.032$ mol.dm^{-3}, and
$[H_2(g)] = 0.055$ mol.dm^{-3}.
Skryf die antwoord in wetenskaplike notasie.
Die eerste syfer is die volgende:

Voorbeeld:
3.67×10^4

A 0
B 1
C 2
D 3
E 4
F 5
G 6
H 7
I 8
J 9

Question 19 [3]

Calculate the reaction rate at 150.°C when
$[NO(g)] = 0.032$ mol.dm^{-3}, and
$[H_2(g)] = 0.055$ mol.dm^{-3}.
Write the answer in scientific notation.
The first digit is the following:

Example:
3.67×10^4

A 0
B 1
C 2
D 3
E 4
F 5
G 6
H 7
I 8
J 9

T1 423.15
T2 773.15

Vraag 20 [4]

Bereken die tempokonstante van hierdie reaksie by 500.°C.

Skryf die antwoord as 'n normale desimale getal.

Die eerste desimale syfer is die volgende:

Voorbeeld: 0.123

A 0
B 1
C 2
D 3
E 4
F 5
G 6
H 7
I 8
J 9

Question 20 [4]

Calculate the rate constant of this reaction at 500.°C.

Write the answer as a normal decimal number.

The first decimal digit is the following:

Example: 0.123

A 0
B 1
C 2
D 3
E 4
F 5
G 6
H 7
I 8
J 9

Vraag 21 [3]

Bereken die reaksietempo by 500.°C wanneer

$[NO(g)] = 0.015$ mol.dm^{-3}, and

$[H_2(g)] = 0.075$ mol.dm^{-3}.

Skryf die antwoord in wetenskaplike notasie.

Die eerste syfer is die volgende:

Voorbeeld: 3.67×10^4

A 0
B 1
C 2
D 3
E 4
F 5
G 6
H 7
I 8
J 9

Question 21 [3]

Calculate the reaction rate at 500.°C when

$[NO(g)] = 0.015$ mol.dm^{-3}, and

$[H_2(g)] = 0.075$ mol.dm^{-3}.

Write the answer in scientific notation.

The first digit is the following:

Example: 3.67×10^4

A 0
B 1
C 2
D 3
E 4
F 5
G 6
H 7
I 8
J 9

Vrae 22 en 23 verwys na die volgende chemiese reaksie:

$$2N_2O_5(g) \rightarrow 4NO_2(g) + O_2(g)$$

Dit is bekend dat hierdie reaksie 'n eerste orde reaksie is in terme van $N_2O_5(g)$, met 'n tempokonstante van 0.0813 s^{-1}.

Questions 22 and 23 refer to the following chemical reaction:

$$2N_2O_5(g) \rightarrow 4NO_2(g) + O_2(g)$$

It is known that this reaction is a first order reaction in terms of $N_2O_5(g)$, with a rate constant of 0.0813 s^{-1}.

Vraag 22 [3]

Bereken die tydsverloop (in sekondes) vir $[N_2O_5(g)]$ om te daal van 1.00 mol.dm^{-3} tot 0.100 mol.dm^{-3}.

Skryf die antwoord as 'n normale desimale getal.

Die eerste desimale syfer is die volgende:

Voorbeeld: 23.12

A 0
B 1
C 2
D 3

Question 22 [3]

Calculate the time elapsed (in seconds) for $[N_2O_5(g)]$ to drop from 1.00 mol.dm^{-3} to 0.100 mol.dm^{-3}.

Write the answer as a normal decimal number.

The first decimal digit is the following:

Example: 23.12

A 0
B 1
C 2
D 3

E 4
F 5
G 6
H 7
I 8
J 9

Vraag 23 [3]

Bereken die tydsverloop (in sekondes) vir enige begin-konsentrasie van $N_2O_4(g)$ om gehalveer te word.
Skryf die antwoord as 'n normale desimale getal.
Die eerste desimale syfer is die volgende:

Voorbeeld:
23.12

A 0
B 1
C 2
D 3
E 4
F 5
G 6
H 7
I 8
J 9

Vraag 24 [3]

Watter een van die volgende oplossings bevat 'n swak suur?

A 0.12 mol.dm^{-3} HNO_3
B 0.0022 mol.dm^{-3} HCl
C 0.0013 mol.dm^{-3} $HClO_4$
D 0.14 mol.dm^{-3} $HClO_3$
E 2.6 mol.dm^{-3} HNO_2
F 2.4 mol.dm^{-3} HI
G 2.0 mol.dm^{-3} HCl
H 1.5 mol.dm^{-3} HBr
I A, B, C en D is oplossings van swak sure.
J Nie een van bogenoemde is 'n oplossing van 'n swak suur nie.

Vraag 25 [3]

Watter een van die volgende is die gekonjugeerde basis van $H_2PO_4^-$?

A $H_2PO_4^{2-}$
B $H_2PO_3^-$
C HPO_4^-
D H_2PO_4
E H_3PO_4
F HPO_4^{2-}
G HPO_4^{3-}
H HPO_3^{2-}
I $H_3PO_4^-$
J Nie een van bogenoemde nie.

E 4
F 5
G 6
H 7
I 8
J 9

Question 23 [3]

Calculate the time elapsed (in seconds) for any starting concentration of $N_2O_5(g)$ to be halved.
Write the answer as a normal decimal number.
The first decimal digit is the following:

Example:
23.12

A 0
B 1
C 2
D 3
E 4
F 5
G 6
H 7
I 8
J 9

Question 24 [3]

Which one of the following solutions contains a weak acid?

A 0.12 mol.dm^{-3} HNO_3
B 0.0022 mol.dm^{-3} HCl
C 0.0013 mol.dm^{-3} $HClO_4$
D 0.14 mol.dm^{-3} $HClO_3$
E 2.6 mol.dm^{-3} HNO_2
F 2.4 mol.dm^{-3} HI
G 2.0 mol.dm^{-3} HCl
H 1.5 mol.dm^{-3} HBr
I A, B, C and D are solutions of weak acids.
J None of the above is a solution of a weak acid.

Question 25 [3]

Which one of the following is the conjugate base of $H_2PO_4^-$?

A $H_2PO_4^{2-}$
B $H_2PO_3^-$
C HPO_4^-
D H_2PO_4
E H_3PO_4
F HPO_4^{2-}
G HPO_4^{3-}
H HPO_3^{2-}
I $H_3PO_4^-$
J None of the above.

Vraag 26 [2]

Watter een van die volgende verbindings sal 'n oplossing in water lewer met pH < 7.00 by 25°C?

A NaBr
B NaF
C $NaNO_3$
D $KClO_4$
E $LiClO_3$
F KI
G $LiNO_3$
H $KClO_3$
I NH_4Cl
J Nie een van bogenoemde nie.

Question 26 [2]

Which one of the following compounds will yield a solution in water with pH < 7.00 at 25°C?

A NaBr
B NaF
C $NaNO_3$
D $KClO_4$
E $LiClO_3$
F KI
G $LiNO_3$
H $KClO_3$
I NH_4Cl
J None of the above.

Vrae 27 tot 29 verwys na die volgende:	**Questions 27 to 29 refer to the following:**
Die pH van 'n 1.0 mol.dm^{-3} waterige oplossing van 'n monoprotiese suur by 25°C is 3.76.	The pH of a 1.0 mol.dm^{-3} aqueous solution of a monoprotic acid at 25°C is 3.76.

Vraag 27 [3]

Bereken die pOH van hierdie oplossing by 25°C.
Skryf die antwoord as 'n normale desimale getal.
Die eerste desimale syfer is die volgende:

A 0
B 1
C 2
D 3
E 4
F 5
G 6
H 7
I 8
J 9

Voorbeeld:
3.67

14 - 3.76
= 10.24

Question 27 [3]

Calculate the pOH of this solution at 25°C.
Write the answer as a normal decimal number.
The first decimal digit is the following:

A 0
B 1
C 2
D 3
E 4
F 5
G 6
H 7
I 8
J 9

Example:
3.67

Vraag 28 [3]

Bereken die konsentrasie van die hidroksiedione in hierdie oplossing by 25°C.
Skryf die antwoord in wetenskaplike notasie.
Die eerste syfer is die volgende:

A 0
B 1
C 2
D 3
E 4
F 5
G 6
H 7
I 8
J 9

Voorbeeld:
3.67 x 10^4

Question 28 [3]

Calculate the concentration of the hydroxide ions in this solution at 25°C.
Write the answer in scientific notation.
The first digit is the following:

A 0
B 1
C 2
D 3
E 4
F 5
G 6
H 7
I 8
J 9

Example:
3.67 x 10^4

$pH = -\log[OH^-]$
$10.23 = -\log(OH^-)$
$[OH^-] = 10^{-10.23}$

Vraag 29 [3]

Bereken $[H_3O^+]$ van hierdie oplosing by 25°C.
Skryf die antwoord in wetenskaplike notasie.
Die eerste syfer is die volgende:

A 0
B 1
C 2
D 3
E 4
F 5
G 6
H 7
I 8
J 9

Voorbeeld:
3.67 x 10^4

Question 29 [3]

Calculate $[H_3O^+]$ of this solution at 25°C.
Write the answer in scientific notation.
The first digit is the following:

A 0
B 1
C 2
D 3
E 4
F 5
G 6
H 7
I 8
J 9

Example:
3.67 x 10^4

$3.76 = -\log[H_3O]^+$
$[H_3O^+] = 10^{-3.76}$
$= 1.737800...$

Vrae 30 tot 32 verwys na die volgende:	**Questions 30 to 32 refer to the following:**
Beskou 'n 1.5 mol.dm^{-3} waterige oplossing van ammonia (NH_3) by 25°C. (Wenk: gebruik inligting van die datablad.)	Consider a 1.5 mol.dm^{-3} aqueous solution of ammonia (NH_3) at 25°C. (Hint: use information from the data sheet.)

Vraag 30 [3]

Bereken die konsentrasie van hidroksiedione in hierdie oplossing by 25°C.
(Wenk: om die korrekte antwoord hieronder te verkry, moet u 'n aanname maak om die algebra te vereenvoudig.)
Skryf die antwoord in wetenskaplike notasie.
Die eerste syfer is die volgende:

A 0
B 1
C 2
D 3
E 4
F 5
G 6
H 7
I 8
J 9

Voorbeeld:
3.67 x 10^4

Question 30 [3]

Calculate the concentration of the hydroxide ions in this solution at 25°C.
(Hint: to get the correct answer below, you must make an assumption to simplify the algebra involved.)
Write the answer in scientific notation.
The first digit is the following:

A 0
B 1
C 2
D 3
E 4
F 5
G 6
H 7
I 8
J 9

Example:
3.67 x 10^4

Vraag 31 [3]

Bereken die pH van hierdie oplossing by 25°C.
Skryf die antwoord as 'n normale desimale getal.
Die eerste desimale syfer is die volgende:

A 0
B 1
C 2
D 3
E 4
F 5
G 6

Voorbeeld:
3.67

Question 31 [3]

Calculate the pH of this solution at 25°C.
Write the answer as a normal decimal number.
The first decimal digit is the following:

A 0
B 1
C 2
D 3
E 4
F 5
G 6

Example:
3.67

H 7
I 8
J 9

Vraag 32 [3]

Bereken die persentasie-ionisasie van ammoniak in hierdie oplossing by 25°C.
(Wenk: om die korrekte antwoord hieronder te verkry, moet u 'n aanname maak om die algebra te vereenvoudig.)
Skryf die antwoord in wetenskaplike notasie.
Die eerste syfer is die volgende:

Voorbeeld:
3.67 x 10^4

A 0
B 1
C 2
D 3
E 4
F 5
G 6
H 7
I 8
J 9

Vraag 33 [3]

Watter een van die volgende sure is die sterkste?

A $HBrO_4$
B $HBrO_3$
C HBrO
D HIO
E HIO_4
F $HClO_4$
G $HClO_3$
H $HClO_2$
I HClO
J Nie een van bogenoemde nie.

H 7
I 8
J 9

Question 32 [3]

Calculate the percent ionisation of the ammonia in this solution at 25°C.
(Hint: to get the correct answer below, you must make an assumption to simplify the algebra involved.)
Write the answer in scientific notation.
The first digit is the following:

Example:
3.67 x 10^4

A 0
B 1
C 2
D 3
E 4
F 5
G 6
H 7
I 8
J 9

Question 33 [3]

Which one of the following acids is the strongest?

A $HBrO_4$
B $HBrO_3$
C HBrO
D HIO
E HIO_4
F $HClO_4$
G $HClO_3$
H $HClO_2$
I HClO
J None of the above.

Einde van die toets / End of the test

DIE PERIODIEKE TABEL VAN DIE ELEMENTE
THE PERIODIC TABLE OF THE ELEMENTS

1 H 1.01																2 He 4.00
3 Li 6.94	4 Be 9.01										5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
11 Na 22.99	12 Mg 24.31										13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.87	23 V 50.95	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.39	31 Ga 69.72	32 Ge 72.61	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc 98.91	44 Ru 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.60	53 I 126.90	54 Xe 131.29
55 Cs 132.91	56 Ba 137.33	57 La 138.91	72 Hf 178.49	73 Ta 180.95	74 W 183.84	75 Re 186.21	76 Os 190.23	77 Ir 192.22	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.20	83 Bi 208.98	84 Po 208.98	85 At 209.99	86 Rn 222.01
87 Fr 223.02	88 Ra 226.03	89 Ac 227.03	104 Rf 261.11	105 Db 262.11	106 Sg 263.12	107 Bh 262.12	108 Hs 265	109 Mt 266									

58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm 144.91	62 Sm 150.36	63 Eu 151.97	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.94	71 Lu 174.97	
90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np 237.05	94 Pu 244.06	95 Am 243.06	96 Cm 247.07	97 Bk 247.07	98 Cf 251.08	99 Es 252.08	100 Fm 257.10	101 Md 258.10	102 No 259.10	103 Lr 262.11	

ELEKTRONEGATIWITEIT-WAARDES VAN DIE ELEMENTE VOLGENS DIE PAULING-SKAAL
ELECTRONEGATIVITY VALUES OF THE ELEMENTS ACCORDING TO THE PAULING SCALE

H 2.1																He
Li 1.0	Be 1.5										B 2.0	C 2.5	N 3.0	O 3.5	F 4.0	Ne
Na 0.9	Mg 1.2										Al 1.5	Si 1.8	P 2.1	S 2.5	Cl 3.0	Ar
K 0.8	Ca 1.0	Sc 1.3	Ti 1.5	V 1.6	Cr 1.6	Mn 1.5	Fe 1.8	Co 1.9	Ni 1.8	Cu 1.9	Zn 1.6	Ga 1.6	Ge 1.8	As 2.0	Se 2.4	Br 2.8	Kr 3.0
Rb 0.8	Sr 1.0	Y 1.2	Zr 1.4	Nb 1.6	Mo 1.8	Tc 1.9	Ru 2.2	Rh 2.2	Pd 2.2	Ag 1.9	Cd 1.7	In 1.7	Sn 1.8	Sb 1.9	Te 2.1	I 2.5	Xe 2.6
Cs 0.7	Ba 0.9		Hf 1.3	Ta 1.5	W 1.7	Re 1.9	Os 2.2	Ir 2.2	Pt 2.2	Au 2.4	Hg 1.9	Tl 1.8	Pb 1.9	Bi 1.9	Po 2.0	At 2.2	Rn
Fr 0.7	Ra 0.9															

$N_A = 6.022 \times 10^{23}\ mol^{-1}$ 1 amu = 1.66054×10^{-24} g

$R = 8.314\ J.mol^{-1}.K^{-1}$ K = °C +273.15

$K_b(NH_3) = 1.8 \times 10^{-5}$ at/by 25°C

$K_w = 1.0 \times 10^{-14}$ at/by 25°C