



UNIVERSITI KUALA LUMPUR
INSTITUTE OF MEDICAL SCIENCE TECHNOLOGY

FINAL EXAMINATION
MARCH 2025 SEMESTER

COURSE CODE : HDB30404
COURSE TITLE : CLINICAL BIOCHEMISTRY
PROGRAMME NAME : BACHELOR OF BIOMEDICAL SCIENCE (HONOURS)
DATE : 01 JULY 2025
TIME : 2:00PM - 5:00PM
DURATION : 3 HOURS



INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper CAREFULLY.
2. This question paper is printed on both sides of the paper.
3. This question paper consist of TWO sections.
4. Answer ALL questions for Section A.
5. Section B consist of four questions. Answer THREE (3) questions only.
6. Please write your answer on the answer booklet provided.
7. Please answer all questions in English only.
8. Please answer MCQ/EMQ questions using OMR sheet. *Tick if applicable*
9. Refer to the attached Formula/ Appendies. *Tick if applicable*

THERE ARE 16 PAGES OF QUESTIONS INCLUDING THIS PAGE

SECTION A (Total: 40 marks)

Answer ALL questions.

Please use the answer booklet provided.

1. Which enzyme is a marker for hepatocellular damage?
 - A. Alanine transaminase
 - B. Acid phosphatase
 - C. Beta-hCG
 - D. Troponins

2. The main consequence of lactase deficiency in the small intestine is _____.
 - A. increased fat absorption
 - B. decreased glucose absorption
 - C. osmotic diarrhea
 - D. constipation

3. Which of the following is a direct effect of carbohydrate enzyme deficiency (eg. maltase)?
 - A. Increased blood glucose levels.
 - B. Osmotic diarrhea due to undigested carbohydrates.
 - C. Increased insulin secretion.
 - D. Hyperglycemia.

4. The compensatory mechanism least expected to occur in metabolic acidosis is _____.
- A. decrease in bicarbonate levels
 - B. decrease in $p\text{CO}_2$
 - C. hyperventilation
 - D. hypoventilation
5. Liver disease caused by viral infections, such as hepatitis, will not present with _____.
- A. abdominal pain and muscle weakness
 - B. jaundice and dark urine
 - C. fatigue and weight gain
 - D. hemorrhage and bruising
6. Which of the following conditions is least likely to be associated with elevated gamma-glutamyl transferase (GGT) levels?
- A. Bone diseases
 - B. Cirrhosis
 - C. Chronic alcoholism
 - D. Acute viral hepatitis
7. The primary cause of hypertriglyceridemia is _____.
- A. overproduction of LDL
 - B. excess cholesterol intake
 - C. excess HDL production
 - D. deficiency of lipoprotein lipase

8. Which laboratory test is used to evaluate long-term glucose control by measuring glycated hemoglobin?
- A. HbA_{1c} measurement.
 - B. Glucose tolerance test.
 - C. Blood insulin measurement.
 - D. Lactose tolerance test.
9. Which of the following is a common cause of hypoglycemia?
- A. Insulin overdose.
 - B. Glucagon excess.
 - C. Increased ketone production.
 - D. Increased plasma glucose.
10. A 55-year-old patient presents with confusion, shortness of breath, and a respiratory rate of 28 breaths per minute. Arterial blood gas (ABG) shows a pCO₂ of 50 mmHg, pH of 7.25, and bicarbonate level of 22 mEq/L. This suggests _____.
- A. metabolic acidosis
 - B. respiratory acidosis
 - C. respiratory alkalosis
 - D. metabolic alkalosis
11. Respiratory acidosis is typically associated with _____.
- A. hyperventilation
 - B. excessive use of diuretics
 - C. pulmonary edema
 - D. anxiety

12. The functional unit of the kidney is the _____.
- A. glomerulus
 - B. nephron
 - C. neuron
 - D. kidney tubule
13. The primary function of albumin in blood plasma is for _____.
- A. transporting oxygen
 - B. breaking down fats
 - C. maintaining the blood oncotic pressure
 - D. fighting infections
14. Which condition causes hyponatremia?
- A. Excessive loss of magnesium.
 - B. Increased water retention or dilution of serum sodium.
 - C. Excessive intake of sodium.
 - D. Increased sodium secretion by aldosterone.
15. Identify the safety equipments commonly used in clinical chemistry laboratories to protect personnel from chemical hazards.
- A. Incubators, centrifuges, autoclaves.
 - B. MRI machines, defibrillators, safety showers.
 - C. Blood pressure monitors, stethoscopes, ventilators.
 - D. Fire extinguishers, fume hoods, personal protective equipment.

16. Anemia in chronic renal failure is typically due to _____.
- A. lack of erythropoietin production
 - B. excessive blood loss
 - C. iron deficiency
 - D. bone marrow failure
17. Creatinine clearance is most accurately used to measure _____.
- A. urinary sodium concentration
 - B. tubular protein leakage
 - C. blood urea nitrogen
 - D. glomerular filtration rate
18. Therapeutic drug monitoring (TDM) involves _____.
- A. evaluating patient age and condition
 - B. measuring circulating concentrations of drugs in blood
 - C. analyzing the presence of drugs in urine
 - D. identifying drug interactions only
19. Tumor markers are used to _____.
- A. monitor cancer recurrence and treatment progress
 - B. diagnose cancer exclusively
 - C. detect cancer at its early stage only
 - D. replace biopsy testing

20. Nephrotic syndrome is most commonly associated with _____.
- A. decreased urine volume
 - B. protein loss in urine
 - C. increased glomerular filtration rate
 - D. hypercalcemia
21. Which of the following is true regarding tumor markers?
- A. Elevated tumor markers are always indicative of cancer.
 - B. Tumor markers are only useful for the initial diagnosis of cancer.
 - C. Tumor markers can be elevated in benign conditions.
 - D. Tumor markers are always specific to a particular type of cancer.
22. The normal pH range of blood is _____.
- A. 6.8 - 7.2
 - B. 7.0 - 7.5
 - C. 7.5 - 8.0
 - D. 7.35 - 7.45
23. The function of bicarbonate (HCO_3^-) in the body is to _____.
- A. regulates body temperature
 - B. aids in blood coagulation
 - C. buffers acid-base balance
 - D. produces energy in cells

24. Which cation is measured as the major component in the extracellular fluid (ECF)?
- A. Calcium (Ca)
 - B. Magnesium (Mg)
 - C. Potassium (K)
 - D. Sodium (Na)
25. Hemolysis during blood sampling will cause _____.
- A. potassium level remains unchanged
 - B. potassium level falsely increases
 - C. potassium to completely destroyed
 - D. potassium level decreases
26. Which of the following is a key responsibility of a Clinical Laboratory Scientist?
- A. Producing accurate test results.
 - B. Administering patient therapy
 - C. Performing surgical procedures.
 - D. Prescribing medication to patients.
27. Which of the following statements about plasma lipoproteins is correct?
- A. They have a hydrophobic core of triacylglycerol and cholesterol esters.
 - B. They have a hydrophilic core of triacylglycerol and cholesterol esters.
 - C. They have a hydrophobic core of phospholipid and apolipoproteins.
 - D. They have a hydrophobic core of phospholipids and free cholesterol.

28. Serum acid phosphatase level is increased in which conditions?
- A. Liver cirrhosis
 - B. Hyperparathyroidism
 - C. Prostatic carcinoma
 - D. Hepatitis
29. When excessive quantity of fat is excreted in the faeces, the condition is known as _____.
- A. steatorrhea
 - B. proteinemia
 - C. hematuria
 - D. azotemia
30. In which condition serum amylase level is increased upto >1800 U/L?
- A. Liver disease
 - B. Chronic renal failure
 - C. Acute pancreatitis
 - D. Gastroenteritis
31. In metabolic alkalosis _____ is very high.
- A. PO_2
 - B. blood pH
 - C. PCO_2
 - D. plasma bicarbonate

32. In which condition, there is a raised level of bilirubin in the patient's body and there is yellow colouration of the eyes and some parts of the skin.
- A. Azotemia
 - B. Anemia
 - C. Uremia
 - D. Icterus
33. Which enzyme is commonly elevated in obstructive jaundice?
- A. Alanine transaminase
 - B. Alkaline phosphatase
 - C. Albumin
 - D. Aspartate transferase
34. A branch of clinical pharmacology that deals with measurement of medication concentration in the blood, mainly drugs with narrow therapeutic range is called as _____.
- A. pharmacotherapeutics
 - B. therapeutic drug monitoring
 - C. pharmacovigilance
 - D. pharmacokinetics
35. Therapeutic drug monitoring is useful in drugs _____.
- A. with wide therapeutic index
 - B. with high protein binding
 - C. which are not liable to interact
 - D. in which metabolite is inactive

36. A decrease in serum albumin indicates _____.
- A. chronic liver disease
 - B. hemolysis
 - C. renal failure
 - D. acute liver disease
37. Triglycerides are transported from liver to extrahepatic tissues by _____.
- A. low density lipoprotein
 - B. high density lipoprotein
 - C. very low density lipoprotein
 - D. chylomicrons
38. Which of the following is a marker of cholestasis?
- A. Aspartate transferase
 - B. Alanine transaminase
 - C. Lactate dehydrogenase
 - D. Gamma-glutamyl transferase
39. In pre-hepatic jaundice, conjugated bilirubin level in serum is _____.
- A. normal
 - B. decreased
 - C. fluctuated
 - D. increased

40. A 23 year old woman is seen for a lump in her breast that she palpated on self breast examination. History reveals that her mother and her aunt both had breast an ovarian cancer. Given this presentation, you suspect the patient may have a mutation in which off the following genes involved in DNA repair?
- A. p53
 - B. Bcl-2
 - C. Ras
 - D. BRCA-1

SECTION B (Total: 60 marks)

Answer THREE (3) questions only.

Please use the answer booklet provided.

Question 1

Answer the following questions:

- (a) A 50-year-old man with no family history of chronic heart disease underwent an annual laboratory investigation. His results showed a fasting total cholesterol level of 260 mg/dL, triglycerides at 505 mg/dL, HDL cholesterol at 25 mg/dL, and a glucose level of 134 mg/dL.

*Reference Values: Total Cholesterol: <200 mg/dL, Total Triglycerides: <150 mg/dL, HDL: >59 mg/dL, LDL: <100 mg/dL, VLDL: <30 mg/dL, Glucose: 70-110 mg/dL.

- i. Write Friedewald formula of lipoprotein calculation. (2 marks)
- ii. Calculate the man VLDL and LDL level. (5 marks)
- iii. Explain the relationship between glucose levels and triglyceride (TG) levels. (3 marks)
- (b) Explain the purpose of TG measurement, the process of sample collection, and the method of detection. (10 marks)

Question 2

Answer the following questions:

- (a) A 3.5 kg infant was delivered, displaying above-average weight and length. The mother reported no medical care during her pregnancy. After birth, the infant exhibited lethargy and flaccidity. To assess the infant's condition, a whole blood glucose test was conducted in the nursery, revealing a level of 1.8 mmol/L (reference range for normal: 3.3-5.5 mmol/L). Based on the finding, an intravenous glucose solution was administered, and whole blood glucose levels were monitored hourly.
- i. Give a possible explanation for the infant's overweight and size.
(5 marks)
 - ii. If the mother was a gestational diabetic, correlate the occurrence of hypoglycemia in the baby.
(3 marks)
 - iii. Proposed a diagnostic test to determine the mother's condition.
(2 marks)
- (b) Differentiate between Type 1 Diabetes and Type 2 Diabetes in terms of causes, mechanisms, age of onset and risk factors.
(10 marks)

Question 3

Answer the following questions:

- (a) Drug of abuse monitoring is the process of checking if someone has taken drugs that are often misused, like heroin, cocaine, or some prescription medicines. It is done in places like hospitals, workplaces, or during police investigations. The test can use samples like urine, blood, or saliva to find out if the person recently used drugs. This helps doctors give the right treatment, keeps workplaces safe, and supports legal cases.
- i. State the importance of chain of custody. (2 marks)
 - ii. Propose one way to detect an altered Specimen. (2 marks)
 - iii. Explain the two-tiered method used in measuring drugs of abuse. (6 marks)
- (b) Differentiate any three (3) drugs classified under the drug of abuse category based on their effects, overdose symptoms and its detection half life. (10 marks)

Question 4

Answer the following questions:

- (a) A physician contacted the clinical chemistry section of the laboratory to inquire about the 11:00 am fasting glucose result for a diabetic patient, whose fasting began at 9:00 pm. The scientist verified the name and date with the requisitions and previously received samples. The specimen could not be found in the laboratory initially, but after some searching, it was discovered in an EDTA tube inside the pocket of a young nurse, who had drawn the sample four hours earlier. The sample was promptly transported to the laboratory, where the glucose value was determined to be 6.4 mmol/L.
- i. Outline three (3) pre-analytical errors that might have occurred.
(6 marks)
- ii. Explain the impact and consequences of the errors on the interpretation of the patient's sample result and management.
(4 marks)
- (b) Discuss the importance of adhering to the scope of practice in ensuring professional excellence as a Clinical Laboratory Scientist.
(10 marks)

END OF EXAMINATION PAPER

