CHEMISTRY: ART, SCIENCE, FUN

PRACTICAL EXAMINATION
ANSWER SHEETS

JULY 18, 2007
MOSCOW, RUSSIA

Official English version

Problem 1	**Name:** _____	Quest.	1a	1b	1c	2-3	4	Tot	Points
	Student code: _____	Marks	9	0	3	72	2	86	20

Number of the given mixture of amino acids _____ (A number between 301 and 600)

1.1a *Draw the profile of coloration intensity on the plate sketch.*
1.1b *Indicate changes of eluents by drawing lines between the corresponding wells.*

	1	2	3	4	5	6	7	8	9	10	11	12
A	○	○	○	○	○	○	○	○	○	○	○	○
B	○	○	○	○	○	○	○	○	○	○	○	○
C	○	○	○	○	○	○	○	○	○	○	○	○
D	○	○	○	○	○	○	○	○	○	○	○	○
E	○	○	○	○	○	○	○	○	○	○	○	○
F	○	○	○	○	○	○	○	○	○	○	○	○
G	○	○	○	○	○	○	○	○	○	○	○	○
H	○	○	○	○	○	○	○	○	○	○	○	○

1.1c *Labels of wells corresponding to the chosen fractions.*

Peak number	Labels of wells
1	
2	
3	

1.2-1.3 *Content (in mg) of each amino acid in the amino acid mixture you were given.*

Your work

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Complete the table.

Peak number	Volume of combined fractions, *mL*	Amino acid (3-letter code)	Wavelength λ, *nm*	Absorbance A_λ	Amino acid mass in the given mixture, *mg*
1					
2					
3					

ATTENTION. The print-offs with the spectra of your samples should be put into the envelope and delivered at the end of examination alongside with the Answer Sheets.

1.4 *Resonance structures of the substance responsible for the mixture coloration.*

Problem 2	**Name:** _____	Quest.	1a	1b	2	3	4	5	6a	6b	Tot	Points
	Student code: _____	Marks	25	5	25	25	5	5	1	9	100	20

2.1a *Standardization of NaOH solution*

Titration No	Initial burette reading, mL	Final burette reading, mL	Volume of NaOH solution consumed (V_1), mL
1			
2			
3			
Final volume of NaOH solution ($V_{1,f}$), mL			

2.1b *Calculation of NaOH concentration*

Your work

c(NaOH) = _____ mol/L

2.2 *The first titration of the sample (BCG)*

Titration No	Initial burette reading, mL	Final burette reading, mL	Volume of NaOH solution consumed (V_2), mL
1			
2			
3			
Final volume of NaOH solution ($V_{2,f}$), mL			

2.3 *The second titration of the sample (TP)*

Titration No	Initial burette reading, mL	Final burette reading, mL	Volume of NaOH solution consumed (V_3), mL
1			
2			
3			
Final volume of NaOH solution ($V_{3,f}$), mL			

2.4 *Calculation of the mass of CO_3^{2-}*

Your work

$m(CO_3^{2-})$ = _____ g

Problem 2	Name: _____	Quest.	1a	1b	2	3	4	5	6a	6b	Tot	Points
	Student code: _____	Marks	25	5	25	25	5	5	1	9	100	20

2.5 *Calculation of the mass of* HPO_4^{2-}

Your work

$m(HPO_4^{2-})$ = _____ g

Additional questions

2.6a *Indicate one reaction (write down the equation) for a process interfering in the sample analysis you have carried out in the presence of* Ca^{2+}.

2.6b *A list of mistakes possible at different steps is given in the table. Indicate which of the mistakes can lead to errors in* CO_3^{2-} *and/or* HPO_4^{2-} *content determination. Use the following symbols: "0" if no error is expected, "+"or "–" if the result is higher (positive error) or lower (negative error) than the true one.*

Mistake	Step	Error	
		CO_3^{2-} content	HPO_4^{2-} content
Incomplete removal of CO_2	1		
Too large excess of $K_2C_2O_4$ on calcium precipitation	2		
Too late indication of the endpoint (overtitration) on NaOH standardization	3		
Insufficient washing of the filter at CaC_2O_4 filtration	4		
Overtitration of the sample against BCG	5		
Overtitration of the sample against TP	6		

H_2CO_3: $pK_{a1} = 6.35$; $pK_{a2} = 10.32$

$H_2C_2O_4$: $pK_{a1} = 1.25$; $pK_{a2} = 4.27$

Extra samples given or column broken

Problem No	Sample No	Column broken and replaced	Student's signature	Lab assistant's signature