**Protein Synthesis and DNA Test.**

**Marking key**

**Use a ball point or ink pen to mark an X** on the letter that represents the best answer from the choice of answers . Marks are not deducted for wrong answers.

|  |  |
| --- | --- |
| Question | Answer |
| 1 | A B C D |
| 2 | A B C D |
| 3 | A B C D |
| 4 | A B C D |
| 5 | A B C D |
| 6 | A B C D |
| 7 | A B C D |
| 8 | A B C D |
| 9 | A B C D |
| 10 | A B C D |

7. Transcription during protein synthesis can be described as:

a. the copying of the template for making a protein form DNA to RNA.

b. The movement of tRNA from the nucleus to the cytoplasm.

c. The joining of Amino acids into specific sequences.

d. the combination of different peptide chains to form polypeptide chains.

8. Translation during protein synthesis can be described as:

a. the copying of the template for making a protein form DNA to RNA in the cytoplasm of the cell.

b. The movement of tRNA from the nucleus to the cytoplasm.

c. The joining of Amino acids into specific sequences at the ribosome to produce peptide chains. A template held on mRNA allows the correct sequencing of the amino acids.

d. The movement of mRNA from the nucleus to the cytoplasm.

9. For a specific gene:

a. The promoter region of DNA is located just before the structural gene.

b. The promoter region of DNA is located just after the structural gene.

c. The promoter region of DNA is located just before the inhibiter region.

d. The promoter region of DNA is located just after the point where the RNA polymerase disconnects after transcription.

10. Which of the following DOES NOT show a nitrogen base sequence for a strand of DNA?

a. AATTCTAGGTAG

B. TTCCGTAGCTGA

c. TTCGUCTCGATC

d. ACGTTACGCGCG

Short answer questions

1. Write definitions for the words in the table below.

|  |  |
| --- | --- |
|  |  |
|  |  |
|  |  |

(2 marks)

1. The following is a sequence of nitrogenous bases found in part of a human cell.

AUGGCCUCGAUAACGGCCACCAUG

(i) What type of substance do these bases belong to? (1 mark)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(ii) How many amino acids could this piece code for? (1 mark)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(iii) Name the process by which mRNA is formed in the nucleus. (1 mark)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(iv) Give two ways the structure of a DNA differs from that of an RNA molecule.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(6marks)

1. At transcription, the DNA with the gene to be copied unwinds. This divides the length of DNA into two single unwound strands. Name and describe these two strands.

(5 marks)

**The template strand** (1 mark)is the strand that is copied to make the RNA(1 mark).

**The coding strand** (1 mark)is contains the sequence of bases seen on the RNA (1 mark)except that uracil replaces thymine(1 mark).

4. A type of leucocyte that matures in the Thymus is involved in the body’s specific immune response.

What occurs to sensitize these leucocytes to a specific antigen?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(2 marks)

(8 marks)

5. Complete this table.

|  |  |
| --- | --- |
| Structure | Function |
| Structural gene |  |
| Promoter region |  |
| RNA polymerase |  |
| mRNA |  |
| Codon |  |
| Anticodon |  |

(6 marks)

6. Complete the following steps in protein Translation.

In the cytoplasm are a kind of RNA molecule that are only 3 bases long . They are called \_\_\_\_\_\_\_\_\_ RNA . One end of these RNA molecules has a special site to which only one kind of \_\_\_\_\_\_ \_\_\_\_\_\_ can be attached. The other end of each of these RNA molecule carries a unique code which identifies it. The code is written in the usual code of a nucleic acid sequence of bases. Each amino acid carrying molecules has its own three letter code.

With the strand of \_\_\_\_\_\_\_\_ RNA bound to the ribosome and acting as a \_\_\_\_\_\_\_\_\_\_\_\_, the base pairs again are attracted to their partners. This time the attraction is between the complementary bases of the \_\_\_\_\_\_\_\_\_\_RNA and the \_\_\_\_\_\_\_\_\_ RNA. A sequence of three nucleotides in RNA bound to the ribosome, codes for each amino acid. This sequence is called a \_\_\_\_\_\_\_\_\_. There is one \_\_\_\_\_\_\_\_\_\_ for each of the twenty amino acids. The \_\_\_\_\_\_ RNAs carrying amino acids attach to the \_\_\_\_\_\_\_\_\_\_RNA by means of *base-pairing* between the \_\_\_\_\_\_\_\_\_ RNA and the \_\_\_\_\_\_\_\_\_\_\_ RNA “anticodons”. Each \_\_\_\_\_\_\_\_ RNA then donates its amino acid, in the proper order, to the growing chain of amino acids that will become a \_\_\_\_\_\_\_\_\_\_\_\_\_ chain. Special bonds called \_\_\_\_\_\_\_ bonds join the amino acids together. The \_\_\_\_\_\_\_\_\_\_\_ chains formed will in turn form \_\_\_\_\_\_\_\_\_\_\_\_\_ chains and finally \_\_\_\_\_\_\_\_\_\_\_\_\_\_.

(9 marks)

EXTENDED ANSWER QUESTION

1. Describe the process of RNA splicing. This should be accompanied with a suitable diagram.(10 marks)

When the RNA polymerase copies the structural gene not all of the base sequences on the DNA are needed to make the desired protein**(1 mark).**

The unneeded sequences are called **introns. (1 mark)**

After the initial RNA has been made at transcription the unwanted sequences are cut out. **(1 mark)**

This is called RNA splicing**.(1 mark)**

The mature mRNA made as a result of the splicing is taken out of the nucleus and used in translation**.(1 mark)**

The mature mRNA is made out of **exons.(1 mark)**

**Exons** are the base sequences that code for the amino acid needed to assemble the desired protein**.(1 mark)**

Diagram

**DNA** that code for protein is being copied from (structural gene).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Exon | Exon | **intron** | exon | **intron** | exon | **intron** | exon |

**(1 mark)**

**Transcription**

**Initial (primary) mRNA transcript.**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Exon | Exon | **intron** | exon | **intron** | exon | **intron** | exon |

**(1 mark)**

**Splicing**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Exon | Exon | **intron** | exon | **intron** | exon | **intron** | exon |

Introns cut out

**Mature mRNA**. This carries the base sequence code that will be used to assemble (translate) the protein.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Exon | Exon | exon | exon | exon |

(1mark)