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

Lab report from the practical lesson on biochemistry

Topic: Selected examination of kidney and CSF

Task 1: Estimation of creatinine in serum and urine

Principle:

Results:

	Serum sample (Tube No 1)	Urine sample (Tube No 2)	Standard (Tube No 3)	Blank (Tube No 4)
A500 nm – 1st read				
A500 nm – 2nd read				
ΔA = 1st read – 2nd read				
Blank ΔA subtracted:				0

Calculations:

Concentration of creatinine in serum (S-Creatinine):

$$\text{S-Creatinine (µmol/l)} = \frac{\Delta A_{serum}}{\Delta A_{standard}} \times c_{standard}\ (\mu mol/l)$$

$$\text{S-Creatinine (µmol/l)} = \frac{\ldots\ldots}{\ldots\ldots} \times \ldots\ldots = \ldots\ldots$$

Concentration of creatinine in the urine (U-Creatinine):

$$\text{U-Creatinine (mmol/l)} = \frac{\Delta A_{urine}}{\Delta A_{standard}} \times c_{standard}\ (mmol/l) \times \text{Dilution of urine}$$

$$\text{U-Creatinine (mmol/l)} = \frac{\text{.....}}{\text{.....}} \times \text{.....} \times \text{.....} = \text{.....}$$

Daily output of creatinine into urine (dU-Creatinine):

dU-Creatinine (mmol/24 hrs) = U-Creatinine (mmol/l) × Volume of urine (liters/24 hrs)

dU-Creatinine (mmol/24 hrs) = …….. × …….. = …….

Task 2: Calculation of clearance of endogenous creatinine

Principle:

Clearance of endogenous creatinine (Cl_{Cr}):

U Concentration of creatinine in urine (mmol/l): …..……..

P Concentration of creatinine in serum (mmol/l): ……..

V Volume of urine per 24 hours (ml/s): ……..

$$Cl_{Cr}\ (\text{ml/s}) = \frac{U \times V}{P}$$

$$Cl_{Cr}\ (\text{ml/s}) = \frac{\text{..... } \times \text{ .....}}{\text{.....}} = \text{.....}$$

Clearance of endogenous creatinine corrected to body surface:

m Weight of patient in kg: .....

l Height of patient in m: .....

$$A = 0.167 \times \sqrt{m \times l}$$

$$A = 0.167 \times \sqrt{\text{..... } \times \text{.....}} = \text{.....}$$

$$Cl_{Cr}\ \text{corr. (ml/s)} = Cl_{Cr} \times \frac{1.73}{A\ (m^2)}$$

$$Cl_{Cr}\ \text{corr. (ml/s)} = \text{.....} \times \frac{1.73}{\text{.....}} = \text{.....}$$

Calculation of creatinine clearance from serum creatinine using the Cockroft & Gault formula:

Gender of the patient: .....

Age of the patient: .....

$$Cl_{Cr}\ \text{(ml/s)} = \text{.....} \times \frac{(140 - \text{.....}) \times \text{.....}}{44.5 \times \text{.....}} = \text{.....}$$

Calculation of fractional excretion and tubular reabsorption of water:

a) Fractional excretion (FE) of water:

$$FE_{H2O} = \frac{P_{creatinine}}{U_{creatinine}}$$

$$FE_{H2O} = \frac{\text{.....}}{\text{.....}} = \text{.....}$$

b) Tubular reabsorption (TR) of water:

$$TR_{H2O} = \frac{Cl_{Cr} - V}{Cl_{Cr}}$$

$$TR_{H2O} = \frac{\text{..... } - \text{.....}}{\text{.....}} = \text{.....}$$

Conclusion to Task 1 and 2:

Do any of these parameters indicate impaired renal functions?
Is there a discrepancy between measured and calculated clearance that would suggest an inadequate collection of urine?

Task 3: Estimation of uric acid in serum and urine

Principle:

Results:

	Serum sample (Tube No. 1)	Urine sample (Tube No. 2)	Standard (Tube No. 3)
Absorbance 550 nm			

Calculations:

Uric acid in serum (S-Uric acid):

$$\text{S-Uric acid (µmol/l)} = \frac{A_{serum}}{A_{standard}} \times c_{standard}\ (\mu mol/l)$$

$$\text{S-Uric acid (µmol/l)} = \frac{\ldots\ldots}{\ldots\ldots} \times \ldots\ldots = \ldots\ldots$$

Uric acid in the urine (U-Uric acid):

$$\text{U-Uric acid (mmol/l)} = \frac{A_{urine}}{A_{standard}} \times c_{standard}\ (mmol/l) \times \text{Dilution of urine}$$

$$\text{U-Uric acid (mmol/l)} = \frac{\ldots\ldots}{\ldots\ldots} \times \ldots\ldots \times \ldots\ldots = \ldots\ldots$$

Daily output of uric acid into urine (dU-Uric acid):

dU-Uric acid (mmol/24 hrs) = U-Uric acid (mmol/l) × Volume of urine (liters/24 hrs)

dU-Uric acid (mmol/24 hrs) = …….. × …….. = …….

Clearance of uric acid (Cl_{UA}):

U_{UA} Concentration of uric acid in urine (mmol/l): .....

P_{UA} Concentration of uric acid in serum (**mmol/l**): .....

V Volume of urine per 24 hours (ml/s): .....

$$Cl_{UA}\ (ml/s) = \frac{U_{UA} \times V}{P_{UA}}$$

$$Cl_{UA}\ (ml/s) = \frac{..... \times .....}{.....} = ...$$

Fractional excretion of uric acid:
(Use also data from Task 2)

U_{Cr} Concentration of creatinine in urine (mmol/l): .....

P_{Cr} Concentration of creatinine in serum (mmol/l): .....

U_{UA} Concentration of uric acid in urine (mmol/l): .....

P_{UA} Concentration of uric acid in serum (mmol/l): .....

$$FE_{UA} = \frac{U_{UA} \times P_{Cr}}{U_{Cr} \times P_{UA}}$$

$$FE_{UA} = \frac{..... \times .....}{..... \times .....} = ...$$

Conclusion:

Task 4: Quantitative estimation of protein in urine and CSF

Principle:

Results:

	Urine sample (Tube No. 1)	CSF sample (Tube No. 2)	Standard (Tube No. 3)
A 600 nm			

Calculations:

Concentration of protein in urine (U-Protein):

$$\text{U-Protein (g/l)} = \frac{A_{Urine}}{A_{Standard}} \times c_{Standard}\ (g/l)$$

U-Protein (g/l) = ———————— × …… = ……..

Daily loss of protein into urine (dU-protein):

dU-Protein (g/24 hrs) = U-Protein (g/l) × Volume of urine (liters/24 hrs)

Concentration of protein in cerebrospinal fluid (Sp-Protein):

$$\text{Sp-Protein (g/l)} = \frac{A_{CSF}}{A_{Standard}} \times c_{Standard}\ (g/l)$$

Sp-Protein (g/l) = ———————— × …… = ……..

Conclusion:

Task 5: Evaluation of electrophoresis of urinary proteins

Evaluate three electrophoreograms. Draw the positions of the observed protein fractions and try to determine what type of proteinuria is present.

Electrophoreogram 1 Electrophoreogram 2 Electrophoreogram 3

Type of proteinuria: Type of proteinuria: Type of proteinuria:

Task 6: Evaluation of isoelectrophoreograms of CSF and serum

Electrophoreogram 1 **Electrophoreogram 2**

Serum *CSF* *Serum* *CSF*

Type: …….. ……..

Possible condition: …….. ……..

Task 7: Potentiometric estimation of Na^+ in urine

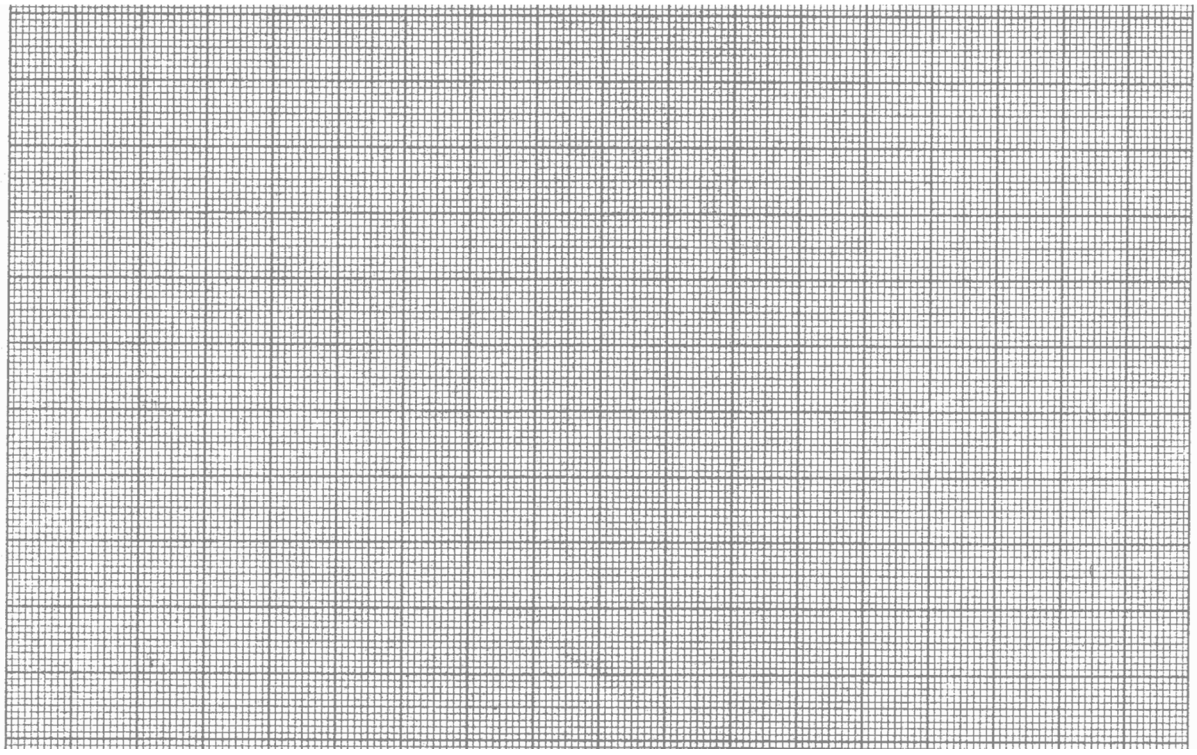
Principle:

Results:

	E (mV)	pNa	Concentration Na^+ (mol/l)
Standard solution 1		1	0.1
Standard solution 2		2	0.01
Standard solution 3		3	0.001
Urine sample			

Calibration curve for estimation of Na^+ concentration:

Plot the pNa values on the x axis and the potential in mV on the y axis. Next, use the calibration graph to read the pNa for the analyzed urine sample.



Calculation of urinary Na^+ concentration (U-Na^+):

$pNa = -\log[Na^+]$

$pNa_{diluted\ urine}$ = ... $[Na^+]_{diluted\ urine} = 10^{-pNa}$ = ... mol/l

$U\text{-}Na^+ = 10 \times [Na^+]_{diluted\ urine}$ = ... mol/l

Daily output of Na^+ into urine (dU- Na^+):

dU- Na^+ = U-Na^+ (mol/l) × Vol. urine (liters/24 hrs)

dU- Na^+ = ... × ..... = ... mol/24 hrs

Fractional excretion (FE) of Na^+:
(Use also data from Task 2)

U_{Cr} Concentration of creatinine in urine (mmol/l): .....

P_{Cr} Concentration of creatinine in serum (mmol/l): .....

U_{Na} Concentration of sodium in urine (mmol/l): .....

P_{Na} Concentration of sodium in serum (mmol/l): .....

$$FE_{Na} = \frac{U_{Na} \times P_{Cr}}{U_{Cr} \times P_{Na}}$$

$$FE_{Na} = \frac{..... \times .....}{..... \times .....} = ...$$

Tubular resorption (TR) of Na^+:

$TR_{Na} = 1 - FE_{Na}$ = ...

Conclusion: