Name: Enrolment No:	

UPES

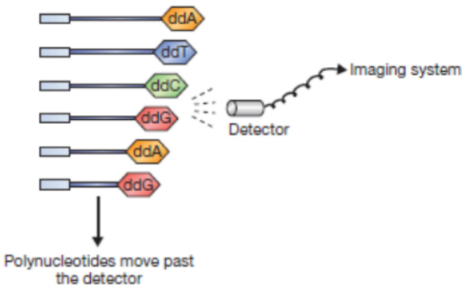
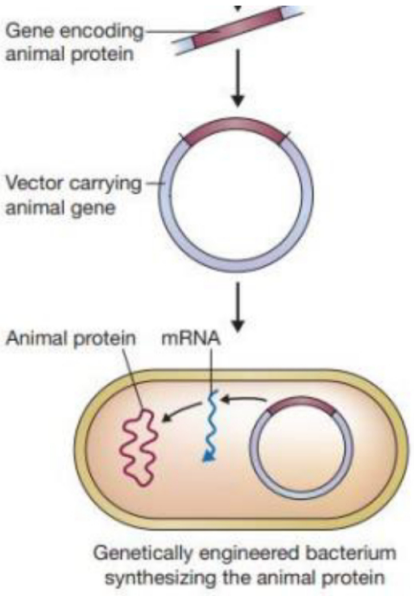
End Semester Examination, December 2024

Course: Biotechnology — Semester: III
Program: M. Sc Microbiology — Time: 03 hrs
Course Code: HSMB 8003 — Max. Marks: 100
Instructions: Answer all questions

Q.No	Section A MCQs /True &False	(20x1.5= 30 Marks)	COs
Q	Statement of question (each question carries 1.5 marks)		CO
1.	How many classes of restriction enzymes are there? a) 2 b) 1 c) 3 d) 4	1.5	CO1
2.	Type II cuts the sequence in the following way _____ a) Within the recognition sequence b) At 100-1000 nucleotides away from the recognition sequence c) At 27-30 nucleotides away from the recognition sequence d) It cuts randomly	1.5	CO1
3.	If all the nucleotides are present with equal frequencies and at random, what are the chances of having a particular four nucleotide long motif? a) 1/256 b) 1/64 c) 1/16 d) 1/8	1.5	CO1
4.	Restriction endonucleases can recognize_____ a) Tandem repeats b) Palindromic sequences c) GATC d) No sequence specificity	1.5	CO2
5.	If all the nucleotides are present with equal frequencies and at random, what are the chances of having a particular four-nucleotide long motif? a) 1/256 b) 1/64 c) 1/16 d) 1/8	1.5	CO2
6.	At times, the gene which is cloned is not well known for the protein encoded by it. To access the function, the endogenous gene for the mutant strain is inactivated. This technique is called _____ a) reverse genetics b) protein engineering c) mutation d) location of function	1.5	CO3
7.	At times, the gene which is cloned is not well known for the protein encoded by it. To access the function, the endogenous gene for the mutant strain is inactivated. This technique is called as _____ a) reverse genetics b) protein engineering	1.5	CO2

	c) mutation d) location of function		
8.	Additional restriction sites can be introduced near the existing restriction site by mutagenesis. a) True b) False	1.5	CO2
9.	The upper size of the DNA to be packed is limited. Choose the correct statement regarding phages in this context. a) There is some phage DNA lost in this process b) The phages are known as transformed phages c) These type of phages can't be selected and harvested d) Lambda is not a special attachment site	1.5	CO3
10.	Linkers are often used in cloning. Choose the incorrect statement for linkers. a) These are short chemically synthesized molecules that contain a particular restriction enzyme site within the sequence b) They are blunt-ended molecules c) They are ligated to staggered-ended insert molecules by T4 DNA ligase d) After treatment with enzyme, both the ends of the linker are staggered	1.5	CO3
11.	It is required to distinguish between the cells that have taken up the vector and those that have not. It is done by using _____ a) multiple cloning site b) origin of replication c) high copy number d) selectable marker	1.5	CO2
12.	Which of the statements is true for pBR322? a) It contains only an ampicillin resistance gene b) It contains both ampicillin-resistant and tetracycline-resistant gene c) The cloning site is present only in the ampicillin-resistant gene d) It is a natural vector	1.5	CO3
13.	_____ integration systems are used for the transfer of DNA in Drosophila and it is composed of _____ a) Artificial, P elements b) Artificial, S elements c) Natural, P elements d) Natural, S elements	1.5	CO2
14.	Sequences that can function as origins of replication are called as _____ a) partial replicating sequences b) self replicating sequences c) autonomously replicating sequences d) modified replicating sequences	1.5	CO3
15.	The protein bands transferred by the western blotting are previously _____ a) Electrophoresed b) Heated c) Calibrated d) Mixed	1.5	CO4
16.	What is the basic difference between a modified (non-essential regions removed) and an unmodified lambda vector? a) Gene expression increases b) Stable infection	1.5	CO4

	c) Non- lysogenic cycle d) Star activity		
17.	Chain-termination is a type of _____ a) Sequencing b) Vector Generation c) Antibiotic production d) Gene manipulation	1.5	CO3
18.	Which of the following acts as a chain terminator? a) Exogenous RNA b) DNA c) Deoxynucleotides d) Dideoxynucleotides	1.5	CO4
19.	Ti plasmids are ____ plasmids. a) Tumor inducing b) Degradation c) High copy number d) Mammalian	1.5	CO4
20.	To be able to coexist in the same cell, different plasmids must be _____ a) Conjugative b) Of high copy number c) Stable at high temperatures d) Compatible	1.5	CO3
	Section B	(4x5=20 Marks)	CO
Q	Statement of question (each question carries 5 marks)		
1.	a) Draw a well-labeled restriction map of the pUC8 series vector. b) Compare Linkers, adaptors, and homopolymer tails.	2+3	CO1
2.	With the help of a well-labeled diagram, outline the following steps involved in cloning a gene of interest employing a pUC8 series vector: a) Formation of recombinant DNA. b) Selection of transformants.	5	CO2
3.	With the help of relevant examples compare lambda-based a) Insertion vectors. b) Replacement vectors.	5	CO3
4.	Briefly discuss the principle behind the following strategies for the identification and selection of recombinant phages: a) Selection using cI gene. b) Selection using Spi phenotype.	5	CO4
	Section C	(2x15=30 Marks)	
Q	Statement of question (Case studies) (each question carries 15 marks)		CO
1.	In relevance to the diagram below, answer the following techniques: a) What is the technique shown in the diagram? Briefly explain the principle of this technique. b) Name the first,	15	CO2

	i) Single-celled eukaryote ii) Multi-celled eukaryotes, whose genomes were first sequenced. c) Briefly discuss the role of the following reagents in this technique. i). Primer ii). dNTP iii). ddNTP d) Discuss all the steps involved while performing this technique. a) Name the specialized enzyme and its unique characteristic trait that makes it an ideal polymerase for the technique, in question 	(2+2+3+4+4)	
2.	Regarding the diagram below, answer the following questions: a) Differentiate between cloning and expression vectors. b) Briefly discuss the three essential regions that form a cassette in an expression vector. c) Outline the characteristic traits of the promoter to be used in an expression vector. Give an example of one such promoter. d) What are fusion proteins? Discuss the advantages and disadvantages of fusion proteins. e) Interpret the significance of Cyanogen Bromide in the production of recombinant proteins. 	15 (2+6+2+3+2)	CO3

	Section D	(2x10=20 Marks)	
Q	Statement of question (each question carries 10 marks)		CO
1.	Briefly outline the aim, principle, and steps involved in the following techniques: i) SDS-PAGE Electrophoresis. ii) Northern Hybridization.	5+5	CO2
2.	a) Briefly discuss the cloning vectors used for transformations in mammalian cells. b) Argue the applications of Biotechnology in the production of recombinant vaccines.	5+5	CO4