First Name: ..... Surname(s): .....Faculty: ..... Group: .....

Lab Report: Refractometry

Biophysics Lab – 2014/2015 first semester

Date of lab:…….

Measured together with:……...

Evaluation by lab teacher:
☐ ☐ ☐ ☐ to be corrected*

…….
☐ accepted signature

Aim of the measurement: *Determination of concentration by measuring refractive index:*

1. *Construction of a refractive index–concentration calibration curve using glycerol solutions of known concentrations.*
2. *Determination of concentrations of unknown glycerol solutions.*
3. *Determination of blood plasma protein concentration using the calibration curve in the lab manual.*

Measuring principle:

The determination of concentration requires the measurement of a physical quantity that is a monotonic function of concentration. In our case, this is the refractive index. Between the refractive index and the concentration a linear relationship is supposed, which we prove by construction of a calibration curve. Then, the calibration curve can be used to determine the concentration of unknown solutions.

Measuring instrument and materials:

The measurement is carried out with an Abbe-refractometer. Its principle is that if the sample liquid–measuring prism interface is illuminated from all directions, non of the light rays entering the measuring prism are refracted more than the critical angle. This results in a dark-bright frontline (in a suitable optical system). If this frontline is centered on the crosshairs visible in the "telescope" on the right hand side of the instrument, the refractive index of the sample liquid can be read from the pre-calibrated scale visible through the "microscope" on the left hand side of the instrument.

A frontline that is blurred due to dispersion can be set sharp by the rotation of the compensator (Amici-prism).

The setting and the reading has to be done three times for each of the solutions.

The following solutions are provided for the measurement: distilled water, 5 glycerol solutions of known concentrations, 2 glycerol solutions of unknown concentrations, 1 blood plasma preparation.

Measurement results:

Check the calibration of the instrument with distilled water: $n_{dist.\ water\ theoretical}=1{,}333$.

$n_{dist.\ water\ measured}$ =…….. *=> it is .....*

* The parts to be corrected should be **repeated on a new sheet** that is attached to this one upon resubmission.

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Table of measurement results:

solution		*measured refractive index values*			*average refr. index*
		1st reading	*2nd reading*	*3rd reading*	
distilled water					
glycerol	*c= ..... mol/L*				
	c= ..... mol/L				
	c= ..... mol/L				
	c= ..... mol/L				
	c= ..... mol/L				
	$c_{x.....}$				
	$c_{x.....}$				
blood plasma					

Lab teacher's signature proving lab work :…….....

Evaluation and final results:

1. *The calibration linear was prepared using the average refractive indices of the glycerol solutions of known concentrations and that of distilled water.* ***(Graph 1 is attached)****.*
   The parameters of the calibration linear determined by linear regression (with Excel):

   slope: a=……. L/mol *y-axis intercept: b=…….*

2. *The concentrations of unknown glycerol solutions as read out from the graph (see lines aiding the reading in Graph. 1):*

   $c_{x.....}$*= ……..mol/L* $c_{x.....}$*= ……..mol/L*

   The same concetrations are also determined by calculation using the equation $c_x = \frac{n_{x.} - b}{a}$ *where* n_x *is the refractive index measured for the solution* c_x*.*

   Calculation:

   $c_{x.....} = \frac{.....-.....}{.....} =$ *..... mol/L, as well as:*

   .....

   $c_{x.....} = \frac{.....-.....}{.....} =$ *..... mol/L.*

   .....

3. *The protein concentration of blood plasma as per the calibration curve in fig. 14 of the lab manual:*

   c_{plasma}*=……. …….*