



Faculty of Health Sciences
BSc (Hons) in Biomedical Sciences
Laboratory parasitology – BMS 4113
4th Year 1st Semester -End Examination SEQ

Date: 08th June 2026

Time: 9.00 AM to 12.00 PM (Three Hours)

INSTRUCTIONS TO CANDIDATES

- This question paper consists of **Six** questions.
- Answer **ALL** questions.
- You should write legibly in black or blue ink

Question 01

(100 Marks)

- 1.1. Differentiate 'definitive host' and 'intermediate host'. (20 marks)
- 1.2. A 32-year-old farmer from a rural village presents with a painful burning blister on the lower leg associated with itching, redness, swelling, and difficulty walking. A few days later, the blister ruptures when the patient immerses the leg in water, revealing a long, thread-like worm emerging slowly from the lesion. Mention the causative tissue nematode in the above condition. (20 marks)
- 1.3. Explain the general life cycle of above (1.2) tissue nematode. (30 marks)
- 1.4. Describe the morphological characteristics of the adult stage and eggs of intestinal nematode *Trichuris trichiura*. (30 marks)

Question 02

(100 Marks)

- 2.1. Differentiate the trophozoites and Cysts stages of protozoa. (30 marks)
- 2.2. Describe the symptoms of protozoa disease caused by *Entamoeba histolytica*. (30 marks)
- 2.3. Explain the general life cycle of the parasitic trematodes. (40 marks)

Question 03

(100 Marks)

- 3.1. Define the term Vector. (15 marks)
- 3.3. List down the stages of the general life cycle of mosquitoes. (20 marks)
- 3.2. Describe the structure of the thorax of a mosquito. (30 marks)
- 3.4. Explain the lifecycle of *Plasmodium* spp., (35 marks)

Question 04**(100 Marks)**

A 28-year-old patient was diagnosed with a cestode infection and presented Cysticercosis with muscular pain, weakness, fever, and eosinophilia. MRI reveals multiple cyst-like lesions in the brain. The patient reports on occasional consumption of street food pork dishes.

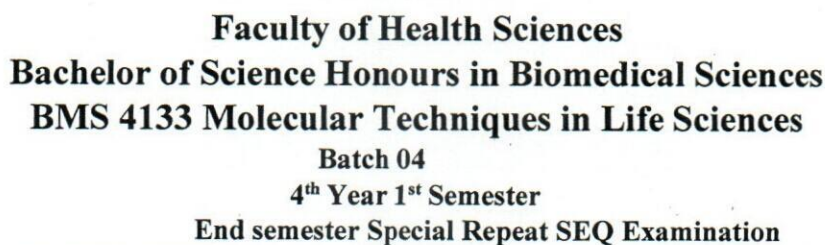
- 4.1. Mention the responsible parasite in above patient. (20 marks)
- 4.2. Discuss the life cycle of the above (4.1) parasite with reference to host involvement and parasitic development. (40 marks)
- 4.3. Describe five (05) general modes of transmission of parasitic diseases with suitable examples. (40 marks)

Question 05**(100 Marks)**

- 5.1. Define the terms endoparasites and ectoparasites. (20 marks)
- 5.2. Differentiate the two (02) major classes of arthropods, Insecta and Arachnida. (20 marks)
- 5.3. Explain the general life cycle of the parasitic head louse. (30 marks)
- 5.4. Describe the symptoms associated with scabies infection. (30 marks)

Question 06**(100 Marks)**

- 6.1. Mention the anatomical components of the venom apparatus in snakes. (15 marks)
- 6.2. Differentiate between the venom apparatus of Elapidae and Viperidae. (15 marks)
- 6.3. Explain One (01) therapeutic application of modified snake venom in modern medicine. (30 marks)
- 6.4. Describe the effects of enzymes and toxins in snake venom on the neuromuscular system leading to paralysis in animals. (40 marks)



Time : 9.00 a.m. – 12.00 p.m. (Three Hours)

INSTRUCTIONS TO CANDIDATES

- This question paper consists of **SIX** questions.
- Answer **ALL** questions.
- You should write legibly in black or blue ink.

QUESTION 01

(100 marks)

1.1.Mention three properties of an ideal molecular biomarker.

(15 marks)

[illegible]

1.2. Compare and contrast between minisatellites and microsatellites.

(25 marks)

[illegible]

1.3. Write short notes on the following:

1.3.1. Advantages of using molecular biomarkers in cancer research.

(30 marks)

[illegible]

1.3.2. Techniques used to validate molecular biomarkers.

(30 marks)

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QUESTION 02

(100 marks)

2.2. State the principle of Chain termination method.

(25 marks)

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2.2. Mention three types of DNA sequencing methods.

(15 marks)

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2.3. List the applications of next generation sequencing.

(30 marks)

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2.4. Compare between manual and automated sanger sequencing methods.

(30 marks)

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QUESTION 03**(100 marks)**

3.1. You have been instructed to prepare a culture from a brain tissue of a mouse. Denote the basic steps that you need to carry out to prepare the culture from it. (30 marks)

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3.2. State the main aseptic conditions that has to be followed in cell culture. (25 marks)

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3.3. List the applications of cell culture. (25 marks)

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3.4. State four methods to access the growth of cells during cell culture. (20 marks)

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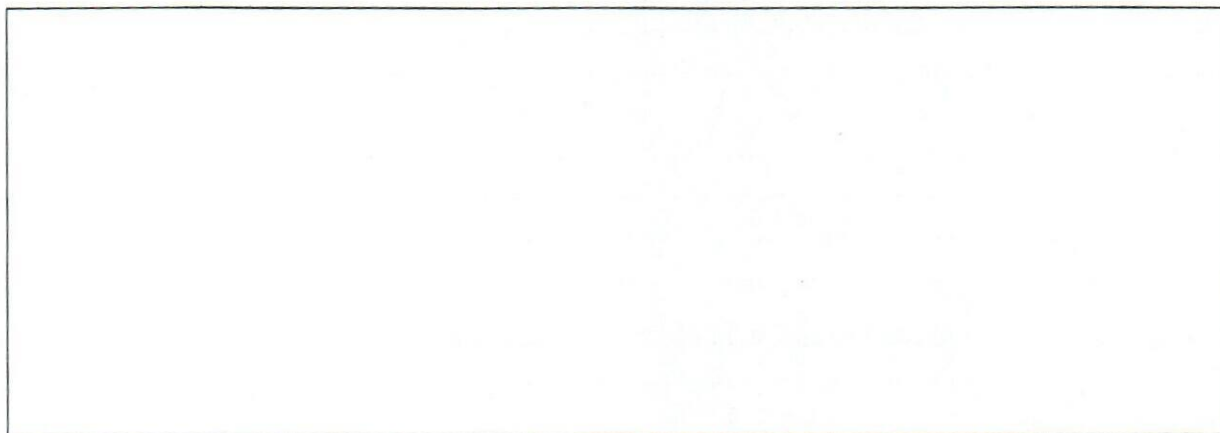
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QUESTION 04**(100 marks)**

4.1. Mention the most suitable blotting technique that could be used to evaluate the gene expression of mRNA. (10 marks)

4.2. Draw a flow chart to denote the procedure of the technique mentioned in 4.1 above. (25 marks)



4.3. Compare and contrast between Northern and Western blotting techniques. (30 marks)

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4.4. State the limitations of Southern blotting. (35 marks)

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QUESTION 05**(100 marks)**

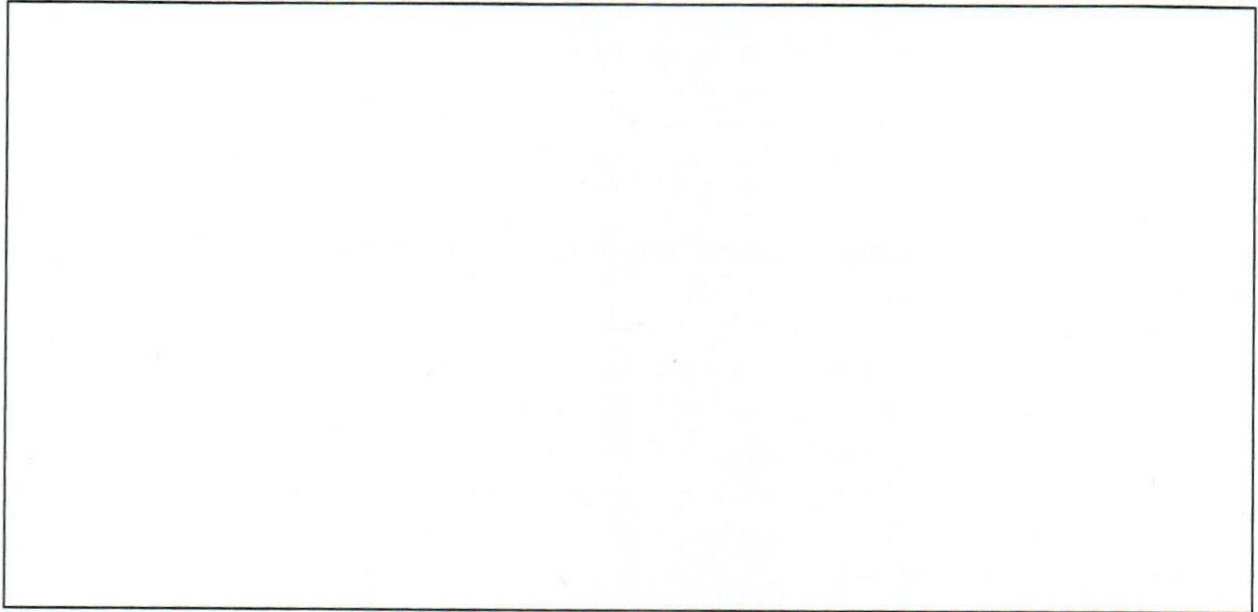
5.1. Mention three (03) suitable expression systems that could be used to produce Hepatitis B vaccine. (15 marks)

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5.2. Draw a flow chart to denote the procedure of producing the above recombinant protein mentioned in 5.1. above. (25 marks)



5.3. Differentiate between prokaryotic and eukaryotic expression systems. (30 marks)

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5.4. Discuss the procedures to minimize false positives and false negatives in a nuclear based diagnostic assay. (30 marks)

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QUESTION 06**(100 marks)**

6.1. Define the term proteomics.

(20 marks)

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6.2. Differentiate between normal and reverse phase High performance liquid chromatography (HPLC) methods.

(30 marks)

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6.3. State the principle of nuclear magnetic resonance (NMR) technique.

(25 marks)

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6.4. Mention three applications of protein microarray technology.

(25 marks)

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Faculty of Health Sciences

BSc (Hons) in Biomedical Sciences

Laboratory parasitology – BMS 4113

4th Year 1st Semester -End Examination

Special repeat - SEQ

Date: 26th of May 2025

Time: 9.00 AM to 12.00 PM (Three Hours)

Index no:

Question 01

(100 Marks)

1.1. State the definition of the term 'parasite'

(25 Marks)

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1.3. Differentiate the terms definitive host, and intermediate host.

(35 Marks)

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1.2. List down five modes of parasite transmission

(40 Marks)

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Question 02

(100 Marks)

2.1. Define the term nematodes in parasitology

(25 Marks)

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2.2. Name two tissue nematodes that infect the lymphatic system

(35 Marks)

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2.3. Write three symptoms of Guinea worm disease caused by tissue nematode *Dracunculus medinensis*

(40 Marks)

Question 03

(100 Marks)

A 5-year-old child presents with intense itching around the anal region, especially at night. The parents also report teeth grinding during sleep and frequent episodes of disturbed sleep.

3.1. State the possible parasitic disease

(25 Marks)

3.2. List four practices this patient and family can follow to prevent the disease from spreading.

(35 Marks)

3.3. Provide a step-by-step description of the diagnostic procedure used to confirm the presence of the parasitic infection in this patient (40 Marks)

(40 Marks)

Question 04**(100 Marks)**

A 45-year-old fisherman presents with mild abdominal discomfort, nausea, and intermittent diarrhea. He reports that his diet frequently includes raw or undercooked fish. The cestode infection was identified after stool examination.

4.1) Name the possible cestode infection caused by eating raw fish (25 Marks)

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4.2) State how do cestodes differ from nematodes and trematodes (35 Marks)

4.3) State how the fisherman infected with the above (5.1) mentioned cestode after consuming raw fish, mentioning the main stages of the lifecycle. (40 Marks)

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Question 05**(100 Marks)**

5.1. List down the four stages of the mosquito life cycle (20 marks)

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5.2. State the general physical characteristics of mosquitoes (40 Marks)

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5.3. Write the lifecycle of *Plasmodium* spp., with the stages that occur in both the mosquito vector and the human host including the role of the liver and red blood cells in the lifecycle.

(40 Marks)

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Question 06

(100 Marks)

6.1. State the difference between endoparasites and ectoparasites?

(20 marks)

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6.2. List down three common ectoparasites that infest humans

(25 Marks)

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6.3. Outline the anatomical features of the venom apparatus in venomous snakes

(25 marks)

[illegible]



QUESTION 02**(100 marks)**

2.1. State the applications of BLAST (Basic Local Alignment Search Tool) .

(25 marks)

2.2. Briefly explain types of BLAST along with their specific function.

(25 marks)

2.3. Write the short notes on following topics,

2.3.1 UniProt/Swiss-Prot

(25 marks)

2.3.2 Genomic databases

(25 marks)

QUESTION 03**(100 marks)**

3.1. State the importance of sequence alignment process.

(20 marks)

3.2. Online the role of pairwise sequence alignment and multiple sequence alignment.

(20 marks)

3.3. Write the short notes on following topics,

3.3.1 Sequence identity

(10 marks)

3.3.2 Sequence similarity

(10 marks)

QUESTION 04**(100 marks)**

4.1. Define the process DNA sequencing.

(25 marks)

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4.2. List out the methods of DNA sequencing along with examples.

(25 marks)

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4.3. Outline the principle of one of the methods mentioned in 4.2.

(25 marks)

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4.4. Outline the importance of next generation sequencing.

(25 marks)

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QUESTION 05**(100 marks)**

5.1. Outline the importance of protein data bank (PDB).

(30 marks)

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5.2. Briefly explain the term resolution used in protein determination.

(30 marks)

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5.3. Interpret the BLAST result that obtained from the student no.2 in 5.2.

(40 marks)

Hit: Mouse homologous gene.

E-value: $2e-30$ (very low, highly significant).

Bit Score: 250 (high score).

Identity: 95%.

Query Coverage: 90%

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QUESTION 06**(100 marks)**

6.1. Define the process of phylogenetic tree analysis.

(20 marks)

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6.2. Define the following terms,

(20 marks)

6.6.1 Plesiomorphy

6.6.2 Apomorphy

6.6.3 Synapomorphy

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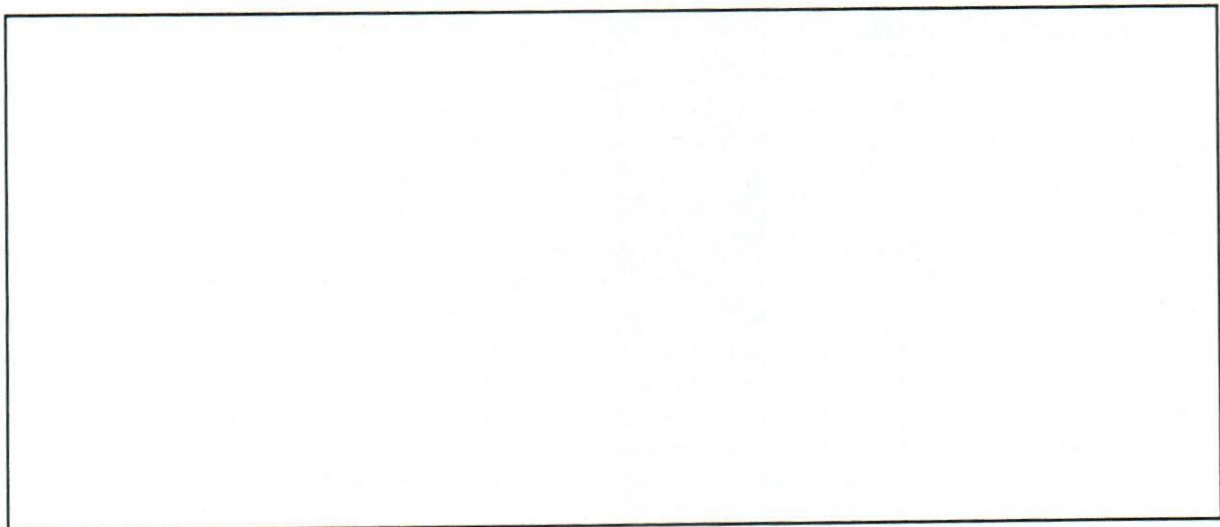
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6.3. Illustrate and label a typical phylogenetic tree.

(20 marks)

6.4. Outline the principle of Parsimony in phylogenetic tree analysis.

(40 marks)

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librmy

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Faculty of Health Sciences
Bachelor of Science Honours in Biomedical Sciences
BMS 4143 Clinical Microbiology
Batch – 05
4th Year 1st Semester
End Semester SEQ Examination

Date : 07th February 2025
Time : 9.00 am. – 12.00 pm. (Three Hours)

INSTRUCTIONS TO CANDIDATES

- This question paper consists of **SIX** questions.
- Answer **ALL** questions.
- You should write legibly in black or blue ink.

QUESTION 01

(100 marks)

A 30-year-old female patient presented with fever, a cough accompanied by chest pain, and discolored sputum, seeking medical treatment. A Gram stain of her sputum smear revealed the presence of Gram-positive diplococci. Additionally, the sputum culture demonstrated flat, gray colonies exhibiting alpha hemolysis on a blood agar plate.

1.1. Identify the suspected disease of the patient. (20 marks)

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1.2. Specify the causative agent. (20 marks)

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1.3. List other potential pathogens that would cause the same disease condition identified in 1.1. (20 marks)

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1.4. Outline the microbiological laboratory procedures and other identification tests used to confirm the disease-causing organism mentioned in 1.2. (40 marks)

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QUESTION 02**(100 marks)**

A one-year-old infant was admitted to the medical ward presenting with symptoms of fever, stiff neck, petechiae, vomiting, nausea, and poor feeding. Analysis of a CSF smear confirmed the presence of gram-negative diplococci, which was identified as *Neisseria meningitidis* through laboratory testing.

2.1. Identify the underlying disease condition. (10 marks)

2.2. List the virulence factor of the above-mentioned pathogens. (20 marks)

2.3. Outline the pathogenesis of the disease causative agent *Neisseria meningitidis*. (30 marks)

2.4. Mention the microbiological and biochemical tests that can be used to confirm the identification of the pathogen responsible for the disease mentioned above, along with the corresponding observations.

(40 marks)

QUESTION 03**(100 marks)**

A farmer was admitted to the hospital with symptoms including difficulty swallowing, fever, painful muscle stiffness, and a locked jaw appearance. A deep wound on his foot led to the collection of a tissue sample, which was cultured. The resulting colony tested positive for the indole test.

3.1. Identify the disease-causing organism.

(10 marks)

3.2. List the virulence factors associated with the disease described above.

(20 marks)

3.3. Summarize the pathogenesis of the disease caused by the identified organism.

(30 marks)

(40 marks)

[illegible]

(100 marks)

(10 marks)

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(20 marks)

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(35 marks)

[illegible]

4.4 Outline the microbiological investigations that can be used to identify the above disease causative agent. (35 marks)

QUESTION 05

(100 marks)

A 70-year-old female was admitted to the hospital with complaints of pleuritic chest pain. She reported experiencing fatigue, arthralgia, myalgia, low grade fever, back pain and abdominal pain that had persisted nearly two weeks. Further she mentioned she had dental surgery and experienced inflammation 16 days ago. During the clinical examination, tender, raised lesions were observed on the pads of her fingers and toes and the splinter hemorrhage.

5.1 Identify the clinical outcome of the patient. (10 marks)

5.2 List the causative agents of the above disease condition. (20 marks)

5.3 Mention the pathophysiology of the above diseases condition based on the clinical presentation of the patient. (35 marks)

[illegible]

(100 marks)

6

[illegible]

6.3 Outline the pathophysiology of the above diseases condition via flow chart.

(30 marks)

[illegible]

6.4 Outline the important laboratory investigations required to identify the specific causative agent.

(35 marks)

[illegible]

[illegible]

1.3. Write short notes on the following:

1.3.1. Advantages of using molecular biomarkers in cancer research.

(30 marks)

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1.3.2. Techniques used to validate molecular biomarkers.

(30 marks)

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QUESTION 02

(100 marks)

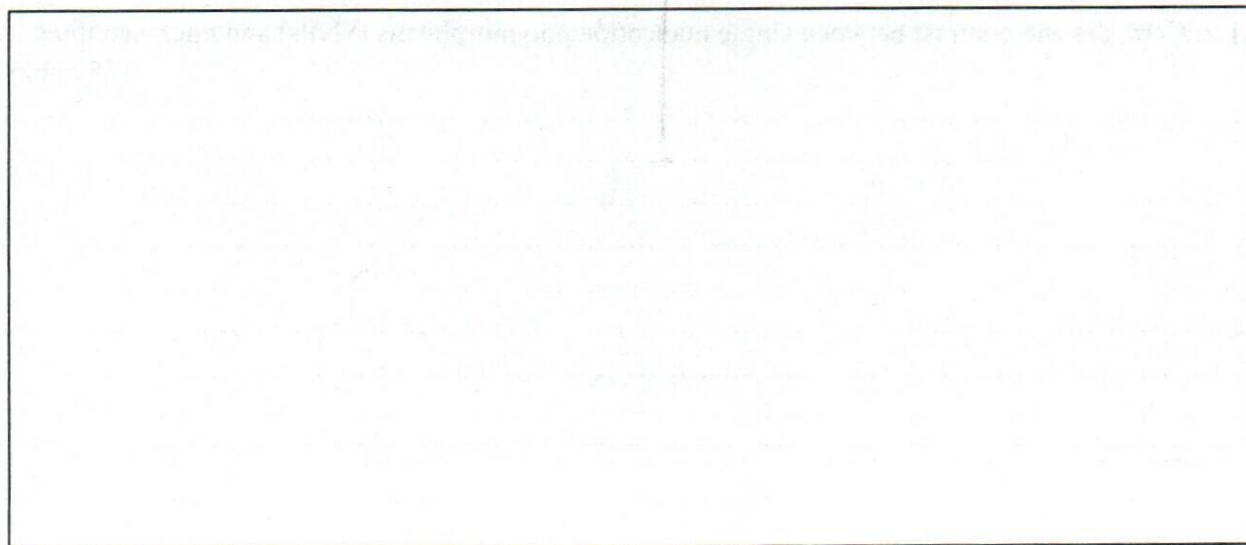
2.1. Mention the most appropriate blotting technique to analyze protein expression levels.(10 marks)

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2.2. Create a step-by-step diagram of the Western blotting procedure.

(20 marks)



2.3. Compare and contrast between Southern blotting and Northern blotting techniques. (25 marks)

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2.4. Write short notes on the following:

2.4.1. Limitations of Northern blotting. (20 marks)

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2.4.2. Applications of Western blotting in clinical diagnostics. (25 marks)

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QUESTION 03

(100 marks)

3.1. List three next-generation DNA sequencing technologies.

(15 marks)

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3.2. State three (03) advantages of the Illumina sequencing platform.

(25 marks)

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4.3. List four assays to assess cell viability in culture.

(20 marks)

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4.4. Write short notes on the following:

4.4.1. Applications of 3D cell culture systems.

(20 marks)

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4.4.2. Characteristics and significance of immortalized cell lines.

(20 marks)

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QUESTION 05

(100 marks)

5.1. Define the field of proteomics and its significance in modern medicine.

(15 marks)

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5.2. Differentiate between ion-exchange and size exclusion chromatography in HPLC. (20 marks)

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5.3. Discuss the principle of mass spectrometry.

(30 marks)

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 5.4. Mention three advantages of using protein microarray technology in biomedical research.

(15 marks)

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5.5. Describe the principle of X-ray diffraction in structural biology.

(20 marks)

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QUESTION 06

(100 marks)

Imagine you are tasked with designing a monoclonal antibody for therapeutic purposes.

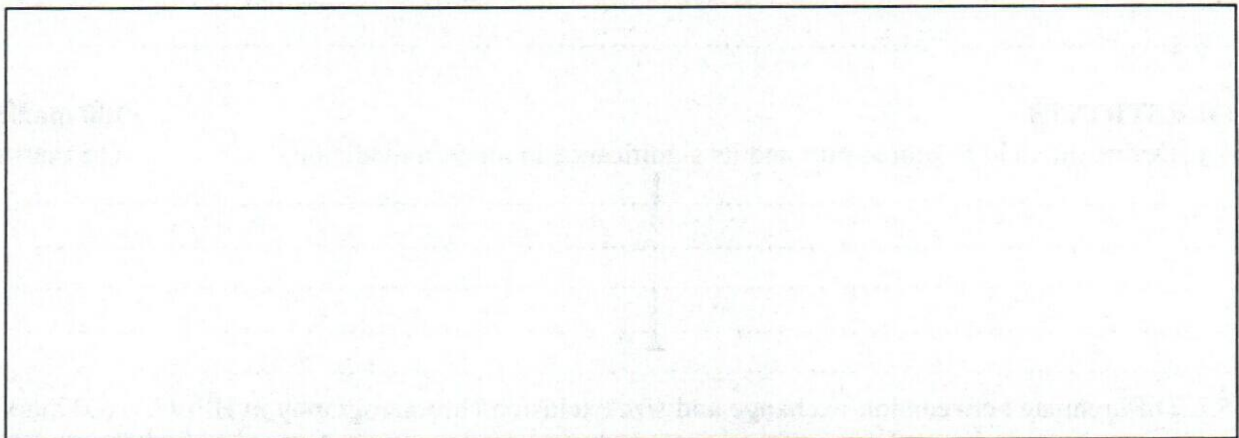
6.1. Mention two expression systems used to produce monoclonal antibodies.

(10 marks)

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6.2. Draw a flow chart depicting the hybridoma technology process.

(25 marks)



6.3. Discuss strategies to reduce off-target effects in antibody-based therapies.

(30 marks)

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6.4. State three limitations of using bacterial systems to express glycoproteins. (15 marks)

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6.5. Compare and contrast between mammalian and bacterial expression systems. (20 marks)

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Faculty of Health Sciences
Bachelor of Science Honours in Biomedical Sciences
BMS 4123 Medical Informatics
Batch – 05
4th Year 1st Semester
End Semester SEQ Examination

Date : 30th January 2025
Time : 9.00 am. – 12.00 pm. (Three Hours)

INSTRUCTIONS TO CANDIDATES

- This question paper consists of **SIX** questions.
- Answer **ALL** questions.
- You should write legibly in black or blue ink.

QUESTION 01

(100 marks)

1.1. List **three** key applications of RNA-seq in gene expression analysis. (20 marks)

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1.2. Name **two** tools commonly used for sequence alignment in molecular evolution studies. (20 marks)

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1.3. Mention the role of GEO (Gene Expression Omnibus) in storing gene expression data. (20 marks)

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1.4. Outline the role of computational tools in phylogenetic tree construction and evolutionary studies. (40 marks)

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QUESTION 02**(100 marks)**

2.1. State the applications of VMD (Visual Molecular Dynamics).

(20 marks)

2.2. State key features of the VMD (Visual Molecular Dynamics) software.

(20 marks)

2.3. List the important information that can obtain from the PDB file.

(20 marks)

2.4. State the 3 (three) types of windows open in VMD software and state the function of one window. (40 marks)

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QUESTION 03

(100 marks)

3.1. State the importance of computational bioinformatics in identification of nucleotide sequence. (25 marks)

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3.2. Outline the mechanism of pyrosequencing method in DNA sequencing. (25 marks)

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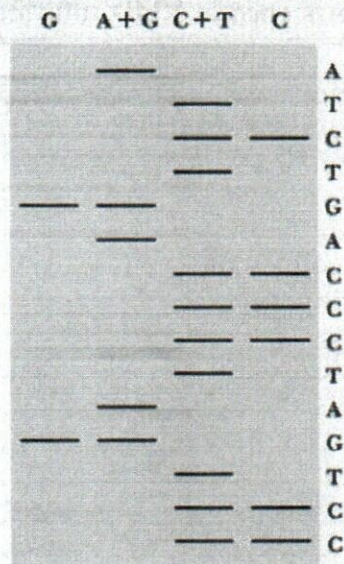
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3.3. Identify the sequencing method and write the DNA sequence based on the given gel picture (25 marks)



3.4. State 5 (five) advantages of the illumine sequencing method in DNA sequencing.

(25 marks)

QUESTION 04**(100 marks)**

4.1. Define the pairwise and multiple sequence alignment in medical informatics.

(20 marks)

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4.2. List out the publicly available sequence alignment tools.

(20 marks)

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4.4. Define the terms “matches, mismatches and gaps” in sequence alignment.

(40 marks)

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4.2. Outline the result of given protein1 and protein 2 sequence alignment.

(20 marks)

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# Length: 6
# Identity: 2/6 (33.3%)
# Similarity: 3/6 (50.0%)
# Gaps: 0/6 ( 0.0%)
# Score: 8.0
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#
#=====
Protein1      1 LMNPQR      6
                :|...|
Protein2      1 IMATAR      6

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QUESTION 05**(100 marks)**

5.1. State 3 (three) types of BLAST and state the use of each.

(20 marks)

5.2. Medical informatic students performed BLAST and student no. 1 supposed to have a DNA sequence from a virus and want to know if this sequence is present in other organisms and student no. 2 have isolated a protein from a new species and want to know if it has any known function of the protein. Mention the BLAST types that they performed and justify your answer.

(40 marks)

(40 marks)

E-value: 2e-30 (very low, highly significant).

Identity: 95%.

Query Coverage: 90%

[illegible]

(100 marks)

(10 marks)

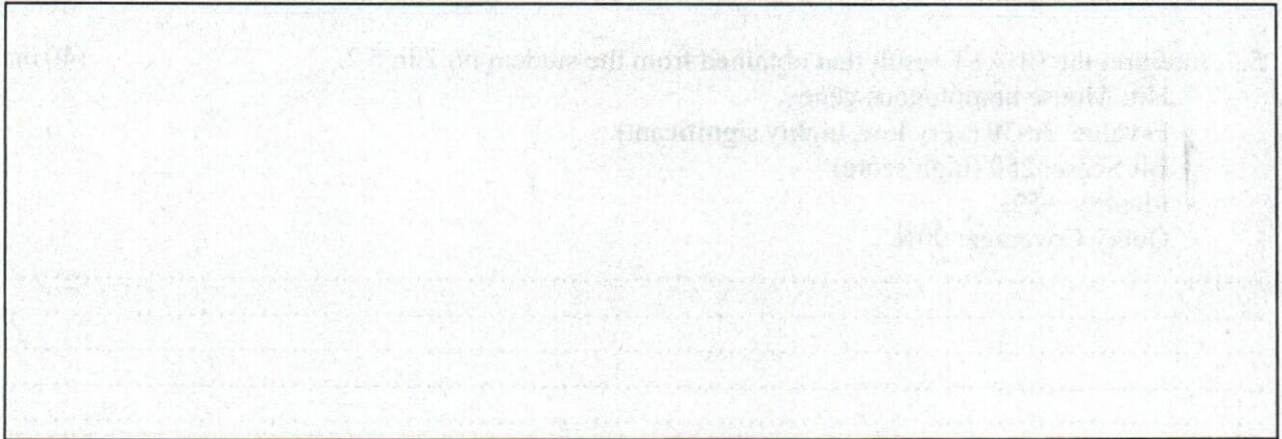
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6.2. Define the terms cladogram and phylogram.

(10 marks)

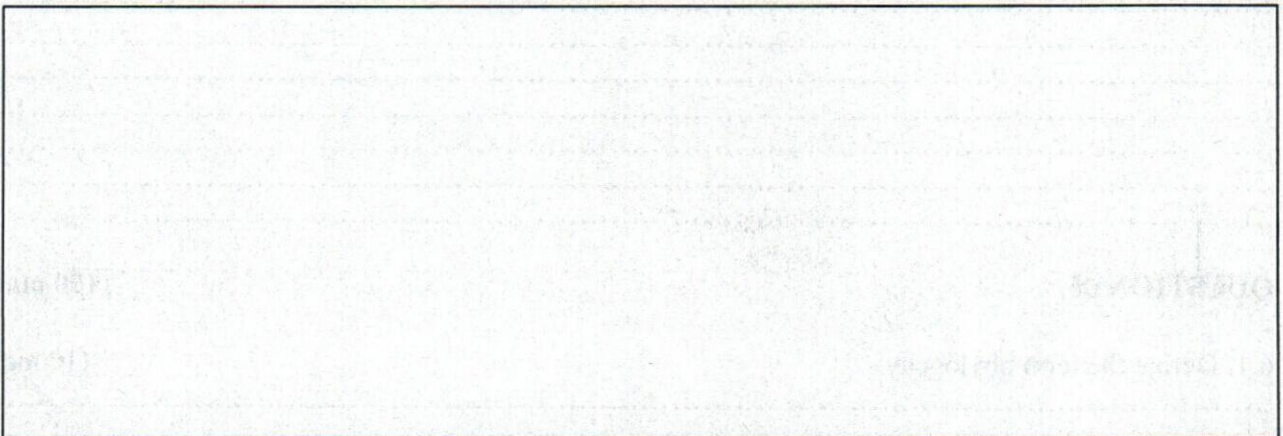
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6.3. Illustrate and label a typical phylogenetic tree.

(40 marks)



6.4. Illustrate the groups of monophyletic, paraphyletic and poly phyletic in phylogenetics.

(40 marks)





Faculty of Health Sciences
Bachelor of Science Honours in Biomedical Sciences
Laboratory Parasitology (BMS4113)
4th Year 1st Semester -End Examination
SEQ -Batch 05

Date : 28th of January 2025
 Time : 9.00 a.m. – 12.00 p.m. (Three Hours)

Index no:

Question 01

- 1.1. Differentiate definitive host and intermediate host in the life cycles of parasites. (25 Marks)

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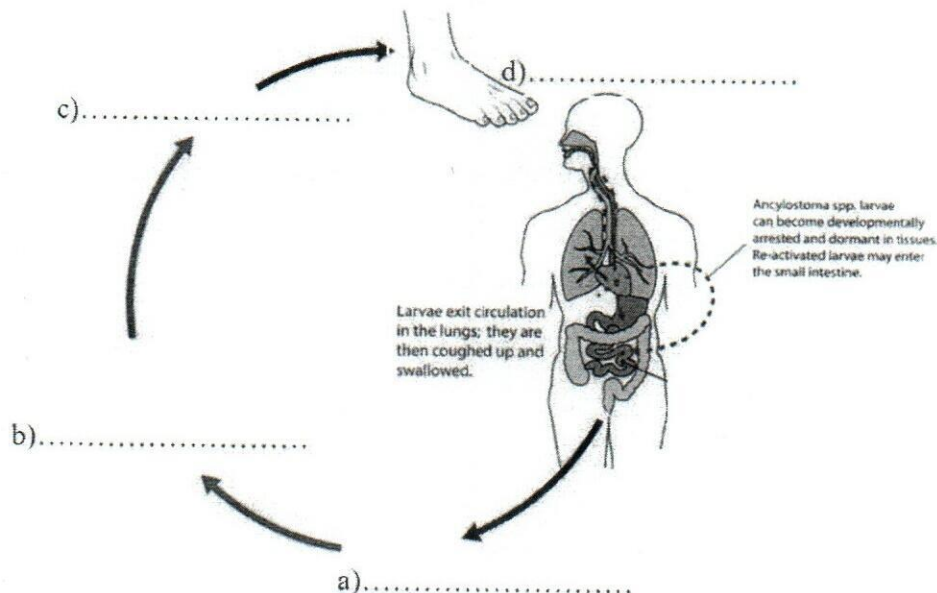
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- 1.2. Fill the a, b, and c sections in the given table with the name of the helminth or the shape as appropriate. (35 Marks)

Helminth	The shape of the helminth
Trematodes	b)
a).....	Elongated, segmented, flatworms.
Nematodes	c)

- 1.3. Complete the given life cycle (a,b,c and d) of intestinal hookworm. (40 Marks)



Question 02

A 50-year-old woman from a rural area presents with a history of tissue nematode *Onchocerca volvulus*, which is transmitted by blackflies.

2.1. Name the disease caused by the above tissue nematode. (10 Marks)

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2.2. Define the term tissue nematode. (20 Marks)

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2.3. List down the three main symptoms of the above-mentioned (2.1) disease. (30 Marks)

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2.4. List down four prevention methods to prevent the above (2.1) disease. (40 Marks)

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Question 03

3.1. List down how trematodes can be classified according to the site of infection with examples for each. (30 Marks)

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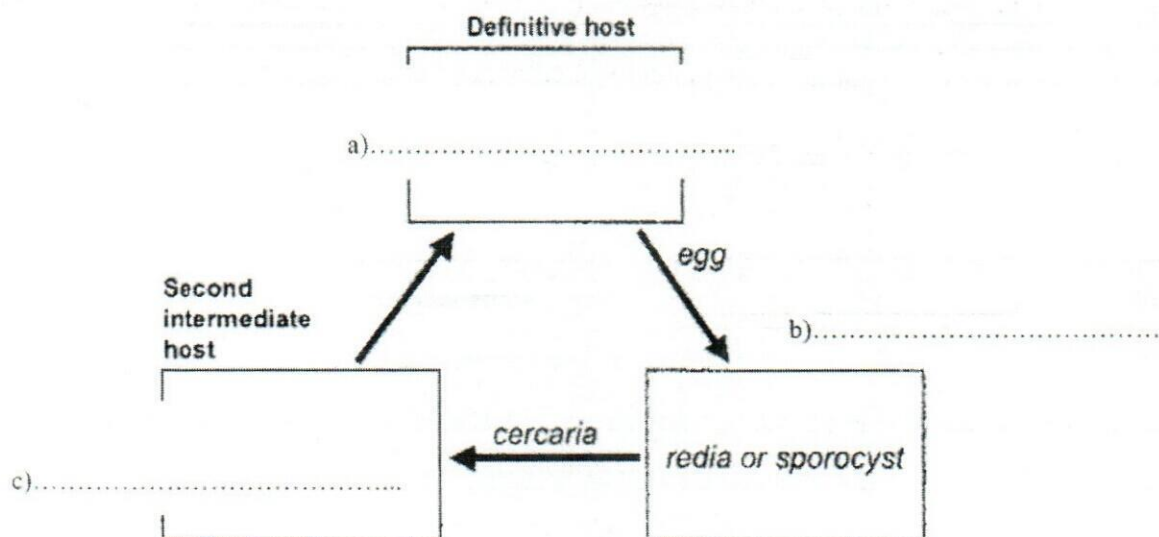
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3.2. Fill the following general three-host life cycle of trematodes.

(30 Marks)



3.3. State the general life cycle of the protozoan parasites.

(40 Marks)

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Question 04

A 30-year-old individual presents with mild abdominal discomfort, nausea, and intermittent diarrhea. The patient has a history of consuming raw or undercooked pork. A stool examination confirms the presence of a cestode infection.

4.1) State the scientific name of the responsible cestode of above patient. (15 Marks)

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4.2) Name one of the main morphological differences of Scolex (head structure) of the above cestode and beef tapeworm. (20 Marks)

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4.3) Write the significant observation in the stool examination of the above patient. (25 Marks)

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4.4) How does the individual got infected with the above-mentioned (4.1) condition after consuming raw pork, outlining the main stages of the life cycle of above 4.1 cestode. (40 Marks)

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Faculty of Health Sciences
Bachelor of Science Honours in Biomedical Sciences
BMS 4133 Molecular Techniques in Life Sciences
Batch 02/03
4th Year 1st Semester
End semester Special Repeat SEQ Examination

Date : 27th of June 2024
Time : 9.00 a.m. – 12.00 p.m. (Three Hours)

INSTRUCTIONS TO CANDIDATES

- This question paper consists of **SIX** questions.
 - Answer **ALL** questions.
 - You should write legibly in black or blue ink.
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QUESTION 01

(100 marks)

1.1. Mention three types of DNA sequencing methods.

(15 marks)

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1.2. State the principle of Sanger sequencing method.

(25 marks)

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1.3. List the Applications of Crisper Cas9 technology.

(30 marks)

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1.4. Compare between manual and automated sanger sequencing methods.

(30 marks)

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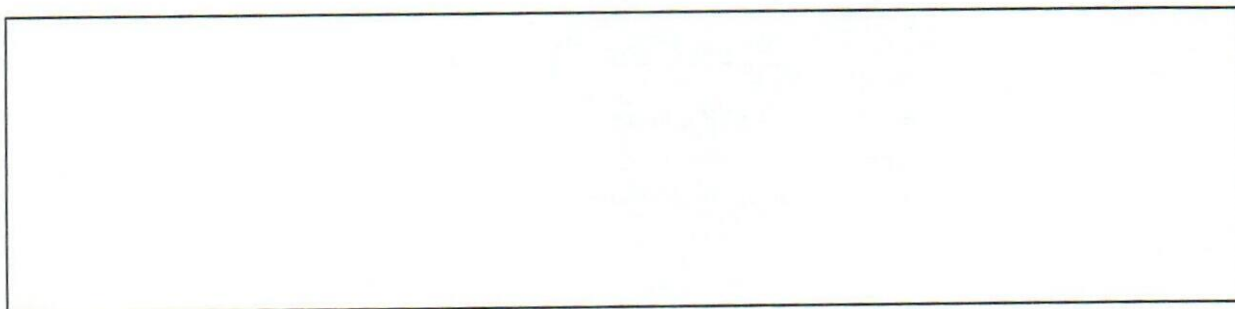
QUESTION 02**(100 marks)**

2. As, a biomedical undergraduate imagine that you have been asked to produce Hepatitis B vaccine with the intension of scaling up for commercial purposes.

2.1. Mention three (03) suitable expression systems that could be used for this process. (15 marks)

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2.2. Draw a flow chart to denote the procedure of producing the above recombinant protein.

(25 marks)


2.3. Discuss the procedures to minimize false positives and false negatives in a nuclear based diagnostic assay. (30 marks)

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2.4. Differentiate between eukaryotic and prokaryotic expression systems.

(30 marks)

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QUESTION 03**(100 marks)**

3.1. Define the term proteomics.

(20 marks)

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3.2. Differentiate between normal and reverse phase High performance liquid chromatography (HPLC) methods. (30 marks)

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3.3. State the principle of nuclear magnetic resonance (NMR) technique. (25 marks)

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3.4. Mention three applications of protein microarray technology. (25 marks)

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QUESTION 04

(100 marks)

4.1. You have been instructed to prepare a culture from a brain tissue of a mouse. Denote the basic steps that you need to carry out to prepare the culture from it. (25 marks)

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4.2. State the main aseptic conditions that has to be followed in cell culture. (25 marks)

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4.3. Mention four methods to check for the growth of cells in a cell culture. (25 marks)

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4.4. List the applications of cell culture. (25 marks)

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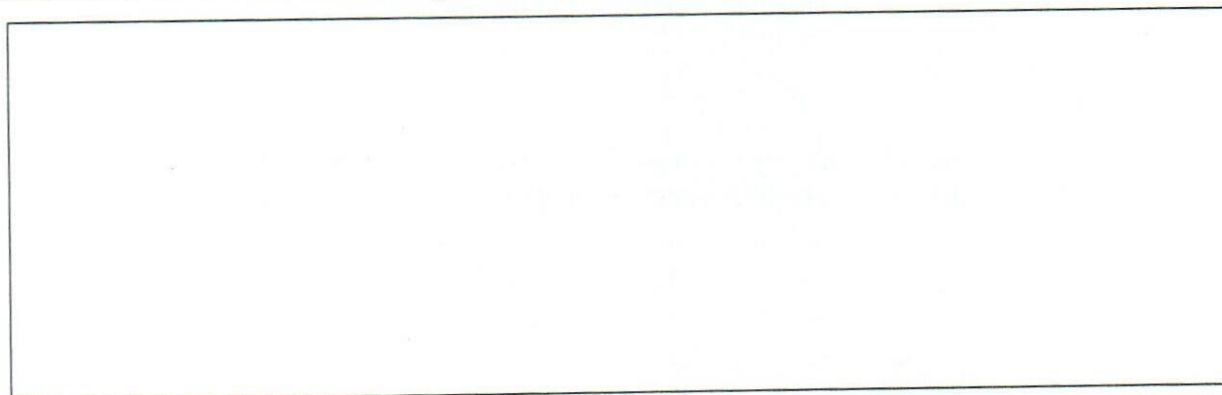
QUESTION 05

(100 marks)

5.1. Mention the most suitable blotting technique that could be used to evaluate the gene expression of mRNA. (10 marks)

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5.2. Draw a flow chart to denote the procedure of the technique mentioned in 5.1 above. (25 marks)



5.3. Compare and contrast between Northern and Western blotting techniques. (30 marks)

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(100 marks)

(25 marks)

[illegible]

(35 marks)

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Faculty of Health Sciences
Bachelor of Science Honours in Biomedical Sciences
BMS 4143 Clinical Microbiology
Batch – 2nd 3rd
4th Year 1st Semester
End Semester SEQ Examination- Special repeat

Date : 26/06/2024
Time : 9.00 am. – 12.00 pm. (Three Hours)

INSTRUCTIONS TO CANDIDATES

- This question paper consists of **SIX** questions.
- Answer **ALL** questions.
- You should write legibly in black or blue ink.

QUESTION 01

(100 marks)

A one-year-old infant was admitted to medical ward with the symptoms of fever, stiff neck, vomiting, nausea and poor feeding. The smear analysis of CSF sample had confirmed the presence of gram-negative diplococci.

1.1. State the suspected causative agent and underlying disease condition. (30 marks)

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1.2. List other possible microorganisms that cause the disease condition mentioned in 2.1. (20 marks)

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1.3. State the microbiological and biochemical tests that could be used to identify the disease causative agent mentioned in 1.1. (40 marks)

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QUESTION 02

(100 marks)

A patient visited a clinician seeking treatment for fever, dysuria, suprapubic pain, and increased frequency of urine passage. The patient was asked to collect a urine sample and perform laboratory testing to check for a Urinary Tract Infection (UTI).

2.1. List 5 microorganisms that might cause UTI. (20 marks)

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2.2. Differentiate common UTI and complicated UTI.

(20 marks)

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2.3. State the urine collection procedure for a male/female for a laboratory urinalysis.

(20 marks)

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2.4. What is the identification procedure of pathogenic microorganisms available in the urine sample using microbiological techniques.

(40 marks)

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QUESTION 03

(100 marks)

A 48-year-old male patient presented with symptoms of a persistent cough lasting more than three weeks, fever, hemoptysis, and chest pain during breathing and coughing. The patient came for treatment, and acid-fast staining of the sputum smear was reported as positive. The sputum was cultured on Lowenstein-Jensen medium for colony identification.

3.1. Identify the suspected disease of the patient.

(20 marks)

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3.2. Mention the causative agent.

(20 marks)

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3.3. State the pathogenesis of the above organism in the human body.

(20 marks)

3.4. State microbiological laboratory diagnosis and identification tests of the disease-causing agent mentioned in 3.2.

(40 marks)

QUESTION 04

(100 marks)

A 25-year-old woman was admitted to the hospital with severe diarrhea, nausea, cramps, and vomiting. She reported that these symptoms began after four days of traveling in a rural area and continued for twelve days before she sought medical attention. She mentioned consuming dairy food and ground beef during her trip. Upon examination, acute renal failure was identified. The physician suspected a gastrointestinal tract infection and obtained a sample from the patient for further diagnosis.

4.1 Identify the disease condition of the patient.

(20 marks)

4.2 List two types of complications in the above medical condition.

(20 marks)

4.3 What is the bacteria causing the above suspected disease?

(25 marks)

4.4 What is the laboratory diagnosis techniques that can be used to identify the disease mentioned in 5.1.

(35 marks)

QUESTION 05**(100 marks)**

A 75-year-old woman was admitted to the hospital with chest and abdominal pain. She complained of shortness of breath, arthralgias, myalgias, and pleuritic chest pain for more than two weeks. During the examination, Osler's nodes were identified on the pads of her fingers and toes, as well as Janeway lesions on her palms. Laboratory analysis revealed a diagnosis of bacteremia.

5.1 State the three types of causative organisms of the disease.

(20 marks)

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5.2 State the factors causing bacteremia.

(20 marks)

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5.3 What is the pathogenesis of the above disease?

(25 marks)

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5.4 What is the laboratory identification procedure of gram-positive bacteria using biochemical and antibiotics in the above condition?

(35 marks)

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QUESTION 06**(100 marks)**

A 36-year-old woman was hospitalized with a four-day history of nausea, vomiting, and diarrhea containing blood and mucus. She had a body temperature of 39.5°C (103.1°F) and was dehydrated.

6.1 State the type of sample required from the patient to determine the cause of her signs and symptoms.

(10 marks)

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6.3 State the potential microorganisms which could be isolated from the sample by the laboratory identification procedure mentioned in 6.2. (20 marks)

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6.4 What is the pathogenesis of the microorganisms mentioned in 6.3 within the human body? (30 marks)

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Faculty of Health Sciences
Bachelor of Science Honours in Biomedical Sciences
BMS 4133 Molecular Techniques in Life Sciences
Batch – 04
4th Year 1st Semester
End semester SEQ Examination

Date : 19th of March 2024
Time : 9.00 a.m. – 12.00 p.m. (Three Hours)

INSTRUCTIONS TO CANDIDATES

- This question paper consists of **SIX** questions.
 - Answer **ALL** questions.
 - You should write legibly in black or blue ink.
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QUESTION 01

(100 marks)

- 1.1. Imagine that you are conducting an experiment to evaluate the gene expression level of mRNA. Mention the most suitable blotting technique that could be used. (05 marks)
- 1.2. Draw a flow chart to denote the procedure of the technique mentioned in 1.1 above. (20 marks)
- 1.3. Compare and contrast between Northern and Western blotting techniques. (25 marks)
- 1.4. Write short notes on the following.
 - 1.4.1. Limitations of Southern blotting. (25 marks)
 - 1.4.2. Applications of Northern blotting. (25 marks)

QUESTION 02

(100 marks)

- 2.1. Define the term proteomics. (10 marks)
- 2.2. Differentiate between normal and reverse phase High performance liquid chromatography (HPLC) methods. (20 marks)
- 2.3. Describe the principle of nuclear magnetic resonance (NMR) technique. (25 marks)
- 2.4. Mention three uses of protein microarray technology. (15 marks)
- 2.5. Discuss the principle of X-ray crystallography technique. (30 marks)

QUESTION 03

(100 marks)

- 3.1. Mention three properties of a good molecular biomarker. (15 marks)
- 3.2. Compare and contrast between minisatellites and microsatellites. (25 marks)
- 3.3. Write short notes on the following.
 - 3.3.1. Applications of molecular biomarkers. (30 marks)
 - 3.3.2. Techniques used for identification of molecular biomarkers. (30 marks)

QUESTION 04**(100 marks)**

- 4.1. Mention three types of DNA sequencing. (15 marks)
- 4.2. Briefly describe the principle of Sanger sequencing method. (25 marks)
- 4.3. Write a short note on the following.
 - 4.3.1. Applications of Crisper Cas9 technology (30 marks)
 - 4.3.2. Sanger sequencing (30 marks)

QUESTION 05**(100 marks)**

5. As, a biomedical undergraduate imagine that you have been asked to produce Hepatitis B vaccine with the intension of scaling up for commercial purposes.
- 5.1. Mention two suitable expression systems that could be used for this process. (10 marks)
 - 5.2. Draw a flow chart to denote the procedure of producing the above recombinant protein. (25 marks)
 - 5.3. Discuss the procedures to minimize false positives and false negatives in a nuclear based diagnostic assay. (25 marks)
 - 5.4. State three limitations in expressing the above protein in the prokaryotic system. (15 marks)
 - 5.5. Differentiate between eukaryotic and prokaryotic expression systems. (25 marks)

QUESTION 06**(100 marks)**

- 6.1. You have been instructed to prepare a culture from a brain tissue of a mouse. Denote the basic steps that you need to carry out to prepare the culture from it. (20 marks)
- 6.2. Discuss the main aseptic conditions that has to be followed in cell culture. (20 marks)
- 6.3. Mention four methods to check for the growth of cells in a cell culture. (20 marks)
- 6.4. Write short notes on the following.
 - 6.4.1. Applications of cell culture. (20 marks)
 - 6.4.2. Infinite cell lines. (20 marks)

Faculty of Health Sciences
Bachelor of Science Honours in Biomedical Sciences
BMS 4113 Laboratory parasitology
Batch – 04
4th Year 1st Semester
End Semester SEQ Examination

Date : 18.03.2024
Time : 9.00 am. – 12.00 pm. (Three Hours)

INSTRUCTIONS TO CANDIDATES

- This question paper consists of **SIX** questions.
- Answer **ALL** questions.
- You should write legibly in black or blue ink.

QUESTION 01

(100 marks)

- 1.1. Briefly describe about the “exo-erythrocytic cycle” of malaria parasite within human body. (25 marks)
- 1.2. Infection with *Plasmodium falciparum* is more dangerous than *Plasmodium vivax*. Justify the above sentence. (20 marks)
- 1.3. Explain the damage occurring to the **human** Red Blood Cells due to *Plasmodium* infection. (25 marks)
- 1.4. Describe the method of identification of *Plasmodium vivax* from *Plasmodium falciparum* during laboratory diagnosis. (30 marks)

QUESTION 02

(100 marks)

- 2.1. State the **mode of infection** and **infective stage** of following parasites to human.

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|---------------------------------------|------------|
| 2.1.1. <i>Ascaris lumbricoides</i> | (10 marks) |
| 2.1.2. <i>Brugia malai</i> | (10 marks) |
| 2.1.3. <i>Necator americanus</i> | (10 marks) |
| 2.1.4. <i>Giardia lamblia</i> | (10 marks) |
| 2.1.5. <i>Enterobius vermicularis</i> | (10 marks) |
| 2.1.6. <i>Taenia solium</i> | (10 marks) |
| 2.1.7. <i>Fasciola hepatica</i> | (10 marks) |

- 2.2. Describe the life cycle of a **selected hookworm** with a flow chart. (30 marks)

QUESTION 03

(100 marks)

- 3.1. State the definitive host (DF) and the intermediate host (IF) for *Wuchereria bancrofti*. (10 marks)

- 3.2. Distinguish between Bancroftian filariasis and the Brugian filariasis relevant to **intermediate host (IF)** and the **parasite causing the disease condition**. (20 marks)
- 3.3. Describe the life cycle of *Wuchereria bancrofti* with a flow chart. (35 marks)
- 3.4. Describe the pathogenesis of filarial worm, *Wuchereria bancrofti* (35 marks)

QUESTION 04**(100 marks)**

4.1. Define the following giving examples

- 4.1.1. Nematode parasites with a tissue stage (10 marks)
 - 4.1.2. Nematode parasites without a tissue stage (10 marks)
 - 4.1.3. Ovoviviparity (10 marks)
 - 4.1.4. Ectoparasitism (10 marks)
- 4.2. State scientific names of another two protozoan parasites infecting to human gastrointestinal tract. (10 marks)
- 4.3. State how you can identify the *Giardia lamblia* trophozoite stage and cyst stage using morphological features. (25 marks)
- 4.4. Describe the pathogenesis of *Giardia lamblia* within the human body. (25 marks)

QUESTION 05**(100 marks)**

- 5.1. What is the mode of infection of following helminths to human ?
- 5.1.1. *Fasciola hepatica* (10 marks)
 - 5.1.2. *Paragonimus westermanii* (10 marks)
 - 5.1.3. *Schistosoma* (10 marks)
 - 5.2.4. *Taenia saginata* (10 marks)
- 4.2. State the pathogenesis of scabies mites to human. (20 marks)
- 4.3 State the following of the parasite *Taenia solium*.
- a) Definitive host (10 marks)
 - b) Intermediate host (10 marks)
 - d) Sample for laboratory identification in definitive host (10 marks)
 - e) Sample for laboratory identification in intermediate host (10 marks)

QUESTION 06**(100 marks)**

- 6.1. Write a disease transmitted by following mosquito species/genera.
- a) *Aedes aegypti* (10 marks)
 - b) *Culex quinquefasciatus* (10 marks)
 - c) *Mansonia* (10 marks)
 - d) *Anopheles* (10 marks)
- 6.2. State the parts of the poison apparatus of the snakes. (15 marks)
- 6.3. Differentiate the structures of the venom gland of colubroids, viperids, elapids and atractaspidids. (15 marks)
- 6.4. Explain the types of toxins present in snake venom. (30 marks)



Faculty of Health Sciences
Bachelor of Science Honours in Biomedical Sciences
BMS 4143 Clinical Microbiology
Batch – 04
4th Year 1st Semester
End Semester SEQ Examination

Date : 14th March 2024
Time : 9.00 am. – 12.00 pm. (Three Hours)

INSTRUCTIONS TO CANDIDATES

- This question paper consists of **SIX** questions.
- Answer **ALL** questions.
- You should write legibly in black or blue ink.

QUESTION 01

(100 marks)

A 45-year-old male patient presented with symptoms of persisting cough for more than three weeks, fever, coughing up blood and a chest pain when breathing and coughing came for the treatments. Acid fast staining of the smear containing sputum had reported as positive and sputum was cultured on Lowenstein-Jensen for colony identification.

- 1.1. Identify the suspected disease of the patient. (20 marks)
- 1.2. Mention the causative agent. (20 marks)
- 1.3. Briefly explain the pathogenesis of the above organism in the human body. (20 marks)
- 1.4. Discuss on microbiological laboratory diagnosis and other identification tests of disease-causing agent that you have mentioned in 1.2. (40 marks)

QUESTION 02

(100 marks)

A one-year-old infant was admitted to medical ward with the symptoms of fever, stiff neck, vomiting, nausea and poor feeding. The smear analysis of CSF sample had confirmed the presence of gram-negative diplococci.

- 2.1. State the suspected disease causative agent. (10 marks)
- 2.2. Mention the underlying disease condition. (10 marks)
- 2.3. List other possible microorganisms that cause the disease condition mentioned in 2.2. (20 marks)
- 2.4. Briefly describe the pathogenesis of the diseases causative agent mentioned in 2.1. (20 marks)
- 2.5. Explain the microbiological and biochemical tests that could be used to identify the disease causative agent mentioned in 2.1. (40 marks)

QUESTION 03

(100 marks)

A patient who had fever, dysuria, suprapubic pain and increased frequency of urine passage visited to a clinician seeking for the treatments. The patient was asked to collect a urine sample and perform the laboratory testing for the urine to check whether the patient is having Urinary Tract Infection (UTI).

- 3.1. List 4 microorganisms that might cause UTI. (10 marks)

- 3.2. Differentiate common UTI and complicated UTI. (20 marks)
- 3.3. Briefly describe the urine collection procedure of a male/female for a laboratory urinalysis. (20 marks)
- 3.4. Describe the identification procedure of pathogenic microorganisms available in the urine sample, using microbiological techniques. (50 marks)

QUESTION 04**(100 marks)**

A 36 year old female was hospitalized with a 4 day history of nausea, vomiting and blood & mucous diarrhoea. She had a body temperature of 39.5°C (103.1°F), and was dehydrated.

- 4.1 State the type of sample required from the patient to determine the cause of her signs and symptoms. (10 marks)
- 4.2. Briefly describe the procedure of isolation of causative agent from patient sample using culture media that you mentioned in 4.1. (40 marks)
- 4.3. State the potential microorganisms which could be isolated from the sample, by the laboratory identification procedure that you mentioned in 4.2. (20 marks)
- 4.4. Briefly describe the pathogenesis of the microorganisms that you mentioned in 4.3 within the human body. (30 marks)

QUESTION 05**(100 marks)**

A 26-year-old girl admitted to the hospital with clinical presentations, severe diarrhoea, nausea, cramps and vomiting. The patient complained that she suffered with above mentioned symptoms after 4 days of travel in rural area and admitted to the hospital after 12 days of symptoms. The patient revealed that she had dairy food and ground beef and during examination acute renal failure was identified. The physician suspected that patient is infected with GI tract infection and a sample was obtained from the patient for the further diagnosis.

- 5.1 Identify the disease condition of the patient. (20 marks)
- 5.2 Briefly explain two types of complications in above medical condition. (20 marks)
- 5.3 Explain the types of bacterial agents suspected for the above condition. (25 marks)
- 5.4 Explain the laboratory diagnosis techniques that can be used to identify the clinical condition mentioned in 5.1. (35 marks)

QUESTION 06**(100 marks)**

A 75-year-old female with chest pain and abdominal pain was admitted to the hospital and the patient was complained that she was suffered with shortness of breath, arthralgias, myalgias and pleuritic chest pain more than 2 weeks. During the examination Osler's Nodes on pads of the fingers and toes and Janeway lesions on the palms were identified. The laboratory analysis revealed a diagnosis of bacteraemia in blood.

- 6.1 State the three types of causative agents of the disease. (20 marks)
- 6.2 State the factors causing bacteraemia. (20 marks)
- 6.3 Explain the pathogenesis of above condition. (25 marks)
- 6.4 Discuss the laboratory identification steps of gram-positive bacteria using biochemical and antibiotics in above condition. (35 marks)



Faculty of Health Sciences
Bachelor of Science Honours in Biomedical Sciences
BMS 4123 Medical Informatics
Batch – 04
4th Year 1st Semester
End Semester Assignment Examination

Date : 13.03.2024
Time : 1.30pm – 2.30pm (One hour)

INSTRUCTIONS TO CANDIDATES

- This question paper consists of **Two** questions.
- Answer **ALL** questions.

QUESTION 01

(100 marks)

1.1 Use Data set 01 to perform the following activities.

1.1.1 Comment on the Data set 01. (20 marks)

1.1.2 What is the appropriate version of blast to find the unknown sequence of Data set 01? (30 marks)

1.2 Perform BLAST and answer the following questions. (When performing blast, name the sequence as Data set 01).

1.2.1 What is the query length? (12 marks)

1.2.2 State the sequence ID. (12 marks)

1.2.3 What is the highest percentage identity and state its accession number? (12 marks)

1.2.4 What is the name of the unknown sequence? (14 marks)

QUESTION 02

(100 marks)

2.1 Create a phylogenetic tree using NCBI of the following proteins.

i. Glutamine (50 marks)

ii. Albumin (50 marks)



Faculty of Health Sciences
Bachelor of Science Honours in Biomedical Sciences
BMS 4123 Medical Informatics
Batch – 04
4th Year 1st Semester
End Semester SEQ Examination

Date : 13.03.2024
Time : 9.00 am. – 12.00 pm. (Three Hours)

INSTRUCTIONS TO CANDIDATES

- This question paper consists of **SIX** questions.
- Answer **ALL** questions.
- You should write legibly in black or blue ink.

QUESTION 01 (100 marks)

1.1 What is sequence alignment? (10 marks)

1.2 Differentiate Multiple and Pairwise sequence alignments. (20 marks)

1.3 Describe the below results of sequence alignment and method of obtaining sequence identity, similarity, and gaps. (70 marks)

Gamma	MRLSKTLVDMMDADYSAALDNHMYSCRFRRSVKGFRKI
Alpha	MRLSKTLVDMMDADYSAALDPAYTTLEFEN-----V
Beta	MRLSKTLVDMMDADYSAALDPAYTTLEFENHYGASSLI
	***** : * . :

QUESTION 02 (100 marks)

Differentiate between the following categories of biological databases:

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|--|------------|
| 2.1 Sequence databases | (25 marks) |
| 2.2 Structural databases | (25 marks) |
| 2.3 Function and interaction databases | (25 marks) |
| 2.4 Literature databases | (25 marks) |

QUESTION 03 (100 marks)

3.1 Define Bioinformatics. (10 marks)

3.2 What units are used in bioinformatics? (25 marks)

3.3 What are the benefits of using bioinformatics? (25 marks)

3.4 Discuss the limitations and challenges of bioinformatics. (40 marks)

QUESTION 04**(100 marks)**

Write a short note on the components below in a bioinformatic system with examples.

- 4.1 Primary data (25 marks)
- 4.2 Uncurated data (25 marks)
- 4.3 Tertiary data (25 marks)
- 4.4 Annotation (25 marks)

QUESTION 05**(100 marks)**

- 5.1 What are the common components in a FASTA result? (25 marks)
- 5.2 Discuss the Search Phase and Alignment Phase of BLAST search. (40 marks)
- 5.3 What are the importance of E value and Z value? (20 marks)
- 5.4 Mention the benefits of using BLAST over FASTA. (15 marks)

QUESTION 06**(100 marks)**

- 6.1 Differentiate Homology and Homoplasy using a phylogenetic tree. (40 marks)
- 6.2 What is the purpose of parsimony method? (20 marks)
- 6.3 Define the following cladistics character states.
 - 6.3.1 Plesiomorphy (10 marks)
 - 6.3.2 Apomorphy (10 marks)
 - 6.3.3 Synapomorphy (10 marks)
 - 6.3.4 Autapomorphy (10 marks)