



UNIVERSITI KUALA LUMPUR
ROYAL COLLEGE OF MEDICINE PERAK

FINAL EXAMINATION
MARCH 2026 SEMESTER

COURSE CODE : RCB10203
COURSE NAME : BIOCHEMISTRY
PROGRAMME NAME : BACHELOR IN PHARMACEUTICAL TECHNOLOGY
(HONOURS)
DATE : 24 JUNE 2026
TIME : 9.00 AM – 11.00 AM
DURATION : 2 HOURS

INSTRUCTIONS TO CANDIDATES

1. Please read CAREFULLY 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 WITH AT LEAST ONE (1) question from 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 9 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

SECTION A (Total: 40 marks)

I) MULTIPLE CHOICE QUESTIONS (20 marks)

INSTRUCTION: Answer ALL questions.

Use the OMR sheet provided.

1. Identify the major imbalance molecule that is related to atherosclerosis.
 - A. Nucleic acids
 - B. Proteins
 - C. Lipids
 - D. Carbohydrates
 - E. Uric acids

2. Select the **CORRECT** function of flagella in prokaryotic cells.
 - A. Involves in protein synthesis.
 - B. Involves in energy production.
 - C. Acts as a control centre for cells activity.
 - D. Facilitates the cells movement.
 - E. Conserves nutrient or waste produced by the cells.

3. Select the **CORRECT** statements about the properties of water.
 - I. Water molecules repel each other to form a water droplet.
 - II. Water has higher specific heat capacity as compared to alcohol.
 - III. Water molecules have tendency to stick on other surfaces.
 - IV. The solid phase has lower density than the liquid phase.
 - A. I and II
 - B. II and III
 - C. I, II, and IV
 - D. I, III, and IV
 - E. II, III, and IV

4. Choose the **CORRECT** statements about eukaryotic cells.
- I. The complex form of cells.
 - II. Plant cells are protected by a rigid cell wall.
 - III. The nucleus is bound by membrane.
 - IV. A single cell could derive to an organism.
- A. I and II
B. III and IV
C. I, II, and III
D. I, II, and IV
E. II, III, and IV
5. Identify the number of ATPs produced from the metabolism of a single molecule of glucose assuming oxaloacetate is present in the Krebs's cycle.
- A. 28
B. 30
C. 32
D. 64
E. 96
6. Choose the **CORRECT** statement about citric acid cycle.
- A. Oxaloacetate will be degraded after completing the cycle.
B. One molecule of NADH is produced in a complete cycle.
C. It is commonly known as an intermediate process.
D. The cycle begins with the condensation between acetyl-CoA and oxaloacetate.
E. Three molecules of GTP are produced in a complete cycle.
7. Identify Psi (ψ) torsion angle.
- A. C-C $_{\alpha}$ -N-C
B. C $_{\alpha}$ -C-N-C $_{\alpha}$
C. C-N-C $_{\alpha}$ -C
D. N-C $_{\alpha}$ -C-OH
E. N-N $_{\alpha}$ -N-N

8. Select the **CORRECT** function of proteins in human body system.
- I. Involve in the production of hormones.
 - II. Act as part of body defence mechanism.
 - III. Provide structural and mechanical supports of certain parts of human body.
 - IV. Act as energy storage site.
- A. I and II
 - B. II and III
 - C. I, II, and III
 - D. I, II, and IV
 - E. I, II, III, and IV
9. Identify the hormone that deactivates the process of glycogenolysis.
- A. Insulin
 - B. Thyroxine
 - C. Glucagon
 - D. Gonadotrophin
 - E. Follicle stimulating hormone
10. Identify the phenomenon of a positive nitrogen balance.
- A. An adult that exposed to normal nutrient intake.
 - B. A growing foetus in a pregnant woman.
 - C. An individual that experienced allergic to seafoods.
 - D. A person on food-restricted diet for medical purpose.
 - E. A man with alcohol addiction.
11. Which of the following is a ketone body?
- A. Pyruvate
 - B. Lactate
 - C. Acetoacetate
 - D. Glucose
 - E. Citrate

12. Acetyl-CoA carboxylase is involved in _____.
A. β -oxidation
B. lipolysis
C. cholesterol synthesis
D. ketone body formation
E. fatty acid synthesis
13. A low K_m indicates _____.
A. low substrate affinity
B. high substrate affinity
C. no enzyme activity
D. low enzyme concentration
E. high inhibitor concentration
14. Choose the **CORRECT** statement regarding competitive inhibition of enzymes action.
A. The apparent K_m is decreased
B. The apparent K_m is increased
C. V_{max} is decreased
D. Apparent concentration of enzyme molecules decreased
E. V_{max} is increased
15. Select the statement that best explains semi-conservative DNA synthesis.
A. Both strands are newly synthesised.
B. One parental and one new strand form daughter DNA.
C. DNA fragments are randomly distributed.
D. RNA replaces DNA.
E. Only one strand is replicated.
16. The phosphodiester bond forms between _____.
A. nitrogen base and sugar
B. sugar and phosphate
C. phosphate and phosphate
D. base and phosphate
E. sugar and sugar

17. Select the **CORRECT** forms of vitamin A.
- I. Retinol
 - II. β -carotene
 - III. Retinaldehyde
 - IV. Retinomanine
 - A. I and II
 - B. II and III
 - C. I, II, and III
 - D. I, III, and IV
 - E. II, III, and IV
18. Select the vitamin that is required for carboxylation reactions.
- A. Vitamin A
 - B. Vitamin B₃
 - C. Vitamin B₇
 - D. Vitamin C
 - E. Vitamin D
19. Choose the active form of vitamin B₃.
- A. Flavin mononucleotide
 - B. Deoxyadenosylcobalamine
 - C. Retinoic acid
 - D. Thiamine pyrophosphate
 - E. Nicotinamide adenine dinucleotide
20. Identify the mineral that is involved in the production of a thyroxine hormone.
- A. Potassium
 - B. Sodium
 - C. Iodine
 - D. Calcium
 - E. Magnesium

II) SHORT ANSWER QUESTIONS (20 marks)**INSTRUCTION: Answer ALL questions in the answer booklet provided.****Each question carries TWO (2) marks.**

1. Predict the number of ATPs produced if 8 units of FADH_2 and 16 units of NADH molecules proceed through the electron transport chain.
2. Illustrate the general chemical structure of an amino acid.
3. Describe the differences in the cellular locations of β -oxidation and fatty acid synthesis in the human body.
4. Describe nucleoside.
5. Describe the reactions catalysed by ligases with an example.
6. Differentiate between apoenzyme and holoenzyme.
7. Define K_m .
8. Describe the effect of temperature on enzyme activity.
9. Differentiate between cofactor and coenzyme.
10. Differentiate between competitive and non-competitive inhibition.

SECTION B: MODIFIED ESSAY QUESTIONS (Total: 60 marks)

INSTRUCTION: This section consists of **FOUR (4)** questions.

You are required to answer THREE (3) questions in the answer booklet provided.

Question 1 and 2 are COMPULSORY.

Answer EITHER Question 3 OR 4.

Question 1

- (a) i. Describe the carbohydrates absorption process in human digestive system. (5 marks)
- ii. Explain the mechanism of glucose transportation into the cells that can be influenced by the present of insulin. (5 marks)
- (b) i. Elaborate the process of permanent protein denaturation caused by temperature. (5 marks)
- ii. Illustrate the chemical structure of a dipeptide formation from the combination between alanine and serine. Mark the related bond formed. (5 marks)

Question 2

- (a) Explain how simple two-carbon units derived from acetyl-CoA are progressively assembled and modified to form cholesterol.

(10 marks)

- (b) Explain the molecular events that occur when a double-stranded DNA molecule is separated and copied into two identical DNA molecules, highlighting strand directionality and enzyme involvement.

(10 marks)

Question 3

- (a) Analyse the metabolic effect on the major biomolecule processes during short term starvation. (5 marks)
- (b) Elaborate the process of calcium regulation by the bone if low serum calcium level is detected. (5 marks)
- (c) Thiamine-dependent enzymes play critical roles in energy metabolism. Analyse the metabolic pathways that depend on thiamine. (10 marks)

Question 4

- (a) Analyse the metabolic effect of insulin in the carbohydrate, protein, and lipid metabolisms. (5 marks)
- (b) Elaborate the process of sodium regulation by the kidney if low serum sodium level is detected. (5 marks)
- (c) Elaborate the metabolism, transport, and storage of vitamin A in the human body. (10 marks)

END OF EXAMINATION PAPER