Damietta University
Faculty of Science
Zoology Department

FINAL TERM EXAM
Jan 2026

جامعة دمياط
Damietta University

المستوي الثالث / حيوان وكيمياء
مقرر: خلية وبيولوجيا جزيئية (301ح)

Date: 22-01-2026 **Time: 2 Hours** **Marks: 90**

الامتحان في صفحتين:

Answer ALL the following questions:

QUESTION (1): **(25 Marks)**

Answer the following:

1- What are the different types of small RNA molecules? (5 marks)
2- Explain how the telomere is replicated? (6 marks)
3- Discuss one example for how proteins control the characteristics of living cells. (6 marks)
4- Explain the molecular mechanisms of 3 different mRNA modifications. (8 marks)

QUESTION (2): **(20 Marks)**

Which of the following statements are probably true (√) and which are probably false (×).

DO NOT copy the sentences to your answer sheet

1- The GPI -anchored proteins are linked through their N-termini to GPI.
2- Annexins bind tightly to membrane lipid bilayer through a GPI anchor.
3- Rosalind Franklin was awarded Noble prize after her death for her contribution to the discovery of the double helix.
4- Avery, MacLeod, and McCarty were the first to suggest that something from the dead type IIIS *S. pneumoniae* can transform the type IIR bacteria.
5- Helicases break the covalent bonds between two DNA strands.
6- In the leading strand, the synthesis of DNA strand occurs in 5′ to 3′ manner, while in the lagging strand, the DNA synthesis occurs in a 3′ to 5′ manner.
7- The amino terminal of a protein corresponds to the 5′ end of the respective gene's mRNA.
8- DNA polymerase slides along the template strand as it synthesizes a new strand by connecting dNTPs in a 5′ to 3′ direction.
9- DNA unwinding at the origin of replication is thought to stimulate ATP hydrolysis by ORC.
10- The hydroxyl on C3 of cholesterol is oriented toward the surface of the plasma membrane.
11- Myristoyl tails are added to the amino group of an N-terminal glycine during the biosynthesis of some peripheral membrane proteins.
12- In RNA, the nitrogenous base is always attached to the 1′ carbon atom.
13- In the translation process, the adaptor molecule is mRNA.
14- Type IIIS bacteria can transform into type IIR.
15- DnaA and DnaB proteins recruit DnaC protein to form a ring around DNA strand.
16- TFIID phosphorylates the CTD of RNA polymerase.
17- The DNA backbone is negatively charged due to a negative charge on each nitrogenous base
18- It is easier to separate two DNA strands at AT-rich region than at GC-rich region.
19- PolyA tail of mRNA is not encoded in the sequence of the encoding gene.
20- Watson and Crick assumed that the chemical linkage between two nucleotides is always the same.

QUESTION (3): **(20 Marks)**

Complete the following with suitable words:

DO NOT copy the sentences to your answer sheet

- Fatty acids are oxidized in the _____(1)_____ into ATP.
- _____(2)_____ is the major sterol in animal plasma membranes, with lower concentrations in internal membranes.
- _____(3)_____ is first integral membrane protein to be characterized.
- Catenins bind to transmembrane cell adhesion proteins called _____(4)_____.
- Enzymes that interconvert all phosphoglyceride head groups and remodel fatty acid chains are located on the cytoplasmic surface of the _____(5)_____.
- Sugar head groups of some glycosphingolipids serve as receptors for _____(6)_____.
- _____(7)_____ showed that traits are inherited as units as they pass from parent to offspring.
- ____(8)____ RNA is found in eukaryotes and it is necessary in the targeting of proteins to the endoplasmic reticulum.
- _____(9)_____ are specific sequences within the promoter region that can repress the transcription of a given gene.
- _____(10)_____ mRNA encodes 2 or more polypeptides.
- _____(11)_____ rule states the importance of G at the +4 position and a purine, preferably an adenine, at the -3 position for start codon selection.
- Besides the cytosolic ribosomes, all eukaryotic cells have ribosomes within the _____(12)_____.
- Dam methylase methylates _____(13)_____ sites in oriC.
- During the translation process, a specific tRNA termed _____(14)_____ tRNA recognizes the start codon in the mRNA.
- For structural genes, the non-template DNA strand is called the _____(15)_____ strand.
- Moving the polypeptide from the tRNA in the P site to the amino acid at the A site is catalyzed by an enzyme known as _____(16)_____.
- The _____(17)_____ consists of a TATA box and a transcriptional start site.
- The 40S and 60S subunits associate to form an 80S ribosome in _____(18)_____.
- The biological advantage of _____(19)_____ is that two (or more) different proteins can be derived from a single gene.
- The coding sequences within eukaryotic genes are separated by other untranslatable DNA sequences called _____(20)_____.

QUESTION (4): **(25 Marks)**

Answer the following:

1- Discuss the contribution of Chargaff to the discovery of the double helix. (7 marks)
2- Write on the structure of membrane phosphoglycerides and sphingolipids. (7 marks)
3- What are the components of the promoter of the structural genes? (6 marks)
4- An RNA transcript has the following sequence: (5 marks)

5′-GGCAUGCAUUACGGCAUCACACUAGGGAUC-3′

i- What is the sequence of the template and coding strands of the DNA that encodes this RNA?

ii- On which side (5′ or 3′) of the template strand is the promoter located?

Best wishes,,,,,

Examiner: Prof. Ahmed M. Ghoneim