

# West Midlands Training Course in Clinical Biochemistry

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## Course Assessment – Spring 2000

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

1. Define the following terms: -
  - a. Pharmacokinetics
  - b. Pharmacodynamics
  - c. Pharmacogenetics
  - d. Pharmacogenomics
2. List the characteristics of an ideal tumour marker.
3. A lipophilic drug distributes itself into both the plasma and cellular compartments in blood. Comparison of whole blood to plasma concentrations gave: -

*Whole blood concentration = 3 x plasma drug concentration*

If it is assumed that the haematocrit is 40% and that the drug only distributes between erythrocytes and plasma, what would be the relative concentration of drug in plasma versus cells.
4. Plasma methotrexate measured 8 and 24 hours post infusion were 112 and 70  $\mu\text{mol/L}$  respectively. What is the half life during the first 24 hours. Assuming a terminal half life of 12 hours, estimate how much longer it will take for the methotrexate to fall below 0.01  $\mu\text{mol/L}$ ?
5. In a population of 20,000 men to be screened for prostate disease, using single PSA measurements, there is a known prevalence of prostate cancer of 3%. The diagnostic sensitivity and specificity of a PSA value exceeding 4 $\mu\text{g/L}$  for the presence of the cancer is 67% and 97% respectively. Derive some figures from these data that may help persuade your local urologist that using PSA measurements in this way may adversely affect the size and usefulness of his outpatient clinics.
6. What is the molarity of a concentrated solution of a mineral acid (molecular weight = 98) which has a minimum assay of 88% and a specific gravity of 1.75.
7. Starting with tyrosine, write down the major pathway for catecholamine biosynthesis

in the adrenal medulla. Give the names of the main enzymes of the pathway and indicate the rate-limiting step in the pathway.

8. An HPLC assay of an extract of a catecholamine standard mixture and an extract of an identical volume of a 24 hour urine collection, each containing an equivalent mass of DHBA as internal standard, gave the following detector responses: -

Peak Height Units

Standard

Noradrenaline ( 300nmol/L) 60

Adrenaline (50 nmol/L) 25

DHBA 100

Dopamine (1500 nmol/L) 150

Urine

Noradrenaline 55

Adrenaline 33

DHBA 110

Dopamine 77

Given that the volume of the urine collection was 1500 mL, calculate the patient's 24h urinary output of noradrenaline, adrenaline and dopamine.

9. Calculate the osmolarity of a 10% mannitol solution in 0.9% saline. Mannitol has a molecular weight of 182 and sodium chloride 58.5.

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10. You are contacted for advice on further biochemical investigations of a 23-year-old patient with intermittent hypertension associated with a tachycardia and other symptoms consistent with a phaeochromocytoma. The physician tells you that the patient has been investigated in another hospital in the past. The notes from those admissions revealed normal urinary output of HMMA (VMA) and phaeochromocytoma had therefore been excluded by the previous investigators. The physician is not convinced that this is the correct conclusion. Briefly indicate how you would advise him to proceed.