Department of Biology

College of Education

University of Salahaddin -Erbil

Subject: Introduction to Molecular Biology

Course Book – 4th stage

Lecturer's name: Assist. Prof. Dr. Sazan Qadir Maulud

Academic Year: 2023-2024

Course Book

1. Course name	**Molecular Biology**
2. Lecturer in charge	**Dr.Sazan Qadir Maulud**
3. Department/ College	**Biology /Education**
4. Contact	**e-mail: sazan.maulud@su.edu.krd** **Tel: 07504687617**
5. Time (in hours) per week	**Theory: 1**
6. Office hours	**8hr**
7. Course code	**EdB0405**
8. Teacher's academic profile	Teaching is process that need many requirements like instruments, halls, library.... etc.so to meet this requirement financial support are need, because without this requirements teaching can't be performed in optimum ways. Also, the teacher to rise his teaching efficiency he needs to make research and to see many courses in the broad to become more active and become open mind and perform research at high level.so am as a teacher when I graduated from a college, I got little information but when i applied to M.Sc. i expand my information and more information could be acquired when the lecturer carru out research beside reading the most update books and review.
9. Keywords	**Replication, transcription, and translation**

10. Course overview:

Molecular biology is the study of biology at a molecular level. This field overlaps with other areas of biology and chemistry, particularly genetics and biochemistry. Molecular biology chiefly concerns itself with understanding the interactions between the various systems of a cell, including the interactions between DNA, RNA and protein biosynthesis as well as learning how these interactions are regulated.

Molecular biology is the study of molecular underpinnings of the process of replication, transcription and translation of the genetic material. The central dogma of molecular biology where genetic material is transcribed into RNA and then translated into protein, despite being an oversimplified picture of molecular biology, still provides a good starting point for understanding the field. This picture, however, is undergoing revision in light of emerging novel roles for RNA. Much of the work in molecular biology is quantitative, and recently much work has been done at the interface of molecular biology and computer science in bioinformatics and computational biology. As of the early 2000s, the study of gene structure

and function, molecular genetics, has been amongst the most prominent sub-field of molecular biology. The word *cell* comes from the Latin *cellula*, meaning, a small room. The descriptive term for the smallest living biological structure was coined by Robert Hooke in a book he published in 1665 when he compared the cork cells he saw through his microscope to the small rooms monks lived in.

11. Course objective:

Increasingly many other loops of biology focus on molecules, either directly studying their interactions in their own right such as in cell biology and developmental biology, or indirectly, where the techniques of molecular biology are used to infer historical attributes of populations or species, as in fields in evolutionary biology such as population genetics and phylogenetics. There is also a long tradition of studying biomolecules "from the ground up" in biophysics.Since the late 1950s and early 1960s, molecular biologists have learned to characterize, isolate, and manipulate the molecular components of cells and organisms. These components include DNA, the repository of genetic information; RNA, a close relative of DNA whose functions range from serving as a temporary working copy of DNA to actual structural and enzymatic functions as well as a functional and structural part of the translational apparatus; and proteins, the major structural and enzymatic type of molecule in cells.

One of the most basic techniques of molecular biology to study protein function is expression cloning. In this technique, DNA coding for a protein of interest is cloned (using PCR and/or restriction enzymes) into a plasmid (known as an expression vector). This plasmid may have special promoter elements to drive production of the protein of interest, and may also have antibiotic resistance markers to help follow the plasmid.

This plasmid can be inserted into either bacterial or animal cells. Introducing DNA into bacterial cells can be done by transformation (via uptake of naked DNA), conjugation (via cell-cell contact) or by transduction (via viral vector). Introducing DNA into eukaryotic cells, such as animal cells, by physical or chemical means is called transfection. Several different transfection techniques are available, such as calcium phosphate transfection, electroporation, microinjection and liposome transfection. DNA can also be introduced into eukaryotic cells using viruses or bacteria as carriers, the latter is sometimes called bactofection and in particular uses Agrobacterium tumefaciens. The plasmid may be integrated into the genome, resulting in a stable transfection, or may remain independent of the genome, called transient transfection.

12. Student's obligation

The student are obliged to attend to the class room.Student also enforced to make examination ,prepare reports and presentation

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13. Forms of teaching

The kind of teaching method include :data show, powerpoint,white board and reports

14. Assessment scheme
Monthly theory exam:20 marks
Practical exam :20 marks
Final theory exam :30 marks
Final practical :30 marks

15. Student learning outcome:
The student will be familiar with main topics in biology which concerned with replication, transcription, translation and how this process are regulated.

16. Course Reading List and References:

"Introduction to molecular biology" Paollela ,P.. McGraw – Hill. USA

"Molecular biology " Weaver, R.F.3rd ed.

"Cell and molecular biology" karp, G.3rd ed.

1-Journal of Algorithms for Molecular Biology
2-APPLIED MICROBIOLOGY AND BIOTECHNOLOGY
3-Biotechnology Journal

17. The Topics:	**Lecturer's name**
Course programmed Week 1 General concept Week2: Definition of molecular biology , DNA as genetic material, Griffith experiment ,.	1 hrs.

Week 3 : Genome, Origin of term , Overview, Types, Comparison of different genome type, What are the difference and similarities between prokaryote and eukaryote of the genome. Week 4: Nucleic acid , Chemical structure , Types of nucleic acid , RNA, DNA, Nucleoside, nucleotide and deoxynucleotide. Week 5: Primary structure of DNA , DNA methylation , polynucleotide strand , RNA structure, types of RNA. Week 6: DNA replication, definition,. Week 7: Mechanism of DNA replication, Difference between prokaryote and eukaryote in DNA replication Week 8: Models of DNA replication , meselson and stahl experiment , evidence of most acceptable model.	

Week 9: Gene definition, structural gene, regulatory gene, promoter, Week 10 : operator , repressor protein in gene regulation function. Week 11 : Gene expression , Central dogma in molecular biology Transcription , Translation Week 12 : Steps of DNA transcription , Initiation , Elongation , and Termination Week 13 : , Difference between prokaryote and eukaryote, Posttranscriptional modification. Week 14 : Structure of tRNA , mRNA , rRNA , ribosome and site of mRNA binding , ribosome in prokaryote and eukaryote. Week 15 :	

Genetic code , General feature, The 64 codon , The reading frame, The almost universal genetic code . Week 16 Protein synthesis , translation , Definition , Steps of translation Week 17 Initiation , elongation Week 18 Termination , Energy needs for protein synthesis , Difference between prokaryote and eukaryote . Week 19 Control of gene expression , Control of metabolism , Operon Week 20 Lactose operon , Component of lactose operon , Inactivation of lactose operon . Week 21 : Molecular cloning method , Gene cloning , The role of restriction endonuclease , vectors , Identifying specific clone . Week 22 : Molecular cloning method , Gene cloning , Week 23 The role of restriction endonuclease , vectors , Identifying specific clone	

18. Practical Topics (If there is any)	
In this section The lecturer shall write titles of all practical topics he/she is going to give during the term. This also include a brief description of the objectives of each topic, date and time of the lecture	Lecturer's name ex: (3-4 hrs) ex: 14/10/2020

19. Examinations:

e following with scientific words

1- The central dogma of molecular biology where _____

2- The primer laid down by _____ in dna replication is necessary because_____

3- Adenosine is always modified to_____ which lack _____

Q2/ Correct the underlined sentences

1- All histones protein have high amount of <u>glycine and thrionine</u>

2- <u>Helicase</u> bind to OriC and wind stretch

Q3/ Give the function for the following

1- 1- poly(A) tail 2- ϱ factor in RNAP 3- 5'cap 4- IF-3 5- trna

(20 marks)

Q4/ Give the full name for the following

1-SINEs 2 - PABП 3- hn rna 4- SSbp 5- 40S 6- ORF 7-TMV8-P-site

9-RF-1 10- dAMP (20 marks)

Q5/ Count only

1- Arms of trna

2- Types of eukaryotic RNAP with product

3- Subunits of RNAP

4- types DNA sequence in eukaryote

5- Component necessary for protein synthesis during initation

(10 marks)

Q6/ Explain the second stage of elongation in protein synthesis

(10 marks)

20. Extra notes:

No more notes

21. Peer review

This course book has to be reviewed and signed by a peer. The peer approves the contents of your course book by writing few sentences in this section.
(A peer is person who has enough knowledge about the subject you are teaching, he/she has to be a professor, assistant professor a lecturer or an expert in the field of your subject).