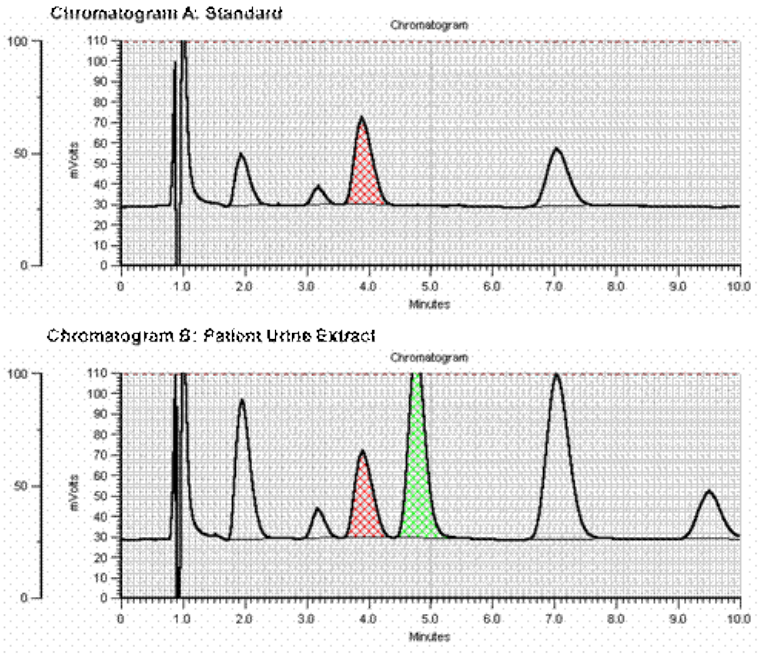
West Midlands Training Course in Clinical Biochemistry

Course Assessment – JULY 2003

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

1. You are given below copies of HPLC chromatograms of a catecholamine standard solution and extract of a urine from a patient with phaeochromocytoma. The standard concentrations and retention times are given in the Table. The method uses an internal standard (DHBA) to correct for losses incurred during the extraction. If the patient had a urinary output of 2400 mL in 24 hours, calculate the 24 hour outputs of noradrenaline, adrenaline and dopamine in this case.



Standard	Retention Time (Mins)	Standard Concentration (nmol/L)
Noradrenaline	1.9	500
Adrenaline	3.2	150
DHBA	3.9	*(INTERNAL STANDARD)*
Dopamine	7.1	1500

2. The following set of data are presented to you as the duty biochemist with a request to add a CK-MB analysis to the latest specimen. The patient is a 74 year old male admitted 7 days ago with chest pain. You contact the locum SHO on the ward who is only able to tell you that the patient he believes has had a previous myocardial infarction a number of years ago and has been on lipid lowering drugs since. You are told that there is no evidence of any trauma and that they need the CK-MB measurement to exclude myocardial infarction. The reference range for CK-MB by an immuno-inhibition method is less than 6% of the total CK activity. **Briefly** indicate what you would say regarding the validity of the request and indicate appropriate further biochemical investigations.

Date		**14.06.03**	**17.06.03**	**19.06.03**	**20.06.03**	**21.06.03**
Sodium	mmol/L	138	138	139	140	139
Potassium	mmol/L	4.4	5.1	4.9	4.9	4.8
Urea	mmol/L	13.4	18.5	21.6	21.0	17.9
Creatinine	µmol/L	399	535	572	523	489
AST	U/L	91		410	531	541
CK	U/L	2510	5727	12248		15827
CK-MB	%	2.6	3.5			

CRP			60		50	39
Bilirubin	µmol/L			10	9	
Alkaline Phosphatase	U/L			116	115	

3. To 2.0 mL of a glucose solution, is added 1.0 mL of a solution containing excess ATP, $NADP^+$, $MgCl_2$, hexokinase and glucose-6-phosphate dehydrogenase. The change of absorbance of the final solution (in a 1 cm cuvette) relative to the blank reading was 0.91 at 340 nm. The molar absorptivity of NADPH is 6.22×10^3. What is the concentration of glucose in the final solution.

4. A screening test for a lethal, but easily curable, disease with a population prevalence of 0.002 has a diagnostic sensitivity of 95% and specificity of 99%. Calculate the negative and positive predictive values and diagnostic efficiency of the test for a population of 1 million. The cost of this test is £1.00 per patient and the cost of the confirmatory test is £10.00 per patient. What would be the impact on total cost of provision of screening and confirmatory testing if a new screening test is adopted which has a sensitivity of 99% and specificity of 97%, but costs £2.00 per test.

5. Calculate the approximate plasma osmolality of a patient with normal plasma chemistry except for a plasma glucose of 15 mmol/L and a plasma urea of 25 mmol/L.

6. What is the ratio of the hydrogen ion concentration of a solution of pH 6.5 to that of a solution of pH 7.5?

7. If an isotope has a half life of 60 days how many weeks must pass for it's activity to drop to 1% of the initial activity?

8. Match the following with the appropriate definitions: -

a. Polyclonal
b. Hapten
c. Antigen
d. Immunogen
e. Antibody
f. Affinity
g. Avidity

i. A measure of binding strength for total antigen-antibody binding sites.
ii. Causes formation of antibodies in a host
iii. Product of many plasma cell lines
iv. A measure of single site binding strength
v. A small molecule requiring conjugation to a larger molecule to produce antibodies
vi. Any molecule capable of binding to an antibody
vii. An immunoglobulin capable of binding a specific molecule.

9. A) The following analytical results were obtained on the same QC sample: -

110, 90, 106, 113, 88,92,114, 90, 113, 91, 93 mmol/L

Calculate: -

a. The mean
b. The median
c. The mode

B) Which of these 3 measures of central tendency of a distribution is most affected by outliers?

10. **A)** Which of the following vitamins is **least** likely to be affected by long periods of fat malabsorption?

a. Vitamin A
b. Vitamin C
c. Vitamin D
d. Vitamin E
e. Vitamin K

B) Which of the following vitamin deficiencies would result in lower activity of aspartate aminotransferase (AST) if the vitamin is not added to the enzyme assay in vitro ?

a. Niacin
b. Riboflavin
c. Thiamin
d. Pyridoxin

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C) What is the functional relationship between vitamin A and ß-carotene?

a. Vitamin A is metabolized to ß-carotene for excretion
b. ß-carotene is the principal provitamin of vitamin A

c. ß-carotene potentiates absorption of Vitamin A
d. vitamin A circulates complexed with ß-carotene.

D) Which measure of ascorbic acid reflects availability of the vitamin for storage?

a. Plasma ascorbate.
b. Leukocyte ascorbate.
c. Erythrocyte ascorbate.
d. Platelet ascorbate.