Name:

Enrolment No:

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2023

Course: Genetic Engineering & Omics — Semester : V

Program: Integrated BMSc Microbiology — Duration : 3 Hours

Course Code: HSMB3013 — Max. Marks: 100

Instructions: Carefully read and attempt all questions

S. No.	Section A Short answer questions/ MCQ/T&F (20Qx1.5M= 30 Marks)	Marks	COs
Q 1	The restriction endonuclease is having a defense mechanism in the bacterial system against foreign DNA such as viruses. But how it is able to protect its own DNA? a) By methylation of bacterial DNA by restriction enzyme b) By methylation of foreign DNA by restriction enzyme c) By phosphorylation of bacterial DNA by restriction enzyme d) By phosphorylation of foreign DNA by restriction enzyme	1.5	CO1
Q 2	Recall the name of enzyme which removes RNA from RNA-DNA hybrid.	1.5	CO1
Q 3	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
Q 4	The specificity of an enzyme is affected by the concentration of buffer/high glycerol used. This phenomenon is termed as: a) star activity b) specificity elevation c) concentration gradient effects d) diamond activity	1.5	CO1
Q 5	Which of the following is the correct nomenclature of a restriction enzyme obtained from the first activity of strain R of Escherichia coli? a) ECOR1 b) EscRI c) EcorI d) EcoRI	1.5	CO1
Q 6	Phosphatases refer to _____ a) the enzymes which add phosphate group at the end of the DNA molecule in the place of hydroxyl group	1.5	CO1

	b) the enzymes which hydrolytically remove phosphate group from the DNA molecules and replace them with hydroxyl group c) the enzymes responsible for removal of phosphate group from the DNA molecules and replace them with hydrogen d) the enzymes responsible for replacing hydrogen in the DNA molecules with the phosphate group		
Q 7	If high copy number is there, the replication is called as _____ and if low copy number is there the replication is called as _____ a) stringent, relaxed b) relaxed, stringent c) relaxed, relaxed d) stringent, stringent	1.5	CO1
Q 8	Thermostable DNA polymerases are very important in PCR. How are they obtained? a) They are obtained by heating the bacteria manually over high temperatures b) They are isolated from extremely stable thermophilic bacteria which are often found growing in oceanic vents c) They are found everywhere in nature d) They are obtained by genetically modifying the E. coli bacteria with thermal stability property	1.5	CO1
Q 9	Which of the following enzyme is said as reverse transcriptase? a) DNA dependent DNA polymerase b) RNA dependent RNA polymerase c) RNA dependent DNA polymerase d) DNA dependent RNA polymerase	1.5	CO1
Q 10	IPTG stands for……..	1.5	CO1
Q 11	Template independent polymerases are the enzymes which add….. a) They only add a single nucleotide b) They only add a string of nucleotides and not a single nucleotide c) Terminal transferase adds a series of nucleotides at the 3’ end without a template d) Taq polymerase adds a single nucleotide at the 5’ end of the PCR product	1.5	CO2
Q 12	Alkaline Phosphatase is used at times and the vector is treated with it. Choose the incorrect statement. a) It removes 5’ terminal phosphate group from nucleic acids b) The 5’ phosphate group is required for the ligation to take place c) Two phosphate bonds should be formed for the complete ligation to take place d) The ligation between vector and insert won’t take place	1.5	CO2
Q 13	The ligation reaction is more efficient in which case? a) Blunt end ligation	1.5	CO2

	b) Sticky end ligation c) Both have the same efficiency d) Depends on the reaction conditions		
Q 14	T4 DNA ligase require ATP as cofactor True or False.	1.5	CO2
Q 15	In Replacement vector, EMBL4 multiple cloning site is present on one side of the stuffer region (T/F). Explain	1.5	CO2
Q 16	Which of the characteristics is present in lacZ gene? a) It encodes for beta galactosidase enzyme b) Beta galactosidase enzyme is responsible for cleaving monosaccharides into the constituent elements c) It doesn't cleaves a substrate called as X-gal d) But if X-gal is cleaved, it liberates pink coloured dye	1.5	CO2
Q 17	After carrying out the cloning experiment, the cells are plated on agar. Along with agar, it also contains antibiotic resistant genes, X-gal and an inducer of lacZ gene. Which of the following would grow? a) Cells that have taken up plasmid DNA b) Cells that have taken up genomic DNA c) Cells having no insert d) Cells either having no insert or having genomic DNA	1.5	CO2
Q 18	Klenow fragment is a DNA fragment of DNA polymerase which enzymatically cleaved by subtilisin protease lacks 3' ⟶ 5' exonuclease activity	1.5	CO2
Q 19	Eco RI is a hexa cutter which cuts once every 256 bp. True/False Explain	1.5	CO2
Q 20	What will be the consequence of not having an origin of replication (ori) in the vector? a) If an ori is absent, replication of vector would not take place b) As the cells divide after taking up the vector, both the daughter cells would be having the vector c) A colony of transformed colonies is observed d) The vector won't be taken up by the cell	1.5	CO2
Section B (4Qx5M=20 Marks)			
Q 1	Write a note on role of terminal polynucleotide kinase in genetic engineering.	5	CO1
Q 2	Distinguish endonucleases and exonucleases with reference to their applications in genetic engineering.	5	CO1
Q 3	Sate the difference between Isoscizomers and neoschizomers.	5	CO1
Q 4	Differentiate between insertional and replacement vector.	5	CO2
Section C			

(2Qx15M=30 Marks)			
Q 1	A) A gene encoding for a novel protein needs to be cloned with a pUC vector. Develop rDNA process for this objective and explain how do you select positive recombinants? B) Define proteomics. Explain why proteomics needed when genomics is there?	10+5	CO2
Q 2	A) Define Restriction Enzymes? Differentiate between different types of restriction enzymes. B) Distinguish between adapters and linkers.	2+8+5	CO3
Section D (2Qx10M=20 Marks)			
Q 1	Explain in detail about sanger's Dideoxy method (enzymatic method) of DNA sequencing with using a sequence 5'ATGCTAGCATACGATGAT3"	10	CO3
Q 2	Define genomics. The third-year class of Integrated B.MSc. in the school of Health Sciences at UPES has been tasked with re-sequencing the bacterium E. coli genome, using the shotgun approach to genome sequencing. give a detailed account of how they would go about this project.	2+8	CO3