UNIVERSITI KUALA LUMPUR
ROYAL COLLEGE OF MEDICINE PERAK

FINAL EXAMINATION
JULY 2025 SEMESTER

COURSE CODE	: RPD11502
COURSE NAME	: BIOCHEMISTRY
PROGRAMME NAME	: DIPLOMA IN PHARMACY
DATE	: 18 SEPTEMBER 2025
TIME	: 09.00 AM – 11.00 AM
DURATION	: 2 HOURS

INSTRUCTIONS TO CANDIDATES

1. Please CAREFULLY read the instructions given in the question paper.
2. This question paper has information printed on both sides of the paper.
3. This question paper consists of TWO (2) sections; Section A and Section B.
4. Answer ALL questions in Section A. For Section B, answer THREE (3) questions where Question 1 and Question 2 are COMPULSORY, answer either Question 3 or Question 4.
5. Please write your answers on the OMR answer script and answer booklet provided.
6. Answer all questions in English language ONLY.

THERE ARE 10 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

SECTION A (Total: 25 marks)

INSTRUCTION: Answer ALL questions.
Please use the objective answer sheet provided.

1. Which fluid compartment contains about 63% of total body water?
   A. Extracellular fluid
   B. Interstitial fluid
   C. Intracellular fluid
   D. Plasma

2. An amphipathic molecule is placed in water.
   How will it likely arrange itself?
   A. The molecule dissolves fully with no special arrangement
   B. All molecular parts interact equally with water
   C. Hydrophobic parts are positioned outward toward water
   D. Hydrophilic parts outside, hydrophobic parts inside

3. Which of the following is prokaryotic cell type?
   A. Algae
   B. Fungi
   C. Bacteria
   D. Protozoa

4. Which of the following organelles is responsible for storing water and providing support in cells?
   A. Vacuole
   B. Ribosome
   C. Cytoplasm
   D. Mitochondria

5. Which of the following is an example of active transport?
   A. Oxygen entering cell by diffusion
   B. Osmosis of water molecule from high to low concentration
   C. Glucose entering bloodstream down concentration gradient
   D. Mineral salts moved into root hair cells from low to high concentration

6. Chromosomes are replicated and split apart into daughter chromosomes located at the opposite ends of the cell in miosis stage.
Which of the following miosis stage it occurs?
A. Prophase
B. Anaphase
C. Telophase
D. Metaphase

7. Which level of protein structure is characterized by a globular structure of the polypeptide chain?
A. Primary structure
B. Tertiary structure
C. Secondary structure
D. Quaternary structure

8 What happens to the amylases' activity above the optimum temperature range?
A. The enzymes are denatured
B. The solubility of the enzymes increases
C. They maintain the enzyme's 3D structure
D. The enzymes increase the rate of reactions

9. Which category of amino acids is characterized by negative charged at physiological pH?
A. Polar amino acids
B. Basic amino acids
C. Acidic amino acids
D. Non-polar amino acids

10. The main product of the oxidative phase of the pentose phosphate pathway is
A. $FADH_2$
B. NADPH
C. ATP
D. Pyruvate

11. Stephen becomes lost during a hiking trip and is found after several days without food. Upon hospitalization, he appears skinny with signs of muscle wasting. Laboratory tests show that his muscle protein breakdown is reduced compared to the first few days after his admission.

What is the main role of ketone bodies in this adaptation?

A. Stimulate protein synthesis in the liver.
B. Replace glucose as the main energy source.
C. Prevent fatty acid oxidation in muscle cells.
D. Increase glycogen stores in the liver.

12. Select the main site for dietary lipid digestion.

A. Mouth
B. Stomach
C. Small intestine
D. Large intestine

13. Select the **CORRECT** statement about trans fats.

A. They are uncommon in nature and may lead to heart disease.
B. They lower LDL cholesterol levels and improve heart health.
C. They have a cis double bond structure in their fatty acids.
D. They are healthy fats that are mainly found in plants.

14. Which of the following enzymes is involved in the transamination process of most amino acids?

A. Urease
B. Transferases
C. Dehydrogenase
D. Aminotransferase

15. Identify the two primary forms in which nitrogen is excreted from the body.

A. Ammonia and urea
B. Nitric oxide and nitrate
C. Glutamate and aspartate
D. Sodium chloride and glycine

16. Select the **CORRECT** statement regarding the leading strand during DNA replication.
    A. The leading strand is synthesized discontinuously.
    B. The leading strand is made of Okazaki fragments.
    C. The leading strand is synthesized in the 5' to 3' direction.
    D. The leading strand is synthesized away from the replication fork.

17. Where does transcription take place in eukaryotic cells?
    A. Cytoplasm
    B. Nucleus
    C. Ribosome
    D. Endoplasmic reticulum

18. Which of the following is a purine base?
    A. Adenine
    B. Thymine
    C. Uracil
    D. Cytosine

19. Which of the following glands act as a master gland of the endocrine system?
    A. Pineal gland
    B. Pituitary gland
    C. Thyroid gland
    D. Adrenal gland

20. Which of the following is an example of paracrine signaling?
    A. Neurons releasing acetylcholine at a synapse
    B. Adrenal gland releasing cortisol into the bloodstream
    C. Clotting factor affecting nearby cells to stop bleeding
    D. Pituitary gland stimulating the thyroid to release thyroxine

21. Which molecule does a ligand bind to during cell communication?
    A. Ribosome
    B. Lysosome
    C. Mitochondria
    D. Receptor protein

Question 22 to 25 requires the following answer.

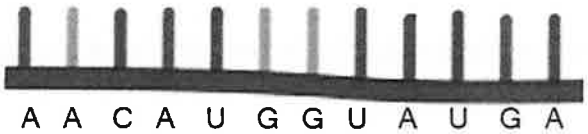
A	B	C	D
I and III	II and IV	I, II and III	II, III and IV

22. Select the major molecules of life.
    I. Vitamins
    II. Carbohydrates
    III. Proteins
    IV. Lipids

23. Which of the following are required for oxidative phosphorylation to occur?
    I. Oxygen
    II. Glucose
    III. Inner mitochondrial membrane
    IV. Ribosome

24. Rumi, a 38-year-old woman with a BMI of 33, decides to join a community weight loss challenge. Over four months, she follows a structured meal plan and engages in regular physical activities. By the end of the challenge, her BMI decreases to 24.
    Which of the following best describe the changes in her adipocytes during this transition?
    I. The size of adipocytes decreases.
    II. The number of adipocytes decreases significantly.
    III. Smaller adipocytes are more efficient at regaining fat.
    IV. Adipocytes lose their ability to store fat.

25.



Select the **CORRECT** statement about the second codon.
    I. It is paired with the CGU anticodon
    II. It is the start codon.
    III. It is the stop codon.
    IV. It is codes for methionine.

SECTION B (Total: 75 marks)

INSTRUCTION: This section consists of FOUR (4) modified essay questions (MEQ).
You are required to answer THREE questions in the answer booklet provided.
Question 1 and Question 2 are COMPULSORY.
Answer either Question 3 OR Question 4.

Question 1

(a) i. Name **THREE (3)** most abundant elements in living organisms.

(3 marks)

ii. State **TWO (2)** important roles of biochemistry in the pharmacy field.

(2 marks)

(b) i. Define prokaryotes cells.

(2 marks)

ii. State the function of mitochondria.

(1 mark)

(c) State **TWO (2)** types of passive transport.

(2 marks)

(d) i. State **TWO (2)** differences between intracellular enzymes and extracellular enzymes.

(4 marks)

ii. State **ONE (1)** factor that affects the rate of enzyme activity.

(1 mark)

iii. Proteolysis breaks peptide bonds and amino acid through process M. Identify process M.

(1 mark)

(e) Explain the carbohydrate digestion, including the main enzymes involved.

(3 marks)

(f) Discuss the effect of glucose-6-phosphate dehydrogenase (G6PD) deficiency on red blood cell function.

(3 marks)

(g) A 22-year-old competitive sprinter completes an intense training session at the track. Shortly afterward, he enjoys a large protein-rich meal to help his body recover. Explain how his body regulates protein metabolism in this post-meal state.

(3 marks)

Question 2

(a) The graduation day is approaching, and Kirana wants to look her best. She decides to try intermittent fasting and skips all meals for 24 hours.
Explain the **TWO (2)** metabolic processes that maintain her blood glucose at this stage.

(4 marks)

(b) List **TWO (2)** examples of reducing sugars.

(2 marks)

(c) State **THREE (3)** health risks associated with obesity.

(3 marks)

(d) State **TWO (2)** metabolic changes observed in uncontrolled diabetes mellitus.

(2 marks)

(e) Malik, a 50-year-old man who enjoys trying new cafes and restaurants, eats a large carbohydrate-rich breakfast. Shortly after the meal, he feels full and content.

i. State the hormone that rises and involved in this situation.

(1 mark)

ii. Explain how this hormone regulates his carbohydrate metabolism.

(3 marks)

(f) i. State **TWO (2)** codons that serve as stop signals in translation.

(2 marks)

ii. State **THREE (3)** structural characteristics of the RNA molecule.

(3 marks)

(g) Briefly explain how non-steroid hormones affect target cells.

(3 marks)

(h) Give **TWO (2)** examples of steroid hormones.

(2 marks)

Answer either Question 3 OR Question 4

Question 3

(a) State **TWO (2)** differences between catabolism and anabolism.

(4 marks)

(b) i. State the location of glycolysis in the cell.

(1 mark)

ii. Name **TWO (2)** end products of glycolysis.

(2 marks)

(c) i. Explain how cholesterol is eliminated from the body.

(2 marks)

ii. State the function of very low-density lipoprotein (VLDL).

(1 mark)

(d) Explain why β-oxidation is crucial during fasting.

(2 marks)

(e) Anand, 50-year-old man with obesity and type 2 diabetes, along with an unhealthy lifestyle, is diagnosed with steatosis after an ultrasound examination.
Explain how his condition contributes to steatosis.

(2 marks)

(f) i. List **THREE (3)** sources of ammonia in the human body.

(3 marks)

ii. State **TWO (2)** organs where aminotransferases are found.

(2 marks)

iii. State the role of glutamate dehydrogenase in the amino acid catabolism.

(1 mark)

(g) i. State **THREE (3)** enzymes involved in DNA replication.

(3 marks)

ii. State **TWO (2)** structural characteristics of the DNA molecule.

(2 marks)

Question 4

(a) State **TWO (2)** differences between autotrophs and heterotrophs.

(4 marks)

(b) i. State the location of the Krebs cycle in the cell.

(1 mark)

ii. Name **TWO (2)** end products of the Krebs cycle.

(2 marks)

(c) i. Explain how low HDL levels can increase the risk of heart disease.

(2 marks)

ii. State the function of chylomicron.

(1 mark)

(d) Explain the conditions that trigger fatty acid synthesis.

(2 marks)

(e) A 45-year-old patient reports persistent greasy, foul-smelling stools that float in the toilet. Laboratory tests show a deficiency in bile salt production.
Explain how bile salt deficiency leads to the patient's symptoms.

(2 marks)

(f) i. Describe the process of transamination in the amino acid catabolism.

(3 marks)

ii. State where urea is produced and excreted.

(2 marks)

iii. Name **ONE (1)** coenzyme commonly used in oxidative deamination process.

(1 mark)

(g) i. Define the central dogma of molecular biology.

(2 marks)

ii. Name the **THREE (3)** types of RNA.

(3 marks)

END OF EXAMINATION PAPER