

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

Date: 23-01-2025

Time: 2 Hours

Marks: 90

الإمتحان في 3 صفحات:

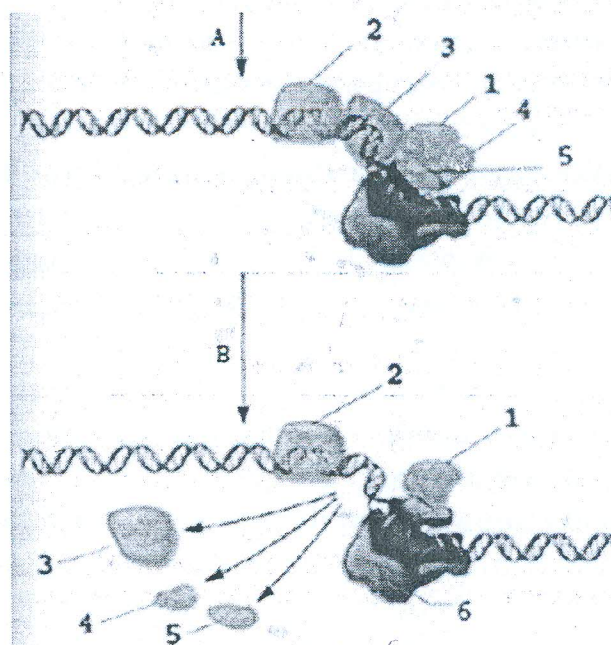
Answer ALL the following questions:

QUESTION (1):

(25 Marks)

Answer the following:

- 1- What does the figure below represent? Suggest the name and the processes for what each number and letter refer to. (9 marks)



- 2- List and briefly describe the different types of modifications that pre-RNA molecules may undergo before translation. (8 marks)
- 3- Discuss the experiment that proved that DNA is the genetic material. (8 marks)

QUESTION (2):

(20 Marks)

Which of the following statements are probably true (✓) and which are probably false (x).

DO NOT copy the sentences to your answer sheet

- 1- 16S rRNA is important in maintaining high fidelity of mRNA translation.
- 2- 3' polyA tailing is important for RNA stability and translation.
- 3- All eukaryotes contain mitochondrial DNA.
- 4- All genes must be transcribed in the correct type of cell and during the proper stage of development.

- 5- An exonuclease cleaves the precursor tRNA to remove a 170-nucleotide segment from its 5' end.
- 6- All viruses, protozoa, fungi, algae, plants, and animals use DNA as the genetic material.
- 7- Any AUG codons near the 5' end of mRNA can function as start codons.
- 8- Because of the number of the codons, any cell must have 64 types of aminoacyl-tRNA synthetase enzymes.
- 9- Cells can be lysed using lysozyme and detergent.
- 10- DNA replication takes place only when a cell is about to divide.
- 11- Hershey and Chase reasoned that the attachment between T2 phage and bacteria is fairly precarious, and it can be disrupted by subjecting the bacteria to high shear forces.
- 12- In the sugar ring of DNA, carbon atoms are numbered in a clockwise direction, beginning with a carbon atom adjacent to the ring oxygen atom.
- 13- The genetic material of Influenza virus is RNA.
- 14- Two or more tRNAs can recognize the same codon.
- 15- If TATA box is missing from the promoter, the transcription will not start.
- 16- DNA pol III holoenzyme consists of 3 different subunits that play various roles in the DNA replication process.
- 17- In the white-eyed *Drosophila*, the pigment precursor molecules can not be converted into red pigment because of the lack of the gene encoding the required enzyme.
- 18- Nonstructural genes encode the amino acid sequence of polypeptide.
- 19- Telomerase contains a DNA sequence that is complementary to the DNA sequence found in the telomeric repeat.
- 20- The 40S and 60S subunits associate to form an 80S ribosome within the nucleolus.

QUESTION (2):

(20 Marks)

Complete the following with suitable words:

DO NOT copy the sentences to your answer sheet

- A ____ (1) ____ is a glycerol with fatty acids esterified to all 3 carbons.
- Receptor-activated enzymes remove phosphorylcholine from sphingomyelin to produce the second messenger ____ (2) ____.
- *Trypanosoma brucei* covers itself with a high concentration of a ____ (3) ____ protein.
- Enzymes that interconvert all phosphoglyceride head groups and remodel fatty acid chains are located on the cytoplasmic surface of the ____ (4) ____.
- Band 3 and glycophorin anchor an actin-binding protein called ____ (5) ____ to the RBC membrane.
- ____ (6) ____ tails anchors the tyrosine kinase Src and other proteins involved in cellular signaling to the inner surface of the plasma membrane.

- _____(7)_____ is a small RNA molecule that exist in the nucleolus and is necessary in the processing of eukaryotic rRNA transcripts.
- Hershey and Chase used P radioisotope to distinguish _____(8)_____ from proteins.
- _____(9)_____ charge tRNAs by attaching the appropriate amino acid.
- _____(10)_____ sequence is a sequence within bacterial mRNAs that is involved in the binding of the mRNA to the 30S subunit.
- _____(11)_____ rRNA is responsible for catalyzing bond formation between adjacent amino acids.
- _____(12)_____ is the scientist who proposed ball and stick model.
- _____(13)_____, _____(14)_____ and _____(15)_____ are three types of DNA sequences within *oriC*.
- All of the genes that encode ribosomal RNA except for the 5S rRNA are transcribed by the RNA polymerase _____(16)_____.
- Mendel showed that traits are inherited as _____(17)_____ units as they pass from parent to offspring.
- In most cases, the third base in the codon is the degenerate base and it is sometimes referred to as the _____(18)_____.
- Stop codons are recognized by proteins known as _____(19)_____.
- The ability to remove mismatched bases at the 3' end is called the _____(20)_____ function of DNA polymerase.

QUESTION (4):

(25 Marks)

Answer the following:

- 1- A hypothetical sequence at the beginning of an mRNA molecule is
5'-AUUUGCCCCUAGCAAACGUAGCAAACG.....-3'.
Using two out of the three underlined sequences, draw two possible models for potential stem-loop structures at the 5' end of this mRNA. **(6 marks)**
- 2- Explain 4 strategies for binding peripheral proteins to the cell membrane surface. **(6 marks)**
- 3- Discuss the contribution of Rosalind Franklin to the discovery of the double helix. **(6 marks)**
- 4- What are differences between DNA replication in Eukaryotes and Prokaryotes? **(7 marks)**

Best wishes,,,,,

Examiner: Prof. Ahmed M. Ghoneim