



WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 6th Semester Examination, 2022

MCBADSE06T-MICROBIOLOGY (DSE3/4)

INSTRUMENTATION AND BIOTECHNIQUES

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.*

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

1. Answer any *four* questions from the following: 2×4 = 8
 - (a) What is an absorption spectrum? Explain with a diagram.
 - (b) What is meant by the term *phase* in phase contrast microscopy?
 - (c) What is the major limitation of bright field microscopy?
 - (d) Which is the most effective use of dark field microscopy?
 - (e) Why is gel filtration called so?
 - (f) What is the difference between ascending and descending paper chromatography?
 - (g) Why is acetic acid used in thin Layer chromatography?
 - (h) How would you select the pH of a native PAGE?

2. (a) Among the following amino acids which one would have the highest R_f value on a paper chromatography experiment: valine, serine, glutamic acid? Why? $\frac{1}{2} + 2\frac{1}{2} = 3$
 - (b) Mention one application of HPLC in drug industries. 3
 - (c) Can the R_f value be *zero* in a chromatography experiment? Explain your answer. $\frac{1}{2} + 1\frac{1}{2} = 2$

3. (a) Images in an electron microscope cannot be observed through human eye. Then how are images seen? 2
 - (b) What kind of compounds are used to stain electron microscopy samples? 1
 - (c) Both dark field microscopy and negative staining produces dark backgrounds. Why is it so and how? 4
 - (d) Name a dye used to stain bacterial flagella. 1

4. (a) A homodimeric protein of molecular weight 100 kD shows a single band at 50 kD position in SDS-PAGE gel. Explain this observation. 2
 - (b) Mention one use of native-PAGE. 1
 - (c) How can you separate two proteins, having the same molecular weight, using polyacrylamide gel electrophoresis? Discuss the importance of pH in this technique. $\frac{1}{2} + 2\frac{1}{2} = 3$

- (d) What is agarose? How is it used to separate nucleic acids according to their molecular weights? $\frac{1}{2} + 1 \frac{1}{2} = 2$
5. (a) The extinction coefficient of a substance is $1.4 \text{ L.mol}^{-1}.\text{cm}^{-1}$. How will you calculate its concentration using a spectrophotometer? What will be the unit of the concentration value? 2
- (b) What is the unit of optical density? 1
- (c) Derive a relationship between absorbance and transmittance? 2
- (d) What is the purpose of a diffraction grating in a spectrophotometer? 3
6. (a) Which of the following chromatography techniques will you prefer to use to separate a mixture of proteins of varying molecular weights — gel filtration, ion exchange, affinity? Justify your answer. 4
- (b) What kinds of biomolecules can be separated using paper chromatography? Explain how. 1+2=3
- (c) What kind of support is used in thin layer chromatography? 1
7. (a) What is the principle of column chromatography? 1
- (b) Which is the factor responsible for the separation in column chromatography? 1
- (c) “The greater the polarity of solute, more strongly it will adsorb on a polar surface” — Justify the statement. 2
- (d) Why activation of TLC plate is necessary? 2
- (e) What is the mobile phase in affinity chromatography? 2
8. (a) What do you mean by resolution of a light microscope? 2
- (b) How is resolving power of a microscope related to the numerical aperture? 2
- (c) What controls the resolution of TEM and SEM? 2
- (d) Why are SEM images black and white? 2
9. (a) Why do we use ultracentrifugation? 2
- (b) What is the difference between centrifugation and ultracentrifugation? 2
- (c) What is relative centrifugal force (RCF)? Explain its importance. 2
- (d) Why is vacuum needed inside an ultracentrifuge? 2

N.B.: *Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within 1 hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.*

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WEST BENGAL STATE UNIVERSITY
B.Sc. Programme 6th Semester Examination, 2022

MCBGDSE03T-MICROBIOLOGY (DSE2)

MICROBES IN SUSTAINABLE AGRICULTURE AND DEVELOPMENT

Time Allotted: 2 Hours

Full Marks: 40

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

1. Answer any *four* questions from the following: 2×4 = 8
 - (a) What is rhizosphere?
 - (b) Give the examples of non symbiotic N₂- fixing bacteria.
 - (c) What are 2nd generation biofuel?
 - (d) What are methanogen?
 - (e) Define PGPR.
 - (f) Briefly describe ammonification.
 - (g) What does it mean by mineralization?
 - (h) Give the example of green house gas and briefly describe how it contributes to global warming.

2.
 - (a) Describe the benefit of biofertilizer. 2
 - (b) What is green house effect? 2
 - (c) What is endomycorrhiza? Give an example. 2
 - (d) What is Biomagnification? 2

3.
 - (a) What does it mean by 'Bt' in Bt-cotton. 2
 - (b) What is the mode of action of Bt- toxin? 3
 - (c) What is golden rice? 1
 - (d) What are the probable negative effect of using excessive GM crop on environment? 2

4.
 - (a) Write down the difference between biomagnification and bioaccumulation. 2
 - (b) What does it mean by phosphate solubilization? Give the example of one bacterium that can execute this process. 2+1
 - (c) Discuss the beneficial role of any one transgenic animal in human use. 3

5. (a) Discuss the nitrogenase enzyme system. 2
(b) What are the different categories of biopesticides? 2
(c) Discuss the role of baculovirus in biopesticides. 3
(d) Why Soil acts as good reservoir of different kinds of bacteria? 1
6. (a) Discuss nitrification and de-nitrification with examples. 2+2
(b) Is nitrification aerobic or anaerobic process? 1
(c) What is the ill effect of nitrification process? How it can be overcome? 1+2
7. (a) Briefly describe the function of Leg haemoglobin. 2
(b) Describe the function of 'nod' gene. 2
(c) What is Biogas? Describe its advantages. 1+1
(d) What is recalcitrance? Give an example. 2
8. (a) What does it mean by eutrophication? 2
(b) What is VAM? Give example. 2
(c) Describe the characteristics of 'Bacteroid'. 2
(d) What is the difference between manure and fertilizer? 2

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WEST BENGAL STATE UNIVERSITY
B.Sc. Honours 6th Semester Examination, 2022

MCBADSE04T-MICROBIOLOGY (DSE3/4)

Time Allotted: 2 Hours

Full Marks: 40

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GROUP-A

Answer any five of the following

2×5 = 10

1. Define endophytes with an example.
2. What is rhizospheric effect?
3. Which type of Prokaryotes can produce methane in soil? Give one example of methane producing Prokaryote.
4. Give examples of two microorganisms that can be used as biocontrol agents against insect.
5. Give one advantage and disadvantage of GM crop.
6. Write the functions of Nod factors.
7. What are the roles of PGPR in agriculture?

GROUP-B

Answer any three of the following

10×3 = 30

8. (a) Diagrammatically describe the structural plan of a biogas plant. 4
(b) What is the main chemical component of biogas? 1
(c) Describe in detail about the mechanism(s) of production of this gas by microorganisms within the biogas plant. 5
9. Write short notes on the following (any *two*): 5×2 = 10
(a) Transgenic animals
(b) Bt crops
(c) Plant growth promotion by mycorrhiza.

10. (a) Why soil anaerobicity is detrimental for plants as well as for environment? 5
(b) Discuss about the factors that may regulate microbial activity in soil. 5
11. (a) Write the advantages of biofertilizer over chemical fertilizer. 2
(b) Describe briefly the process of rhizobial inoculant preparation for use as biofertilizer. 4
(c) Give a brief account of the carrier materials used in biofertilizer. 4
12. Write short notes on the following: $2\frac{1}{2} \times 4 = 10$
(a) Green manure
(b) Indicate the biochemistry behind the production of Golden rice
(c) Advantages and disadvantages of biofuel production
(d) Role of microorganisms in Global climate change.

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WEST BENGAL STATE UNIVERSITY
B.Sc. Honours 6th Semester Examination, 2022

MCBACOR13T-MICROBIOLOGY (CC13)

Time Allotted: 2 Hours

Full Marks: 40

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

1. Answer any *four* questions from the following: 2×4 = 8
 - (a) What do you mean by Schizont?
 - (b) What are Gnotobiotic animals?
 - (c) Mention the prophylactic measures of cholera.
 - (d) What is tetanospasmin?
 - (e) What is PBP?
 - (f) What is Zoonotic disease?
 - (g) What is Sandwich ELISA?
 - (h) What do you mean by invasiveness of pathogen?

2.
 - (a) How do microbes attach to and invade the host? 2
 - (b) What are the normal Microfloras associated with the following body sites? 2+2
 - (i) Oral cavity
 - (ii) Gastrointestinal tract
 - (c) Write briefly about the sample collection process from lower respiratory tract. 2

3.
 - (a) What are the predisposing factors of poliovirus infection? 3
 - (b) Make an outline sketch of pathogenesis of poliovirus. 3
 - (c) What do you mean by inapparent poliovirus infection? 2

4.
 - (a) What are the different antigens present in *Salmonella typhi*? 2
 - (b) Give a brief account on vaccines to control typhoid. 4
 - (c) How can an athlete's foot spread? 2

5. Describe the principles of each technique in disease diagnosis: 2×4 = 8
 - (a) Nested PCR
 - (b) Compliment fixation
 - (c) Secondary immunofluorescence
 - (d) Hemagglutinin inhibition test.

6. (a) What are the tri-drugs used to control AIDS? 2
(b) Why HIV infection leads to immunodeficiency? 2
(c) What is the relation between MDR and antibiotic resistance? 2
(d) What is toxic Shock Syndrom? 2
7. (a) What are the four types of anthrax? Describe each in brief. 1+3
(b) What are the drugs used to treat peptic ulcer caused by *Helicobacter pylori*?
Narrate the mode of action of the drug for the treatment of the disease. 1+2
(c) What is EIEC? 1
8. (a) Describe the symptoms of Kala-azar. What is its causative agent? Which organ is
affected by this disease? What is recrudescence? 2+2+1+2
(b) What is transport media? 1
9. (a) What do you mean by bacteriostatic and bacteriocidal antibiotics? Furnish with
examples of each. 2+2
(b) Mention the aminoglycoside antibiotic and what is its target site of action. 1+1
(c) What do you mean by antibiogram? 2

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WEST BENGAL STATE UNIVERSITY
B.Sc. Honours 6th Semester Examination, 2022

MCBACOR14T-MICROBIOLOGY (CC14)

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: 2×4 = 8
- (a) What is the name of first type II restriction enzyme that was discovered and mention its cleavage site?
- (b) How some bacteriophage perform anti-restriction mechanism to get entry into host *E. coli* cell?
- (c) Why TEMED is used during SDS-PAGE?
- (d) Name any two methods that can be used for the screening of genomic DNA library.
- (e) How would you increase the stringency and specificity of Southern blotting reaction?
- (f) Why nested PCR is considered to be advantageous over conventional PCR technique?
- (g) What are the limitations of DNA microarray?
- (h) How would you minimize the 'star activity' of a restriction enzyme?
2. (a) Describe the essential features of a recombinant plasmid that is required to express foreign genes in mammalian cell line. 2
- (b) How can you modify foreign protein to facilitate its purification? 2
- (c) What is the advantage of expressing a protein in mammalian cell than a bacterial cell? 2
- (d) Why M13 vector is used for gene sequencing? 2
3. (a) How does the gene delivery take place by micro-injection process? 2
- (b) What factors affect SDS-PAGE? 2
- (c) What are the applications of gene therapy? 2
- (d) Mention the advantage of nylon membrane over nitrocellulose membrane in southern blotting. 2

4. (a) Describe the differences between RFLP, SNP and VNTRs. 3
(b) How GFP and CAT gene act as reporter gene? 3
(c) What are the two different types of gene therapy? 2
5. (a) Describe the principle of DNA Microarray citing a hypothetical experimental condition. 3
(b) What are opines? 1
(c) Describe one method of production of one biomedically important protein using RDT. 3
(d) Name the hybridization technique used to screen RNA. 1
6. (a) What is the difference between PCR and Real time PCR? 3
(b) How cosmids can act as cloning vector? 3
(c) What are the advantages of using SV40 as cloning vector? 2
7. (a) How will you determine the localization of a particular gene in mammalian genome? 3
(b) Describe the principles of selection of recombinants when cloning is supposed to be done by using YAC vector. 3
(c) Why are type II restriction enzymes important for recombinant DNA technology? 2
8. Write short notes on: 2×4 = 8
(a) C DNA library
(b) Colony PCR
(c) Selectable marker
(d) Ti plasmid.
9. (a) Draw the autoradiograph derived from dideoxynucleotide sequencing of 5'-CCTAGTTGATCTTAGCCAT-3'. 2
(b) Comment on the rate of chain termination if the ratio of ddNTP : dNTP is 2
(i) 1 : 100
(ii) 1 : 50
(c) What is linker? How is it used? 2
(d) What are the conditions that must be met for T4 DNA ligase catalysis? 2

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