



C. U. SHAH UNIVERSITY

FACULTY OF SCIENCES

DEPARTMENT OF LIFE SCIENCES

COURSE: B.Sc.

SEMESTER: II

SUBJECT NAME: Molecular Biology

SUBJECT CODE: 4SC02MOB1

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester								
Th	Tu	Pr	Total		Theory				Practical				Total Marks
					Sessional Exam		University Exam		Internal		University		
					Marks	Hrs	Marks	Hrs	Pr	TW			
4	0	4	8	6	30	1.5	70	3	20	10	70	200	

Objectives:- The objective of this course is that the students can learn about basics of molecular biology.

Prerequisites:- Basic knowledge of Biological Sciences.

Course outline:-

Sr. No.	Course Contents	Hours
1	<p>Structures of DNA and RNA/Genetic Material DNA Structure: Miescher to Watson and Crick- historic perspective, DNA structure, Salient features of double helix, Types of DNA, Types of genetic material, denaturation and renaturation, cot curves. DNA topology-linking number, topoisomerases; Organization of DNA Prokaryotes, Viruses, Eukaryotes. RNA Structure, Organelle DNA-mitochondria and chloroplast DNA.</p> <p>Replication of DNA (Prokaryotes and Eukaryotes) Bidirectional and unidirectional replication, semi- conservative, semi-discontinuous replication Mechanism of DNA replication: Enzymes and proteins involved in DNA replication-DNA polymerases, DNA ligase, primase, telomerase-for replication of linear ends, Various models of DNA replication including rolling circle, D- loop (mitochondrial), Θ (theta) mode of replication and other accessory protein, Mismatch and excision repair.</p>	22
2	<p>Transcription in Prokaryotes and Eukaryotes Transcription: Definition, difference from replication, promoter-concept and strength of promoter, RNA Polymerase and the transcription unit. Transcription in Eukaryotes: RNA polymerases, general Transcription factors</p> <p>Transcriptional Processing Split genes, concept of introns and exons, RNA splicing, spliceosome machinery, concept of alternative splicing, Polyadenylation and capping, Processing of r-RNA, RNA interference: si-RNA, mi-RNA and its significance.</p>	16
3	<p>Translation (Prokaryotes and Eukaryotes) Translational machinery, Charging of t-RNA, aminoacyl t-RNA synthetizes, Mechanisms of initiation, elongation and termination of polypeptides in both prokaryotes and eukaryotes, Fidelity of translation, Inhibitors of protein synthesis in prokaryotes and eukaryote</p>	10



4	Regulation of gene Expression in Prokaryotes and Eukaryotes Principles of transcriptional regulation, regulation at initiation with examples from lac and trp operons, Sporulation in Bacillus, Yeast mating type switching, Changes in Chromatin Structure-DNA methylation and Histone Acetylation mechanisms.	12
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Learning Outcomes:- The students are expected to

- Understand the identification of structure of RNA and DNA and their translations etc.

Books Recommended:-

1. 'Molecular Biology of the Gene', **J. D. Watson, T. A. Baker, S. P. Bell, A. L. Gann, M. Levine and R. Losick**, 6th Ed., *Cold Spring Harbour Lab. Press, Pearson Publication* (2008).
2. 'The World of the Cell', **W. M. Becker, L. J. Kleinsmith, J. Hardin and G. P. Bertoni**, 7th Ed., *Pearson Benjamin Cummings Publishing, San Francisco* (2009).
3. 'Cell and Molecular Biology: Concepts and Experiments', **G. Karp**, 6th Ed., *John Wiley and Sons. Inc.* (2010).
4. 'Cell and Molecular Biology', **De Robertis EDP and De Robertis EMF**, 8th Ed., *Lipincott Williams and Wilkins*, Philadelphia (2006).
5. 'Molecular Cloning: A Laboratory Manual', **J. Sambrook and D. W. Russell**, 4th Ed., *Cold Spring Harbour Laboratory press* (2001).
6. 'Lewin's Essential Genes', **J. Krebs, E. Goldstein and S. Kilpatrick**, 3rd Ed., *Jones and Bartlett Learning* (2013).
7. 'Principles of Genetics', **E. J. Gardner, M. J. Simmons, D. P. Snustad**, 8th Ed., *Wiley (India)* (2008).



SUBJECT NAME: Molecular Biology Practical

Objectives:- The objective of this course is that the students can learn about basics of molecular biology.

Prerequisites:- Basic knowledge of Biological Sciences.

Course outline:-

Sr. No.	Course Contents
1	Study of different types of DNA and RNA using micrographs and model/schematic representations.
2	Study of semi-conservative replication of DNA through micrographs/schematic representations.
3	Isolation of genomic DNA from E-coli.
4	Estimation of salmon sperm/calf thymus DNA using colorimeter (diphenylamine reagent) or UV spectrophotometer (A260 measurement).
5	Estimation of RNA using colorimeter (orcinol reagent) or UV spectrophotometer (A260 measurement).
6	Resolution and visualization of DNA by Agarose Gel Electrophoresis.
7	Resolution and visualization of proteins by Polyacrylamide Gel Electrophoresis (SDS-PAGE).
8	Study of B-DNA model.
9	Study of TRNA cloverleaf model.

Learning Outcomes:- The students are expected to

- Understand the identification of structure of RNA and DNA and their translations etc.

Books Recommended:-

1. 'Molecular Biology of the Gene', J. D. Watson, T. A. Baker, S. P. Bell, A. L. Gann, M. Levine and R. Losick, 6th Ed., Cold Spring Harbour Lab. Press, Pearson Pub. (2008).
2. 'The World of the Cell', W. M. Becker, L. J. Kleinsmith, J. Hardin and G. P. Bertoni, 7th Ed., Pearson Benjamin Cummings Publishing, San Francisco (2009).
3. 'Cell and Molecular Biology: Concepts and Experiments', G. Karp, 6th Ed., John Wiley and Sons. Inc. (2010).
4. 'Cell and Molecular Biology', De Robertis EDP and De Robertis EMF, 8th Ed., Lipincott Williams and Wilkins, Philadelphia (2006).
5. 'Molecular Cloning: A Laboratory Manual', J. Sambrook and D. W. Russell, 4th Ed., Cold Spring Harbour Laboratory press (2001).
6. 'Lewin's Essential Genes', J. Krebs, E. Goldstein and S. Kilpatrick, 3rd Ed., Jones and Bartlett Learning (2013).
7. 'Principles of Genetics', E. J. Gardner, M. J. Simmons, D. P. Snustad, 8th Ed., Wiley (India) (2008).