Date ..... **Name** ..... **Group** .....

Lab report form for the practical lesson on biochemistry

Topic: **Buffers, Electrochemistry**

Task 1: Calculation of pH of buffers using Henderson-Hasselbalch equation and determination of buffer capacity

Predictions (calculations):

pH of buffer with NaH_2PO_4/Na_2HPO_4 ratio 1:1 (No. 1):

No. 1 after addition of HCl (No. 1A):

No. 1 after addition of NaOH (No. 1B):

pH of buffer with NaH_2PO_4/Na_2HPO_4 ratio 1:9 (No. 2):

No. 2 after addition of HCl (No. 2A):

No. 2 after addition of NaOH (No. 2B):

pH of buffer with NaH_2PO_4/Na_2HPO_4 ratio 9:1 (No. 3):

No. 3 after addition of HCl (No. 3A):

No. 3 after addition of NaOH (No. 3B):

***Results*:**

		Container No.			
		1	2	3	4
	NaH_2PO_4 c = 0.1 mol·l^{-1}	5 ml	1 ml	9 ml	-
	Na_2HPO_4 c = 0.1 mol·l^{-1}	5 ml	9 ml	1 ml	-
	NaCl c = 0.1 mol·l^{-1}	-	-	-	10 ml
Ratio NaH_2PO_4/Na_2HPO_4					
pH measured					
pH calculated					

		Container No.			
		1A	2A	3A	4A
	Add HCl c = 0.1 mol·l^{-1}	1 ml	1 ml	1 ml	1 ml
pH measured					
pH calculated					
Δ pH measured/calculated					
Buffer capacity β					

		Container No.			
		1B	2B	3B	4B
	Add NaOH c = 0.1 mol·l^{-1}	1 ml	1 ml	1 ml	1 ml
pH measured					
pH calculated					
Δ pH measured/calculated					
Buffer capacity β					

Conclusion:

Which buffer has the highest buffer capacity and why?

Task 2: Relationship of buffer capacity on the molar concentration of buffer

Predictions (calculations):

pH of phosphate buffer 0.04 mol·l^{-1} with NaH_2PO_4/Na_2HPO_4 ratio 1:1 (No. 5):

No. 5 after addition of HCl (No. 5A):

No. 5 after addition of NaOH (No. 5B):

Results:

	Container No. 5(A)	*Container No. 5(B)*
Phosphate buffer 1:1 0.04 mol·l^{-1}	10 ml	10 ml
pH measured		
pH calculated		
Add acid or base:	1 ml HCl 0.1 mol·l^{-1}	1 ml NaOH 0.1 mol·l^{-1}
pH measured		
pH calculated		
Δ pH measured/calculated		
Buffer capacity β		

Conclusion:

Task 3: Effect of ionic strength on pH of buffer

Results:

	Container No.			
	1	5	6	7
Buffer concentration [mol·l^{-1}]	0.1	0.04	0.01	0.001
Ratio	1 : 1	1 : 1	1 : 1	1 : 1
pH measured				
pH calculated				

Conclusion:

Task 4: Electrochemical cell

Principle:

Results:

Measured voltage of Daniell's cell:

Calculated voltage of Daniell's cell:

Voltage of the cell with reversed electrodes:

Observable changes on the electrodes during experiment:

Discussion and Conclusion:

Provide chemical equations for the processes that take place on the surface of electrodes when immersed to the electrolytes:

Copper electrode in solution of copper sulfate:

Zinc electrode in solution of zinc sulfate:

Copper electrode in solution of zinc sulfate:

Zinc electrode in solution of copper sulfate:

Task 5: Electrolysis

Principle:

Results:

Discussion and Conclusion:

Explain the observed changes. Use chemical equations to describe the processes that occur on cathode and anode.

Task 6: Electrochemical series of metals

Principle:

Results:

	⊙ $ZnSO_4$	⊙ $CuSO_4$	⊙ $AgNO_3$
Zinc-coated wire			
Copper wire			
Silver wire			

Discussion and Conclusion:

Use chemical equations to describe reactions that occur on the wire surface. Describe both oxidations and reductions.

	⊙ $ZnSO_4$	⊙ $CuSO_4$	⊙ $AgNO_3$
Zinc-coated wire	——		
Copper wire		——	
Silver wire			——

What can be concluded from these results on the redox potentials of zinc, copper, and silver?