



CMY 117

SEMESTERTOETS 3 / SEMESTER TEST 3

AFDELING B: VEELVOUDIGE KEUSEVRAE  
SECTION B: MULTIPLE CHOICE QUESTIONS

DATUM / DATE: 11 Mei 2009 / 11 May 2009  
TYD / TIME: 2½ uur / hours  
PUNTE / MARKS: 100

EKSAMINATORE / Prof. S Lotz  
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INSTRUKSIES

1. Beantwoord die volgende vrae op die rekenaar- antwoordblad.
2. Gebruik slegs kant 2 van die antwoordblad.
3. Slegs een antwoord per vraag is toelaatbaar.
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.
5. Die puntetoekenning per vraag varieer en word by elke vraag aangedui.
6. Antwoorde word nie negatief nagesien nie.
7. Vir berekeninge moet die numeriese inligting van die aangehegte Periodieke tabel gebruik word.

INSTRUCTIONS

1. Answer the following questions on the computer answer sheet.
2. Use only side 2 of the answer sheet.
3. Only one answer per question is allowed.
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. The allocation of marks per question varies and is indicated at each question.
6. Answers are not marked negatively.
7. The numerical information from the attached Periodic Table must be used for calculations.

Vraag 1

Merk opsie J van Vraag 1 op u rekenaarantwoordblad. Dit is slegs vir kontroledoelindes.

Vraag 2

Die elektronkonfigurasie van 'n neutrale atoom eindig op die volgende: .....  $5p^1$ . Die element is die volgende:

- [6]
- A Sc
  - B Y
  - C La
  - D In
  - E Nie een van bogenoemde nie.

Vraag 3

Die aantal ongepaarde elektrone in 'n neutrale swaelatoom is

- [3]
- A 1
  - B 2
  - C 3
  - D 4
  - E Nie een van bogenoemde nie.

Question 1

Mark option J of Question 1 on your computer answer sheet. This is for control purposes only.

Question 2

The electron configuration of a neutral atom ends with the following: .....  $5p^1$ . The element is the following:

- 49 In
- $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^1$
- A Sc
  - B Y
  - C La
  - D In
  - E None of the above.

Question 3

The number of unpaired electrons in a neutral sulphur atom is

- A 1
- B 2
- C 3
- D 4
- E None of the above.



1s<sup>2</sup>

122

53 I

1s<sup>2</sup> 2s<sup>2</sup> 2p<sup>6</sup> 3s<sup>2</sup> 3p<sup>6</sup> 4s<sup>2</sup> 3d<sup>10</sup> 4p<sup>6</sup>  
5s<sup>2</sup> 4d<sup>10</sup>

[6]

**Vraag 4** [2]  
Die totale aantal d-elektrone in 'n neutrale jodiumatoom is

A 0  
B 5  
C 10  
D 20  
E Nie een van bogenoemde nie.

**Question 4** [2]  
The total number of d electrons in a neutral iodine atom is

A 0  
B 5  
C 10  
D 20  
E None of the above.

[6]

**Vraag 5** [2]  
Watter een van die volgende neutrale atome het 4 valenselektrone?

A B  
B Si  
C As  
D Te  
E At

**Question 5** [2]  
Which one of the following neutral atoms has 4 valence electrons?

A B  
B Si  
C As  
D Te  
E At

[6]

**Vraag 6** [2]  
Die totale aantal d-elektrone in 'n Fe<sup>3+</sup>-ioon is

A 3  
B 4  
C 5  
D 6  
E Nie een van bogenoemde nie.

**Question 6** [2]  
The total number of d electrons in an Fe<sup>3+</sup> ion is

A 3  
B 4  
C 5  
D 6  
E None of the above.

23 Fe<sup>3+</sup>  
1s<sup>2</sup> 2s<sup>2</sup> 2p<sup>6</sup> 3s<sup>2</sup> 3p<sup>6</sup> 4s<sup>2</sup> 3d<sup>3</sup>  
3d<sup>5</sup>

[7]

**Vraag 7** [2]  
Die neutrale atome Na, Be en Mg, gerangskik van groot na klein, is

A Be, Na, Mg  
B Na, Be, Mg  
C Na, Mg, Be  
D Mg, Be, Na  
E Mg, Na, Be

**Question 7** [2]  
The neutral atoms, Na, Be and Mg, arranged from large to small, is

A Be, Na, Mg  
B Na, Be, Mg  
C Na, Mg, Be  
D Mg, Be, Na  
E Mg, Na, Be

[8]

**Vraag 8** [2]  
Watter een van die volgende elemente se tweede ionisasie-energie is kleiner as sy eerste ionisasie-energie?

A P  
B S  
C Cl  
D Ar  
E Nie een van bogenoemde nie.

**Question 8** [2]  
Which one of the following elements' second ionisation energy is smaller than its first ionisation energy?

A P  
B S  
C Cl  
D Ar  
E None of the above.

[7]

**Vraag 9** [2]  
Die eerste ionisasie-energie van die hoofgroepelemente varieer as volg op die Periodieke Tabel:

A styg in 'n groep van bo na onder en styg in 'n periode van links na regs.  
B daal in 'n groep van bo na onder en styg in 'n periode van links na regs.  
C styg in 'n groep van bo na onder en daal in 'n periode van links na regs.  
D daal in 'n groep van bo na onder en daal in 'n periode

**Question 9** [2]  
The first ionisation energy of the main group elements varies as follows on the Periodic Table:

A increases in a group from top to bottom and increases in a period from left to right.  
B decreases in a group from top to bottom and increases in a period from left to right.  
C increases in a group from top to bottom and decreases in a period from left to right.  
D decreases in a group from top to bottom and

period (row)  
group (column)



van links na regs.

E Nie een van bogenoemde nie.

decreases in a period from left to right.

E None of the above.

[7] **Vraag 10**

Watter een van die volgende elemente is 'n metalloïed?

- A Al
- B Ga
- C Ge
- D P
- E Nie een van bogenoemde nie.

[2] **Question 10**

Which one of the following elements is a metalloid?

- A Al
- B Ga
- C Ge
- D P
- E None of the above.

[7] **Vraag 11**

Wanneer 'n alkalimetaal met waterstofgas in aanraking kom, vorm die volgende:

- A metaalhidried
- B metaalhidroksied en water
- C metaaloksied en water
- D geen reaksie vind plaas nie
- E Nie een van bogenoemde nie.

[2] **Question 11**

When an alkali metal comes in contact with hydrogen gas, the following forms:

- A metal hydride
- B metal hydroxide and water
- C metal oxide and water
- D no reaction takes place.
- E None of the above.

**Vrae 12 tot 15 verwys na die  $PCl_3$ -molekule.**

**Questions 12 to 15 refer to the  $PCl_3$  molecule.**

[8] **Vraag 12**

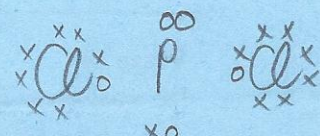
Die aantal alleenpare op die sentrale atoom is

- A 0
- B 1
- C 2
- D 3
- E Nie een van bogenoemde nie.

[2] **Question 12**

The number of lone electron pairs on the central atom is

- A 0
- B 1
- C 2
- D 3
- E None of the above.



[8] **Vraag 13**

Die elektrondomein geometrie van die molekule is

- A trigonaal vlakkig
- B trigonaal piramidaal
- C tetrahedraal
- D vierkantig piramidaal
- E Nie een van bogenoemde nie.

[2] **Question 13**

The electron domain geometry of the molecule is

- A trigonal planar
- B trigonal pyramidal
- C tetrahedral
- D square pyramidal
- E None of the above.

Handwritten notes: tetrahedral, pyramidal, trigonal. Arrows point from these terms towards the question area.

[8] **Vraag 14**

Die molekule geometrie van die molekule is

- A trigonaal vlakkig
- B trigonaal piramidaal
- C tetrahedraal
- D vierkantig piramidaal
- E Nie een van bogenoemde nie.

[2] **Question 14**

The molecular geometry of the molecule is

- A trigonal planar
- B trigonal pyramidal
- C tetrahedral
- D square pyramidal
- E None of the above.

[8] **Vraag 15**

Die benaderde grootte van die bindingshoeke in die molekule is

- A  $45^\circ$
- B  $90^\circ$
- C  $109^\circ$
- D  $120^\circ$
- E  $180^\circ$

[2] **Question 15**

The approximate size of the bonding angles in the molecule is

- A  $45^\circ$
- B  $90^\circ$
- C  $109^\circ$
- D  $120^\circ$
- E  $180^\circ$

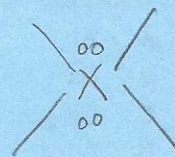


[8] **Vraag 16** [2]  
Die molekulêre geometrie van 'n molekule met 'n sentrale atoom met 6 elektronpare in totaal, waarvan 2 alleenpare is, is

- A tetrahedraal
- B vierkantig piramidaal
- C vierkantig vlaklig
- D wiplank
- E Nie een van bogenoemde nie.

**Question 16** [2]  
The molecular geometry of a molecule with a central atom with 6 electron pairs in total, of which 2 are lone pairs, is

- A tetrahedral
- B square pyramidal
- C square planar
- D seesaw
- E None of the above.



[10] **Vraag 17** [2]  
Watter een van die volgende stellings oor die ewewigsituasie is korrek?

- A Die voorwaartse reaksie kom tot stilstand.
- B Die terugwaartse reaksie kom tot stilstand.
- C Alle konsentrasies bly konstant.
- D Ten minste een van die produkte of reagense het 'n konsentrasie van nul.
- E Al bogenoemde stellings is verkeerd.

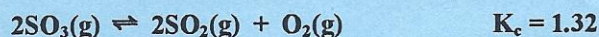
**Question 17** [2]  
Which one of the following statements about the equilibrium situation is correct?

- A The forward reaction comes to a standstill.
- B The backward reaction comes to a standstill.
- C All concentrations remain constant.
- D At least one of the products or reactants has a concentration of zero.
- E None of the above statements are incorrect.

**Vrae 18 tot 21 verwys na die volgende ewewig by 650 K:**



**Questions 18 to 21 refer to the following equilibrium at 650 K:**



[10] **Vraag 18** [2]  
Die waarde van  $K_p$  van hierdie ewewig by 650 K is

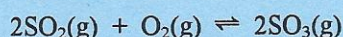
- A  $3.8 \times 10^3$
- B 0.0247
- C 70.4
- D 40.4
- E Nie een van bogenoemde nie.

**Question 18** [2]  
The value of  $K_p$  of this equilibrium at 650 K is

- A  $3.8 \times 10^3$
- B 0.0247
- C 70.4
- D 40.4
- E None of the above.

$$K_p = K_c (RT)^{\Delta n} = (1.32)(650)^{(0.082)}$$

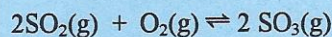
[10] **Vraag 19** [2]  
Die waarde van  $K_c$  van die volgende ewewig



by 650 K is:

- A 1.15
- B -1.32
- C 0.320
- D 0.758
- E Nie een van bogenoemde nie.

**Question 19** [2]  
The value of  $K_c$  of the following equilibrium



at 650 K is:

- A 1.15
- B -1.32
- C 0.320
- D 0.758
- E None of the above.

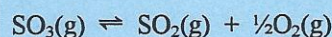
[10] **Vraag 20** [2]  
Die waarde van  $K_c$  van die volgende ewewig



by 650 K is:

- A 1.15
- B 0.660
- C 1.74
- D 0.320
- E Nie een van bogenoemde nie.

**Question 20** [2]  
The value of  $K_c$  of the following equilibrium



at 650 K is:

- A 1.15
- B 0.660
- C 1.74
- D 0.320
- E None of the above.

$$K_p = K_c (RT)^{\Delta n} \quad \Delta n = \frac{1}{2}$$

$$K_c (RT)^{\frac{1}{2}} = K_p$$

$$K_c = \frac{K_p}{(RT)^{\frac{1}{2}}}$$



SO <sub>3</sub>	SO <sub>2</sub>	O <sub>2</sub>
3.0M	2.0M	1.0M
↓	↑	↑

[10]

**Vraag 21**  
'n 1.00 dm<sup>3</sup> fles word gevul met 3.0 mol SO<sub>3</sub>(g), 2.0 mol SO<sub>2</sub>(g) en 1.0 mol O<sub>2</sub>(g) by 650 K. Die volgende sal gebeur wanneer ewewig ingestel word:

A [SO<sub>3</sub>] verminder, [SO<sub>2</sub>] verminder, [O<sub>2</sub>] verhoog  
B [SO<sub>3</sub>] verminder, [SO<sub>2</sub>] verhoog, [O<sub>2</sub>] verhoog  
C [SO<sub>3</sub>] verhoog, [SO<sub>2</sub>] verminder, [O<sub>2</sub>] verhoog  
D [SO<sub>3</sub>] verhoog, [SO<sub>2</sub>] verminder, [O<sub>2</sub>] verminder  
E Nie een van bogenoemde nie.

**Question 21**  
A 1.00 dm<sup>3</sup> flask is filled with 3.0 moles of SO<sub>3</sub>(g), 2.0 moles of SO<sub>2</sub>(g) and 1.0 mole of O<sub>2</sub>(g) at 650 K. The following will happen when equilibrium is established:

A [SO<sub>3</sub>] decreases, [SO<sub>2</sub>] decreases, [O<sub>2</sub>] increases  
B [SO<sub>3</sub>] decreases, [SO<sub>2</sub>] increases, [O<sub>2</sub>] increases  
C [SO<sub>3</sub>] increases, [SO<sub>2</sub>] decreases, [O<sub>2</sub>] increases  
D [SO<sub>3</sub>] increases, [SO<sub>2</sub>] decreases, [O<sub>2</sub>] decreases  
E None of the above.

[11]

**Vraag 22**  
Watter een van die volgende reageer volledig met water?

A NH<sub>3</sub>  
B NH<sub>4</sub><sup>+</sup>  
C HNO<sub>3</sub>  
D Bensoësuur  
E Nie een van bogenoemde nie.

**Question 22**  
Which one of the following reacts fully with water?

A NH<sub>3</sub>  
B NH<sub>4</sub><sup>+</sup>  
C HNO<sub>3</sub>  
D Benzoic acid  
E None of the above.

[11]

**Vraag 23**  
In watter een van die volgende gevalle vorm 'n gas? Soutsuur word gemeng met die volgende:

A NH<sub>4</sub>Br  
B LiCl  
C Na<sub>2</sub>SO<sub>4</sub>  
D Li<sub>2</sub>CO<sub>3</sub>  
E Nie een van bogenoemde nie.

**Question 23**  
Which one of the following cases yields a gas? Hydrochloric acid is mixed with the following:

A NH<sub>4</sub>Br  
B LiCl  
C Na<sub>2</sub>SO<sub>4</sub>  
D Li<sub>2</sub>CO<sub>3</sub>  
E None of the above.

[11]

**Vraag 24**  
Die hidrosiedioonkonsentrasie van 'n oplossing by 25°C is 3.4 x 10<sup>-4</sup> mol.dm<sup>-3</sup>. Die pH van hierdie oplossing by 25°C is

A 3.40  
B 3.47  
C 10.53  
D 10.05  
E Nie een van bogenoemde nie.

**Question 24**  
The hydroxide ion concentration of a solution at 25°C is 3.4 x 10<sup>-4</sup> mol.dm<sup>-3</sup>. The pH of this solution at 25°C is

A 3.40  
B 3.47  
C 10.53  
D 10.05  
E None of the above.

$[H_3O^+] = \frac{1.0 \times 10^{-14}}{3.4 \times 10^{-4}}$

[11]

**Vraag 25**  
Die pOH van 'n oplossing by 25°C is 4.56. Die hidronium ion konsentrasie van hierdie oplossing by 25°C is

A 2.8 x 10<sup>-5</sup> mol.dm<sup>-3</sup>  
B 3.6 x 10<sup>-10</sup> mol.dm<sup>-3</sup>  
C 1.0 x 10<sup>-14</sup> mol.dm<sup>-3</sup>  
D 1.0 x 10<sup>-7</sup> mol.dm<sup>-3</sup>  
E Nie een van bogenoemde nie.

**Question 25**  
The pOH of a solution at 25°C is 4.56. The hydronium ion concentration of this solution at 25°C is

A 2.8 x 10<sup>-5</sup> mol.dm<sup>-3</sup>  
B 3.6 x 10<sup>-10</sup> mol.dm<sup>-3</sup>  
C 1.0 x 10<sup>-14</sup> mol.dm<sup>-3</sup>  
D 1.0 x 10<sup>-7</sup> mol.dm<sup>-3</sup>  
E None of the above.

pH = 9.44

$pOH = -\log(OH)$   
 $4.56 = -\log(OH)$   
 $OH = 10^{-4.56}$



1223343454564567  
 sspspsdpsdpsf dpsfdp

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

Handwritten notes: 1A, 2A, 3A, 4A, 5A, 6A, 7A, 1S, 2S, 3S, 4S, 5S, 6S, 7S, s → 2, p → 6, d → 10, f → 14, 3d, 4f, 5f.

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 40.01	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	Rn						
Fr 0.7	Ra 0.9																						

- Aktiwiteitsreeks van Metale in Waterige Oplossing**  
**Activity Series of Metals in Aqueous Solution**
- Li
  - K
  - Ba
  - Ca
  - Na
  - Mg
  - Al
  - Mn
  - Zn
  - Cr
  - Fe
  - Co
  - Ni
  - Sn
  - Pb
  - H<sub>2</sub>
  - Cu
  - Ag
  - Hg
  - Pt
  - Au

Suur / Acid	K <sub>a</sub> (25°C)	Basis / Base	K <sub>b</sub> (25°C)
H <sub>3</sub> PO <sub>4</sub>	7.1 x 10 <sup>-3</sup>	NH <sub>3</sub>	1.8 x 10 <sup>-5</sup>
HNO <sub>2</sub>	7.1 x 10 <sup>-4</sup>	CH <sub>3</sub> NH <sub>2</sub>	4.4 x 10 <sup>-4</sup>
H <sub>2</sub> CO <sub>3</sub>	4.5 x 10 <sup>-7</sup>	C <sub>6</sub> H <sub>5</sub> NH <sub>2</sub>	4.3 x 10 <sup>-10</sup>
CH <sub>3</sub> COOH	1.8 x 10 <sup>-5</sup>	(CH <sub>3</sub> ) <sub>2</sub> NH	5.4 x 10 <sup>-4</sup>
HF	6.8 x 10 <sup>-4</sup>	(CH <sub>3</sub> ) <sub>3</sub> N	6.4 x 10 <sup>-5</sup>
C <sub>6</sub> H <sub>5</sub> COOH	6.3 x 10 <sup>-5</sup>	C <sub>5</sub> H <sub>5</sub> N	1.7 x 10 <sup>-9</sup>

$N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$        $R = 0.0821 \text{ atm.L.mol}^{-1}.\text{K}^{-1}$   
 $1 \text{ amu} = 1.66054 \times 10^{-24} \text{ g}$        $K_w = 1.0 \times 10^{-14} \text{ at / by } 25^\circ\text{C.}$