



UNIVERSITY OF
BIRMINGHAM

STUDENT BOOKLET

ID No: _____

College of Medical and Dental Sciences

MSc in Clinical Biochemistry

Course Code 5602

Module 2

Friday 2nd July 2010

Room WF15, Medical School

University of Birmingham

Enter your student ID number in the space provided on this answer booklet.

For the Essay Questions please answer ONE question for each module in the answer booklets provided. One answer per booklet.

For the Short Answer Questions please answer all questions using this booklet. Please write final answers to calculations in the boxes provided below the question.

Time Allowed: 1 hour 15 minutes (1530 – 1645). Allow 45 minutes for the essay question and 30 minutes for the short answer questions.

For examiners use only

	Module 2		
Question	Mark 1	Mark 2	Final
1			
2			
3			
4			
5			

Essay Questions

Module 2

1. A 51 year old woman arrives in AE with a grand mal fit. Her capillary blood glucose using a glucose meter is 1.5 mmol/L. Venous blood samples are collected into fluoride oxalate, lithium heparin and serum gel tubes following which she is resuscitated with intravenous glucose. The patient does not have diabetes mellitus. The laboratory plasma glucose is 1.9 mmol/L. Describe the laboratory investigations you would perform on the available blood specimens collected during hypoglycaemia to elucidate the cause of her hypoglycaemia.

OR

2. Discuss the methods used for the measurement of HDL cholesterol. What are the advantages and disadvantages of each method?

Short Answer Questions

Module 2

1. Match the following venous plasma glucose results with the correct interpretation **2 marks each**

Results

- A. Random glucose result of 10.9 mmol/L in a patient with polydipsia.
- B. Oral glucose tolerance test results in a non pregnant 33 year old obese woman of :
0 min 6.9 mmol/L
120 min 10.8 mmol/L
- C. Two fasting glucose results of 8.3mmol/L and 7.7 mmol/L in an asymptomatic patient.
- D. Fasting glucose result of 4.5 mmol/L in a patient without any significant history of disease
- E. Oral glucose tolerance test results in a 26 year old man of:
0 min 6.1 mmol/L
120 min 6.9 mmol/L

Interpretation

- F. Diabetes
G. Impaired Glucose Tolerance
H. Normoglycaemia
I. Suggest sent repeat fasting Glucose
J. Impaired Fasting Glycaemia

A = I
B = G
C = F
D = H
E = J

2. A 79 year old man, with known type 2 Diabetes Mellitus for 10years, is admitted in a semi-comatosed state.

Investigations showed:

Plasma

Glucose	55 mmol/L	
Na ⁺	146 mmol/L	(135-145)
K ⁺	5.1 mmol/L	(3.5 – 5.0)
Urea	17.4 mmol/L	(1.0-7.0)
Creatinine	205 µmol/L	(60-120)

Arterial Blood Gases

H ⁺	44 nmol/L	(36-44)
pO ₂	10.0 kPa	(12-15)
pCO ₂	4.1 kPa	(4 – 6)
HCO ₃ ⁻	24 mmol/L	(22-25)

What is the diagnosis?

2 marks

Hyperosmolar non-ketotic coma (HONK)

What is the serum osmolality?

2 marks

Osmolality = 2(Na⁺ + K⁺) + urea + glucose
= 375 mmol/kg

Why does he not have a metabolic acidosis?

3 marks

Relative insulin deficiency causes hyperglycaemia but enough insulin to suppress lipolysis and ketosis (No acidosis)

Outline the mechanism for the elevated urea and creatinine **3 marks**

Osmotic diuresis -> dehydration-> hypovolaemia -> Reduced GFR -> prerenal uraemia

3. A 65 year old man presents with back pain and a serum total protein concentration of 96g/L. The initial report to the ward states that the electrophoresis of the specimen revealed a monoclonal band which is to be further characterized. There is no Bence Jones protein in the urine. List five factors that would help the SHO in distinguishing between a benign and malignant paraproteinaemia. **2 marks each**

For MGUS

M protein in serum <30 g/L
Bone marrow clonal plasma cells <10%
No myeloma related organ or tissue impairment or symptoms

Clinical effects due to myeloma

Increased Calcium levels - corrected ca >0.25 mmol/L above ULN or >2.75mmol/L
Renal insufficiency attributable to myeloma
Anaemia - Hb 2g/dl below the lower limit of normal or Hb < 10g/dl
Bone lesions
Other – symptomatic hyperviscosity, amyloidosis, recurrent bacterial infection (>2 episodes in 12 months)

Accept

Raised β_2 microglobulin
Raised serum free light chains
Bence Jones Proteinuria

4. The following analytical results were obtained on the same QC sample for total protein
110; 90; 106; 113; 88; 92; 114; 90; 113; 91; 93 g/L
Determine the mean, median, variance, standard deviation and coefficient of variation. **2 marks each**

Mean = $\text{sum}/n = 1100/11 = 100 \text{ g/L}$
Median = Middle number = 93 g/L
Variance = $\text{sum } (x-\text{mean})^2 / n-1 = 120.8$
SD = square route of variance = 10.99
%CV = $(\text{SD}/\text{mean}) * 100 = 10.99\%$

5. 0.1 mL of serum is mixed with 3.0 mL of a reagent which forms a coloured product with glucose. After the reaction has reached equilibrium the absorbance (versus a reagent blank) in a 1cm cuvette was found to be 0.75. If the absorptivity of the chromogen is $933 \text{ L}\cdot\text{mol}^{-1}\cdot\text{cm}^{-1}$ what is the serum glucose concentration expressed as mmol/L? **10 marks**

$$A = ECl$$

A = absorbance

C = concentration moles/L

L = pathlength in cm

E = absorptivity of chromogen $\text{L}\cdot\text{mol}^{-1}\cdot\text{cm}^{-1}$

$$A/El = C$$

$$0.75/(933 \times 1) = 8.04 \times 10^{-4} \text{ Mol/L} = 0.804 \text{ mmol/L}$$

This is the concentration of glucose in the solution being measured

$$\text{Concentration in serum} = 0.804 \times 3.1/0.1 = 24.9 \text{ mmol/L}$$