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Dialysis of body fluids and adsorption on medical carbon

Task 1

The purpose of this activity is to perform the dialysis of milk and verification of the correctness of the process by the determination of selected components in the dialysis solution.

Procedure

Wet dialysis tube section (length 25 cm) derived from hydrated cellulose (Nadir) with distilled water. Close one of the ends of the tube with a seal clip.

Pour the 50 cm^3 of milk (accurately measured volume) to the prepared dialysis bag. Close the second end of a tube filled with milk using a clip, leaving some space over the layer. Rinse the outer part of a bag (where could be any traces of milk) with distilled water from a wash bottle. Use the graduated cylinder to measure 200 cm^3 of distilled water (the liquid before dialysis) and pour the water to the beaker, which will be used for dialysis. Insert dialysis bag into beaker. Perform dialysis for 30 minutes in room temperature, gently moving the bag from time to time.

Perform the tests according to the table:

	Solution before dialysis	Solution after dialysis	milk
Detection of Cl^-			-
Detection of Ca^{2+}			-
Detection of PO_4^{3-}			-
Detection of lactose			-
Detection of protein			

Detection of Cl^- ions

Add by drops 0,5 cm^3 of 0,1 mol/dm^3 $AgNO_3$ to 1 cm^3 tested dialysis solution. In the presence of Cl^- ions white, iridescent AgCl appears.

Detection of Ca^{2+} ions
Add 0,5 cm^3 0,2 mol/dm^3 of ammonium oxalate $(NH_4)_2C_2O_4$ to 1 cm^3 tested dialysis solution. A crystalline calcium oxalate is precipitated.

Detection of PO_4^{3-} ions
Add 5 drops of concentrated HNO_3 and 0,5 cm^3 of 0.1 mol/dm^3 ammonium molybdate to 1 cm^3 tested dialysis solution. Warm the solution gently over the burner until the appearance of yellow precipitate, which indicates the presence of ammonium phosphomolybdate $(NH_4)_3PMo_{12}O_{40}$

Detection of lactose
Add 0,5 cm^3 of Fehling's reagent I and 0,5 cm^3 of Fehling's reagent II to 1 cm^3 of tested dialysis solution. Boil the solution gently over the burner until the appearance of yellow, orange or red precipitate of copper oxide (I) Cu_2O.

Detection of protein (biuret method)
Add 2 cm^3 of copper reagent to 0,5 cm^3 of tested dialysis solution.

Analogously, perform the test on the presence of the protein in the milk. For this purpose, add 2 cm^3 of copper reagent to 0,5 cm^3 of milk derived from dialysis.

Compare the colors that appeared in both samples. If the solution turns violet, protein is present.

Task 2
The purpose of this activity is to perform the adsorption of organic acids (acetic acid) on activated carbon and to demonstrate medical properties of *carbo medicinalis*.

Procedure
Dilute 0,5 mol/dm^3 of acetic acid with distilled water in the conical flasks (marked as A and B) in accordance with the following table:

Flask	CH_3COOH 0,5 mol/dm^3	H_2O	Concentration
A	12 cm^3	38 cm^3	
B	3 cm^3	47 cm^3	

From flask A take 5 cm^3 of acetic acid solution and transfer to the new one (marked as A1) and from flask B move 10 cm^3 of the solution to the new flask marked as B1.

Add a few drops of phenolphtalein to flasks A1 and B1 and then titrate each of them with standard solution of NaOH (0,1 mol/dm^3).

Calculate the real concentrations of obtained acetic acid solutions, using the following formula:

$$C_{CH3COOH} \cdot V_{CH3COOH} = C_{NaOH} \cdot V_{NaOH}$$

Add 1 g of activated carbon to the flasks A and B (please weigh the carbon precisely), and then gently shake them for 30 minutes. After that, filtrate the contents of the flasks. Take 10 cm^3 from each flask and put in the new conical flasks marked A2 and B2. Add the indicator (phenolphtalein) and titrate with 0,1 mol/dm^3 of NaOH solution. Calculate the concentration of acetic acid in the flasks after adsorption.

Knowing the concentration values of the acid before adsorption (C_0) and after adsorption (C), calculate the number of moles of acetic acid, which has been adsorbed by 1 gram of activated carbon.

$$X_A = (C_0 - C) \cdot V_A \quad ; \quad X_B = (C_0 - C) \cdot V_B$$

where:

X – number of moles of adsorbed acid,

V – volume of the solution, for flask A: V = 45 cm^3; and for flask B: V = 40 cm^3

C_o – concentration of the acid before adsorption [mol/dm^3]

C – concentration of the acid after adsorption [mol/dm^3]

Note the results in the table:

Flask	A	B
C_0 - concentration of the acid before adsorption [mol/dm^3]		
C - concentration of the acid after adsorption [mol/dm^3]		
X – number of moles of acetic acid adsorbed by 1 gram of activated carbon		

Compare the influence of acetic acid concentration on the adsorption abilities of activated carbon.