Instructions: Answer question A and three (3) of B to E. Answer each question in a separate book. Be concise and to the point. If in doubt about any part of the examination, discuss the problem with your invigilator.

A) Short answer questions: Answer eight (8) of the following (40 marks, 5 marks each).

1. Describe the principal differences between a competitive radioimmune assay and a radioimmunometric assay, giving a typical example for each.

2. Outline an assay for parathyroid hormone (PTH) including a description of the reagents, the analyzer and the principle of the assay and the calibration curve.

3. Describe a current approach employed in clinical laboratories for the investigation of suspected Monoclonal Gammopathy. Comment on the type of information such testing provides, how it is used and its clinical significance.

4. Briefly describe the principle of two (2) methods for measuring plasma creatinine and advantages and/or disadvantages of each method.

5. Describe how to perform a heel prick blood collection in neonates, and comment on the advantages and disadvantages of the procedure.

6. Briefly discuss the issues involved in the selection of a Point of Care Testing (POCT) instrument for measuring HbA1c in your Pediatric Diabetic Clinic.

7. Define the following terms: accuracy, precision, coefficient of variation, standard deviation, standard deviation index.

8. Explain briefly how to establish target values for a given parameter (e.g. serum TSH) in a new quality control serum. How do you decide if the material is suitable?

9. Describe the role of the internal standard in the quantitative chromatographic analyses of drugs in serum.

10. A technologist is reviewing the daily QC and notes that the control result is +2.2 SD of the mean. Is this acceptable? List the steps you would follow to decide about reporting the patient results.
**Long Answer Questions:**

**Answer three (3) of the four (4) following questions B – E (20 marks each).**

**B.** Outline in detail the patient preparation, sample collection and sample handling procedures that should be followed prior to the analysis of four (4) of the following substances. Discuss the major analytical problems with each of the assays, and describe how you would choose to measure each analyte. (5 marks each)

1. Ionized calcium
2. Low Density Lipoprotein-Cholesterol (LDL-C)
3. Urinary albumin (microalbumin)
4. Fecal occult blood
5. Cyclosporine

**C.** Explain the concept of definitive method, reference method, and field method and how they relate to each other, using the determination of total cholesterol and hemoglobin A1c as example.

**D.** In your new position as laboratory scientist you have been asked to develop an HPLC system for measuring urinary porphyrins. Discuss your choice of the critical components of this system, and describe a protocol for method development.

**E.** Give a detailed outline for a generic procedure manual (template document) for analytical tests used in your laboratory. List all relevant sections in the manual and what should be covered under each. Discuss why is it important to prepare such operational documents.
CANADIAN ACADEMY OF CLINICAL BIOCHEMISTRY

CLINICAL PAPER (1300 – 1600h)

Instructions: Answer question A and three (3) of B to E. Answer each question in a separate book. Be concise and to the point. If in doubt about any part of the examination, discuss the problem with your invigilator.

A) Short answer questions: Answer eight (8) of the following (40 marks, 5 marks each).

1. What are the primary causes of hyperuricemia?

2. Write short descriptive notes on (i) transudates and (ii) exudates and their identification by laboratory tests.

3. How does metabolic acidosis arise in uncontrolled diabetes?

4. List the biochemical parameters that are increased in the nephrotic syndrome.

5. Describe the symptoms and the changes in various biochemical parameters in Acetaminophen (e.g. Tylenol) intoxication. What role does laboratory testing play in managing the overdosed patient?

6. List the main classes of plasma lipoproteins, indicating their major associated apolipoprotein(s) component, and function of each in lipoprotein metabolism.

7. List the symptoms, physical or medical history consistent with Type 2 diabetes and list laboratory testing criteria to establish the diagnosis of Type 2 diabetes.

8. Briefly explain the concept of pharmacogenomics and give an example of how it could be usefully applied.

9. List five clinical applications of blood-borne tumor markers in the management of cancer, and provide a different example of a tumor marker and associated tumor type for each application.

10. How do you determine the predictive value of a positive test, and what does it mean?
**Long Answer Questions:**

Answer three (3) of the four (4) following questions B – E (20 marks each).

**B.**

a) What is cystic fibrosis? Describe the clinical features of this disease. How is it diagnosed?

b) D508 is a common mutation associated with this disease and affects more than 70% of the North American population. How is this mutation identified?

c) Describe briefly an approach to universal screening for CF and comment on the limitations of this approach.

**C.**

Outline the pathogenesis, major clinical features, and laboratory investigations of four (4) of the following (5 marks each).

1. Pheochromocytoma
2. Congenital Adrenal Hyperplasia
3. Iron deficiency anemia
4. Celiac disease
5. Phenylketonuria

**D.**

a) Give an outline of the basic concepts of pharmacokinetics (10 points).

b) Describe the clinical use of phenytoin, its pharmacokinetics and its interaction with other drugs. Describe the potential problems encountered in its use and the role of the clinical lab (10 points).

**E.**

a) Describe the current understanding of the pathophysiology of “acute coronary syndromes”.

b) Comment on the characteristics of the Troponins, CK-MB, and myoglobin, and their use in the light of these findings. Describe what marker(s) and testing strategy you would use in your lab.