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University Examinations 2023/2024

FOURTH YEAR SECOND SEMESTER EXAMINATION FOR THE DEGREE OF
BACHELOR OF SCIENCE IN MEDICAL MICROBIOLOGY

HMM 3424: GENETIC ENGINEERING

DATE: APRIL 2024

TIME: 2 HOURS

INSTRUCTIONS: Answer all questions in section one and two and any two questions in section three

SECTION ONE (20 MARKS)

- Which of the following gene helps in identifying transformed cells?
 - Plasmid
 - Selectable marker
 - Structural gene
 - Vector
- If the plasmid and the foreign DNA are cut by the same restriction endonuclease, recombinant DNA can be formed by joining both by
 - Polymerase III
 - EcoRt
 - Ligase
 - Taq polymerase
- A single strand of nucleic acid tagged with a radioactive molecule is called
 - Plasmid

- b) Probe
 - c) Selectable marker
 - d) Vector
4. PCR technique was invented by
- a) Karry Mullis
 - b) Boyer
 - c) Sanger
 - d) Cohn
5. Klenow fragment is derived from
- a) DNA Ligase
 - b) DNA Poi-I
 - c) DNA Poi-II
 - d) Reverse Transcriptase
6. Cutting and joining: Of the three main types of restriction endonucleases, the one most useful in molecular cloning is:
- a) Type I
 - b) Type II
 - c) Type III
 - d) All the above
7. The coding regions of genes are interrupted by ----- sequences.
- a) Intron
 - b) Exon
 - c) Chromosomal loops
 - d) Stop codon
8. -----vectors can be used to construct genomic libraries.
- a) Plasmids
 - b) Phage
 - c) Cosmid
 - d) All the above are correct
9. Plasmid pBR322 was constructed by Bolivar and Rodriguez from the ----- and is derivative number 322 of the plasmids they constructed.

- a) ColE1 plasmid
 - b) R— plasmid
 - c) Ti plasmid
 - d) Tol — plasmid
10. Low-copy-number plasmids, such as F, must replicate only once or very few times during each cell cycle and so must have a tighter mechanism for regulating their replication. Hence, they are called:
- a) Relaxed plasmids
 - b) ColE1 piasmid
 - c) Broad host range plasmids
 - d) Stringent plasmids
11. If two plasmids cannot coexist stably, they are said to be members of the:
- a) Same incompatibility group
 - b) Different incompatibility groups
 - c) Same compatibility group
 - d) Different compatibility groups
12. A very effective mechanism that plasmids have to avoid being lost from dividing cells is -----systems.
- a) Maintenance
 - b) Cured
 - c) Methylated
 - d) Partitioning
13. Cells that have lost a plasmid during cell division are said to be -----of the plasmid.
- a) Maintenance
 - b) Cured
 - c) Methylated
 - d) Partitioning
14. Bacteriophage λ particles, contain -----
- a) Linear RNA molecule
 - b) Linear double-stranded DNA
 - c) Circular DNA molecule

- d) Circular RNA molecule
- 15) pBR325 is:
- a) pBR322 with a chloramphenicol resistance gene inserted
 - b) The new number, 325, distinguishes the plasmid from pBR322.
 - c) pBR322 with a kanamycin resistance gene inserted
 - d) a and b are correct
- 16) How many types of DNA libraries are possible?
- a) 1
 - b) 2
 - c) 3
 - d) 4
- 17) cDNA is synthesized from _____
- a) Protein chain
 - b) tRNA
 - c) mRNA
 - d) DNA
- 18) The ordered steps for the construction of library involves _____
- i. Vector preparation
 - ii. Amplification
 - iii. Ligation and introduction into the host
 - iv. Isolation of genomic DNA
 - v. Fragmentation of DNA
- a) iv, v, i, iii, ii
 - b) v, iv, i, iii, ii
 - c) i, ii, iii, iv, v
 - d) ii, iii, iv, v, i
- 19) _____ is the right granted by a government to an inventor to prevent others from the commercial use of his invention.
- a) Piracy
 - b) Ethics

- c) Biosafety
 - d) Patents
- 20) After hybridization how the position of the labelled DNA probe is determined?
- a) By staining
 - b) By UV irradiation
 - c) By using chemiluminescence
 - d) By electronic microscope

SECTION TWO: 40 MARKS

1. Outline the advantages of using bacteriophage lambda as a cloning vector (6 marks)
2. Describe using diagrams where appropriate how the Par system helps segregate plasmids from different incompatible groups into bacterial daughter cells upon cell division (6 marks).
3. Differentiate between genomic library and cDNA library (6 marks)
4. Write short notes on the nomenclature restriction enzymes (6 marks)
5. Outline the qualities of a good cloning vector (4 marks)
6. Describe the various approaches used to treat cancer using gene therapy (6 marks)
7. Describe briefly the steps involved in the construction of phage display libraries (6 marks)

SECTION THREE: 40 MARKS

1. Discuss the sanger DNA sequencing techniques and all the steps involved in the procedure (20 marks)
2. (i) Discuss Restriction Fragment Length Polymorphism as genetic mapping technique (8 marks)
(ii) Describe in detail the steps involved in the construction of a cDNA library (12 marks)
3. Discuss giving specific examples some of the bioethical consideration associated with genetically modified foods (20 marks)