

CHEMISTRY: ART, SCIENCE, FUN



PRACTICAL  
EXAMINATION  
ANSWER SHEETS

































































































JULY 18, 2007  
MOSCOW, RUSSIA

<b>Problem 1</b>	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

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

Complete the table.

Peak number	Volume of combined fractions, <i>mL</i>	Amino acid (3-letter code)	Wavelength $\lambda$ , <i>nm</i>	Absorbance $A_\lambda$	Amino acid mass in the given mixture, <i>mg</i>
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.

<b>Problem 2</b>	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

$c(\text{NaOH}) = \text{_____ mol/L}$

**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  $\text{CO}_3^{2-}$

Your work

$m(\text{CO}_3^{2-}) = \text{_____ g}$

<b>Problem 2</b>	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 $\text{HPO}_4^{2-}$

Your work

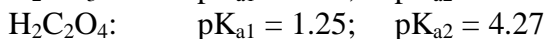
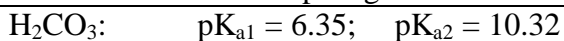
$$m(\text{HPO}_4^{2-}) = \text{_____ g}$$

### 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  $\text{Ca}^{2+}$ .

**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  $\text{CO}_3^{2-}$  and/or  $\text{HPO}_4^{2-}$  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	
		$\text{CO}_3^{2-}$ content	$\text{HPO}_4^{2-}$ content
Incomplete removal of $\text{CO}_2$	1		
Too large excess of $\text{K}_2\text{C}_2\text{O}_4$ on calcium precipitation	2		
Too late indication of the endpoint (overtitration) on NaOH standardization	3		
Insufficient washing of the filter at $\text{CaC}_2\text{O}_4$ filtration	4		
Overtitration of the sample against BCG	5		
Overtitration of the sample against TP	6		



Extra samples given or column broken

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