
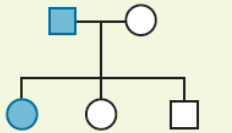
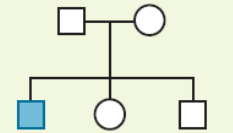
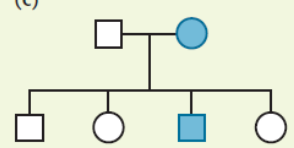


Name:			
Enrolment No:			
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES End Semester Examination, May 2022			
Course: GENETICS AND EPIGENETICS		Semester: IInd	
Program: B.Sc., Integrated (B.Sc.) - (M.Sc.)- Allied Science		Time : 03 hrs	
Course Code: HSCC1016		Max. Marks: 100	
Instructions:			
Q.No	Section A	(20x1.5= 30 Marks)	COs
	MCQs/Short answer questions/True &False		
Q	Statement of question (each question carries 1.5 marks)		CO
1.	First eukaryotic genome to be sequenced was a) Saccharomyces cerevisiae b) Haemophilus influenza c) Caenorhabditis elegans d) Neurospora crassa	1.5	
2.	Who won 2020 Nobel prize for the discovery of CRISPR-CAS9 as a tool for Gene Editing technology?	1.5	
3.	Who discovered the first antibiotic “Penicillin”? a) J. Watson b) A. Fleming c) F. Crick d) H. Moseley	1.5	
4.	Hargovind Khorana received Nobel prize for the discovery of: a) Determination of nucleic acid b) Sex determination c) Discovery of RNA polymerase d) Deciphering the genetic code	1.5	
5.	Who is credited with the discovery of blood groups?	1.5	
6.	Who gave the chromosome theory of inheritance?	1.5	
7.	Compare between “epistasis” and “pleiotropy”. Give an example for each	1.5	
8.	All of these obey Mendel’s law except a) Linkage	1.5	

	<ul style="list-style-type: none"> b) Dominance c) Independent assortment d) Purity of gametes 		
9.	<p>Each gamete carries only</p> <ul style="list-style-type: none"> a) Only recessive allele b) Only dominant allele c) Only one of the two alleles d) Both the alleles 	1.5	
10.	What is “quorum sensing”?	1.5	
11.	<p>After cross-fertilization of true-breeding tall and dwarf plants, the F₁ generation was self-fertilized. The resultant plants have genotype in the ratio</p> <ul style="list-style-type: none"> a) 1:2:1 (homozygous tall : heterozygous tall : dwarf) (b) 1:2:1 (heterozygous tall : homozygous tall : dwarf) (c) 3:1 (tall : dwarf) (d) 3:1 (dwarf : tall) 	1.5	
12.	List three contrasting pair of characters in pea plants that were used by Mendel in his experiments to establish “The theory of inheritance”.	1.5	
13.	<p>The cross where the sources of gametes are reversed is called</p> <ul style="list-style-type: none"> (a) reciprocal cross (b) reverse cross (c) dihybrid cross (d) test cross 	1.5	
14.	<p>If both genotype and phenotype shows the same ratios of 1:2:1 in the F₂ generation, it shows</p> <ul style="list-style-type: none"> (a) incomplete dominance in monohybrid cross (b) complete dominance in monohybrid cross (c) dihybrid cross (d) co-dominance 	1.5	
15.	<p>State “True” or “ False”</p> <p>DNA methylation in CpG islands leads to transcriptional silencing of the downstream target gene.</p>	1.5	
16.	In human DNA, which nucleotide base is methylated at the 5' position?	1.5	

	<ul style="list-style-type: none"> a) Adenine b) Cytosine c) Guanine d) Thymine 		
17.	<p>Which of the following is not a non-coding RNA?</p> <ul style="list-style-type: none"> a) mRNA b) tRNA c) rRNA d) miRNA 	1.5	
18.	<p>Monozygotic (MZ) twins have identical genotypes and, at birth, epigenetic patterns are similar in MZ twins. What happens to these epigenetic patterns as the twins age?</p> <ul style="list-style-type: none"> a) Become more different b) Remain similar 	1.5	
19.	<p>What enzyme is responsible for copying methylation marks from the parental to the daughter strand of DNA during replication?</p> <ul style="list-style-type: none"> a) DNMT1 b) DNMT3a c) DNMT3b d) DNMT3L 	1.5	
20.	<p>Which of the following diet-derived compounds have epigenetic effects?</p> <ul style="list-style-type: none"> a) Butyrate b) Curcumin c) Genistein d) All of the above 	1.5	
	Section B	(4x5=20 Marks)	CO
Q	Statement of question (each question carries 5 marks)		
1.	<ul style="list-style-type: none"> (a) Define genotype and phenotype. (b) Describe how they are related with the help of examples each from a “monohybrid” and “dihybrid” crossing scheme. 	2+3	CO1
2.	<ul style="list-style-type: none"> (a) Compare between “gene” and “allele”? (b) Describe the central dogma of molecular genetics? (c) What is “genomic imprinting”? 	1+2+2	CO2
3.	<ul style="list-style-type: none"> (a) Explain the biochemical basis for ABO blood groups with reference to H-substance? (b) Briefly explain “Bombay phenotype” 	3+2	CO3

4.	Discuss the “mechanism” and “future applications” of CRISPR/ CAS9 as an advanced tool for genome editing.	5	CO4
Section C		(2x15=30 Marks)	
Q	Statement of question (Case studies) (each question carries 15 marks)		CO
1.	<p>Eukaryotic tissue was homogenized and re-suspended into TRIZOL. Protocol for the total RNA extraction was followed. The total RNA extracted by iso-propanol based precipitation was later processed for small non-coding RNA enrichment:</p> <ol style="list-style-type: none"> Predict the three types of small non-coding RNAs that would be isolated in the aforesaid protocol. What are ribozymes? Give an example What is RNAi (RNA-interference)? Who is credited with the discovery of RNAi? Give the mechanism of miRNA based RNA interference. Draw a well labelled diagram for the same? Briefly describe what is RNA Induced Transcriptional silencing (RITS)? Compare forward genetics with reverse genetics. Give a classical example of reverse genetics. Justify your answer. 	15 (3+2+3+2+2+3)	CO3
2.	<p>The wild-type eye color in <i>Drosophila</i> is brick red. When two autosomal recessive mutants, brown and scarlet, are crossed, the F1 generation consists of flies with wild-type eye color. In the F2 generation, wild, scarlet, brown, and white-eyed flies are found in a 9:3:3:1 ratio.</p> <ol style="list-style-type: none"> Give the explanation of the biochemical basis of four eye colour phenotypes produced in the cross between <i>Drosophila</i> with brown eyes and scarlet eyes What is an X-linked mutation? How does X-linked white mutation in <i>Drosophila</i> differ from the white-eyed flies obtained in (a)? Give two examples of X-linked mutation in Humans? Below are three pedigrees. For each trait- a, b, c, consider whether it is or is not consistent with X-linked recessive inheritance? <div data-bbox="272 1516 821 1892" style="background-color: #e6f2e6; padding: 10px; margin: 10px 0;"> <p>(a) </p> <p>(b) </p> <p>(c) </p> </div> <ol style="list-style-type: none"> One of the progeny in Pedigree (c) has a fault in trait prediction. What is it? 	15 (3+2+2+3+2+3)	CO4

	f) Compare between Sex-linked, Sex limited and Sex influenced traits. Give an example for each.		
	Section D	(2x10=20 Marks)	
Q	Statement of question (each question carries 10 marks)		CO
1.	(a) Compare between “genome” and epigenome”? (b) Give three salient features of an epigenetic trait? (c) Discuss the mechanisms for: (i) DNA methylation and (ii) Histone modifications, as two major epigenetic alterations to the genome.	2+3+5	CO3
2.	(a) What is “dosage compensation”? (b) Explain Lyon hypothesis with an example. (c) Give a detailed account of the mechanism of X-chromosome inactivation. Draw a well labelled diagram for the same.	2+3+5	CO2