DIPLOMA CLINICAL CHEM MAY 2016 MODERATED

1) 6 mmol/L of urea is equivalent to:-
   a) 360mg/L
   b) 60mg/L
   c) 36mg/L
   d) 360g%

2) The product of protein deamination is:-
   a) Creatinine
   b) Creatine
   c) Used in clearance tests
   d) Creatine anhydride

3) Parameters used to assess liver function include:-
   a) Albumin level
   b) Plasma urea
   c) Lipase activity
   d) Trypsin activity

4) Ketoacidosis is associated with:-
   a) Diabetes inspidus
   b) Raised plasma pH
   c) Post-prandial hyperglycaemia
   d) Acute starvation

5) False positive results with albustix may be due to:-
   a) Alkaline urine
   b) Albuminuria
   c) Acidic urine
   d) High altitude

6) Detection of CSF total proteins is achieved by:-
   a) Albustix
   b) Turbidimetric methods
   c) Using phenol solutions
   d) Pandy test

7) In gastric juice analysis, free acidity refers to:-
   a) Combined acid
   b) Strong acid

c) Total acid
d) HCl

8) The highest level a substance is present in plasma before it is excreted is:-
a) Indicative of diabetes mellitus
b) Indicative of diabetes inspidus
c) Renal threshold value
d) Known as glucosuria

9) Biuret test involves the reaction of copper ions with:-
a) 2-OH
b) 2C=O
c) 2-CONH
d) 2-NH_2

10) Which of these can be used to make equivalent standards of urea:-
a) Sodium sulphate
b) Potassium sulphate
c) Ammonium chloride
d) Barium sulphate

11) Decarboxylated diacetic acid is known as:-
a) Aceto acetic acid
b) Principal ketone body
c) Beta-hydroxy butyric acid
d) Acetone

12) The separation phases in paper chromatography are:-
a) Normal phase
b) Fast phase
c) Stationary phase
d) Second phase

13) Occult test detects:-
a) The presence of WBC's in urine
b) Malignancies of gastro-intestinal tract
c) Peroxidase activity
d) Presence of dyes in stool

14) Which of the following plasma substance(s) will decrease in liver failure:-

a) Glucose
b) Creatinine
c) Uric acid
d) Transaminase

15) Which of the following is/are pre-analytical error(s):-
a) Reagent quality
b) Specimen collection technique
c) OD reading
d) Reporting of test result

16) Simple lipids are derived from:-
a) Esters
b) Alcohol
c) Acetone
d) Carboxylic acids

17) The following vitamin is required in blood clotting:-
a) B_6
b) C
c) B_{12}
d) K

18) Water prepared by distillation is:-
a) Sterile but has soluble salts
b) Sterile and free from soluble salts
c) Not sterile but free from soluble salts
d) Sterile only

19) To prepare 10ml of a 1:200 serum dilution, you need:-
a) 2ml of serum
b) 0.05ml of serum
c) 1 ml of serum
d) 0.5 ml of water

20) Glycosuria with hyperglycaemia denotes:-
a) Diabetes mellitus
b) Diabetes inspidus
c) Lowered renal threshold
d) Renal glycosuria

21) Tetrabromophenol blue is an indicator in:-
   a) Clinistix
   b) Urostrat
   c) Glucostix
   d) Albustix

22) At pH below their isoelectric points, proteins:-
   a) Ionize as bases
   b) Acquire zwitterionic state
   c) Acquire cationic state
   d) Are anions

23) The direct reacting bilirubin is also:-
   a) Unconjugated
   b) Insoluble in water
   c) Water soluble
   d) Very toxic

24) In indirect agglutination test, agglutination is interpreted as:-
   a) Positive
   b) False positive
   c) False negative
   d) Negative

25) Surface tension of urine can be lowered by:-
   a) Bile salts
   b) Glucose
   c) Amino acids
   d) Bilirubin

26) What is the waste end product of purine metabolism:-
   a) Urea
   b) Uric acid
   c) Creatine
   d) Creatinine

27) Characteristics of enzymes include:-
   a) Activated by fluoride
   b) Reacting at 37^{o}C

c) Specificity
d) Resists UV denaturation

28) Blood glucose levels are directly regulated by:-
a) ADH
b) Cortisol
c) Glucagon
d) Epinephrine

29) Oxidative deamination of proteins yields:-
a) Urea
b) Amino acids
c) Peptide residues
d) Peptide bonds

30) Amylase activity assay are performed to diagnose:-
a) Gastric disorders
b) Diabetes mellitus
c) Chronic pancreatitis
d) Acute pancreatitis

31) A control in clinical chemistry is:-
a) Same as a standard solution
b) A solution of known reference range
c) A solution of known dilution
d) A solution used to calibrate a machine

32) Parenteral stimulants of gastric juice secretion include:-
a) Alcohol
b) Gruel
c) Insulin
d) Tea without milk

33) The ability of plasma proteins to buffer blood is due to their ability to:-
a) Neutralize H^+ and OH^-
b) Chelate Ca^{2+}
c) Form peptide bonds
d) Form hydrogen bonds

34) Markers of cardiac diseases is/are:-

a) Lipase assay
b) Alkaline phosphatase activity assay
c) Raised tryptic activity values
d) Raised creatine kinase activity

35) Major fluid compartments of the body include:-
a) Intracellular
b) Interstitial space
c) Extravascular
d) Intravascular

36) Vitamin intermediates with hormone-like activity include:-
a) B_1
b) E
c) K
d) D

37) Man and other primates excrete nitrogen in form of:-
a) Uric acid
b) Ammonia
c) Urea
d) Creatinine

38) Diabetes inspidus is characterized by:-
a) Urine of high specific gravity
b) Lack of antiduiretic hormone (ADH)
c) Excess insulin secretion
d) Deficiency of aldosterone

39) Select from the list below cation(s) that are tested for in serum:-
a) Sodium
b) Calcium
c) Caesium
d) Magnesium

40) Enzymes of clinical importance analysed in stool include:-
a) Amylase
b) Trypsin
c) Lipase
d) Diastase

41) Chloride shift in the body ensures:-
   a) Fluid balance
   b) Sodium balance
   c) Cationic/anionic balance
   d) Potassium balance

1) Indicate the organ assessed by assaying each of the analytes listed below:-
   i) Glucose
   ii) Acid phosphatase
   iii) Urea
   iv) LDH_4
   v) PSA **(10 marks)**
2) Match the substances listed in column A with their respective organ/tissue source in column

	A	B
1	CK_{BB}	Corpus luteum
2	Amylase	Adrenal medulla
3	Progesterone	Brain
4	Epinephrine	Pancreas
5	Insulin	

(10 marks)

3) Discuss the formation of ketone bodies. **(10 marks)**

4) List two analytes under the following function test/profile and the unit of measure for each.
   i) Liver
   ii) Lipid
   iii) Heart
   iv) Pancreas
   v) Kidney **(10 marks)**

5) State the principle behind the following serum estimation methods:-
   a. Uricase

b. Biuret test

(10 marks)

6) State the principle behind the following serum estimation methods:-
   a. Sackett's
   b. Jaffe's reaction

(10 marks)

Answers

1. Indicate the organ assessed by blood assay of each of the analytes listed below:-
   i) Glucose **Pancreas**
   ii) Troponin I **Heart**
   iii) Urea **Kidney**
   iv) LDH_4 **Liver**
   v) PSA **Prostate** **(10 marks)**
2. Match the substances listed in column A with their respective organ/tissue source in column B.

	A	B
1	CK_{BB}	**Brain**
2	Amylase	**Pancreas**
3	Progesterone	**Corpus luteum**
4	Epinephrine	**Adrenal medulla**
5	Insulin	**Pancreas**

(10 marks)

3. List two analytes under the following function test/profile and the unit of measure for each.
   i. Liver **ALT, AST, ALP, u/l**
   ii. Lipid **HDL, LDL, VLDL, CHOLESTEROL, mg/dl or Mmol/L**
   iii. Heart **Troponin I, Troponin T, Myoglobin, Creatinine Kinase, ng/ml**
   iv. Pancreas **GLUCOSE, INSULIN, LIPASE, AMYLASE, mmol/l U/L**
   v. Kidney **urea, creatinine, Na, K, Cl, Mmol/l**

   (10 marks)
4. Discuss the formation of ketone bodies. **(10 marks)**

Ketone bodies are produced mainly in the mitochondria of liver cells, and synthesis can occur in response to an unavailability of blood glucose, such as during fasting
Ketogenesis takes place in the setting of low glucose levels in the blood, after exhaustion of other cellular carbohydrate stores, such as glycogen. It can also take place when there is insufficient insulin e.g. in diabetes
The production of ketone bodies is then initiated to make available energy that is stored as fatty acids.
Fatty acids are enzymatically broken down in β-oxidation to form acetyl-CoA. Under normal conditions, acetyl-CoA is further oxidized by the citric acid cycle (TCA/Krebs cycle) and then by the mitochondrial electron transport chain to release energy.
However, if the amounts of acetyl-CoA generated in fatty-acid β-oxidation challenge the processing capacity of the TCA cycle; i.e. if activity in TCA cycle is low due to low amounts of

intermediates such as oxaloacetate, acetyl-CoA is then used instead in biosynthesis of ketone bodies via acetoacyl-CoA and β-hydroxy-β-methylglutaryl-CoA (HMG-CoA).

Steps in ketogenesis:

1. Catalyzed by enzyme thiolase, 2 molecules of acetyl-CoA condense to form acatoacetyl-CoA.
2. Catalyzed by enzyme HMG-CoA synthase, acetoacetyl-CoA combines with another molecule of acetyl-CoA to produce HMG-CoA (β-hydroxy β-methyl glutaryl-CoA).
3. HMG-CoA lyase cleaves HMG-CoA to produce acetoacetate and acetyl-CoA.
4. Acetoacetate can undergo spontaneous decarboxylation to form acetone.
5. Acetoacetate can be reduced by a dehydrogenase to β-hydroxybutyrate.

5.

i. Uricase

Used for serum uric acid estimation. Uricase enzyme digests uric acid to form allantoin, hydrogen peroxide and carbon dioxide. The decrease of absorption at 293nm is monitored and is related to the uric acid present.

ii. Biuret reaction

Used for serum protein estimation. Peptide bonds in protein molecular react with copper (ii) ions in alkaline medium to form a violet/blue coloured complex. The intensity of the colour is proportional to the amount of protein present.

6.

i. Jaffe's reaction

Used for serum creatinine estimation. Creatinine reacts with picnic acid in alkaline medium to form a red colour. The intensity of the red colour is proportional to the amount of creatinine present

ii. Sackett's method

Used for serum cholesterol estimation. Cholesterol reacts with acetic anhydride – sulphuric acid mixture to form a green colour. The intensity of the green colour is proportional to the amount of cholesterol present

Practical

You are provided with a urine specimen labelled “K”. Use the reagents and apparatus provided to detect abnormal substances in the specimen.

(i) Record your results
(ii) Outline the principles of the positive tests performed.
(iii) Comment on the results
(iv) Suggest further tests

(30 Marks)

PRACTICAL PREPARATION (02) CHEMISTRY

Provide the following each candidate

- Urine specimen “K” containing -Glucose
  - Protein
  - salicylates
- Combur strips

Results

Show all the parameters

Parameter	**Result**	**Marks**
Glucose	Pos	1
Protein	Pos	1
Ketones	Pos	1
Others		1
		1
		1
		1
		1
		1
		1

- Principles
  - G.O. D - (2)
  - albustix - (2)
  - Gerhardts - (2)

- Comment
  - Specimen contains Glucose (1)
    Protein (1)
    Salicylates/ acetoacetic acid (1)
  - The specimen could be from a patient with
    (i) Diabetes mellitus (1)
    (ii) Kidney problem (1)
    (iii) Aspirin poisoning (1)
- Tests
  - o OGTT/ FBS for Diabetes (2)

- Boiling to differentiate salicylates and acetoacetate (2)

- Neatness (2)
- - Work evidence -
  (2)

TOTAL 30 points

Q.2. You are provided with a 200 mg/dl protein standard. Using the reagents and apparatus provided, prepare a C.S.F. Protein calibration curve to represent 0, 40, 80, 120, 160 and 200 mg/dl.

a) Use the curve to read the concentration of C.S.F. sample 'S'

b) Comment on the result

PROCEDURE

a) Mix 3 ml of 3% TCA with 1 ml of the protein standards

b) Mix 3 ml of 3% TCA with 1 ml of C.S.F.

c) Stand the tubes at room temperature for 10 minutes

d) Set up a blank containing 3 ml of 3% TCA and 1 ml distilled water

e) Read the absorbances (O.D) of the test and standards against blank using a blue filter or at 450 nm wavelength.

Prep guide

- Distilled water 5 ml each
- Normal saline - 10 ml each
- Sample “S” (each) 5 ml of 50 mg % protein solution
- Rack 1 each
- Test tubes 7 each
- 1 ml pipette 2 each
- 5 ml pipette 1 each
- 200 mg% protein solution - 10ml each
- Graph paper
- Colorimeter with filter – 450 nm

Marking Guide

1. Use of the formula RVxRC/OC **2 marks**
2. Calculation of dilutions 0, 40, 80, 120, 160, 200 mg/dl **1mark each = 6 marks**
3. Table of dilutions

Tube	**0**	**40**	**80**	**120**	**160**	**200**	**S**
Standards (ml)	1	1	1	1	1	1	-
Test (ml)	-	-	-	-	-	-	1
3% TCA (ml)	3	3	3	3	3	3	3
Total (ml)	4	4	4	4	4	4	4
OD							

2 marks

4. Plot a curve
   a. Label X and Y axes **1 mark**
   b. Title **1 marks**
   c. Date **1 mark**
   d. Machine used **1 mark**
   e. Wavelength and light path **1 mark**
   f. Prepared by **1 mark**
   g. Table of OD and Concentration **2marks**
   h. 4 points in line **2 marks**
   i. Reading of "S" **50 mg/dl +/_ 2 mg/dl** **2 marks**
   j. Neatness **2 marks**
   k. Evidence **2 marks**
5. Comment
   i. Reference range 15-45 mg/dl **1 marks**
   ii. Above normal **1 mark**
   iii. Conditions meningitis, intra cranial bleeding **2 marks**

30 marks