



Higher Specialist Diploma

Clinical Chemistry

Examination – September 2023

Short-answer questions

60 minutes

Attempt all four questions

Instructions to candidates

1. Record your candidate number and HSD discipline on the front sheet of the answer booklet
2. Record your candidate number, the question number and the page number in the spaces provided on the answer sheets
3. Begin each new answer on a new page
4. Each question is worth 25 marks

1. You are required to put together a tutorial on therapeutic drug monitoring. Provide a brief description of the key learning outcomes and terminology you consider important to include in a tutorial on pharmacokinetics and therapeutic drug monitoring.

2. You are introducing a new Tumour Marker immunoassay kit on your analyser. What are the steps you need to follow before this new method can be implemented?

3. A trainee comes to you regarding hormone pathways and the negative feedback loop. You decide to provide a tutorial on this topic.
 - a. Provide a brief description of how negative feedback systems work. (5 marks)
 - b. Provide an example of this homeostatic regulation and any disease states, resulting from its dysregulation. (10 marks)
 - c. Provide a brief overview of the role of the biochemistry laboratory in the diagnosis and treatment of the resulting disease(s). (10 marks)

4. Due to a period of extend staff absence you are temporarily in charge of a section which has received a poor EQA return. Describe the processes you would follow.



Higher Specialist Diploma

Clinical Chemistry

Examination – September 2023

Essay Paper

120 minutes

Attempt 2 out of 5 questions

Instructions to candidates

1. Record your candidate number and HSD discipline on the front sheet of the answer booklet
2. Record your candidate number, the question number and the page number in the spaces provided on the answer sheets
3. Begin each new answer on a new page
4. Each question is worth 100 marks

1. Critically discuss the role of CSF xanthochromia in the diagnosis of Sub-Arachnoid Haemorrhage.
2. Critically discuss the different types of pre-analytical variables and their impact on biochemistry result interpretation and reporting.
3. Using named examples, critically discuss the pathophysiology and the role of the clinical biochemistry laboratory in the detection and monitoring of inborn errors of metabolism.
4. Critically discuss the role of the biochemistry laboratory in the screening, diagnosis and treatment of cardio-vascular disease.
5. Critically evaluate the use of community POCT and its role in clinical biochemistry diagnostics.



Higher Specialist Diploma

Clinical Chemistry

Examination - September 2023

Case Study Paper

1. Record your candidate number and HSD discipline on the front sheet of the answer booklet
2. Record your candidate number, the question number and the page number in the spaces provided on the answer sheets
3. Begin each new case study on a new page
4. Each question is worth 100 marks
5. For these case study questions you are strongly advised to answer the questions as they arise during the case study to avoid later information impacting adversely on your answers to the earlier questions by presuming an “outcome”

SEEN CASE STUDY

1. A 24 year old woman presented with vague symptoms of tiredness and feelings of dizziness on standing up. The following results were obtained:

Analyte	Result	Reference	Units
Sodium	127	133 – 146	mmol/L
Potassium	5.2	3.5 – 5.3	mmol/L
Urea	7.3	2.5 – 6.4	mmol/L
Creatinine	74	55 – 95	µmol/L
Glucose	2.7		mmol/L

- a. Discuss these results (10 marks)

An 'add on test' gave the following result

Analyte	Result	Reference	Units
Cortisol	172	170 – 540 (9 am)	nmol/L

- b. What role does cortisol play and how is it controlled? (20 marks)

This was followed by a synacthen test which gave the following cortisol results

Time	Result	Units
09:00	145	nmol/L
09:35	226	nmol/L
09:55	284	nmol/L

- c. Discuss these results. (15 marks)
- d. Suggest a further test that could be performed stating your reasons and outline any precautions in collecting the sample. (20 marks)
- e. Describe and critically evaluate the synacthen test. (15 marks)
- f. What advances have been made in Cortisol measurement and how will this benefit both the laboratory and the patient? (20 marks)

UNSEEN CASES

2.

A 22 year old man presents to his GO with 'erection difficulties'. The following results were obtained from a sample collected at the afternoon clinic:

Albumin	34	g/L	34 – 50
Bilirubin	6	µmol/L	<17
Alkaline phosphatase	71	U/L	35-130
Alanine aminotransferase	54	U/L	<40
Total Protein	70	g/L	60-80
Testosterone	2.1	nmol/L	8.6-29
FSH	1.1	U/L	1.4-14
LH	2.1	U/L	1.8-8.2

- a. Comment on these results and state what additional tests would you perform and why? (10 marks)
- b. What might you suspect as a reason for this finding as the patient was known to spend at least an hour a day in the gym? (5 marks)

A further sample is received a week later taken at 8:30am:

Testosterone	2.5	nmol/L	8.6 - 29
SHBG	10	nmol/L	15-48
CFT	0.076	nmol/L	0.2-0.6
Prolactin	7013	mU/L	<277
TSH	1.7	mU/L	0.35 - 3.5
fT4	14.1	pmol/l	7.8 - 17
FSH	1.1	U/L	1.4 - 14
LH	2.1	U/L	1.8 - 8.2

- c. Discuss the results and explain why you would perform one additional assay before issuing one of the results. (10 marks)
- d. Also suggest any additional tests that could be performed or suggested to the GP or future analysis, giving your reasons. (10 marks)
- e. What do the letters SHBG and CFT mean in this context? (5 marks)
- f. What is the physiological role of SHBG and why might the CFT be a more appropriate measure than testosterone? (10 marks)

g. Why is important to state the time of sample collection for hormones such as testosterone? (10 marks)

h. Increased prolactin is a relatively common finding, state the reasons for an increased level and describe the control of its secretion in the adult human. (40 marks)

3.

A 19 year old female presented to her GP complaining of vague symptoms, wondering if she had caught 'something' whilst on holiday. A blood sample was sent for LFT analysis giving the following results:

Albumin	49	g/L	34 – 50
Bilirubin	9	µmol/L	< 17
Alkaline phosphatase	67	U/L	35-130
Alanine transaminase	17	U/L	<40
Total Protein	72	g/L	60-80
Gamma GT	13	U/L	<42

a. Comment on the results. (5 marks)

b. Discuss the use of gamma GT as a marker of liver damage. (15 marks)

Seven years later she visited her GP complaining of leg pain.

C reactive protein	22	mg/L	< 5
Albumin	44	g/L	34 – 50
Bilirubin	19	µmol/L	< 17
Alkaline phosphatase	91	U/L	35-130
Alanine transaminase	129	U/L	<40
Total protein	78	g/L	60-80
Glucose	4.3	mmol/L	
Sodium	137	mmol/L	133-146
Potassium	5.5	mmol/L	3.5 - 5.3
Chloride	99	mmol/L	95-108
Bicarbonate	28	mmol/L	22 - 29
Creatinine	140	µmol/L	55 - 95

c. Comment on the results. (10 marks)

d. Calculate the anion gap, showing your working. (10 marks)

Three years later further samples were received, with the clinical details 'drug and alcohol dependency':

Sodium	126	mmol/L	133-146
Potassium	4.1	mmol/L	3.5 - 5.3
Urea	3.1	mmol/L	2.5 - 6.4
Creatinine	69	µmol/L	55 – 95
Albumin	32	g/L	34 – 50
Bilirubin	72	µmol/L	< 17
Alkaline phosphatase	110	U/L	35-130
Alanine transaminase	70	U/L	<40
Total protein	69	g/L	60-80
GGT	92	U/L	<42

- e. Comment on the above results (10 marks)
- f. Suggest any further analyses that could be performed giving your reasons. (15 marks)

A month later she presented to the emergency department with abdominal pain, nausea, and vomiting.

Her Lipase was 680 U/L (reference range, 13–60 U/L) and triglycerides were 25 mmol/L (reference range <2.3 mmol/L).

- g. What do these results suggest? (10 marks)
- h. Describe the methodology involved in Amylase/Lipase measurement. What analytical variations can impact on the results? (15 marks)
- i. What are the benefits of using Lipase measurement over Amylase measurement? (10 marks)