CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY

Second Semester of M Sc Biotechnology/Microbiology/Biochemistry Examination April 2019

Course code & Name: MS763 Genetic Engineering

Date: 27/04/2019 Day: Saturday Time: 10:00 a.m To 01:00 p.m. Maximum Marks: 20

MCQ

Important Instructions:

- Tick the correct answer and it should be written in question paper itself.
- Use of non-programmable calculator is allowed.

Q - I Choose the correct answer for the following questions. **20**

1. Which of the following makes an ideal substrate for cloning using topoisomerase?

(i) Blunt ends with 5' OH and 3'P (ii) Cohesive ends with 5' OH and 3'P

(iii) Blunt ends with 3' OH and 5'P (iv) Either of the above

2. A 5000 bp long unknown DNA was digested with a tetracutter BstUI. Based on theoretical probability, BstUI is likely to cut the DNA maximum_____number of times.

(i) 20 (ii) 256

(iii) 19 (iv) unpredicatble

3. Which of the following enzymes is/are used for labeling 3'ends of DNA?

(i) Terminal transferase (ii) Alkaline phosphatase

(iii) Polynucleotide kinase (iv) Both (i) and (iii)

4. PCR mediated amplification of DNA fragments larger than 3000 bp prefers the use of Pfu DNA polymerase over Taq DNA polymerase mainly because Pfu DNA polymerase has_____.

(i) efficient 5'→3' polymerase activity (ii) high fidelity, low processivity

(iii) 3'→5' exonuclease activity (iv) None of the above

5. The idea that DNA fragments can be joined at cohesive sites emerged from _____.

(i) discovery of *E. coli* DNA ligase

(ii) the insight that linear λDNA circularizes by complementary base pairing of the *cos* sites once into the host bacterium.

(iii) the observation that phages grown in one bacterial host often failed to grow in different bacterial strains

(iv) from the discovery that hexacutter restriction endonucleases generate cohesive ends

6. Which of the following cloning vectors infect a host bacterium and circularizes like phages, but replicate like plasmids?

(i) M13 phages

(ii) P1 phage based vectors

(iii) λ phage replacement vectors

(iv) Cosmids

7. *In vitro* phage DNA packaging can be considered as a method for _____.

(i) selection of bacterial cells transduced with λ phage

(ii) transfer of recombinant λ phage vectors into *E. coli* host

(iii) Screening of recombinant λ phage vectors

(iv) preparation of mutant λ phage lysogen

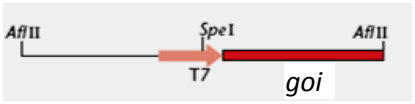
8. Which of the following is NOT TRUE for a plasmid copy number?

(i) Relaxed plasmids are maintained as multiple copies per cell

(ii) Stringent plasmids are maintained as multiple copies per cell

(iii) Copy number is regulated at the level of replication initiation

(iv) Plasmid size does not affect the copy number

9. A linearized vector with the features as in 

is likely to be useful in _____. (*goi* means gene of interest)

(i) promoting protein export

(ii) synthesis of RNA probes

(iii) high level protein expression from *goi*

(iv) both (ii) and (iii)

10. Co-expression of chaperones with gene of interest in *E. coli* host is a strategy for _____.

(i) improving soluble expression of gene

(ii) preventing inclusion body formation

(iii) fusion protein expression

(iv) Both (i) and (ii)

11. Which of the following features shall NOT be reflected in cDNA library?

(i) Promoter of the gene

(ii) introns

(iii) upstream activator sequences

(iv) all of the above

12. Which of the following could serve as a fusion tag facilitating secretion of protein in yeast?

(i) Glutathione-S-transferase

(ii) MalE (Maltose binding protein)

(iii) α-factor pheromone (MFα1)

(iv) Both (ii) and (iii)

13. Which of the following depicts an aspect of similarity between *Baculovirus* and SV40 virus?

(i) both are not recommended for expression of glycoproteins

(ii) both are capable of high-level expression of heterologous proteins

(iii) both have common host specificity

(iv) both cause host cell lysis upon protein expression

14. Which of the following is NOT a strategy to screen the DNA libraries at protein level?

(i) Functional complementation

(ii) Immunoscreening

(iii) Activity assays

(iv) None of the above

15. Which of the following plant vectors targets chloroplast genome for delivering the transgene?

(i) *Agrobacterium tumefaciens*

(ii) Tobacco Mosaic Virus

(iii) Cauliflower Mosaic Virus

(iv) None of the above

16. For Ti plasmid mediated gene transfer in plants, the binary vector strategy is based on the observation that _____.

(i) T-DNA confers opine biosynthesis ability

(ii) T-DNA does not need to be physically attached to the rest of the Ti plasmid

(iii) T-DNA is not required for virulence

(iv) Ti plasmid is too large in size for in vitro modifications

17. Primer extension is a method that allows _____.

(i) mapping of 3' ends in transcript

(ii) mapping of 5' ends in transcript

(iii) mapping of 5' cap in eukaryotic gene

(iv) mapping of introns

18. Simplest plasmid capable of episomal replication in yeast is _____.

(i) YIp

(ii) YRp

(iii) 2µm plasmid

(iv) YEp

19. Which of the following can be used for inducible expression of transgene in post-mitotic cells?

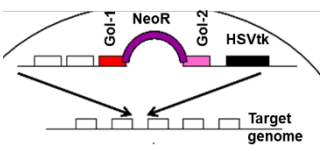
(i) SV40 virus

(ii) Adeno-associated virus

(iii) Herpes Simplex Virus

(iv) Vaccinia virus

20.



The phenotype of the indicated recombination between knock-out vector construct and target mouse genome is expected to be _____. (GoI1 &2- fragments of Gene of interest)

(i) NeoR+ HSVTk+

(ii) NeoR+ HSVTk-

(iii) NeoR- HSVTk+

(iv) NeoR- HSVTk-

CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY

Second Semester of M Sc Biotechnology/Microbiology/Biochemistry Examination April 2019

Course code & Name: MS763 Genetic Engineering

Date: 27/04/2019 Day: Saturday Time: 10:00 a.m To 01:00 p.m. Maximum Marks: 50

Instructions:

1. **Section I and II must be attempted in TWO ANSWER SHEET.**
2. Make suitable assumptions and draw neat figures wherever required.
3. Use of non-programmable calculator is allowed.
4. Show necessary calculations.

SECTION –I

Q - II Answer the following questions as directed (20)

(A) Discuss variations in cutting and pasting of DNA, processing of insert DNA and alternate strategies of cloning. **04**

OR

(A) Elaborate on DNA dependent and RNA dependent DNA polymerases used in rDNA technology. **04**

(B) Explain the following in brief (Any TWO) **06**

(i) Types of nucleases used in rDNA technology
(ii) Importance of plasmid copy number, host range and segregational stability
(iii) Various forms of plasmids and their electrophoretic mobility

(C) Discuss various types of cloning vectors. **04**

OR

(C) Discuss the features of λ phage replacement vectors and explain a strategy useful for screening recombinant λ phage vectors. **04**

(D) Answer the following (Any TWO) **06**

(i) P1 phage based cloning vectors

(ii) Features, advantages and disadvantages of cosmids as cloning vectors

(iii) Compare BAC and YAC

SECTION – II

Q-III Answer the following questions as directed (30)

(A) Explain the following (Any SIX) 18

(i) Yeast three hybrid system and its application
(ii) Viral vectors for DNA transfer in animal cells (Any two)
(iii) Non-radioactive probes for library screening
(iv) Strategy and vector to construct bacterial gene knockouts
(v) Ti plasmids a vector for delivery of transgene in plant cells
(vi) Restriction mapping using suitable example
(vii) Mechanism of Gal1 promoter regulation by Gal4 and its use to design expression vectors for yeast.

(B) Answer the following (Any THREE) 12

(i) List down the reasons for formation of inclusion bodies. Describe the strategies and vectors to promote soluble expression of proteins in *E. coli*

(ii) Discuss a strategy to synthesize and clone full length cDNA on to a plasmid vector.

(iii) Discuss the features and applications of pLITMUS and pMUTIN as cloning vectors.

(iv) Explain various methods of DNA transfer in plant cells.

(v) Design a strategy to construct a floxed gene and explain the subsequent strategy to generate conditional knockout mice.