RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

B.A./B.SC. SIXTH SEMESTER EXAMINATION, MAY 2015

THIRD YEAR

Date : 05/05/2015 **MICROBIOLOGY (Honours)**

Time : 11 am – 1 pm **Paper :** VII Full Marks : 50

[Use a separate Answer book for each group]

Group - A

(*Answer **any three** of the following*)

1. a) Write the function of DNA photolyase to repair the UV induced DNA damage. [2]
   b) What are meant by dominant gain of- and recessive loss-of-function mutations in relation to development of cancer. [2]
   c) "Each IS element in bacteria is flanked by a directly repeated segment of host DNA" —Can you suggest any mechanism for creation of such repeats? [3]
   d) In a survey of blood grouping the following result was obtained.

Group	No of Individuals
A	63
B	21
AB	6
O	92

   What is the gene frequency? [3]

2. a) How can you establish a link between the presence of a particular type of transposon in bacteria and resistance against antibiotics? [3]
   b) What is depurination? How can it be induced? What would be its fate in bringing a mutational effect? [4]
   c) Which gene of the human genome is regarded as "guardian" and why? [2]
   d) Name two factors which alter Hardy-Wienberg equilibrium. [1]

3. a) State the characteristic features of site-specific recombination. What is transposase? [2+1]
   b) In a fluctuation test done to determine the rate of mutation to Azetadine resistance in *Salmonella typhimurium*, the following results were obtained.
   Number of culture tubes with no Azt^R mutants = 5
   Total number of culture tubes = 20
   Final concentration of cells in culture = 10^9 cells/ml. What is the mutation rate? [3]
   c) "Loss of heterozygosity is a prerequisite for the development of certain type of cancer". Explain this with reference to a suitable example. [2]
   d) What is intercalating agent? Give an example. [1+1]

4. a) State the roles of Rec A and Rec BCD complex in homologous recombination. [3]
   b) How can you prove that the target molecule of UV light is DNA to exert a bactericidal effect? [3]
   c) Which sequences of *E. coli* DNA is used to identify the errors in daughter DNA during repair and how are these mistakes recognized by repair enzymes? [3]
   d) What is a proto-oncogene? [1]

5. a) How does deamination process lead to wrong base incorporation in DNA chain? Explain with an example. Mention the name of one enzyme that recognises the wrong base in DNA and corrects it. [2+2]
   b) What are alkylating agents? Give an example. If the phosphate group of DNA backbone is the target for such alkylating agent, what will be the consequence? [2+1+2]
   c) Cite an example where cancer is derived through reciprocal translocation of chromosome. [1]

6. a) '*ras*' gene product is essential for cell proliferation but this gene can be converted to oncogene how? [3]
   b) In *Neurospora,* the cross between $m_1m_2^+ \times m_1^+m_2$ yielded some asci where allelic ratios are $m_2^+ : m_2 = 6:2$ and $m_2^+ : m_2 = 5:3$ instead of normal $m_2^+ : m_2 = 4:4$. How can you explain the result? [3]

c) Write the characteristic features of *Salmonella* auxotrophs used by Ames to screen the chemicals for mutagenesis. [3]

d) Name one genetic disorder in human which results from a defect in nucleotide excision repair. [1]

Group - B

(*Answer **any two** of the following*)

7. a) What do you mean by stringency of hybridization? Why hybridization is performed generally at high stringency during Southern blotting? [2+1]

b) Mention the function of following enzymes in relation to recombinant DNA techniques. [4]

i) Polynucleotide kinase ii) Proteinase k.

c) How can you purify the mRNA from a mixture of all other RNA. [3]

8. a) With reference to polymerase chain reaction define,

i) Linker Primers ii) Tailed Primers [1+1]

b) What do you mean by Overlap Extension —PCR? [4]

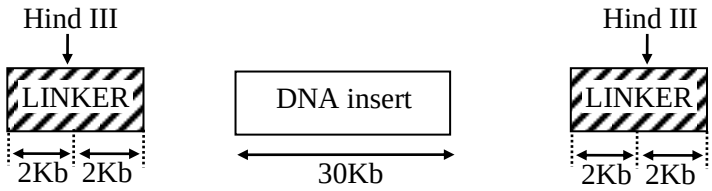
c) What is STS? Mention its one use in recombinant DNA technology. [2+2]

9. a) What do you mean by contig./contiguous map of DNA? What is its relevance in DNA technology? [1+2]

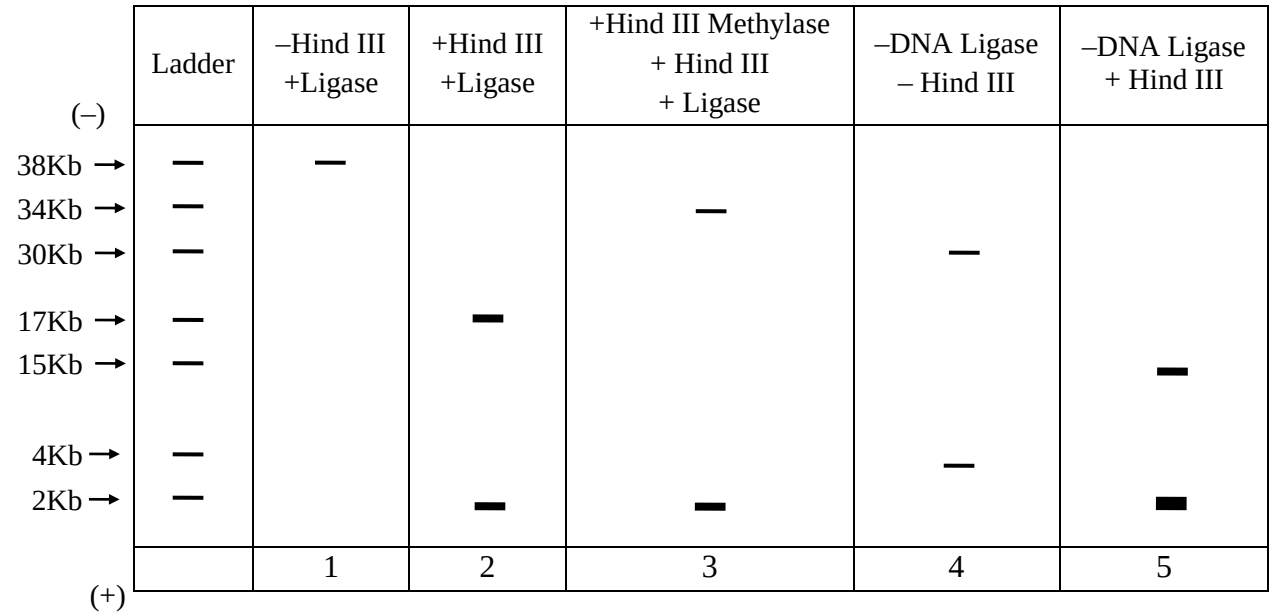
b) What is primer walking? Briefly describe its concept. [1+3]

c) Differentiate between *E.coli* DNA Ligase and T4 DNA Ligase. [3]

10. An unsequenced DNA fragment with blunt ends is to be ligated to a linker having Hind III site.



Upon experimentation, the following agarose gel pattern has emerged,



Substrate of experimentation = DNA insert and linker not ligated to each other

Methylase = Hind III Methylase

Ligase = DNA Ligase for blunt end

Hind III = Hind III Restriction endonuclease.

Explain what reactions can be deduced from the products in each of lanes 1, 2, 3, 4 and 5. [2×5]

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