लक्ष्यं विद्यमानम्

WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 5th Semester Examination, 2023-24

MCBADSE03T-MICROBIOLOGY (DSE1/2)

Time Allotted: 2 Hours | Full Marks: 40

The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.

Question No. 1 is compulsory and answer any *four* from the rest

1. Answer any ***four*** questions from the following: 2×4 = 8
   (a) What is material inheritance?
   (b) Define MAP unit.
   (c) What is the relationship between observed and expected double crossing over, coefficient of coincidence and interference?
   (d) Define multiple alleles with proper example. ABO blood group
   (e) How ring chromosome is originated?
   (f) What is the relation between recombination and gene distance?
   (g) Define repetitive DNA spotted in genome.

2. Write short notes on the following: 2×4 = 8
   (a) Isochromosome
   (b) Non-disjunction
   (c) Pseudodominance
   (d) Linker Histone.

3. (a) A Karyotype of a mitotic nucleus from a female cat shows 76 sister chromatids. What is the diploid and haploid chromosome number of the cat? How many homologous chromosome pairs are present? 1+1+1
   (b) Diagrammatically explain how allopolyploid cotton (*Gossypium hirsutum*, diploid) is formed. 3
   (c) Write the characteristics of Turner's syndrome. 2

4. (a) Are the scaffolds of eukaryotic chromosomes composed of histone or non-histone chromosomal proteins? How has this been determined experimentally? 1+2
   (b) What functions do (i) Centromeres and (ii) Telomeres provide? $1\frac{1}{2}+1\frac{1}{2}$
   (c) Write the functions of telomerase. 2

5. Write short notes on the following: 2×4 = 8

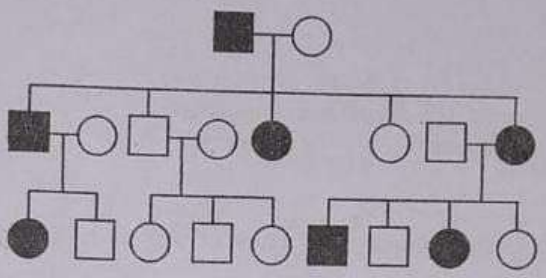
(a) Regulation of plasmid copy number

(b) Importance of 18S rDNA in eukaryotic microbial identification

(c) Transposable element

(d) Double monosomic chromosome.

6. (a) Describe, analyze and determine the probable genotype of the trait of the given pedigree chart. 2+2+2



(b) Define Robertsonian translocation. What do you mean by Quantitative Trait Locus (QTL)? 1+1

7. (a) The X and Y sex chromosomes behave like homologues during meiosis. What type(s) of gametes are produced by a male (XY) and a female (XX) with respect to X chromosomes? Does a father transmit copies of his X chromosome to his sons, daughters, or both? Explain. $1\frac{1}{2}+1\frac{1}{2}$

(b) In man, brown-eyes (+) are dominant to blue (b). Both the parents of a blue-eyed man are brown-eyed. He marries a brown-eyed woman who had a brown-eyed mother, a blue-eyed father, and a blue-eyed brother. The man and woman in question have a brown-eyed child. Give the genotypes of (i) the parents of the man and woman, (ii) the man and woman, (iii) their child. 2+2+1

8. (a) Give all the possible genotypes of the father if (i) the mother belongs to group A and the child to group B, (ii) both mother and child belong to group O. 2+2

(b) What is polytene chromosome? What is the location of this chromosome? 2+1

(c) What is carrier individual in pedigree analysis? 1

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WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 5th Semester Examination, 2023-24

MCBADSE01T-MICROBIOLOGY (DSE1/2)

ADVANCES IN MICROBIOLOGY

Time Allotted: 2 Hours | Full Marks: 40

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Question No. 1 is compulsory and answer any *four* questions from the rest

1. Answer any ***four*** questions from the following: $2\times4=8$
   (a) How *Mycobacterium tuberculosis* resists intracellular killing?
   (b) What is human microbiome initiative?
   (c) What do you mean by Col plasmid?
   (d) What is pathogenicity island?
   (e) What are "reads" in shotgun sequencing?
   (f) How is metatranscriptomics better than metagenomics?
   (g) Explain MDR and XDR in microorganisms.

2. (a) What do you mean by biofilms? 2
   (b) Give two examples of biofilm forming organisms. 2
   (c) Explain why biofilms are a threat to the nosocomial infections. 4

3. (a) Define multifactorial virulence with example. 2
   (b) How adhesion helps in bacterial pathogenesis? What are fimbrial adhesions? 3
   (c) Briefly mention the major strategies adopted by pathogenic bacteria to resist killing by phagocytic cells. 3

4. (a) Mention the role of various proteins in viral pathogenicity. 4
   (b) What is an episome? What function does it play? 4

5. (a) Which sequencing is preferred for metatranscriptomics and give reasons for your answer. 3
   (b) Explain polyphasic taxonomy. 3
   (c) How is a microbial consortium formed? 2

6. (a) What are the primary silencing factors in plants defence mechanism against viral pathogenesis? 4

   (b) State the function of silencing suppressor genes of viruses to combat plant defence and give examples. 4

7. (a) How does the unique genomes of bacteria support mutational hazard hypothesis? 3

   (b) Explain horizontal gene transfer and its implications in the environment. 5

8. (a) Briefly explain human genome project and why was it started. 3

   (b) How do microbes resist the use / action of antibiotics applied during treating infections? 2

   (c) Classify the antibiotics based on their mode of action. 3

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B.Sc. Honours 5th Semester Examination, 2023-24

MCBACOR12T-MICROBIOLOGY (CC12)

Time Allotted: 2 Hours | Full Marks: 40

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All symbols are of usual significance.

Question No. 1 is compulsory and answer any *four* from the rest

1. Answer any ***four*** questions from the following: 2×4 = 8
   (a) Differentiate between innate and adaptive immunity.
   (b) Explain ADCC with proper diagram.
   (c) Graphically explain primary immune response and secondary immune response.
   (d) State the differences between direct and indirect ELISA.
   (e) What are chimeric antibodies?
   (f) Define epitope and agretope.
   (g) Why are the co-stimulatory signals so called?
   (h) Name any two organ-specific-autoimmune diseases.

2. (a) Mention the major contributions of the following scientists in the field of immunology. 2×2 = 4
      (i) Edward Jenner
      (ii) Paul Ehrlich
   (b) What is ELISPOT? 2
   (c) What do you mean by monoclonal antibody? 2

3. (a) What are immunotoxins? 2
   (b) What do you mean by clonal deletion and clonal anergy? 2
   (c) What are mast cells? How are mast cells related to Type I hypersensitivity? 1+2
   (d) Name any two Secondary immune organs. 1
   Thymus Spleen

4. (a) Mention the major components of TCR. 2
   (b) What are super antigens? 2
   (c) Define opsonization. Which complement components behave as opsonins? 1+1
   (d) What is the basic difference between passive agglutination and agglutination inhibition techniques? 2

5. (a) Distinguish between class I and class II MHC molecules. [Mention at least 4 points.] 2
   (b) Explain the class I endogeneous pathway of antigen processing. 3

(c) What is CLIP? 1

(d) Define 2

(i) Paratope.

(ii) Hinge region.

6. (a) Describe the functions of perforin and granzyme. How are they responsible for performing target cell killing? 3

(b) How is the MAC formed? 2

(c) For the pairs of antigens listed below, indicate which of them is likely to be more immunogenic. Explain your answer. 2

(i) Protein with molecular wt. 20,000 Da and protein with molecular wt. 80,000 Da.

(ii) Synthetic co-polymer with non-aromatic amino acids and similar co-polymer with tyrosine residues.

(d) What is an adjuvant? 1

7. (a) State the basic difference between Type I and Type IV Hypersensitivity reactions. 2

(b) Explain the mode of action of the following drugs that are used to treat Type I hypersensitivity. 2

(i) Antihistamine

(ii) Theophylline

(c) What do you mean by primary immunodeficiency? 2

(d) Draw the schematic diagram of IgG and label it properly. Also mention the products obtained when the IgG molecule is treated with papain. 2

8. (a) What is HAT media? How does this media screen the B-cell-myeloma cell fused hybridomas? 3

(b) Name any two tumor antigens. 1

(c) Briefly explain the disease HDNB. 3

(d) 'A defect in the gene encoding Fas can reduce programmed cell death by apoptosis'. Justify. 1

9. (a) Describe the function of Factor D in complement activation. 2

(b) What are C3 convertase and C5 convertase in the classical pathway of complement activation? 2

(c) Explain the action of the following regulators of complement activation: 2

(i) C4bBP

(ii) HRF

(d) What the mediators of Type I hypersensitivity reaction? 2

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WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 5th Semester Examination, 2023-24

MCBACOR11T-MICROBIOLOGY (CC11)

Time Allotted: 2 Hours | Full Marks: 40

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Answer Question No. 1 and any *four* from the rest

1. Answer any ***four*** questions from the following: $2\times4 = 8$
   (a) Define cryopreservation.
   (b) Why is antifoam agent used in fermentation process? Name one antifoam agent.
   (c) How does beer differ from whisky?
   (d) What is the role of hops flowers in beer making?
   (e) Why 'head-space' is essential in a fermentor?
   (f) What do you mean by Solid State fermentation?
   (g) Name one organism which can produce amylase. What is the industrial use of amylase?
   (h) What is fusel oil?

2. (a) Give one example of application of glucose isomerase enzyme in industry. 2
   (b) Mention the different types of preservation processes used for preserving microbial cultures. 3
   (c) What is the principle of Lyophilization? 2
   (d) Define synthetic media with a suitable example. $\frac{1}{2}+\frac{1}{2}$

3. (a) What is continuous culture? 2
   (b) How does it differ from Fed-batch Culture? 2
   (c) Mention the advantages and disadvantages of Continuous culture and Fed-batch Culture. 2
   (d) What are the criteria for selecting microbial strains used for fermentation on an industrial scale? 2

4. (a) Define immobilization. Describe the different techniques used for immobilization. What are the advantages of immobilization? 1+3+1
   (b) Discuss the liquid-liquid extraction method for the separation of soluble products. 2
   (c) What is the function of impellor? 1

5. (a) Define the term "Down Stream Processing". 2
   (b) Describe the down stream processing with a suitable flow chart. 2
   (c) What are the merits and demerits of solid-state fermentation? 2
   (d) Briefly describe the selection process of the microorganisms which are used in antibiotic industry. 2

6. (a) Mention the importance of the following ingredients in fermentation industry: 3
      (i) Corn steep liquor
      (ii) Molasses
      (iii) Specific precursor materials
   (b) Explain the use of genetically-engineered strains for Vitamin B_{12} production in an industrial scale. 2
   (c) How can foaming be detrimental to a fermentation process? 2
   (d) What is submerged fermentation? 1

7. (a) Give a flow diagram of the industrial production of α-amylase, mentioning the following: 3
      (i) Microorganism(s) involved
      (ii) Carbon Source used in the medium
      (iii) Detection of α-amylase in crude fermentation broth.
   (b) Under which condition(s) does *Aspergillus niger* produce citric acid in large quantities? 2
   (c) Write down the treatment process for enhancing the release of glutamic acid by bacteria in fermented broth. 2
   (d) What is probiotic? 1

8. (a) Name the organism used for the industrial production of penicillin. 1
   (b) Write down the composition of the penicillin-producing medium. Mention the pH of the medium. 2
   (c) Why is phenyl acetic acid added in the penicillin producing medium? 2
   (d) How is penicillin recovered from the medium during penicillin production? 3

9. (a) Name the substrate used for industrial production of alcohol. 1
   (b) Name the organism used in industrial production of alcohol. 1
   (c) How is alcohol recovered from the medium after the fermentation process is over? 2
   (d) Write short notes on: 2×2 = 4
      (i) Auxanographic Technique
      (ii) Cheap substrate for bioethanol production.

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