



[Question of Term Final Examination] Khulna University

School: Life Science Discipline: Biotechnology and Genetic Engineering Program: MS
 Year: MS 1st Term: I Examination Year: 2026 Session: 2024-25
 Course Code: 0512 07 BGE 5101 Course Title: Molecular Biosciences
 Total Marks: 60 Time: 3 Hours Credit: 03

- The figures in the margin indicate full marks. The questions are of equal value.
- Use separate script for each section.

Section-A

(There are four (04) questions in this section. Answer any three (03) questions.)

Question no.	Question Description	Marks	Level (L ₁ -L ₆)	CLO No.
1. (a)	Define molecular bioscience. List five early developments in genetics and molecular biology.	02	1	1
(b)	Summarize three key observations of Griffith's experiment of transforming principle.	04	2	2
(c)	Elaborate the concept of central dogma of molecular biology. Discuss how this dogma serves as the foundational framework for modern "omics".	04	6	2
2. (a)	What is replication fork? Mention the roles of replication fork associated proteins.	03	2	1
(b)	How do DNA methylation and sequestration by seqA control re-initiation of replication?	04	2	3
(c)	Telomerase plays a significant role in ageing and cancer development-justify with example.	03	5	3
3. (a)	Name three post transcriptional modifications with their implications.	02	1	1
(b)	Describe spliceosome mediated splicing method.	04	2	1
(c)	How does the uvrABC endonuclease system detect and repair DNA damage?	04	4	3
4. (a)	What is tRNA charging? Why initiator tRNA is formylated?	02	1	1
(b)	Explain the mechanism and importance of signal peptide mediated protein trafficking and post translational protein folding.	04	2	1
(c)	What is epigenetics? Discuss the role of epigenetics in health and disease.	04	1,6	1,3

Section-B

(There are four (04) questions in this section. Answer any three (03) questions.)

Question no.	Question Description	Marks	Level (L ₁ -L ₆)	CLO No.
5.	(a) What is recombinant DNA technology? How does it differ from molecular cloning?	03	1,2	2
	(b) Describe the construction of a cDNA library.	04	2	1
	(c) Compare and contrast between genomic and cDNA library.	03	4	1
6.	(a) What is GMO? Describe the steps involved in creating a GMO.	04	2	2
	(b) Discuss the rationale for genetic modification in plants.	03	1,2	3
	(c) What is reporter gene? Tabulate some reporter genes with their common uses.	03	1	1
7.	(a) What is whole genome sequencing? Summarize the applications of whole genome sequencing.	03	1,2	2
	(b) Illustrate a complete genome project using a flowchart.	04	2	2
	(c) What is DNA fingerprinting? Summarize the current applications of DNA fingerprinting.	03	1,2	1,3
8.	(a) What are omics technologies? Outline the key aspects of omics technologies.	03	1,2	2
	(b) What is genomic profiling? Discuss the application of genomic profiling in agriculture.	04	1,6	2,3
	(c) Create a workflow of genomic profiling in marker assisted selection.	03	6	2



Question of Term Final Examination Khulna University

School: Life Science Discipline: Biotechnology and Genetic Engineering Program: MS
Year: MS 1st Term: I Examination Year: 2026 Session: 2024-25
Course Code: 0512 07 BGE 5103 Course Title: Bioanalytical Techniques
Total Marks: 60 Time: 3 Hours Credit: 03

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- Use separate script for each section.

Section-A

(There are four (04) questions in this section. Answer any three (03) questions.)

Question no.	Question Description	Marks	*Level (L ₁ -L ₆)	CLO No.
1. (a)	Define biological sample. List the major types of biological samples used in bioanalysis.	02	1	2
(b)	Explain the procedures of biological sample collection, handling, processing and storage for bioanalytical investigation.	04	2	2
(c)	Appraise the applications of bioanalytical techniques in pharmaceutical, clinical and environmental biotechnology industries with suitable examples.	04	5	3
2. (a)	State the principle of chromatography and define distribution coefficient.	03	1	1
(b)	How can you purify a recombinant protein by affinity chromatography? Explain with an example.	03	1,2	2
(c)	Compare and justify the applications of HPLC and GC in the quantitative analysis of biomolecules.	04	4,5	3
3. (a)	Define electrophoresis, electrophoretic mobility and supporting medium.	03	1	1
(b)	Describe the principles and different modes of electrophoresis used in nucleic acid and protein analysis.	03	2	1
(c)	Analyze the applications of agarose gel electrophoresis and SDS-PAGE in molecular biology and proteomics research.	04	4	3
4. (a)	What is absorption, emission and scattering of light?	02	1	1
(b)	Explain Beer Lambert's law and discuss the instrumentation of UV-Visible spectroscopy.	04	2,3	1
(c)	Evaluate the significance of fluorescence spectroscopy, AAS and NMR in biochemical and clinical analysis.	04	5	3

Section-B

(There are four (04) questions in this section. Answer any three (03) questions.)

Question no.	Question Description	Marks	*Level (L ₁ -L ₆)	CLO No.
5.	(a) List and explain the components of a mass spectrometer with its applications.	03	1,4	1,2
	(b) Discuss the principle and applications of LC-MS/MS	04	6	3
	(c) Enumerate the advantages and limitations of mass spectrometry.	03	6	3
6.	(a) State the principle of reverse transcription PCR (RT-PCR) mentioning its applications.	03	2	1,2
	(b) Microarray analysis techniques can be used to identify differentially expressed genes of an individual with cancer, e.g. lung cancer- explain.	04	4,6	3
	(c) How can you determine primary sequence of a protein?	03	1	2
7.	(a) Define immunochemistry, antigen and antibody.	02	1	1
	(b) Discuss the principle and applications of Electro Mobility Shift Assay (EMSA) with diagram.	04	3	1
	(c) Define immunohistochemistry. Describe the steps involved in sample preparation and immunohistochemical analysis.	04	1,3	1
8.	(a) Define electrochemistry. Why is a reference electrode necessary for an electrochemical cell? Discuss the components of a hydrogen electrode.	04	2,3	1
	(b) What is electrochemical sensor? List the general characteristics of a biosensor.	03	1,2	2
	(c) Write the components and applications of biosensors with examples.	03	1,2	1



Question of Term Final Examination Khulna University

School: Life Science Discipline: Biotechnology and Genetic Engineering Program: MS
Year: MS 1st Term: I Examination Year: 2026 Session: 2025-26
Course Code: 041707 BA 5107 Course Title: Bio-business and Entrepreneurship
Total Marks: 60 Time: 3 Hours Credit: 03

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- Use separate script for each section.

Section-A

(There are four (04) questions in this section. Answer any three (03) questions.)

Question no.	Question Description	Marks	*Level (L ₁ -L ₆)	CLO No.
1. (a)	Define bioentrepreneurship? How does it differ from traditional entrepreneurship?	03	1,4	1
(b)	How do bioentrepreneurs identify and evaluate opportunities in the life sciences industry?	03	5	3
(c)	What role do universities and research institutions play in fostering bioentrepreneurship, and how can they support aspiring bioentrepreneurs?	04	4,5	3
2. (a)	Describe a three-step negotiation strategy for a biotech startup seeking funding from venture capitalists while simultaneously negotiating with a regulatory authority.	04	3	1,2,3
(b)	Analyze the key challenges in developing distribution channel for a novel biosimilar. What specific market conditions and customer needs must be managed?	03	4	1,2,3
(c)	Draft a basic dispute resolution clause suitable for a joint development agreement between a university and a bio-entrepreneur. Briefly justify the inclusion of two key terms you have written.	03	6	1,2,3
3. (a)	A bio-entrepreneur has two options: an early exit via acquisition by a large pharma company, or a long-term strategy of building an independent entity. Analyze the key tradeoffs of each strategy in the context of the bio-business environment.	05	4	1,2
(b)	Your bio-business faces a sudden crisis due to an adverse regulatory change in a key export market. Evaluate the steps you would take to manage this crisis, considering negotiations with bankers, government authorities and your broader strategic vision.	05	5	1,2

4. (a)	For a virtual start-up company in the bio-services sector, propose a marketing plan that addresses market segmentation, customer need identification and the development of market linkages.	05	6	3,4
(b)	Explain how a bio-agri startup can use branding and franchising as tools to develop its distribution channels. Provide a specific, realistic example for each tool.	05	3	3,4

Section-B

(There are four (04) questions in this section. Answer any three (03) questions.)

Question no.	Question Description	Marks	*Level (L ₁ -L ₆)	CLO No.
5. (a)	Differentiate between an entrepreneur, a manager, and an intrapreneur.	03	1	1
(b)	Explain the major skills required for successful bioentrepreneurship.	04	2	2
(c)	A biotechnology startup developed an eco-friendly microbial product but failed to gain consumer acceptance. Analyze the possible reasons.	03	6	3
6. (a)	Define innovation strategy. Explain different types of innovation strategies with suitable examples.	04	1,2	3
(b)	Why do many biotechnology startups fail during the "Valley of Death" stage?	03	3	3
(c)	Discuss the major stages of emerging bioentrepreneurship.	03	1	1
7. (a)	Define market segmentation.	02	1,4	2
(b)	Explain the importance of product positioning and branding in biotechnology marketing.	04	5	3
(c)	A company is developing a plant-based therapeutic protein. Describe the regulatory compliances and procedures they must adhere to before the product can reach the market.	04	3	1,2
8. (a)	A biotechnology product showed excellent laboratory performance but failed during industrial-scale production. Analyze the possible causes.	04	5	2
(b)	Why is "lab-to-market" transition particularly difficult in industrial biotechnology?	02	1	2
(c)	Analyze the significance of the Human Genome Project in the development of precision medicine.	04	6	4

Question of Term Final Examination Khulna University



MS

School: Life Science Discipline: Biotechnology and Genetic Engineering Program: Bachelor
 Year: MS 1st Term: I Examination Year: 2026 Session: 2025-26
 Course Code: 041707 BA 5107 Course Title: Bio-business and Entrepreneurship
 Total Marks: 60 Time: 3 Hours Credit: 03

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Section-A

(There are four (04) questions in this section. Answer any three (03) questions.)

Question no.	Question Description	Marks	*Level (L ₁ -L ₆)	CLO No.
1. (a)	Define bioentrepreneurship? How does it differ from traditional entrepreneurship? ✓	03	1,4	1
(b)	How do bioentrepreneurs identify and evaluate opportunities in the life sciences industry? ✓	03	5	3
(c)	What role do universities and research institutions play in fostering bioentrepreneurship, and how can they support aspiring bioentrepreneurs? ✓	04	4,5	3
2. (a)	Describe a three-step negotiation strategy for a biotech startup seeking funding from venture capitalists while simultaneously negotiating with a regulatory authority. ✓	04	3	1,2,3
(b)	Analyze the key challenges in developing distribution channel for a novel biosimilar. What specific market conditions and customer needs must be managed? ✓	03	4	1,2,3
(c)	Draft a basic dispute resolution clause suitable for a joint development agreement between a university and a bio-entrepreneur. Briefly justify the inclusion of two key terms you have written. ✓	03	6	1,2,3
3. (a)	A bio-entrepreneur has two options: an early exit via acquisition by a large pharma company, or a long-term strategy of building an independent entity. Analyze the key tradeoffs of each strategy in the context of the bio-business environment. ✓	05	4	1,2
(b)	Your bio-business faces a sudden crisis due to an adverse regulatory change in a key export market. Evaluate the steps you would take to manage this crisis, considering negotiations with bankers, government authorities and your broader strategic vision. ✓	05	5	1,2

4. (a) For a virtual start-up company in the bio-services sector, propose a marketing plan that addresses market segmentation, customer need identification and the development of market linkages. 05 6 3,4
- (b) Explain how a bio-agri startup can use branding and franchising as tools to develop its distribution channels. Provide a specific, realistic example for each tool. 05 3 3,4

Section-B

(There are four (04) questions in this section. Answer any three (03) questions.)

Question no.	Question Description	Marks	*Level (L ₁ -L ₆)	CLO No.
5. (a)	Differentiate between an entrepreneur, a manager, and an intrapreneur.	03	1	1
(b)	Explain the major skills required for successful bioentrepreneurship.	04	2	2
(c)	A biotechnology startup developed an eco-friendly microbial product but failed to gain consumer acceptance. Analyze the possible reasons.	03	6	3
6. (a)	Define innovation strategy. Explain different types of innovation strategies with suitable examples.	04	1,2	3
(b)	Why do many biotechnology startups fail during the "Valley of Death" stage?	03	3	3
(c)	Discuss the major stages of emerging bioentrepreneurship.	03	1	1
7. (a)	Define market segmentation.	02	1,4	2
(b)	Explain the importance of product positioning and branding in biotechnology marketing.	04	5	3
(c)	A company is developing a plant-based therapeutic protein. Describe the regulatory compliances and procedures they must adhere to before the product can reach the market.	04	3	1,2
8. (a)	A biotechnology product showed excellent laboratory performance but failed during industrial-scale production. Analyze the possible causes.	04	5	2
(b)	Why is "lab-to-market" transition particularly difficult in industrial biotechnology?	02	1	2
(c)	Analyze the significance of the Human Genome Project in the development of precision medicine.	04	6	4



Question of Term Final Examination Khulna University

School: Life Science Discipline: Biotechnology and Genetic Engineering Program: Bachelor
Year: MS 1st Term: I Examination Year: 2026 Session: 2024-25
Course Code: 102207 ES-5109 Course Title: Bioethics and Intellectual Property
Total Marks: 60 Time: 3 Hours Credit: 03

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Section-A

(There are four (04) questions in this section. Answer any three (03) questions.)

Question no.	Question Description	Marks	*Level (L ₁ -L ₆)	CLO No.
1. (a)	Differentiate between biosafety and biosecurity in the context of a biotechnology teaching and research laboratory.	03	1	2
(b)	Write down the role of integrated risk assessment in minimizing laboratory acquired infections during handling and testing of emerging infectious diseases.	04	3	1
(c)	Describe the safety equipment and operational procedures required in biosafety level 4 laboratories.	03	4	1
2. (a)	Classify microorganisms into different risk groups based on their disease causing potential.	04	2	1
(b)	How does the Cartagena protocol regulate the transboundary movement of living modified organisms (LMOs)?	04	1	1
(c)	Name the authorities involved in GMO governance in Bangladesh.	02	1	1
3. (a)	Explain the functions of Institutional Biosafety Committee, National Committee on Biosafety and Field Level Biosafety Committee in the governance of biotechnology research and field-level activities.	03	1,3	2,4
(b)	State the role of Codex Alimentarius in risk assessment of genetically modified foods.	04	3	1
(c)	Mention the major documentation and approval process required for the environmental release of LMOs.	03	4	1
4. (a)	A research team proposes to use human biological samples for stem cell research and future commercial development. Identify the ethical issues related to consent, ownership, benefit sharing, privacy and future use of samples.	04	3	3,4
(b)	What is biopiracy? Provide your opinion on the requirement of mandatory GMO labeling.	03	1	3
(c)	How does the DNA Act 2014 regulate the use and protection of DNA profiles in Bangladesh?	03	1	3

Section-B

(There are four (04) questions in this section. Answer any three (03) questions.)

Question no.	Question Description	Marks	*Level (L ₁ -L ₆)	CLO No.
5.	(a) Explain why intellectual property rights are important in biotechnology-based research, product development and commercialization.	03	2,4	2
	(b) Compare patents, copyright, trademarks, industrial design, geographical indications and traditional knowledge protection with suitable biotechnology or life science examples.	04	3,4	2
	(c) Critically evaluate one strong argument in favor of and one strong argument against patent protection in biotechnology, especially in relation to access, affordability and public interest.	03	5	2
6.	(a) Explain the concept of prior art and its relevance to novelty and inventive steps in patent examination.	03	2,4	2
	(b) A research group claims to have developed a genetically engineered microorganism for producing a high-value enzyme. Design a patentability assessment strategy using prior art science, experimental documentation, claim analysis and patent database searching.	05	6	2
	(c) Explain why premature disclosure through thesis submission, conference presentation, publication or social media may weaken patent protection.	02	4,5	2
7.	(a) What is a patent? Mention the essential requirements for patentability.	03	1,2	2
	(b) Explain the steps involved in filling out a patent application.	03	4	2
	(c) Analyze the importance of patent protection in biotechnology with reference to GMO-related inventions.	04	4	2
8.	(a) Distinguish between human organ transplantation and xenotransplantation, highlighting the ethical and biosafety concerns associated with each.	03	2,4	3
	(b) A hospital proposes to initiate xenotransplantation-related research using animal-driven tissues. Identify the ethical, biosafety, animal welfare, infection-risk and regulatory issues that should be reviewed before approval.	04	3,4	3
	(c) Evaluate the bioethical concerns and challenges related to xenotransplantation.	03	5	3



Question of Term Final Examination] Khulna University

School: Life Science Discipline: Biotechnology and Genetic Engineering Program: Bachelor
 Year: MS-1st Term: I Examination Year: 2026 Session: 2024-25
 Course Code: 0512 07 BGE 5111 Course Title: Biotechnology: Concepts and Application
 Total Marks: 60 Time: 3 Hours Credit: 03

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- Use separate script for each section.

Section-A

(There are four (04) questions in this section. Answer any three (03) questions.)

Question no.	Question Description	Marks	*Level (L ₁ -L ₆)	CLO No.
1.	(a) What do you understand by biotechnology frontiers? Discuss the birth of modern biotechnology with its significant milestones.	04	1	1
	(b) "Development of high yielding variety is a threat for biodiversity", do you agree with this statement? Justify your answer with a brief discussion.	03	4	2
	(c) Discuss the controversy about stem cell research and state your opinion with justification.	03	6	2
2.	(a) Illustrate the role of recombinant biotechnology in therapeutic cloning.	03	1,2	1
	(b) Critically assess the limitations of relying only on omics layer, such as transcriptomics, when making decisions about strain improvement or disease biomarker discovery.	03	5	1,3
	(c) "Real time expression analysis of gene uncovers the route causes of a disease condition", explain with examples.	04	2,3	2
3.	(a) Define pharmacogenomics. State and explain the methods involved in structural genomics.	04	6	3
	(b) What is genome annotation? How does microarray analysis help in functional genomic study?	04	3	2
	(c) Write a brief narrative on bioterrorism.	02	1	1
4.	(a) Explain why microbes are considered powerful tools in biotechnology. In your answer, refer to their growth rate, genetic manipulability, metabolic diversity and suitability for industrial fermentation.	03	2	1
	(b) Write the components and applications of electrochemical biosensor with examples.	03	1	1
	(c) What are biopharmaceuticals? You want to formulate biopharmaceutical preparation with some specific flavonoids which could be available in your habitat plant sources. Discuss your strategies.	04	1,6	3

Section-B

(There are four (04) questions in this section. Answer any three (03) questions.)

Question no.	Question Description	Marks	*Level (L ₁ -L ₆)	CLO No.
5.	(a) Distinguish among selective breeding, plant tissue culture and genetic engineering as approaches used in agricultural biotechnology.	03	2,4	1
	(b) A country facing salinity, drought and declining crop productivity wants to use biotechnology for agricultural improvement. Propose an integrated biotechnology-based strategy using plant tissue culture, marker-assisted breeding, genetic engineering, biofertilizers and biopesticides.	04	6	1,2
	(c) Critically evaluate the potential benefits and concerns of biopharming or transgenic animals in relation to food security, pharmaceutical production, biosafety, animal welfare and public acceptance.	03	5	3
6.	(a) Explain the principles of bioremediation, bioleaching and biotransformation, giving one suitable example for each.	03	2,3	1
	(b) Design a biotechnology-based intervention for treating industrial wastewater, contaminated soil or heavy-metal-polluted effluent. Include the biological agent or process, monitoring parameters, expected outcomes and possible limitations.	04	6	1,2
	(c) Environmental biotechnology is often promoted as sustainable, but it may also carry ecological risks. Critically evaluate possible risks associated with releasing engineered microbes, using biopesticides or applying large-scale bioremediation technologies in open environments.	03	5	3
7.	(a) What is innovation? If you want to be an entrepreneur, discuss your idea and execution plan.	04	1,6	3
	(b) A university laboratory has developed a prototype low-cost diagnostic kit. Prepare a preliminary commercialization pathway including proof of concept, intellectual property protection, validation, regulatory approval, funding, incubation and industry partnership.	03	6	2,3
	(c) Critically assess the role of biobusiness incubators and investors in transforming biotechnology research into viable enterprises, especially in developing countries.	03	5	2,3
8.	(a) Differentiate among ethics, biosafety and biosecurity in biotechnology. Explain why these three dimensions are increasingly interconnected in the age of omics and synthetic biology.	03	4	1,3
	(b) How can you ensure biosafety when you are working with a pathogenic genetically modified organism?	03	5	3
	(c) Propose a governance framework for responsible biotechnology research that includes institutional biosafety review, ethical approval, data protection, risk communication, stakeholder engagement and post-project monitoring,	04	6	2,3