

Student Number.....

West Midlands Training Course in Clinical Biochemistry

Course Assessment – Spring 2010

Short Answer Questions. Answer all questions.
Time allowed 1 hour.

1. A screening test for a disease has a diagnostic sensitivity of 99% and a diagnostic specificity of 95%. Calculate the positive predictive value of the test, and the population prevalence of the disease, given that testing of a randomly selected sample of 100,000 subjects gave 10 false negative results. **(5 marks each)**

Positive predictive value

Population prevalence of disease

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2. Assuming the salt XCl_2 is completely dissociated in water and a 19g/L solution of the salt gives an osmolality of 600 mmol/kg calculate the molecular weight of XCl_2 **(10 marks)**

Molecular weight of XCl_2

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3. A plasma sample contains 140 mmol/L of sodium and 95% water by volume. Ignoring sodium binding by plasma proteins, calculate the apparent plasma sodium concentration determined from measurements with an electrode system that responds to water sodium a) in undiluted plasma b) in plasma diluted 1 in 20 with water. **(5 marks each)**

Water sodium concentration in undiluted plasma

mmol/L

Water sodium concentration in diluted plasma

mmol/L

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4. Define the term isoenzyme and briefly describe a single example of the application of an isoenzyme measurement in clinical practice.
(5 marks each)

5. A subject was infused with a drug at the rate of $100 \mu\text{mol}/\text{min}$ until a steady state plasma concentration of $200 \mu\text{mol}/\text{L}$ was reached. What is the clearance of the drug? **(10 marks)**

Clearance

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6. A 19 year-old male was admitted to hospital via A&E from an army camp where he had been undertaking basic training that included strenuous physical exercise. The previous day he had undertaken a 30 mile hike on Bodmin Moor. He was unwell, had generalized muscle pain, complained of feeling weak and was passing brown urine. The urine tested positive for blood (4+) by urine dipstick, but urine microscopy was negative for haematuria. The note from the camp medical officer indicated that the patient had no previous medical history of note and was not taking any medication. His serum biochemistry results were:

Sodium	140 mmol/L
Potassium	5.2 mmol/L
Urea	6.0 mmol/L
Creatinine	110 μ mol/L
Phosphate	1.40 mmol/L
Adj Calcium	2.29 mmol/L
CK	58,800 U/L

a) Comment on the results **(2 marks)**

b) What condition is the patient likely to have? **(2 marks)**

c) What is the cause of the brown discolouration in the urine? **(2 marks)**

d) Why is it important to monitor the biochemistry over the next 24 hours? **(2 marks)**

e) Name two other enzymes that you may expect to be elevated **(2 marks)**

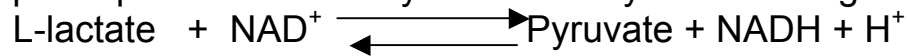
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7. a) Briefly describe what is meant by the term 'secondary hypertension'
(3 marks)

b) Give seven endocrine causes of secondary hypertension (**7 marks**)

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8. Plasma lactate concentration is usually measured by a spectrophotometric assay described by the following formula:



The formation of NADH is monitored, and this is usually configured as an 'end point' assay.

- a) At what wavelength is the reaction monitored, and why?
(2 marks)
- b) Which direction must the equilibrium lie in if the assay is to measure lactate concentration?
(1 mark)
- c) State three ways in which the reaction conditions could be adjusted so that the reaction is optimised to ensure that this is the case.
(3 marks)
- d) What two factors could you change to enable the reaction to proceed more rapidly?
(2 marks)
- e) What would constitute a reagent blank and why is blanking necessary?
(2 marks)

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9. One serum and one urine sample collected from a patient for the measurement of creatinine clearance were each assayed 10 times with the following results:-

Urine Creatinine mmol/L	Serum Creatinine μ mol/L
11.1	102
11.5	108
11.9	107
10.9	112
12.1	103
11.2	105
11.8	109
11.7	114
11.6	110
12.1	100

The urine was a 24 hour collection and had a volume of 1250 mL.
What is the analytical imprecision in the creatinine clearance determination? **(10 marks)**

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Analytical Imprecision

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10. A 70 kg lady is given an oral dose of carbamazepine of 400 mg. What is the plasma carbamazepine concentration 24 hours later assuming a volume of distribution of 1.0 L/kg, a clearance of 0.05 L/h/kg, salt factor of 1 and bioavailability of 0.75? **(10 marks)**

Concentration 24 hr post dose