Name: Enrolment No:	

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

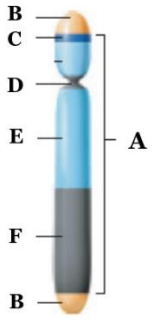
Course: GENETICS AND EPIGENETICS **Semester: IInd**
Program: B.Sc, Int B.Sc./M.Sc- CR, FN&D, Microbiology **Time : 03 hrs**
Course Code: HSCC1016 **Max. Marks: 100**

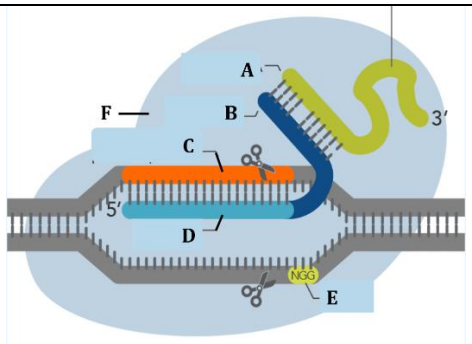
Instructions: Attempt all Questions

Q.No	Section A MCQs/Short answer questions/True &False	(20x1.5= 30 Marks)	COs
Q	Statement of question (each question carries 1.5 marks)		CO
1.	Which of the following enzymes is non-proteinaceous? (a) deoxyribonuclease (b) ligase (c) ribozyme (d) lysozyme	1.5	CO1
2.	Anticodon is present in (a) DNA (b) tRNA (c) rRNA (d) mRNA	1.5	CO1
3.	RNA contains Uridine, it is a (a) pyrimidine (b) purine (c) nucleotide (d) nucleoside	1.5	CO1
4.	In case of two gene interaction, the gene which is masking the expression of another is called_____ and the gene whose expression is masked is called_____ a) Dominant, recessive b) Recessive, dominant c) Epistatic, hypostatic d) Hypostatic, Epistatic	1.5	CO2
5.	The lethal mutation that is seen in the yellow mice is due to _____ mutation a) Insertion	1.5	CO2

	b) Deletion c) Non-sense d) Frame shift		
6.	An X linked recessive gene would appear to _____ a) Be expressed in both males and females equally b) Skip generations c) Be lethal d) Gradually degrade	1.5	CO2
7.	Dicer converts double-stranded RNAs into _____ a) snRNA b) siRNA c) mRNA d) tRNA	1.5	CO1
8.	In a family of four including a normal mother, a normal father, a color blind son and a normal son; who do you think has the defective X gene other than the affected son? a) The mother b) The father c) The normal son d) The effected son only	1.5	CO3
9.	A turner child born to normal parents is haemophilic. Where did the non-disjunction occur? a) Mother b) Father c) Zygote d) Grand mother	1.5	CO3
10.	Which one of the following is the only active gene in the inactivated X chromosome? a) XIST b) XCE c) Histone coding gene d) Ribosomal gene	1.5	CO3
11.	The XXY klinefelter survive but trisomy in most autosome is lethal. Why? a) Autosome carries more genes b) Autosomes have better dominant recessive relations c) X chromosomes are inactivated d) Autosomes are more in number	1.5	CO3
12.	Which one of the following is true for Drosophila? a) They don't have X chromosome b) One of the female X chromosome is inactivated	1.5	CO3

	c) The male Y chromosome is inactivated d) The male X chromosome is hyper active		
13.	Compare between test and back cross.	1.5	CO1
14.	If both genotype and phenotype show the same ratios of 1:2:1 in the F_2 generation, it shows (a) incomplete dominance in monohybrid cross (b) complete dominance in monohybrid cross (c) dihybrid cross (d) co-dominance	1.5	CO1
15.	State "True" or " False" Chromatin remodeling via histone modification is an epigenetic tag.	1.5	CO4
16.	What are CpG islands?	1.5	CO4
17.	Turner's syndrome is a result of _____ a) Nullisomy b) Monosomy c) Trisomy d) Polysomy	1.5	CO4
18.	Bar mutation in Drosophila results from a) Deletion b) Duplication c) Inversion d) Translocation	1.5	CO4
19.	Which statement best describes the main distinction between the origin of the two classes of small regulatory RNAs: siRNA and miRNA? a) siRNAs originate within the cell cytoplasm; miRNAs originate from the cell genome b) siRNAs originate from predominantly exogenous dsRNA; miRNAs originate from the cell genome c) miRNAs are expressed whenever siRNAs are unable to appropriately degrade RNA sequences d) miRNAs are processed from dsRNA viruses, siRNAs are processed from ssRNA viruses	1.5	CO4
20.	The phenomenon of RNA interference was discovered using the organism _____ a) Mus musculus b) Drosophila c) C. elegans d) Arabidopsis thaliana	1.5	CO3

	Section B	(4x5=20 Marks)	CO
Q	Statement of question (each question carries 5 marks)		
1.	(a) Compare between genotype and phenotype. (b) Taking Sickle Cell Anemia as a relevant example, describe how genotype is linked to phenotype.	2+3	CO1
2.	a) Compare between genome and epigenome. b) Briefly describe three major mechanisms through which and epigenetic alteration can be introduced in a genome	2+3	CO2
3.	(a) Explain the biochemical basis for ABO blood groups with reference to H-substance? (b) What formed the basis of RNA world hypotheses?	3+2	CO3
4.	Discuss the three stages of an RNA-Guided viral defense Mechanism, existing in bacteria (CRISPR/ CAS system). Draw a well labelled diagram for the same.	5	CO4
	Section C	**(2x15=30 Marks)**	
Q	Statement of question (Case studies) (each question carries 15 marks)		CO
1.	 The diagram shows the genes and regions of Y chromosome, with potential genetic functions. a) Label the regions A-F b) State the functions of the regions : B and C c) What is the role of TDF in the process of male development? State a few genes that are targeted by TDF? d) How does primary sex ratio, differ from secondary sex ratio? What could be the reason that the primary / secondary sex ratios are found to be greater than 1, in majority of the populations?	15 (6+2+4+3)	CO4

2.	 With relevance to the given diagram, state: a) What is this tool? What is it used for? b) Who received Nobel prize for the discovery of this tool in 2020? c) Label A-F and state their respective functions. d) What is a sgRNA? e) List two changes that you can introduce in a genome with this tool? Mention the respective Cas enzymes you would use for these changes.	15 (2+2+6+2+3)	CO3
	Section D	**(2x10=20 Marks)**	
Q	Statement of question (each question carries 10 marks)		CO
1.	(a) Discuss the mutation that leads to: (i) Down syndrome (ii) Cry du Chat Syndrome (b) Discuss the mechanism of siRNA directed degradation of target mRNA?	5+5	CO2
2.	(a) Discuss the mechanism of "Imprinting"? Name a few imprinting disorders in humans (b) With the help of relevant examples, discuss the role of epigenetics in development of cancer.	5+5	CO1