وزارة التعليم العالي والبحث العلمي
جامعة المستقبل
كلية العلوم
قسم الكيمياء الحياتية

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Nucleic Acids Chemistry II**			**Module Delivery**	
Module Type	Basic			☒**Theory** ☒**Lecture** ☒**Lab** ☐**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	UOMU036363				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level		3	**Semester of Delivery**		2
Administering Department		Biochemistry department	**College**	College of Science	
Module Leader			**e-mail**		
Module Leader's Acad. Title			**Module Leader's Qualification**		
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Review Committee Approval Date			**Version Number**	1.0	

RelationwithOtherModules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	none	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	• Provide an in-depth understanding of the biochemical mechanisms involving DNA and RNA in living cells. • Explore the chemistry of replication, transcription, translation, and repair processes. • Understand the regulatory mechanisms at the nucleic acid level. • Introduce modern technologies related to gene manipulation and analysis.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of the course, students will be able to: 1. Explain the mechanisms of DNA replication, transcription, and translation. 2. Identify types of genetic mutations and mechanisms of DNA repair. 3. Describe basic techniques used in molecular biology and genetic engineering. 4. Perform PCR and restriction enzyme digestion. 5. Analyze DNA and RNA using electrophoresis and gel visualization. 6. Interpret experimental results and apply molecular techniques to real problems.
Indicative Contents المحتويات الإرشادية	1. **DNA Replication Mechanisms**, Origin of replication, replication forks, DNA polymerases 2. **Transcription and RNA Synthesis**, RNA polymerases, promoters, enhancers, termination 3. **Post-Transcriptional Modifications**, RNA splicing, capping, polyadenylation 4. **Translation and Protein Synthesis**, tRNA, ribosomes, codon-anticodon interaction 5. **Genetic Code and its Properties**, Universality, redundancy, start/stop codons 6. **Regulation of Gene Expression**, Prokaryotic (lac operon), eukaryotic mechanisms (epigenetics) 7. **DNA Damage and Repair Mechanisms**, Base excision, nucleotide excision, mismatch repair 8. **Recombinant DNA Technology**, Cloning, restriction enzymes, plasmids, vectors 9. **PCR and Electrophoresis**, Amplification, gel-based separation, interpretation 10. **DNA Sequencing Methods**, Sanger, next-generation sequencing (overview) 11. **Applications of Nucleic Acid Technologies**, Forensics, diagnostics, therapeutics 12. **Ethical and Safety Considerations in Genetic Work**

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• . Lectures supported by visual and interactive media • Laboratory practical sessions • Case-based learning and clinical discussions • Group assignments and mini-presentations

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	65	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	85	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	15	All

Total assessment	100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظر ي	
	Material Covered
Week 1	Overview of nucleic acid metabolism
Week 2	DNA replication: enzymes and mechanisms
Week 3	Transcription in prokaryotes and eukaryotes
Week 4	Translation and genetic code
Week 5	Mutations: types and causes
Week 6	DNA repair mechanisms
Week 7	Regulation of gene expression
Week 8	Introduction to recombinant DNA technology
Week 9	Polymerase Chain Reaction (PCR)
Week 10	Gel electrophoresis of nucleic acids
Week 11	Cloning vectors and plasmids
Week 12	Gene expression analysis
Week 13	Practical exam
Week 14	Theoretical review
Week 15	Final written exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1 -2	Review of lab safety and DNA handling
Week 2 -4	Simulation of replication steps
Week 3	RNA synthesis and transcription demo
Week 4	Translation modeling activity

Week 5	Case-based exercises on mutation effects
Week 6	UV-induced mutation and repair model
Week 7	Analysis of operons (e.g., lac operon model)
Week 8	Restriction enzyme digestion lab
Week9	Performing PCR and analyzing amplification results
Week 10	DNA separation and visualization
Week 11	Plasmid map interpretation and ligation concepts
Week 12	RT-PCR discussion or demo

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1. *Molecular Biology of the Cell* – Alberts et al. 2. *Molecular Biology of the Gene* – Watson et al. 3. *Lewin's Genes XII* – Krebs, Goldstein, Kilpatrick	*Clinical Chemistry*
Recommended Texts	• Laboratory manuals for molecular biology • Journal articles on modern DNA technologies • Online tools for sequence analysis and primer design	*Fundamentals of Clinical Chemistry*
Websites	https://chem.libretexts.org/Bookshelves/Biological_Chemistry/Supplemental_Modules_(Biological_Chemistry)/Nucleic_Acids/Nucleic_Acids	

APPENDIX:

GRADING SCHEME مخطط الدرجا ت				
Group	**Grade**	التقدي ر	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتيا ز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	مقبول بقرا ر	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

ملاحظة: هذا النموذج تم وضعه وتقديمه من قبل مديرية ضمان الجودة يف وزارة التعليم العا يل والبحث العل ي م