



Khulna University

School: Life Sciences Discipline: AT Program: MS in AN
Year: MS 1st Term: 1st Examination Year: 2026 Session: 2025-26
Course Code: 0811 08 AN 5101 Course Title: Ruminant Nutrition
Total Marks: 60 Time: 03 hours Credit: 03
Instructions (if any):
Comments/Remarks (if any):

Section A

There are **FOUR** questions in this section. Answer any **THREE** questions.

Question No.	Question Description	Marks
1.	a) Describe the structure and functions of different compartments of the ruminant stomach. [L2; CLO1]	03
	b) Explain rumen environment and its significance in digestion. [L2; CLO1]	03
	c) Classify rumen microorganisms and describe their functions. [L1; CLO2]	04
2.	a) Explain fermentation of carbohydrates in the rumen and its end products. [L2; CLO3]	03
	b) Describe protein digestion and microbial protein synthesis. [L2; CLO3]	03
	c) Analyze lipid metabolism and biohydrogenation. [L4; CLO3]	02
	d) Discuss importance of microbial protein. [L2; CLO3]	02
3.	a) Describe metabolic fate of VFAs. [L2; CLO4]	03
	b) Explain protein metabolism and nitrogen recycling. [L2; CLO4]	03
	c) Compare and contrast the digestive system of ruminant and non-ruminant. [L4; CLO1]	04
4.	a) Enlist the digestive juices secreted from the ruminant digestive system. [L1; CLO2]	03
	b) State the functions of pancreatic juices. [L1; CLO2]	03
	c) Summarize the different types of rumen movements. [L5; CLO3]	04

*Levels of Bloom's cognitive domain:

[L1=Remember; L2=Understand; L3=Apply; L4=Analyze; L5=Evaluate; L6=Create]



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Section B

There are **FOUR** questions in this section. Answer any **THREE** questions.

Question No.	Question Description	Marks
5.	a) Explain the anatomy and physiology of ruminant digestion. [L2; CLO4]	03
	b) Show in a tabular form the typical rumen bacterium, their energy sources and fermentation products. [L3; CLO4]	03
	c) Explain the protozoal digestion in ruminants. [L4; CLO4]	04
6.	a) Write the metabolic pathways of pyruvate to VFA from structural carbohydrates. [L2; CLO4]	04
	b) What are NPN substances? Enlist the NPN substances used for ruminant nutrition. [L1; CLO4]	03
	c) Briefly describe the metabolism of amino acids in ruminants. [L3; CLO4]	03
7.	a) Explain the functions, deficiency symptoms, and dietary sources of vitamins A and D in ruminants. [L3; CLO6]	05
	b) Define vitamin K, describe its forms, and identify common dietary sources. [L1; CLO6]	03
	c) Analyze vitamin-mineral interactions. [L4; CLO6]	02
8.	a) List the primary precursor for each of the four major milk components. State the two key hormones that trigger lactogenesis at parturition and name the enzyme that regulates lactose synthesis. [L2; CLO4]	03
	b) A lactating cow is producing low milk volume despite adequate feed intake. Using your knowledge of lactose synthesis and nutrient supply to the mammary gland, suggest two possible physiological causes for the low volume and propose one practical management intervention for each cause. [L5; CLO4]	03
	c) Analyze pathways in meat production. [L4; CLO4]	04

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Khulna University

School: Life Science **Discipline:** Agrotechnology **Program:** MS in AN
Year: MS First **Term:** I **Examination Year:** 2026 **Session:** 2025-2026
Course Code: 0811 08 AN 5103 **Course Title:** Non-Ruminant Nutrition
Total Marks: 60 **Time:** 3 hours **Credit:** 03
Instructions (if any):N/A.....
Comments/Remarks (if any):N/A.....

Section A

There are 04 questions in this section. Answer any 03 questions.

Question No.	Question Description	Marks
1 (a)	Draw and label the digestive system of bird with clear diagram. [L2; CLO1]	04
(b)	Describe the organs and functions of small intestine of chicken. [L2; CLO1]	04
(c)	Enlist the function of Caeca in chicken. [L1; CLO1]	02
2 (a)	Analyze factors affecting protein requirements. [L4; CLO1]	03
(b)	Explain role of calcium and phosphorus in animal body. [L2; CLO2]	03
(c)	Evaluate deficiency symptoms of vitamins A and D. [L5; CLO2]	04
3 (a)	Define balanced ration and explain its importance. [L2; CLO3]	03
(b)	Analyze the hormonal regulation of enzyme secretion in poultry, particularly the roles of gastrin, secretin, and cholecystokinin. [L4; CLO1]	03
(c)	Analyze factors affecting feed intake. [L4; CLO3]	04
4 (a)	Explain feeding practices for non-ruminants. [L2; CLO3]	03
(b)	Analyze the relationship between vitamin deficiencies and specific disease conditions in livestock. [L4; CLO2]	03
(c)	Identify causes of poor feed efficiency. [L3; CLO3]	02
(d)	Evaluate strategies to improve feed conversion. [L5; CLO3]	02

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School: Life Science **Discipline:** Agrotechnology **Program:** MS in AN
Year: MS First **Term:** I **Examination Year:** 2026 **Session:** 2025-2026
Course Code: 0811 08 AN 5103 **Course Title:** Non-Ruminant Nutrition
Total Marks: 60 **Time:** 3 hours **Credit:** 03
Instructions (if any):N/A.....
Comments/Remarks (if any):N/A.....

Section B

There are 04 questions in this section. Answer any 03 questions.

Question No.	Question Description	Marks
5 (a)	Briefly describe the factors affecting feed intake of non-ruminant. [L1; CLO3]	03
(b)	How will you calculate a balanced daily ration? Explain. [L4; CLO3]	03
(c)	Propose a systematic method for selecting alternative feed ingredients for use in a region with limited conventional feed resources. [L4; CLO3]	04
6 (a)	What are anti-nutritional factors? Mention their importance in non-ruminant feeding. [L1; CLO3]	03
(b)	Describe the effects of anti-vitamin D and anti-vitamin E in the diet of layer birds. [L2; CLO3]	03
(c)	Describe gossypol in feedstuffs and explain the methods used to destroy or neutralize it. [L3; CLO3]	02
(d)	Analyze the detrimental effects of mycotoxins on poultry health and productivity. [L4; CLO3]	02
7 (a)	What does feed efficiency mean, and how is an animal's feed conversion efficiency calculated? [L1; CLO3]	03
(b)	Explain the quality control of feed and feed ingredients. [L2; CLO3]	03
(c)	Discuss the evaluation procedure of feed ingredients for quality testing. [L3; CLO3]	04
8 (a)	List the two main types of parent stock breeds available in Bangladesh and name one company supplying each. [L1; CLO4]	02
(b)	Explain why the poultry industry in Bangladesh faces a deficit in meat and egg production despite having many private farms and hatcheries. [L1; CLO4]	04
(c)	If you are a poultry farm owner in Bangladesh during an avian influenza outbreak, how would you apply biosecurity measures to protect your flock? [L4; CLO4]	04

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Khulna University

School: Life Science

Discipline: AT

Program: MS

Year: MS 1st

Term: I

Examination Year: 2026

Session: 2025-26

Course Code: 072108 AN 5151

Course Title: Food Technology

Total Marks: 60

Time: 3 hours

Credit: 3

Instructions (if any):

Comments/Remarks (if any):

Section A

There are four questions in this section. Answer any three questions.

Question No.	Question Description	Marks
1.	a) What is the scientific definition for food? Explain traditional and conventional food. [L4; CLO2]. b) Differentiate between food contaminants and food toxicants. [L2; CLO1]. c) List the function of protein in food preparation. Mention some important protein foods available in Khulna City Corporation markets. [L3; CLO2].	4 3 3
2.	a) What are safety nets? Describe the safety nets available in Bangladesh. [L1; CLO1]. b) Explain the types of food insecurity. How will you measure the severity of undernourishment? [L4; CLO1]. c) Is organic food better and cost more? Justify your comments. [L4; CLO2]	4 4 2
3.	a) What is enzyme? Discuss different types of enzymes. [L1; CLO2] b) Write in tabular form the major enzymes used in food industry. [L4; CLO2] c) Describe the textural factors of food. [L4; CLO2]	4 4 2
4.	a) Describe the concepts of quality control, quality assurance and food safety. [L4; CLO3] b) Describe the main components of food law. [L3; CLO3] c) What is food additives. Write down the functions of food additives. . [L2; CLO2]	4 3 3

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Page:



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School: Life Science

Discipline: AT

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Course Code: 072108 AN 5151

Course Title: Food Technology

Total Marks: 60

Time: 3 hours

Credit: 3

Instructions (if any):

Comments/Remarks (if any):

Section B

- | | | |
|----|--|---|
| 5. | a) "Unit operation is very much essential for maintaining quality in food industry" Put your opinion. [L2; CLO3] | 4 |
| | b) Enumerate the criteria of good quality food container. [L2; CLO3] | 3 |
| | c) Why is food packaging needed in modern life? [L5; CLO4] | 3 |
| 6. | a) Give an outline sorting method followed in food industry of Bangladesh. [L4; CLO4] | 3 |
| | b) What is food grading? Point out the principles of food preservation in food industry. [L2; CLO3] | 4 |
| | c) Distinguish between pasteurization and sterilization. [L3; CLO5] | 3 |
| 7. | a) Distinguish among green tea, black tea and milk tea based on nutritional point of view. [L2; CLO5] | 3 |
| | b) Enumerate the post-harvest management of black tea preparation. [L2; CLO5] | 3 |
| | c) Show the schematic representation of parchment coffee processing. [L6; CLO5] | 4 |
| 8. | a) Distinguish between robusta coffee and arabica coffee. Point out the indicator of waste water. [L2; CLO5] | 4 |
| | b) Briefly describe the methods of waste water purification in food industry. [L6; CLO4] | 6 |

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Khulna University

School: Life Science **Discipline:** Agrotechnology **Program:** MS in AN

Year: MS First **Term:** I **Examination Year:** 2026 **Session:** 2025-2026

Course Code: 0512 08 AN 5153 **Course Title:** Nutritional Biochemistry

Total Marks: 60 **Time:** 3 hours **Credit:** 03

Instructions (if

any):N/A.....

Comments/Remarks (if any):N/A.....

Section A

There are 04 questions in this section. Answer any 03 questions.

Question No.	Question Description	Marks
1 (a)	Define nutritional biochemistry. Explain its importance in understanding nutrition science. [L2; CLO1]	03
(b)	Why is the concept of essential and non-essential amino acids important in diet planning? How does protein quality affect human nutrition, and what factors determine the biological value of a protein? [L4; CLO3]	03
(c)	What are limiting amino acids? Explain their nutritional significance. [L2; CLO1]	04
2 (a)	Compare animal proteins and plant proteins. Explain supplementary value of protein. [L4; CLO2]	03
(b)	Demonstrate digestion and absorption of dietary proteins. [L2; CLO2]	04
(c)	Illustrate the role of pepsin in the stomach for protein digestion. [L2; CLO2]	03
3 (a)	Analyze why infants can absorb whole proteins but adults cannot. [L4; CLO3]	03
(b)	Differentiate endopeptidases and exopeptidases. [L2; CLO1]	03
(c)	Explain the structural differences between aldoses and ketoses with examples. [L2; CLO1]	04
4 (a)	Explain how glycogen functions as an energy reserve in the liver and muscles during fasting and exercise. [L2; CLO2]	03
(b)	Identify enzyme deficiency in lactose intolerance and suggest diagnosis. [L3; CLO2]	03
(c)	Describe symptoms and treatment of lactose intolerance. [L2; CLO1]	04

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Course Code: 0512 08 AN 5153

Course Title: Nutritional Biochemistry

Total Marks: 60

Time: 3 hours

Credit: 03

Instructions (if

any):N/A.....

Comments/Remarks (if any):N/A.....

Section B

There are 04 questions in this section. Answer any 03 questions.

Question No.	Question Description	Marks
5 (a)	Define lipids. Differentiate among fats, oils, and lipids. [L1 & L2; CLO2]	1+3=3.0
(b)	Describe the carbon skeleton, structure, systematic name, dietary sources, and three functions of one Omega-3 fatty acid and one Omega-6 fatty acid. [L2; CLO2]	3.5*2=7.0
6 (a)	Explain the digestion of dietary lipids in the gastrointestinal tract. [L4; CLO3]	4.0
(b)	Interpret the role of soluble fibres in regulating blood cholesterol levels. [L4; CLO3]	3.0
(c)	Describe how long-chain fatty acids yield energy in the body. [L4; CLO3]	3.0
7 (a)	List the deficiency symptoms and RDAs of vitamins B2, B6, and B12. [L2; CLO2]	1.5 x 3=4.5
(b)	What is NTD? How to prevent it? [L2; CLO2]	1+2=3.0
(c)	Describe the role of vitamin C in iron (Fe) absorption. [L2; CLO2]	2.5
8 (a)	“Vitamin supplements can replace a balanced diet.” Evaluate [L5; CLO3]	03
(b)	Describe toxicity of Vitamins A and D. [L1; CLO1]	03
(c)	Explain deficiency diseases of thiamin, riboflavin, pyridoxine. [L2; CLO1]	04

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