Name:

Enrolment No:

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2023

Course: Recombinant DNA Technology and Omics
Semester: V
Program: B.Sc Microbiology **Duration: 3 Hours**
Course Code: HSMB3001 **Max. Marks: 100**

Instructions: Read all questions carefully

S. No.	Section A Short answer questions/ MCQ/T&F (20Qx1.5M= 30 Marks)	Marks	Cos
Q 1	Which of the following bacterium is considered as 'natural genetic engineer'? (A) *Agrobacterium tumefaciens* (B) *Agrobacterium radiobactor* (C) *Psueudomonas putida* (D) *Thermus aquaticus*	1.5	CO3
Q 2	The method widely used for transforming *invitro* animal cell cultures that uses lipid vesicles or liposomes (A) lipotransformation (B) liposome mediated transformation (C) lipofection (D) lipid mediated DNA transfer	1.5	CO3
Q 3	A researcher is working with a protein that contains four subunits of differing molecular weights. If the researcher performs SDS-PAGE, how many distinct bands should he see on the gel? (A) One (B) Two (C) Three (D) Four	1.5	CO4
Q 4	Which of the statement hold true for quantitative PCR? (A) A fluorescent dye is used which binds on single stranded DNA molecules (B) SYBR green is the only dye used (C) The quantity of DNA is simply measured by measuring the amount of fluorescence (D) This approach is useful if the products are non-specific in nature	1.5	CO4

Q 5	Which of these projects would best suited for Next Generation Sequencing? (A) To determine if a tumor sample contains a common missense mutation (B) To find the transcriptome of a tumor sample (C) To genotype ten genomic DNA samples for a known SNP (D) All of the above	1.5	CO4
Q 6	Variation between individuals due to single base changes is called as (A) ESTs (B) contigs (C) SNPs (D) Transversion	1.5	CO4
Q 7	Genomics is the study of genomes. Genome refers to the (A) proteins of an organism (B) total DNA and RNA of an organism (C) entire genes of an organism (D) total DNA, RNA and cDNA of an organism	1.5	CO5
Q 8	Inactive miRNA undergoes how many cleavages before incorporation into the RISC complex? (A) 0 (B) 1 (C) 2 (D) 3	1.5	CO5
Q 9	Which of the following is incorrect about a microarray? (A) It is a slide attached with a high-density array of immobilized DNA oligomers representing the entire genome of the species under study (B) Array of immobilized DNA oligomers cannot be cDNAs (C) Each oligomer is spotted on the slide and serves as a probe for binding to a unique complementary cDNA (D) It is the most commonly used global gene expression profiling method	1.5	CO5
Q 10	Separation of ions in mass spectrometer take place on the basis of which of the following? (A) Mass (B) Charge (C) Molecular weight (D) Mass to charge ratio	1.5	CO5
Q 11	The gene formed by the joining of DNA segments from two different sources are called as (A) recombinant gene (B) joined gene (C) both A and B (D) chimeric gene	1.5	CO1
Q 12	Which of the following enzyme is used to cut DNA molecules in rDNA technology (A) ligase (B) phosphatase (C) ribonuclease (D) restriction enzymes	1.5	CO1

Q 13	The DNA segment to be cloned is called (A) gene segment (B) DNA fragment (C) DNA insert (D) all of these	1.5	CO1
Q 14	Which of the following statements are true regarding rDNA technology (A) rDNA technology is used to obtain large number of copies of specific DNA fragments (B) rDNA technology is used to obtain large quantities of the protein produced by the concerned gene (C) rDNA technology is used to integrate gene of interest into chromosomes where it expresses itself (D) all of these	1.5	CO1
Q 15	The virus mediated gene transfer using genetically modified bacteriophages is called (A) transfection (B) transduction (C) transformation (D) conjugation	1.5	CO2
Q 16	Recombinant plasmids are added to a bacterial culture that has been pretreated with _____ ions. (A) iodine (B) magnesium (C) calcium (D) ferric	1.5	CO2
Q 17	Which of the following can be used to clone DNA sequence of size larger than 25 kb? (A) YAC (B) SV40 (C) Plasmid (D) Bacteriophage	1.5	CO2
Q 18	Which of the following is used in PAGE to prevent the mixing of the sample with running buffer? (A) ethanol (B) methanol (C) chloroform (D) sucrose	1.5	CO2
Q 19	If proteins are separated according to their electrophoretic mobility, then the type of electrophoresis is: (A) SDS-PAGE (B) Affinity electrophoresis (C) Electro focusing (D) Free flow electrophoresis	1.5	CO3
Q 20	Labelled antibodies are used to detect the presence of a particular (A) DNA molecule in southern blotting (B) RNA molecule in southern blotting (C) protein molecule in southern blotting (D) protein molecule in western blotting	1.5	CO3

Section B **(4Qx5M=20 Marks)**			
Q 1	Describe restriction endonuclease and its types.	5	CO1
Q 2	Explain BAC and list its applications.	5	CO1
Q 3	Describe the principle of the $CaCl_2$-mediated transformation.	5	CO2
Q 4	List any five applications of the northern blot technique.	5	CO3
Section C **(2Qx15M=30 Marks)**			
Q 1	If you are involved in a project to develop a transgenic plant with pest resistance, how would you create it using recombinant DNA technology? A. Explain the transgene and vector you would select for the project and why? B. Explain the preferred gene transfer method and why? C. What molecular method you would apply to screen for transgenic plant selection?	15	CO2
Q 2	A scientist wants to profile and analyze the gene expression in the cancer tissues compared to adjacent normal tissues. A. What kind of omics data can be used for his study and explain why? B. What are the preferred molecular methods that can be applied to profile the gene expression in different samples, and explain the principle and procedure of any of the two methods?	15	CO5
Section D **(2Qx10M=20 Marks)**			
Q 1	Compare the different chemistries used in the qPCR technique with illustrations	10	CO4
Q 2	Explain the principle and procedure of SDS-PAGE with an illustration	10	CO3