2021

MICRO BIOLOGY

[HONOURS]

Paper : VII

Full Marks : 90 Time : 4 Hours

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP-A

(Microbiol Genetics and genetic engineering)

(Marks: 45)

1. Answer any **five** of the following: 1×5=5

   a) What is central dogma of molecular genetics?

   b) Which of the following strain is auxotrophic only for Leucine and Methionine—

      i) Leu^+ $threo^-$ pro^- met^+

      ii) Leu^+ $threo^-$ pro^- met^-

      iii) Leu^- $threo^+$ pro^+ met^-

      iv) Leu^+ $threo^+$ pro^+ met^-

   c) The action of ultraviolet radiation on DNA to induce mutation is the:

      i) formation of thymine dimers

      ii) methylation of base pairs

      iii) deletion of base pairs

      iv) addition of base pairs.

   d) Point out the speciality of Taq Polymerase.

   e) Name a technique by which a single gene can be increased to one million copy number.

   f) Name two fluorescent dyes that are used for detection of gene expression levels during end point RT-PCR.

   g) What is a palindromic sequence? Explain with example.

   h) 5-BU is an analogue of thymine that normally pairs with Adenine. However 5-BU frequently pairs with guanine. How is this possible?

2. Answer any **four** of the following: 10×4=40

   a) What is Chimeric DNA? What components are required for cloning? What are the different types of Restriction Endonucleases? Distinguish between them

and explain which of them is most suited for genetic engineering and why? What strategies would you follow to clone a blunt end? 1+2+2+3+2=10

b) Distinguish between spontaneous and induced mutation of bacteria. Briefly explain the molecular mechanism of induced mutation catalyzed by alkylating agents and base analogues. 4+6=10

c) What is the full form of RFLP? Describe RFLP technique and mention its application. What is RT-PCR? 1+6+3=10

d) Write short notes on the following: $2\frac{1}{2}\times4=10$

i) Rolling circle model of DNA replication

ii) Principle of inheritance

iii) Southern Blotting

iv) Telomere

e) Describe the mechanism of transformation in bacteria. How does it differ in Gram +ve and Gram –ve bacteria? What are the difference between $F^+\times F^-$ and $1+F_n\times F^-$ types of conjugation in bacteria? Distinguish between generalized and specialized transduction. 3+2+2+3=10

f) What is an operon? What are the components of **trp** operon? What is IPTG? What is Lipofection? 2+4+2+2=10

g) Distinguish between the roles of DNA Polymerase I and DNA Polymerase III during DNA replication in *E. coli*. Draw the density gradient bonding patterns that Meselson and Stahl would have obtained if DNA replication had turned out to be

i) Conservative or

ii) Dispersive?

Also write down the steps of termination of DNA replication with proper diagrammatic representation. 3+(2+2)+3=10

GROUP-B

(Microbiol Pathogeneity and Immunology)

(Marks: 45)

3. Answer any **five** of the following: 1×5=5

a) What is inflammation?

b) In primary immune response, the immunoglobulin implicated is IgG| IgA| IgE| IgM| IgD.

c) Which of the following is an autoimmune disease:

i) Type 1 Diabetes mellitus

ii) Type 2 diabetes mellitus

iii) Haemophilia A

iv) Sickle Cell Anemia

d) What are superantigens?

e) Foetus receives serum IgG antibodies from their mothers. What types of immunity it is?

f) What is a schizont?

g) How are opportunistic infections related to AIDS?

h) What is droplet infection?

4. Answer any **four** of the following: 10×4=40

a) Mention the serotypes of *Vibrio* causing Cholera in India. Describe the pathogenesis and the various symptoms of Cholera. How Cholera can be prevented? 1+6+3=10

b) Write short notes on the following: $2\frac{1}{2}\times4=10$

i) Staphylococcal food poisoning

ii) Ouchterloni method

iii) Association constant

iv) Subunit vaccine

c) What is the difference between humoral immunity and cell mediated immunity? What makes IgA antibody different from IgG? What signals are required to activate helper T-cells? 4+2+4=10

d) List the members of normal microbiota of the GIT and show their specific habitats. What is neurotoxin? Explain its mode of action with suitable diagram. (4+1)+2+(2+1)=10

e) Mention the parasites commonly causing Malaria. Describe the life cycle of Malaria with neat labelled diagram. What are the typical symptoms of Malaria? Write a brief account of control measures of Malaria. 2+4+2+2=10

f) Describe the key steps and pathways of complement system. Also write down any two biological consequences of complement fixation. What is immunoelectrophoresis? 6+2+2=10

g) Describe the process of phagocytosis, the cells involved in, types and the biochemical events occuring during the process? What happens when an antibody is treated with papain and with pepsin? (5+2)+3=10

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