

DONE

MIDNIGHT
genetic

Metabolic - ~~Stomach~~
Intestine
Idiopathic
Degenerative
Neoplasm - Insulinoma
Endocrine -
Drug induced - Quinine

UNIVERSITY OF NAIROBI
CLINICAL CHEMISTRY UNIT
MBCHB IV END OF ROTATION CAT
DATE: 14/07/16 TIME: 2.00 pm- 3.00 pm

INSTRUCTIONS
ATTEMPT ALL QUESTIONS
ANSWER EACH QUESTION ON A SEPARATE SHEET OF PAPER

1. Discuss hypoglycemia under the following headings:-
 - a) Causes (4 marks) *Insulinoma, Adrenal insufficiency*
 - b) Clinical features (2 marks) *Shaking, sweating*
 - c) Biochemical investigations (4 marks) *FBS, RBS*

Non Myoglobin
Albumin
Bilirubin
Ca²⁺
Troponin

A 60 year old male presents to A&E with history of acute onset of constrictive chest pain associated with dyspnoea and profuse sweating. *MI / Angina*

- a) List 2 possible differential diagnosis (2 marks)
- b) List the investigations that can be done at the A & E. (2 marks) *ECG*
- c) Describe the diagnostic biochemical tests. (6 marks)

3. Classify hyperlipidaemias. (10 marks)
4. Distinguish between internal and external quality control programs. (10 marks)

hypercholesterolemia

hypercholesterolemia

dysbetalipoproteinemia

TC

- a) *insulin excess* ✓
stress/anxiety
medications - ✓ *metformin*
Excessive alcohol consumption ✓
chronic illness - *hepatic, kidney* ✓
endocrine
Hormone def
 - b) *fx*
→ *neuroglycopenic* - *headache, dizziness, vision*
→ *↓ cerebral perfusion* - *syncope, coma*
→ *Autonomic* -
- A*
- a) *RBS, FBS*
- 1 ✓ *OGTT*
✓ *Blood culture.*
✓ *Urinalysis*

U&E - must know reference range.

HAEMATOLOGY

CASE HISTORY 1

A 42 year old woman presents with a history of increasing lethargy, dizziness and breathlessness. She had brittle hair and nails. She complained of heart palpitation on exercise and reported particularly heavy periods. Biochemical investigations revealed the following:-

Serum iron	-	4umol/l	N = 4-20 μmol/L 4-20 μmol/L
Transferin saturation	-	10%	W = 33%
Ferritin	-	<5ug/L	30 μg/L

What is the diagnosis and what other investigations should have been done first? PBI
↳ IDA

CASE HISTORY 2

A 12 year old Asian girl presented with nausea and vomiting and non localizing neurological signs.

She has been using brightly coloured facial cosmetics obtained locally.

Diagnosis:-

- What biochemical investigations would be appropriate? ✓ Heavy metal poisoning CI

MULTIPLE ORGAN DISORDER (LIPID PROFILE)

CASE HISTORY 3

A 53 year old male was found to have the following results on a fasting sample:-

Total cholesterol	-	8.4mmol/L	6.7 ↑
Triglycerides	-	6.8mmol/L	2.3 ↑
Glucose	-	9.8mmol/L	6.1
Gamma GT	-	138u/L	50-90

A non smoker, his blood pressure was 145/95mmHg and he was obese with central fat distribution.

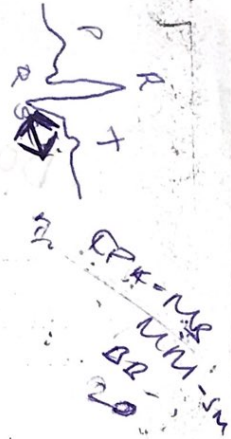
Diagnosis:

- What other information and investigations would be helpful in this man's management?
- What treatment options would you consider in this case.

Rugs
RWS

①

STEM 1



UNIVERSITY OF NAIROBI
CLINICAL CHEMISTRY UNIT

MBCHB IV END OF ROTATION CAT

DATE: 06/10/16 TIME: 2.00 pm - 3.00 pm

INSTRUCTIONS

ATTEMPT ALL QUESTIONS

ANSWER EACH QUESTION ON A SEPARATE SHEET OF PAPER

1. A 60 year old female who is a known diabetic presented to casualty and a lipid profile was requested. Results were as follows:

- Lipids
- Total cholesterol - 11.0 mmol/L (<6.7)
 - Triglycerides - 8.1 mmol/L (<1.7)
 - HDL cholesterol - 0.6 mmol/L (>1.03)
 - LDL cholesterol - 7.9 mmol/L (<5.2)

If TC > 4

ALDL
ATG
TC = A

$(TG + HDL-C)$

- Comment on the results. (2 marks) \uparrow chole \uparrow TG \uparrow LDL - hyperlipidaemia.
- How was the LDL-cholesterol determined? (2 marks) $TC - HDL - C$.
- Outline the role of HDL-cholesterol in 'reverse cholesterol transport'. (3 marks) Collect cholesterol from cells & transport it to liver & thru bile & excreted thru faeces.
- What other biochemical tests would be relevant for this patient? (3 marks)

- glycated HbA1c
- RBS
- Cardiac markers
- RET & LFT
- ECG
- Urinalysis

Compensated metabolic acidosis

2. The following BGA results were obtained from a patient in ICU:

pH	7.26	- 7.35-7.45	\downarrow acidosis.
HCO ₃ ⁻	13 mmol/L	22-28	\downarrow
PCO ₂	31 mmHg (35-45)		\downarrow
Na ⁺	136 mmol/L	135-145	N
K ⁺	4.8 mmol/L	3.5-5.0	N
Cl ⁻	105 mmol/L	98-106	N

met alkalosis
Acid Base map
see abnormality human body's main balance of acids & bases wet causes plasma pH to deviate out of normal range
Cardiac done

What is the acid-base disturbance? (2 marks)

Calculate the anion gap and comment on the result (3 marks)

List the possible causes of the above acid-base disturbance (5 marks)

- Metabolic \rightarrow RTA
- Ureaemia \rightarrow Diarrhoea
- DKA \rightarrow fistula
- Phenazone
- Salicylate
- Adrenal insufficiency
- Chronic kidney disease
- hypoaldosteronism
- Intestinal fluid loss

hyperchloraemic acidosis less than 11 norm
 $(136 + 4.8) - (13 + 105)$
2-16
4-8
Normal anion gap

A 60 year old male presents to A&E with history of acute onset of constrictive chest pain associated with dyspnoea and profuse sweating.

- List 2 possible differential diagnoses (2 marks) Cardiac arrest & MI
- List the investigations that can be done at the A & E. (2 marks) Cardiac markers
- Describe the confirmatory diagnostic biochemical tests. (6 marks)

Fluid & electrolytes done

An old female patient was found to have a plasma sodium level of 126.0 mmol/L. Discuss the possible causes of this finding (10 marks).

High gap MA - MUDPILES

When pulm edema - \downarrow CO₂ & \downarrow O₂

- Methanol Toxic
- Uraemia of RF
- DM
- Paralytic toxic
- Isoniazid
- Lactic acidosis
- Ethylene glycol toxic
- Salicylate toxic

DONE

UNIVERSITY OF NAIROBI
CLINICAL CHEMISTRY UNIT
MARCH IV END OF ROTATION CAT
DATE: 22/09/16 TIME: 2.00 pm - 3.00 pm

INSTRUCTIONS

ATTEMPT ALL QUESTIONS
ANSWER EACH QUESTION ON A SEPARATE SHEET OF PAPER

Do
1/10 marks

1. A 48 year old patient was found to have a plasma potassium level of 7.5 mmol/l

- a) Discuss the possible causes of this finding (8 marks)
- b) List 2 clinical features that can occur due to such potassium levels (2 marks)

Do
2/10 marks

2. A district hospital has introduced a new diagnostic marker for Alzheimer's disease. The hospital laboratory has introduced a method for estimating this marker. Describe the steps you would use to set up its reference interval. (10 marks)

Reference Range

?
3/10 marks

3. Distinguish between internal and external quality control programs. (10 marks)

Cardiac Markers

4/10 marks

4. A 60 year old male presents to A&E with history of acute onset of constrictive chest pain associated with dyspnoea and profuse sweating.

- a) List 2 possible differential diagnosis (2 marks)
- b) List the investigations that can be done at the A & E. (2 marks)
- c) Describe the diagnostic biochemical tests. (6 marks)

Enzymes

Enzymes that changes
the amount of enzyme activity
in the lab for very long time
Concentration of enzymes & time
measuring levels of a newly acq. Reagent
because of a trend down, its used in
troubleshooting.

Ext. qual.

Ext. qual.
- 1st one lab to another lab
- used in regulation
- external data organization
- C-J - to efficiency of research

Chest Pain

(3)

RAS

H31 hess hess

UNIVERSITY OF NAIROBI
CLINICAL CHEMISTRY UNIT
MBCHB IV END OF ROTATION CAT

DATE: 25/08/16 TIME: 2.00 pm - 10.00 am

INSTRUCTIONS

ATTEMPT ALL QUESTIONS
ANSWER EACH QUESTION ON A SEPARATE SHEET OF PAPER

1. The following BGA results were obtained from a patient in ICU.

pH	-	7.83 (7.35-7.45)	Alkalosis	Uncompensated
HCO ₃	-	26 mmol/L (22-28)	✓	
PCO ₂	-	25 mmHg (35-45)	Respiratory	N
PO ₂	-	100 mmHg (90-110)		N

Uncompensated
Respiratory alkalosis

- a) What is the acid-base disturbance? (2 marks)
- b) What is the likely cause? (2 marks) *hypervent & pulm disorder*
- c) Give other conditions that can give rise to this type of disturbance. (6 marks) *chronic liver dx, hyperventilation syndrome, hypoxia, head trauma, brain CVA*

A 48-year old patient was found to have a plasma sodium level of 155.0 mmol/L.

As B Done
chryte

- a) Discuss the possible causes of this finding (8 marks).
- b) List 4 clinical features that can occur due to such sodium levels (2 marks)

repeated

A district hospital has introduced a new diagnostic marker for Alzheimer's disease. The hospital laboratory has introduced a method for estimating this marker. Describe the steps you would use to set up its reference interval. (10 marks)

repeated

A 60 year old male presents to A&E with history of acute onset of constrictive chest pain associated with dyspnoea and profuse sweating.

cc
arteris

- a) List 2 possible differential diagnosis (2 marks) *Myocardial ischaemia, Acute bronchitis*
- b) List the investigations that can be done at the A & E. (2 marks) *ECG, CXR*
- c) Describe the diagnostic biochemical tests. (6 marks)

(10)

Null hypothesis

total 4 2AS

UNIVERSITY OF NAIROBI
CLINICAL CHEMISTRY UNIT
MBCCHB-IV-END-OF-ROTATION-CAT
DATE: 14/07/16 TIME: 2.00 pm - 3.00 pm

INSTRUCTIONS
ATTEMPT ALL QUESTIONS
ANSWER EACH QUESTION ON A SEPARATE SHEET OF PAPER

- 1. Discuss hypoglycemia under the following headings:-
 - a) Causes (4 marks) ← *fast*
 - b) Clinical features (2 marks) ← *reactive*
 - c) Biochemical investigations (4 marks) ← *newly diagnosed diabetes*
- 2. A 60 year old male presents to A&E with history of acute onset of constrictive chest pain associated with dyspnoea and profuse sweating.
 - a) List 2 possible differential diagnosis (2 marks) ← *G&A*
 - b) List the investigations that can be done at the A & E. (2 marks)
 - c) Describe the diagnostic biochemical tests. (6 marks)
- 3. Classify hyperlipidaemias. (10 marks)
- 4. Distinguish between internal and external quality control programs. (10 marks)

causes

fast

reactive

newly diagnosed

1. *hypoglycaemia*

2. *hypoglycaemia*

3. *hypoglycaemia*

type 2 - LDL

type 3 - above LDL + VLDL

type 4 - VLDL + normal

5 RAS

DONE

UNIVERSITY OF NAIROBI
 CLINICAL CHEMISTRY UNIT
 MBCHB IV END OF ROTATION CAT

DATE: 16/06/16 TIME: 2.00 pm - 3.00 pm

INSTRUCTIONS

ATTEMPT ALL QUESTIONS
 ANSWER EACH QUESTION ON A SEPARATE SHEET OF PAPER

burns
 ↓
 ↓ in intake
 haemorrhage
 ↑
 ↑ excretion

Done
 Done
 Done

1. a) List the common causes of dehydration. (4 marks)

b) Describe the fluid regulatory mechanisms involved in dehydration (6 marks)

① Thirst Mechanism ② ADH ③ RAAS

↑ Super th
 ↓ hypoglyc
 ↓ HONK.
 ↓ Cushing
 ↓ placed
 ↓ DKA

2. A 43 year old diabetic patient presents to A&E in a coma.

a. State the possible metabolic causes of coma in this patient. (4 marks)

b. List the biochemical tests useful in:-

(i) Short term management - RBS, FBS, GPT, HbA1c, Urea, Creatinine

(ii) Long term management of this patient (6 marks)

→ C-peptide, HbA1c, Lipid profile, Urinary glucose, and ketones

3. Classify hyperlipidaemias. (10 marks)

Done
 Done
 Done

4. A district hospital has introduced a new diagnostic marker for Alzheimer's disease. The hospital laboratory has introduced a method for estimating this marker. Describe the steps you would use to set up its reference interval. (10 marks)

L.R.R.

↓ Clearance
 ↓ Blood
 ↓ Plasma
 ↓ Urine
 ↓ Creatinine
 ↓ Glucose
 ↓ Lipids
 ↓ Enzymes
 ↓ Hormones
 ↓ Vitamins
 ↓ Minerals
 ↓ Electrolytes
 ↓ Acids
 ↓ Bases
 ↓ Gases
 ↓ Ions
 ↓ Molecules
 ↓ Cells
 ↓ Tissues
 ↓ Organs
 ↓ Systems
 ↓ Organisms

ln DM pt

↓ OHO
 ↓ HbA1c

1 AS

6

UNIVERSITY OF NAIROBI
CLINICAL CHEMISTRY UNIT
MBCHB IV END OF ROTATION CAT

DATE: 10/03/16 TIME: 2:00 pm - 3:00 pm

INSTRUCTIONS

ATTEMPT ALL QUESTIONS

ANSWER EACH QUESTION ON A SEPARATE SHEET OF PAPER

Repeat

A 60 year old female who is a known diabetic presented to casualty and a lipid profile was requested. Results were as follows:

Total cholesterol - 1.10 mmol/L (<6.7)

Triglycerides - 8.1 mmol/L (<1.7)

HDL cholesterol - 0.5 mmol/L (>1.03)

LDL cholesterol - 7.9 mmol/L (<5.2)

- Comment on the results. (2 marks)
- How was the LDL-cholesterol determined? (2 marks)
- Outline the role of HDL-cholesterol in 'reverse cholesterol transport'. (3 marks)
- What other biochemical tests would be relevant for this patient? (3 marks)

DM

2/ Done

Discuss hypoglycemia under the following headings:-

- Causes (4 marks)
- Clinical features (2 marks)
- Biochemical investigations (4 marks)

TC = 1.10 / 20

Cardiac Markers

3/ Done

A 60 year old male presents to A&E with history of acute onset of constrictive chest pain associated with dyspnoea and profuse sweating.

- List 2 possible differential diagnosis (2 marks)
- List the investigations that can be done at the A & E. (2 marks)
- Describe the confirmatory diagnostic biochemical tests. (6 marks)

2/ Done

Briefly describe how you would set up an internal quality control programme in a medium sized laboratory (10 marks)

- google

RAS
UNIVERSITY OF NAIROBI
CLINICAL CHEMISTRY UNIT

MBCHB III CAT GROUP DILEND OF ROTATION CAT
DATE: 19/10/12 TIME: 2.00 - 3.00 PM

INSTRUCTIONS

ATTEMPT ALL QUESTIONS

ANSWER EACH QUESTION ON A SEPARATE SHEET OF PAPER

The following BGA results were obtained from a patient in ICU.

	pH	-	7.22	acidosis
	HCO ₃	-	14 mmol/L (22-28)	↓
Base	PCO ₂	-	37 mmHg (35-45)	N
	Na	-	133 mmol/L	↓
	K	-	4.7 mmol/L	N
	Cl	-	102 mmol/L	N

partially compensated metabolic acidosis

$$(Na + K) - (HCO_3 + Cl)$$

$$133 + 47 - 14$$

- What is the acid-base disturbance? (2 mks)
- Calculate the anion gap and comment on the result (2mks)
- List the possible causes of the above acid-base disturbance (6mks)

$$\begin{array}{r} 7 \\ 186 \\ \hline 116 \\ \hline 64 \end{array}$$

High gap MA

Compare the biochemical findings in primary, secondary and tertiary hyperthyroidism (10 mks)

MUDPILES

A 43 year old diabetic patient presents to A&E in a coma.

- List the possible metabolic causes of coma in this patient (4 marks)
- List the biochemical tests useful in (i) short term (ii) long term management of this patient (6 marks)

Describe the factors that compromise the quality of blood specimens for biochemical analysis (10 marks)

Specimen Collection

Test ordering
Specimen collection
Transport
Reception
Analysis
Reporting
Transport
Interpretation

- High gap MA → Methanol
Ureaemia
DM
Paraldehyde toxicity
Isoniazid
Lactic Acidosis
Ethylene glycol toxicity
Salicylate toxicity

SCHOOL OF MEDICINE

DEPARTMENT OF HUMAN PATHOLOGY

CLINICAL CHEMISTRY UNIT - B. PHARM III CAT FOR 12/9/13

INSTRUCTIONS

1. Answer all questions.
2. Each question to be answered on a separate answer sheet.

Write short notes on the following:

- i) LDL-cholesterol and LDL-receptors
- ii) Reverse cholesterol transport
- iii) Hypolipidaemic drugs
- iv) Common biochemical tests in hyperlipidaemia

lipids

- a) Discuss the factors that affect the interpretation of plasma drug levels (10 marks)
- b) Discuss the hormonal regulator of calcium in the body (10 marks)

Ca²⁺

No *

3. Briefly describe the normal metabolic functions of the liver and identify the ones that are useful in assessing hepatic dysfunction (20 marks)

liver

No *

4. Write short notes on the following:-

- a) Criteria for diagnosis of Diabetes mellitus using Random and fasting plasma sugar levels (5 marks)

Done

Random

3.2-6.9-F
3.9-7.8-

- b) Signs and symptoms of hypothyroidism (5 marks)

7.9-11.1

- c) Biochemical diagnosis of Cushing's syndrome (5 marks)

↑
Impaired glucose tolerance

- d) Role of a pharmacist in managing endocrinopathies (5 marks)

Impaired Fasting - 6.2-7

- a) Outline the instructions necessary to a patient when collecting urine for analysis of secreting tumors (6 marks)

No *

- b) State the errors and how they can be avoided when:

- (i) Collecting specimen - Right Vacutainer - Label it (8 marks)

Get from the right artery. Specimen properly stored

- (ii) Transiting specimen between clinic and laboratory (6 marks)

- Temp
- Time
- Location
- Centrifugation time

Specimen collection

DATE: 09/05/2014 TIME: 2:00-3:00PM

INSTRUCTIONS:

1. ATTEMPT ALL QUESTIONS
2. ANSWER EACH QUESTION ON A SEPARATE SHEET OF PAPER

- No* 1. A 27-year old man with HIV was to be started on ART. Giving reasons, describe the biochemical tests that should be done before treatment is initiated (10mks)
- Done* 2. A district hospital has introduced a new diagnostic marker for Alzheimer's disease. The hospital laboratory has introduced a method for estimating this marker. Describe the steps necessary to set up its reference interval (10mks)
- ? 3. State and explain the factors that have contributed to point of care testing (10mks)
4. The following laboratory results were obtained from serum specimen of a 63-year old male who had generalized weakness for the last 5 months:

Total protein	59g/L (60-80)	
Albumin	30g/L (34-52)	
Total bilirubin	108 μ mol/L (4.2-17)	} cholestasis
Direct bilirubin	73 μ mol/L (0-4.6)	
ALP	575 IU/L (35-110)	
GGT	349 IU/L (0-50)	
ALT	41 IU/L (0-40)	} cholestasis?
AST	37 IU/L (0-40)	

- Comment on the results (2mks)
- What are the differential diagnosis? (3mks)
- What other biochemical tests would be relevant? (3mks)
- Suggest any four clinical features that the patient could have (2mks)

*jaundice
pruritus
dark*

INSTRUCTIONS

1. Answer all questions.
2. Each question to be answered on a separate answer sheet.

Write short notes on the following:

- i) LDL-cholesterol and LDL - receptors
- ii) Reverse cholesterol transport
- iii) Hypolipidaemic drugs
- iv) Common biochemical tests in hyperlipidaemia

- a) Discuss the factors that affect the interpretation of plasma drug levels (10 marks)
- b) Discuss the hormonal regulator of calcium in the body (10 marks)

3. Briefly describe the normal metabolic functions of the liver and identify the ones that are useful in assessing hepatic dysfunction (20 marks)

4. Write short notes on the following:-

- a) Criteria for diagnosis of Diabetes mellitus using Randall and fasting plasma sugar levels (5 marks)
- b) Signs and symptoms of hypothyroidism (5 marks)
- c) Biochemical diagnosis of Cushing's syndrome (5 marks)
- d) Role of a pharmacist in managing endocrinopathies (5 marks)

a) Outline the instructions necessary to a patient when collecting urine for analysis of secreting tumors (6 marks)

b) State the errors and how they can be avoided when:

- (i) Collecting specimen (8 marks)
- (ii) Transiting specimen between clinic and laboratory (6 marks)

DATE: 28/09/12 TIME: 11:00 AM - 12:00 PM

INSTRUCTIONS

ATTEMPT ALL QUESTIONS

ANSWER EACH QUESTION ON A SEPARATE SHEET OF PAPER

1) Explain how the omissions of the following data on the test order form would affect the quality of results generated by the laboratory.

- i) Medical history - Tech want know what exactly to look for with no details abt the pt's
- ii) Diagnosis - cant tell whether findings relevant to doc aim
- iii) Specimen collected Age of the patient dif ranges for dif ranges hence
- iv) Date specimen was collected (5mks) Time affects certain tests, long stay tell if valid causes haemolysis which affects normal lab tech. cant

b) Give examples of anticoagulants and preservatives of blood commonly used in the laboratory (5 mks)

heparin fluoride EDTA citrate oxalate Iodoacetate + est. accuracy of

2) Giving reasons, identify the following acid disturbances. Give 2 possible causes of each. (10 marks)

- alkalosis
- a. pH- 7.52, PCO₂- 26 mmHg (35-45), HCO₃⁻- 23 mmol/L (22-28) N ↓
 - b. pH- 7.22, PCO₂- 62 mmHg (35-45), HCO₃⁻- 27 mmol/L (22-28) N ↑
 - c. pH- 7.57, PCO₂- 44 mmHg (35-45), HCO₃⁻- 40 mmol/L (22-28) ↑
 - d. pH- 7.19, PCO₂- 35 mmHg (35-45), HCO₃⁻- 12 mmol/L (22-28) ↓

pulm dis
Resp-hypervent
Resp-hypovent
asth
Metabolic COF
N GSI
Metabolic
↓ V, hypov

3) A district hospital has introduced a new diagnostic marker for Alzheimer's disease. The hospital laboratory has introduced a method for estimating this marker. Describe the steps you would use to set up its reference interval. (10 marks)

- a) Define hyperthyroidism (2 marks)
- b) List four causes of hyperthyroidism (4 marks)
- c) Name the biochemical tests useful in the diagnosis of hyperthyroidism (4 marks)

No

DATE: 09/05/2014 TIME: 2:00-3:00PM

REPEAT

INSTRUCTIONS:

- 1. ATTEMPT ALL QUESTIONS
- 2. ANSWER EACH QUESTION ON A SEPARATE SHEET OF PAPER

- 1. A 27 year old man with HIV was to be started on ART. Giving reasons, describe the biochemical tests that should be done before treatment is initiated (10mks)
- 2. A district hospital has introduced a new diagnostic marker for Alzheimer's disease. The hospital laboratory has introduced a method for estimating this marker. Describe the steps necessary to set up its reference interval (10mks)
- 3. State and explain the factors that have contributed to point of care testing (10mks)
- 4. The following laboratory results were obtained from serum specimen of a 63 year old male who had generalized weakness for the last 5 months:

Total protein	59g/L (60-80)	} cholestasis
Albumin	30g/L (34-52)	
Total bilirubin	108 μmol/L (4.2-17)	} cholestasis
Direct bilirubin	73 μmol/L (0-4.6)	
ALP	575 IU/L (35-110)	} cholestasis
GGT	349 IU/L (0-50)	
ALT	41 IU/L (0-40)	
AST	37 IU/L (0-40)	

- a. Comment on the results (2mks)
- b. What are the differential diagnosis? (3mks)
- c. What other biochemical tests would be relevant? (3mks) *U/E/Cr*
- d. Suggest any four clinical features that the patient could have (2mks) *jaundice, pruritus, dark urine*

10-BASE BALANCE V

What are the reference values for

- a) Arterial blood gases ^{pH} 7.35 - 7.45
- b) Venous blood gases

PCO_2 - 35-45 mmHg
 PO_2 - 7.80-100 mmHg
 HCO_3^- - 22-28 mmol/L

Describe the main sources of acid in body indicating

- a) Whether it is volatile or non volatile
- b) Quantity produced

volatile
 Carbonic

Non-volatile
 PO_4
 SO₄

protein → carbon
 - buffer - H₂O
 - renal reabsorption of HCO_3^-
 - resp

- 3. a) What are the mechanisms used by the body to stabilize blood pH?
- b) What is compensation? What are the compensatory limits?

Carbonic 24000 mmol

- 4. Describe how haemoglobin contributes to buffering
- 5. Describe the role of the kidney in acid-base balance
- 6. Which are the main buffers in urine? Which responds most rapidly to an acid load? Which urine buffer has greater capacity?

7. a) Describe

- i) Anion gap
- ii) Base excess

difference between anions - Anionic
 - more cations than anion.
 range 8-18

- b. i) What are their reference ranges?
- ii) What is the value of measuring them?

- 8. What are the causes of pre-analytical errors in blood gas analysis (BGA's)
- 9. How is the Handerson-Hasselbalch's equation used in interpretation of BGA's
- 10. Classify clinical disorders of acid base balance(give examples)

$pH = pK_a + 1$

11. Case 1:

→ Mem. A 61 year old man was admitted with pulmonary oedema. Arterial blood gases were done.

PH - 7.10 ↓ acidotic
 PaCO₂ - 25 mmHg ↓
 HCO₃ - 18 mmol/L ↓
 PaO₂ - 34 mmHg ↓
 BE (ECF) - 29

- a) What is the acid-base disturbance? compensated metabolic acidosis. pH norm
- b) Explain the likely cause. lactic acidosis.
- c) Discuss other conditions which can give rise to this type of acid-base disorder.

12. Case 2. A 34 year old woman was brought to the accident and emergency room in coma. She was suspected of having taken a drug overdose. Arterial blood gas analysis revealed the following:

PH - 7.10 ↓ **acidosis**
 PCO2 - 80mmHg ↑
 PO2 - 42mmHg ↓
 HCO3 - 28mmol/L Normal
 SO2 - 65%

partially compensated

Resp acidosis

- a) What is the acid-base disturbance? **Respiratory acidosis**
 b) What drug(s) is she likely to have taken? **Narcotics / sedatives / Benzodiazepine + alcohol**
 c) Discuss other causes of this type of disturbance. **Neurological dx, drugs, COPD**

13. Case 3. A 49 year old man underwent intestinal resection for sigmoid colon perforation. Continuous gastric aspiration was applied post-operatively. Arterial blood gases analysis revealed the following:

pH - 7.44 Normal ↓ **acidosis** ↓ pH = Normal **CO2**
 PaCO2 - 49 mmHg ↑
 HCO3 - 35 mmol/L ↑ **22-28**
 BE (ECF) - +8.5

Metabolic acidosis/resp.

COPD + V

149 + 35 **COPD + diuret**

$$\begin{array}{r} 149 \\ + 35 \\ \hline 184 \\ - 99.4 \\ \hline 84.6 \end{array}$$
 high gap MA

Na+ - 149 mmol/L (135 - 145) ↑
 K+ - 2.4 mmol/L (3.5 - 5.0) ↓
 CL- - 87 mmol/L (95 - 105) ↓

fully compensated **metabolic acidosis**

- a) What is the acid-base disturbance?
 b) Explain the likely cause. **lactic acidosis**
 c) Discuss other conditions which can give rise to this type of acid-base disorder. **ANION GAP.**

14. Case 4.

The following results were obtained from a 55 year old man with liver cirrhosis and gross ascites, who is on diuretic therapy.

PH - 7.60 ↑ **Mixed metabolic resp. alkalosis.**
 PCO - 3.1mmHg ↓
 HCO - 35mmol/L ↑
 BE (EFC) - 11.9
 Na+ - 129mmol/L ↓
 K+ - 3.0mmol/L ↓

hyperventilate
 hyperventilate stimulates resp center
 - hyperventilate

~~respiratory~~ mixed respiratory metabolic alkalosis

hypokalemia in alkalosis body retains H+

- a) What is the acid-base disturbance?
 b) Discuss how it may have come about **paradoxical aciduria**
 c) Discuss other causes of this type of acid-base disturbance. **hyperventilation, hypokalemia.**

Diabetes Mellitus Tutorial Guide

1. What are the reference values for blood glucose? ✓
2. What is diabetes mellitus? ✓
3. What is the classification for diabetes mellitus? ✓
4. Define the following terms:
 - a) Impaired fasting glycaemia ✓
 - b) Impaired glucose tolerance
5. A 47 year old female presented to the outpatient with features suggestive of diabetes mellitus.
 - a) What is the metabolic basis for the typical signs and symptoms of diabetes? ✓
 - b) Describe the algorithm to be used to reach a diagnosis of diabetes in this patient. ✓
6. Screening for diabetes is recommended for at risk individuals in the general population? Who are at high risk? How should screening be done? OGTT, HbA1c, FBS.

FN
 7. A 24 year old pregnant woman attending an ante-natal clinic was found to have glycosuria. The random blood glucose was 6.9mmol/L. What is the diagnosis? What further tests should be done?
 ✓ Hypertension
 ✓ Coronary Artery
 ✓

7. A 24 year old pregnant woman attending an ante-natal clinic was found to have glycosuria. The random blood glucose was 6.9mmol/L. What is the diagnosis? What further tests should be done?
 3.1-7.8 ↓ gestational DM. FBS RFT & microalbumin
8. What is secondary diabetes? What conditions are associated with it? How are plasma insulin levels in secondary diabetes? Give reasons.

9. A 28 year old female, a known diabetic on treatment, was brought to casualty in semi-coma. Biochemical tests revealed the following:

Plasma:	-	Glucose	-	32.8mmol/L ↑	HOME
	-	Sodium	-	153mmol/L ↑	⇒ 3.2-7.8
	-	Potassium	-	6.4mmol/L ↑	
	-	Bicarbonate	-	14mmol/L ↓	Acidosis
	-	Urea	-	8.9mmol/L (N-2.6-4) ↑	

Metabolic acidosis
 DKA
 >6.4 DKA admitted with insulin
 4.5-6.4 - 10 neg
 DKA 3-4.5 20 neg

SIS → ketone & FA
 ↓
 Acidity

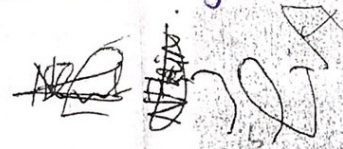
- a) What is the diagnosis? RFT, ketone bodies & BGA
- b) What are the confirmatory tests? - cause hypokalaemia
- c) What is the metabolic basis for this presentation? Gradual
- d) What is the effect of treatment on the electrolytes? Insulin & Potassium In this case no K.

10. A 59 year old man with Type 2 diabetes for over 15 years, presented to casualty with confusion. Biochemical tests were as follows:

Plasma:	-	Glucose	-	64.3mmol/L ↑
	-	Sodium	-	178mmol/L ↑
	-	Potassium	-	5.4mmol/L (N)
	-	Bicarbonate	-	23mmol/L (N)
	-	Urea	-	23.6mmol/L ↑

MONK

- a) Calculate the plasma osmolality and comment on it. 2Na + Glucose + Urea
- b) What is the likely diagnosis? MONK. ↑ SG to show dehydration
- c) What are the expected urine findings? Glycosuria, ↑ SG, mild ketonuria, uric acid ↑ plasma osmolality
- d) What is the cause of this complication? ↑ Extreme dehydration
 ↑ hyperglycaemia



11. A diagnosis of diabetes mellitus was made in a 48 year old female who was admitted to hospital and she was discharged on oral hypoglycaemic treatment. What biochemical tests are recommended for treatment monitoring? Give reasons.
12. What are the long term monitors of glycaemic control? What are the recommendations on use of HbA1c? (frequency of analysis, type of sample, treatment goals). What are limitations of the HbA1c test?
13. What is microalbuminuria? What are the recommendations on microalbumin testing in type1 and type 2 diabetes? What are the causes of false positive microalbumin results?
14. Plasma lipid estimation was recommended in a type 2 diabetic patient.
 - a) What is the mechanism of dyslipidaemia in diabetes mellitus?
 - b) What are the common lipid derangements in diabetic patients?

HAEMATOLOGY

CASE HISTORY 1

A 42 year old woman presents with a history of increasing lethargy, dizziness and breathlessness. She had brittle hair and nails. She complained of heart palpitation on exercise and reported particularly heavy periods. Biochemical investigations revealed the following:-

Serum iron - 4umol/l
 Transferin saturation - 10% \rightarrow 33%
 Ferritin - <5ug/L

What is the diagnosis and what other investigations should have been done first?

CASE HISTORY 2

A 12 year old Asian girl presented with nausea and vomiting and non localizing neurological ~~side~~ signs. *Porphyria like syndrome, - Mostly acquired.*
 She has been using brightly coloured facial cosmetics obtained locally.

Diagnosis:-

- What biochemical investigations would be appropriate?

Signs. Heavy metal poisoning - lead poisoning. Lead inhibits ferrochelatase & PTP.

MULTIPLE ORGAN DISORDER (LIPID PROFILE)

CASE HISTORY 3

A 53 year old male was found to have the following results on a fasting sample:-

barbiturates, alcohol, x-ray of feet
 Total cholesterol Δ - 8.4mmol/L \rightarrow (3.5-5.6) \checkmark PL (organic \rightarrow inorganic)
 Triglycerides - 6.8mmol/L \rightarrow (0.3-1.5) \checkmark FFA
 Glucose - 9.8mmol/L - >6.1
 Gamma GT (liver) - \uparrow indm. - AIP 138u/L \rightarrow (50-70)

hyperlipidaemia (ATC & TG) (Type IIb)

A non smoker, his blood pressure was 145/95mmHg and he was obese with central fat distribution. *apple shaped obesity*

HT + IR + Obesity - Metabolic syndrome (truncal)

Diagnosis:

hypoproteinaemia, hyperuricaemia.

hyperlipidaemia 2^o to DM.

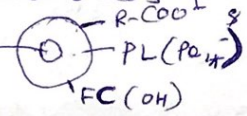
- What other information and investigations would be helpful in this man's management?
- What treatment options would you consider in this case. - Insulin, and HT, HMG-CoA reductase drugs.

48 hrs (GLC or high pressure liquid chromatography).

hyperlipidaemia (chole + TG \uparrow).

lipoproteins (LDL, HDL) - vessels to transport lipids from A \rightarrow B. lipids insoluble so needs protein transporters.

Chylomicron - CE & TG (core - nonpolar).
 Glycerol - parent molecule of TG.
 Apolipoproteins - A - E = has isoforms.



*dyslipidaemia
ATC, TG
LDL \uparrow HDL \downarrow*

DATE: