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SARDAR PATEL UNIVERSITY

B.Sc Examination, VIth Semester

Thursday, Date: 23- 6 -2022

Time 10.00 a.m. to 12.00 p.m.

Subject /Course Code US 06 CBCH 21

Subject/Course Title: Genetic Engineering

Max Marks : 70

Q.I Choose the most correct answer and write in the answer sheet. (10 marks)

1. Which of the following genes of *lac* operon are inducibe?
   (a) lac Z that codes for β-galactosidase (b) lac Z and lac Y (permease)
   (c) lac A (trans acetylase) (d) all three, lacZ, lacY and lacA are inducible
2. The majority of gene regulation is carried out at the stage of
   (a) termination of transcription
   (b) initiation of transcription
   (c) elongation of transcription
   (d) initiation of translation
3. Which of the following could be a source of DNA mutation?
   (a) inaccuracy in DNA replication (c) chemical damage to the genetic material
   (b) insertions by transposomal DNA (d) all of the above
4. Plasmids, which are maintained as multicopy number per cell are known as
   (a) Stringent plasmid (c) Relaxed plasmid
   (b) Cryptic plasmid (d) Multi plasmid
5. Which of the following helps bacteria to defend against bacteriophages?
   (a) specific proteins in their cell wall (b) restriction enzymes
   (c) mitochondrial enzymes (d) all of the above
6. Cosmid vectors are used for
   (a) Cloning small fragments of DNA (c) Cloning large fragments of DNA
   (b) Cloning prokaryotic DNA only (d) Cloning eukaryotic DNA only
7. The *trp* operon is controlled by
   (a) attenuation (c) by riboswitch
   (b) repression (d) both attenuation and repression
8. Which of the following techniques is useful to detect proteins in a tissue homogenate specifically?
   (a) Centrifugation (b) PAGE (c) Capillary electrophoresis (d) Western blotting
9. Which step in PCR needs standardization?
   (a) Denaturation (b) Annealing (c) Extension (d) all of the above
10. In which step of DNA fingerprinting, PCR is used?
    (a) automated DNA extraction (c) quantification of the DNA
    (b) amplification of DNA (d) PCR is not required for DNA fingerprinting

(P.T.O.)

Q.II Fill in the blanks/ TRUE or FALSE **(08 marks)**

1. The lac genes of *Escherichia coli* are efficiently expressed only when _____ is present and _____ is absent.
2. In _____repair, DNA glycosylases and endonucleases remove only the damaged nucleotide.
3. One of the most mutagenic agent, which is also the base analog of thymine is _____.
4. The full form of CAP, a regulatory protein in *lac* operon, is _____.
5. A plasmid can be considered as a suitable cloning vector if insertion of foreign DNA does not alter its replication properties (True or False).
6. Gene mutation occurs at the time of DNA replication also (True or False).
7. CAP and Lac Repressor Bind DNA Using a Common Structural Motif (True or False).
8. For identification, recombinants are plated onto an agar plate containing an antibiotic (True or False).

Q.III Answer the following questions in short. (Any ten). **(20 marks)**

1. Give examples of any two DNA binding activators.
2. What are DNA mutagens? Give examples of chemical mutagens.
3. Define vector, draw figure of any one vector and show important sequences of that vector.
4. Define Operon and give examples.
5. What are base analogues? Can they be used as a drug?
6. Define 'mutation hotspot'.
7. Write the principle of RFLP.
8. What is the significance of Ti plasmid of *Agrobacterium tumefaciens*?
9. Differentiate between cDNA library and genomic DNA library.
10. Which molecules are used as probes in Southern and Northern blotting techniques?
11. What is Gene library? Narrate in brief.
12. List any four enzymes required in the Genetic Engineering along with their functions.

Q.IV Answer the following questions (any four): **(32 marks)**

1. Explain the phenomenon of catabolite repression.
2. Name the type of DNA repair mechanism/s required for following types of errors in DNA and explain any two types of DNA repair mechanism.
   (i) Single nucleotide change that alters one amino acid in a protein chain
   (ii) Mismatched base pairs formed due to errors in DNA polymerase
   (iii) Structural Distortions in DNA
   (iv) Thymine-thymine dimer
3. Define, classify and explain various types of restriction enzymes.
4. Explain the method and applications of Sanger's method of gene sequencing.
5. Draw figures and briefly explain any two types gene cloning vectors.
6. Explain the principle, method and applications DNA finger printing.
7. Explain the principle and applications of PCR.
8. Describe the method for preparation of gene library.
