WEST BENGAL STATE UNIVERSITY

B.Sc. Programme 6th Semester Examination, 2021

MLBGDSE03T-MOLECULAR BIOLOGY (DSE2)

RECOMBINANT DNA TECHNOLOGY AND FUNDAMENTALS OF IMMUNOLOGY

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.

1. Answer any ***ten*** questions from the following: 1×10 = 10

Choose the correct option:

(a) Which of the following does not protect body surfaces:
(i) Skin (ii) Mucus (iii) Gastric acid (iv) Salivary amylase

(b) A plasma cell secretes:
(i) Antibody of a single specificity related to that on the surface of the parent B-cell
(ii) Antibody of two antigen specificities
(iii) The antigen it recognizes
(iv) Many different types of antibodies

(c) The basic Ig unit is composed of:
(i) 2 identical heavy and 2 identical light chains
(ii) 2 identical heavy and 2 different light chains
(iii) 2 different heavy and 2 identical light chains
(iv) 2 different heavy and 2 different light chains

(d) A hapten is:
(i) An epitope
(ii) A paratope
(iii) A small chemical grouping which reacts with preformed antibodies
(iv) A carrier

(e) The first immunoglobulin heavy chain class to be expressed on the surface of a newly produced B-cell is:
(i) IgD (ii) IgE (iii) IgG (iv) IgM

(f) CD8 is a marker of:
(i) B-cells (ii) Helper T-cells
(iii) Cytotoxic T-cells (iv) An activated macrophage

(g) Which of the following enzymes are used to degrade DNA molecules?
(i) DNA polymerases (ii) Nucleases
(iii) Ligases (iv) Kinases

(h) Which technique is used to resolve the different sizes of DNA fragments following a restriction enzyme digest?

(i) DNA sequencing (ii) Gel electrophoresis

(iii) Gene cloning (iv) PCR

(i) To be useful in the preparation of recombinant DNA, a plasmid must have

(i) No origin of replication

(ii) An origin of replication

(iii) The ability to alternate between the linear and circular forms

(iv) Restriction endonuclease activity

(j) DNA ligase synthesizes which type of bond?

(i) The hydrogen bonds between bases

(ii) The phosphodiester bonds between nucleotides

(iii) The bonds between the bases and deoxyribose sugars

(iv) The peptide bonds between amino acids

(k) All three types of restriction enzymes bind to DNA molecules at specific sequences; however, the type II enzymes are favoured for research for which of the following reasons?

(i) Type II enzymes cut the DNA at a specific site

(ii) Type II enzymes always cut the DNA to yield blunt-ended molecules

(iii) Type II enzymes always cut the DNA to yield sticky-ended molecules

(iv) Type II enzymes are the only restriction enzymes to cleave double-stranded DNA

(l) Restriction enzymes

(i) protect bacteria from viral infection (ii) cut DNA in a staggered fashion

(iii) cut DNAs producing a blunt end (iv) all of these

(m) Isoschizomers have

(i) same recognition sequence but different cleavage site

(ii) same cleavage site and same recognition sequence

(iii) same cleavage site and different recognition sequence

(iv) different cleavage site and different recognition sequence

(n) An expression vector

(i) always contains an origin of replication

(ii) usually contains a gene that confers antibiotic resistance to the bacterial host

(iii) always contains DNA segments for the regulation of mRNA production

(iv) all of these

(o) Full form of RFLP is

(i) restriction fragment length polymorphism

(ii) repeated fragment length polymorphism

(iii) renewed fragment length polymorphism

(iv) required fragment length polymorphism

2. Answer any ***ten*** questions from the following: 2×10 = 20

(a) What do you mean by ‘hypersensitivity’?

(b) Name two cells involved in phagocytosis.

(c) What are autoimmune diseases? Give an example.

(d) What do you understand by 'immunodiffusion'?

(e) What are adjuvants?

(f) What are the advantages of the Sabin polio vaccine compared with the Salk vaccine?

(g) What are 'Binary Ti Vectors'?

(h) Will the sequences 5′-GGCC-3′ & 3′-GGCC-5′ be cut by the same restriction enzyme?

(i) Name a restriction enzyme producing blunt ends. Mention its source and recognition sequence.

(j) What are the advantages of using shuttle vectors for genetic engineering?

(k) Give example of a thermostable DNA Polymerase used in PCR having proofreading activity.

(l) Define the term c-DNA.

(m) What do you mean by 'Homopolymeric tailing'?

(n) How can you join blunt ended DNA using linkers?

(o) Mention the important characteristics of a PCR primer.

3. Answer any ***two*** questions from the following: 5×2 = 10

(a) Differentiate between *any* ***two*** of the following: $2\frac{1}{2}\times2 = 5$

(i) MHC Class I and Class II molecules

(ii) Active immunity and Passive immunity

(iii) Southern blotting

(iv) Bacteriophage lambda insertion vectors and replacement vectors

(b) What are 'cloning vectors'? Outline the steps of cloning in a vector of your choice. 2+3

(c) How many types of immunoglobulins are found? Draw a labelled diagram of an antibody molecule. 1+4

(d) Write short notes on any ***two*** of the following: $2\frac{1}{2}\times2 = 5$

(i) Real time PCR

(ii) Clonal selection theory

(iii) Recombinant DNA vaccine

(iv) α-complementation

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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