BIO-302 MIDTERM- 100% GUESS PAPER 2023

MOLECULAR BIOLOGY

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OBJECTIVES

1. All organisms that have a mismatch repair system have MutS and ___ homologs. ***(MutL)***
2. An E. coli chromosome is estimated to have about___ super-coiled loops. ***(400)***
3. The first discovered enzyme is known as__. ***(Diastase)***
4. The incorporation rate of rNTPs is__ folds lower than dNTPs. ***(1000)***
5. There are three human MutS homologs ***(MSH2, MSH3, MSH6)***
6. Which enzyme prevents the accumulation of supercoils ahead of the replication fork? ***(helicase)***
7. Hydrolytic deamination of cytosine is estimated to take place about a…. ***(100 to 500) times a day in a mammalian cell***
8. Which of the following is not a base of RNA? ***(Thymine(T)***
9. Psoralen can___ DNA if photo-activated. ***(Alkylate)***
10. The bond angles in protein primary structure resulting from rotations at C are labelled ***(phi)*** for the__. ***(N- alpha C)***
11. Meselson and Stahl performed a classical experiment to distinguish among three possible models of DNA replication using isotope of__. ***(N)***
12. DNA polymerases introduce about one mis-paired nucleotide per__ nucleotides. ***(105)***
13. over all three dimensional arrangement of all atoms in protein***.(Tertiary structure of protein).***
14. In transcription information of DNA is copied from. ***mRNA***
15. Pyrimidine consist of???***(Heterocyclic aromatic ring structure composed of carbon and nitrogen atoms. It has a six-membered ring with two nitrogen atoms at positions 1 and 3. Examples of pyrimidines include cytosine, thymine (in DNA), and uracil (in RNA).***
16. Most important clue of structure of DNA before 1953 ***(Erwin Chargaff)***
17. DNA with bound histone in the eukaryotes is***(Chromatin).***
18. During DNA replication each strand serve as***(template).***
19. Mutation is necessary evil as? ***not all mutations give advantage to organism***
20. Replication machine achieves remarkably high degree of accuracy ***(proofreading mechanism)***.
21. The RNA AU/GC ration was roughly .... To the DNA AT/GC ration. ***(Similar).***
22. RNA polymerase perform s essentially the same reaction in all cells from bacteria to human***.(RNA).***
23. Strands of DNA are separated at the replication fork.. ***(dsDNA)***
24. Types of histone protein__***5***
25. Simplest amino acid residues __ ***glycine***
26. The most common cyclobutane pyrimidine dimer is _ ***thymine-thymine***
27. Enzyme that converts hydrogen peroxide into water and oxygen is _ ***catalase.***

28. Nucleotides join with bond___ ***phosphodiester bond***
29. CPD photolyase is present in a variety of organisms except _ ***placental mammals***
30. Hydrolytic deamination of cytosine is estimated to take place about _ times a day in a mammalian cell..... ***100 to 500***
31. Okazaki fragments vary in length from _ nucleotides in bacteria. ***1000 to 2000***
32. Griffith theorized that some substance of the dead bacteria might be responsible for that transformation . He called that substance as the transforming principle. _ ***True***
33. The RNA AU/GC ratio was roughly _ to the DNA AT/GC ratio___ ***similar***
34. The viral nucleic acid can be__ ***linear or circular***
35. Cisplatin was found to block cell division in __***E. coli.***
36. DNA helicase separate____ DNA into__ ***Double stranded, Single strand***
37. DNA consist of ____ helical polynucleotide strands which are wound around the same axis to form ____ double helix___ ***Two, right handed***
38. DNA helicases can have a polarity of either___ ***5'3' or 3'5'.***
39. How many different types of amino acids are present___ ***20***
40. The length of DNA around nucleosome also varies from one organism to the other ranging from about____ ***170-240bp***
41. Nucleoside is___ Nucleotide – ***phosphoric acid***
42. The group of adjacent nucleotides are joined by____ ***Phosphodiester bond***
43. RNA can base-pair with complementary regions of either___ ***RNA or DNA.***
44. The overall three dimensional arrangement of all atoms in a protein is referred as____ ***Tertiary structure of protein.***
45. Which of following purine base is present in RNA__ ***Guanine***
46. Which nucleotides are considered as purine__ ***adenine & Guanine***
47. Avery performed his experiment to give evidence about DNA is heredity material___ ***1944***
48. The helical twist of the α-helix found in all proteins is__ ***right-handed***
49. The DNA polymerase require a primer with a free___ ***3'-OH***
50. The bond angles in protein primary structure resulting from rotations at C are labelled (psi) for the____ bond ___ ***Alpha C-C***
51. First enzyme diastase discovered by___ ***Anseime Payen in 1833***
52. About ____ of all amino acid residues in polypeptides are found in α-helices.__ ***one-forth***
53. The palm domain of DNA Polymerase is composed of a ___ sheet and contains the primary elements of the catalytic site.__ ***Beta***
54. A typical human cell contains about___ million copies of each kind of histone___ ***60***
55. The binding of histones to phosphate group of a nucleotide is aided by___ charged site chain of ___: ***Positive, Arginine.***
56. Which shows the correct complimentary base pairing of DNA ___ ***A-T, G-C 63)*** The nucleotide containing nitrogenous base cytosine is known as: ***Deoxycytidylate***
57. A nucleosome has about ___ nucleotides in eukaryotic genome__ ***400***
58. The percentage of nucleic acid in relation to protein is about ____ for the influenza virus__ ***1%***
59. CH_3 Group attached at___ of thymine nitrogenous base__ ***C5***
60. _____ is the nucleoside name of nucleotide adenosine___ ***Deoxyadenosine***
61. Key substrate required for the synthesis of DNA to proceed are ___ and____: ***deoxynucleoside triphosphate , Primer***
62. The two DNA strands in double helix are joined by___ ***Hydrogen bond***
63. Central dogma of molecular biology was laid in___ ***1957 71)***
64. Which is not type of RNA____ ***qRNA***
65. When Frederick Griffith coined the term "transformation" this was in reference to the genetic re-programming of___ ***patients with pneumonia***
66. E-coli chromosome consists of approx.____ nucleotide pairs___ ***4 million***
67. The bond between tRNA and amino acid is____ bond___ ***covalent***
68. Urea was synthesized by Wholer in ___ ***1828***
69. The linkage between two amino acids removes a __ molecule__ ***H_2O***
70. Amino acid attach to__ end of tRNA.___ ***3'***

71. The junction between the newly separated template strands and the ___ dsDNA is known as _____ ***unreplicated , replication fork***

72. DNA bound histone in the eukaryotes is___ ***chromatin***

73. During DNA replication each strand serve as___ ***Template***

74. Mutation is necessary evil as __ ***not all mutations give advantage to organism***

75. Replication machine achieves remarkably high degree of accuracy ___ ***proofreading mechanism***

76. The RNA AU/GC ratio was roughly ___ to the DNA AT/GC ratio___ ***similar***

77. Strands of DNA are separated at the replication fork___ ***dsDNA***

78. PAH stands for___ ***Polycyclic Aromatic Hydrocarbons***

79. Nucleic acids are ___ ***polymeric compounds***

80. RNA contain how many ribonucleotides___ ***5***

81. ____ are exceptionally simple and extremely small microorganisms.____ ***viruses***

82. Simplest amino acid residues ____ ***glycine***

83. First discovered enzyme___ ***Diastase***

84. Transition mutation example____ ***Alkylation Damage to DNA***

85. Rosalind Franklin & Maurice wilkins discovered DNA by _____ ***X-ray diffraction***

86. Types of nucleotides___ ***5***

87. How many types of ribonucleic acids are present in body___ ***three***

88. Which RNA contain anticodon___ ***tRNA***

89. POL IV and POL V are present in plants where they transcribe ____ ***small interference RNAs (RNi)***

90. Which strand replicates in forward direction ___ ***leading strand***

91. CPD photolyase is present in a variety of organisms except ___ ***human and other placental mammals***

92. Replication start on which strand___ ***Leading strand***

93. Which enzyme play major role in replication___ ***DNA polymerase***

94. Nucleic acid to protein ratio in influenza virus___ ***1%***

95. Metabolic ions reason of endogenous mutation____ ***DNA mutation***

96. Which RNA bind with anticodon____ ***tRNA***

97. Superoxide dismutase which convert _____ into hydrogen peroxide and oxygen ___ ***superoxide radicals***

98. Which enzyme breaks the dsDNA and passes some amount of DNA from the break___ ***Topoisomerase***

99. The most common cyclobutane pyrimidine dimer is ___ ***thymine-thymine***

100. Enzyme that convert superoxide into molecular oxygen and hydrogen peroxide___ ***superoxide dismutase***

101. Separation of DNA is accomplished at__ ***chromosome end***

102. Separation of DNA is accomplished by the action of ___ ***Type II topoisomerase.***

103. Chromosome theory of Inheritance was given by ___ in__: ***Thomas Hunt Morgan, 1910***

104. The repeating units in nucleic acids are__ ***nucleotides.***

105. The DNA connecting two nucleosomes is called ___ ***Linker DNA***

106. Large polypeptide chains usually fold into two or more globular clusters known as___ ***domain***

107. Secondary structure of proteins refers to the local confirmation of some part of a ____ ***polypeptide***

108. If a super coiled DNA molecule receives a ____ the strain of unwinding is immediately removed. ___ ***Nick***

109. Primary structure or ___ of protein refers to amino___ ***covalent structure***

110. The first clue that DNA was the carrier of heredity information came from the work of ____ in___: ***Fred Griffth, 1928***

111. Exposure of DNA to dimethyl nitrosamine leads to___ ***produce mono-adduct***

112. Which enzyme are called succide enzyme___ ***alkyltransferase***

113. Two mammalian 3' exonuclease, TREX & $TREX_2$ may convert the errors that introduced by ___ ***pol ß***

114. Wrong statement about (6-4) photoproduct is __ ***They are easily repaired by nucleotide excision repair***

115. Enzyme that converts hydrogen peroxide into water and oxygen is ___ ***catalase.***

116. During elongation the enzyme RNA Transcriptase adds ___ nucleotide at a time to growing. ***One***

117. tRNA having amino acid join with____ during protein synthesis__ ***mRNA***

118. DNA replication is semi-conservative was proved in ___ by ___: ***1956, Mathew Meselson & Frankin Stahl.***

119. The size of the bubble length of DNA that is not double helical remains___ ***Constant***

SUBJECTIVES

Advancement of molecular biology in the field of Agriculture:

Advancements in molecular biology have significantly impacted agriculture. Techniques like genetic engineering enable the development of genetically modified crops with enhanced traits such as pest resistance and increased yield. Molecular diagnostics aid in identifying plant diseases, improving crop management, and ensuring food safety.

What is base excision repair:

Base excision repair (BER) is a DNA repair mechanism that corrects small, non-bulky lesions in the DNA, such as damaged or modified bases. It involves the removal of the damaged base by specific enzymes, followed by the replacement of the correct base through DNA synthesis and ligation.

How Cyclobutane pyrimidine Dimer form in B-DNA:

Cyclobutane pyrimidine dimers (CPDs) can form in B-DNA when adjacent pyrimidine bases (thymine or cytosine) become covalently linked due to the absorption of UV radiation. This leads to the formation of a covalent bond between the two pyrimidines, distorting the DNA structure and potentially causing genetic mutations.

Which nucleotides are purines and pyrimidines:

Purines are adenine (A) and guanine (G). Pyrimidines are cytosine (C), thymine (T) in DNA, and uracil (U) in RNA. Purines have a double-ring structure, while pyrimidines have a single-ring structure. These nucleotides are the building blocks of DNA and RNA molecules.

Define Nucleotides and Nucleosides:

Nucleotides are the building blocks of nucleic acids (DNA and RNA) and consist of a sugar molecule (ribose or deoxyribose), a phosphate group, and a nitrogenous base (adenine, cytosine, guanine, or thymine/uracil). Nucleosides are similar but lack the phosphate group.

Kinds of mutation:

Mutations can result from errors in DNA replication during cell division, exposure to mutagens or a viral infection. Germline mutations (that occur in eggs and sperm) can be passed on to offspring, while somatic mutations (that occur in body cells) are not passed on. Mutations can be of many types, such as substitution, deletion, insertion, and translocation.

Three function of nucleic acids.

Nucleic acids have a very diverse set of functions, such as cell creation, the storage and processing of genetic information, protein building, and the generation of energy cells.

Describe the CPD Photolyase structure and its functions:

The CPD (Cyclobutane Pyrimidine Dimer) Photolyase structure is a protein enzyme found in certain organisms that repairs DNA damage caused by UV radiation. It consists of a catalytic core and a light-harvesting antenna complex. Its functions involve absorbing light energy and transferring it to the catalytic core, where it catalyzes the repair of CPD lesions in DNA by breaking the cyclobutane bonds. This repair mechanism helps maintain genome stability, prevents mutations, and preserves the viability of cells exposed to UV radiation.

Name radiations that damage DNA:

1. **Ultraviolet (UV) radiation:** UVA, UVB, and UVC wavelengths.
2. **Ionizing radiation:** X-rays, gamma rays, and cosmic rays.
3. **Environmental radiation:** Radon gas and radioactive substances like uranium, plutonium, and cesium.
4. **Electromagnetic radiation:** High-energy particles and certain types of microwaves can also damage DNA.

Chargaff's rule:

The Chargaff rule was discovered by Erwin Chargaff in the 1940s. Chargaff's rule, also known as base pairing rule, states that in DNA, the amount of adenine (A) is equal to the amount of thymine (T), and the amount of guanine (G) is equal to the amount of cytosine (C), forming complementary base pairs.

Dealkylation mechanism by an enzyme on E coli:

In E. coli, dealkylation is carried out by enzymes called alkyltransferases. These enzymes remove alkyl groups from damaged DNA bases. The mechanism involves a nucleophilic attack by a cysteine residue within the enzyme's active site on the alkylated DNA base, leading to the transfer of the alkyl group onto the cysteine residue and restoration of the original DNA structure.

What is short strand?

An oligonucleotide is a short single-stranded DNA or RNA molecule usually consisting of fewer than a hundred or so bases. The sequence of these bases determines the type of oligonucleotide.

Pyrimidine / Purine:

Pyrimidine is a type of nitrogenous base found in nucleotides, such as cytosine, thymine (in DNA), and uracil (in RNA). Purine is another type of nitrogenous base found in nucleotides, including adenine and guanine.

Describe Watson and Crick model?

The Watson and Crick model for DNA, proposed in 1953, describes the structure of DNA as a double helix. It consists of two anti-parallel strands held together by hydrogen bonds between complementary base pairs (adenine with thymine, and guanine with cytosine). The sugar-phosphate backbones run on the outside, while the bases are stacked in the interior. This model provided the foundation for understanding DNA replication, transcription, and genetic information storage.

What is primer and its functions:

Primers are short stretches of DNA that target unique sequences and help identify a unique part of genome. Primers are usually 18 to 25 nucleotides long. They can be synthesized in a special lab, and are used in many different ways. Primers bind to the template via complementary base pairs. Like other DNA polymerases, Taq polymerase can only make DNA given a primer, which is a short nucleotide sequence that provides a starting point for DNA synthesis.

Describe alkylation mismatch repair:

Alkylation mismatch repair is a DNA repair mechanism that corrects errors resulting from the improper addition of alkyl groups to DNA. It recognizes and removes alkylated bases that do not align correctly with their complementary bases in the DNA sequence. This repair pathway plays a crucial role in maintaining genomic stability by preventing mutations and other DNA damage caused by alkylation events, thereby preserving the integrity of the genetic material.

Contribution of molecular biology in the field of Agriculture.

1. Genetic modification of crops for improved yield, pest resistance, and tolerance to environmental stress.
2. Development of drought-tolerant and nutrient-rich crops.
3. Marker-assisted selection and genomics for accelerated breeding programs.
4. Molecular diagnostics for early detection and management of plant and animal diseases.
5. Genetic engineering of livestock for enhanced productivity and disease resistance.
6. Identification and utilization of beneficial microbes for sustainable agriculture.
7. Improvement of post-harvest traits and extended shelf life of agricultural products.
8. Preservation and conservation of plant biodiversity through molecular techniques.

what is the structure of CPD and also write its function?

The structure of a Cyclobutane Pyrimidine Dimer (CPD) involves the covalent bonding of two adjacent pyrimidine bases (thymine or cytosine) within DNA, forming a cyclobutane ring. CPDs are formed as a result of UV radiation exposure. Their function is to induce DNA repair mechanisms, such as CPD Photolyase, to remove and correct these UV-induced DNA lesions and maintain genomic integrity.

What are the psi and phi values in alpha helix? Also write their values?

The psi (Ψ) and phi (Φ) values refer to the torsion angles in the peptide backbone of an alpha helix. The typical values for these angles in an alpha helix are $\Psi = -57°$ and $\Phi = -47°$

What is the reaction of DNA helicase in replication?

In DNA replication, DNA helicase catalyzes the unwinding and separation of the double-stranded DNA molecule at the replication fork. It uses ATP hydrolysis to break the hydrogen bonds between the base pairs, allowing the DNA strands to separate and serve as templates for replication.

Describe the Meselson and stahl full experiment:

The Meselson and Stahl experiment provided evidence for the semi-conservative replication of DNA. They cultured E. coli in a medium containing "heavy" nitrogen (15N) to label the DNA. After allowing replication in a "light" nitrogen (14N) medium, DNA samples were taken and subjected to density gradient centrifugation. The results showed intermediate-density DNA after one generation and eventually a complete shift to light DNA, supporting the semi-conservative replication model proposed by Watson and Crick.

What is base excision repaie and write any three ways.

Base Excision Repair (BER) is a DNA repair mechanism that corrects damage to individual DNA bases. Three ways it can occur are:

1. **Glycosylase-mediated BER:** DNA glycosylases recognize and remove damaged bases.
2. **AP endonuclease-mediated BER:** AP endonucleases cleave the DNA backbone at sites lacking a base.
3. **DNA polymerase and ligase-mediated BER:** DNA polymerase fills the gap with the correct nucleotides, and ligase seals the nick in the DNA backbone.

Chemical composition of proteins.

The chemical composition of a protein includes carbon (C), hydrogen (H), oxygen (O), nitrogen (N), and occasionally sulfur (S). Proteins are composed of amino acids, which are organic

compounds consisting of an amino group (-NH2), a carboxyl group (-COOH), and a side chain (R group). The sequence and arrangement of amino acids determine the structure and function of proteins.

Role of Alkb in E.coli:

In E. coli, AlkB is an enzyme responsible for repairing alkylated DNA bases. It functions as an oxidative demethylase, removing alkyl groups from damaged DNA. AlkB plays a crucial role in maintaining genome stability, preventing mutations, and ensuring proper cellular function in response to alkylating agents.

Why cisplastin is cytotoxic and act as chemotherapeutic.

Cisplatin is cytotoxic and acts as a chemotherapeutic agent because it forms covalent bonds with DNA, leading to the formation of DNA adducts. These adducts because DNA crosslinking, DNA strand breaks, and interfere with DNA replication and transcription. By inducing DNA harm, cisplatin disrupts the cellular cycle and triggers apoptosis, ultimately leading to the loss of life of cancer cells.

Role of 8 oxoguanine:

8-oxoguanine (8-oxoG) is an oxidatively damaged DNA base. Its role includes serving as a biomarker for oxidative stress, potential mutagenicity due to mispairing, being repaired by specialized enzymes, association with aging and disease, and being used as a biomarker for DNA damage assessment. 8-Oxo guanine is a changed form of guanine which could end result from oxidative harm to DNA. It is a mutagenic lesion and can cause the mispairing of nucleotides in the course of DNA replication, inflicting G:C to T:A transversions. Eight-Oxo guanine is diagnosed and repaired through unique enzymes concerned in base excision repair (BER) to maintain genomic integrity.

End of replication error:

End of replication error refers to the unfinished replication of the very give up of a linear DNA molecule at some point of DNA replication. Due to the mechanism of DNA replication, the final segment of the lagging strand, known as the telomere, cannot be fully replicated. As a result, it leads to the sluggish shortening of telomeres with every spherical of replication. Telomerase enables to counteract this shortening by way of including repetitive sequences to the telomeres.

Name the protein that catalyzes the direct alkylation.

Three proteins that catalyze direct alkylation are: 1= DNA alkyltransferase (additionally referred to as O6-methylguanine-DNA methyltransferase or MGMT): It upkeep O6-alkylguanine adducts. 2= AlkB homologs (ALKBH): They repair alkylated bases, together with 1-methyladenine and three-methylcytosine. 3= Ada protein: It maintenance O6-methylguanine and O4-methylthymine adducts.

How can one differentiate between pentose of ribose and deoxyribose.

Ribose and deoxyribose are exceptional sugars located in nucleotides. Ribose is the sugar factor of ribonucleotides, which can be the constructing blocks of RNA. Deoxyribose is the sugar aspect of deoxyribose nucleotides, which might be the constructing blocks of DNA. The principal distinction between them is that ribose has a hydroxyl organization (-OH) attached to its 2' carbon, at the same time as deoxyribose has a hydrogen atom (-H) connected to its 2' carbon.

Name the origin of DNA and where alkylation occurs.

The origin of DNA is the nucleotide sequence itself, determined by the arrangement of adenine, thymine, guanine, and cytosine. Alkylation can occur at various sites within DNA, primarily affecting the nitrogenous bases, such as adenine, thymine, guanine, and cytosine.

Discriminative amino acids.

Discriminative amino acids, additionally known as variant or non-conserved amino acids, are amino acid residues that fluctuate among extraordinary proteins or protein sequences. These residues contribute to the precise houses, structure, and function of every protein. They possess distinctive physicochemical properties or sequence patterns that set them apart from other protein sequences. By identifying these discriminative amino acids, researchers can classify and categorize proteins, aiding in the understanding of their functional relationships and evolutionary history.

Explain nucleotide excision repair(NER) in five points:

1. Nucleotide Excision Repair (NER) is a DNA repair mechanism that corrects bulky DNA lesions, including UV-induced photoproducts and chemical adducts.
2. It involves the recognition and removal of damaged DNA segments by specific enzymes.
3. NER operates through a multi-step process, including lesion recognition, excision, gap filling, and ligation.
4. The repair is initiated by specialized proteins that detect and bind to the damaged DNA region.
5. NER is essential for maintaining genome integrity and preventing mutations and diseases associated with DNA damage.

Name of five standard amino acid:

1= Alanine 2= Arginine 3= Aspartic acid 4= Glutamic acid 5= Glycine.

What are okazaki fragments and how they formed?/ also its importance

Okazaki fragments are short, discontinuous DNA strands synthesized during the replication of the lagging strand in DNA replication. They are formed due to the antiparallel nature of the DNA double helix, requiring synthesis of the lagging strand in short, separate fragments that are later joined together by DNA ligase.

They are important because they allow for the continuous replication of the lagging strand, which is synthesized in the opposite direction of the replication fork. Okazaki fragments are later joined together to form a complete, replicated DNA strand.

What is telomerase and its functions:

Telomerase is an enzyme that maintains and extends telomeres. It contains a reverse transcriptase activity and adds repetitive DNA sequences to the ends of chromosomes, counteracting the gradual shortening that occurs during DNA replication. Telomerase plays a crucial role in cellular immortality, stem cell maintenance, and cancer cell proliferation.

What is nucleotide excision repair and give five steps

Nucleotide Excision Repair (NER) is a DNA repair mechanism that removes bulky DNA lesions. The five steps of NER are: 1. Lesion recognition, 2. Damage verification, 3. Dual incision, 4. Excision of the damaged DNA fragment, and 5. DNA synthesis and ligation to restore the original DNA sequence.

Why C-N bond of peptide cannot rotate freely.

Because of the delocalization of electrons from the double-bonded oxygen to the peptide bond the peptide bond has partial double bond character that prevents free rotation around the C-N bond.

How phosphodiester bond is formed:

Phosphodiester bonds are formed during DNA and RNA synthesis through a condensation reaction between the 3' hydroxyl (-OH) group of one nucleotide and the 5' phosphate group of the adjacent nucleotide. This reaction releases a water molecule and joins the nucleotides together, forming a phosphodiester bond between the sugar and phosphate moieties of the nucleotides.

How harshey and chase learn whether genes were made of protein and DNA.

Hershey and Chase conducted the famous "blender experiment" using bacteriophages. They labeled the DNA of one set of bacteriophages with radioactive phosphorus-32 (^32P) and the proteins with radioactive sulfur-35 (^35S). They then infected bacteria with these labeled phages. Upon analyzing the bacterial cells, they found that the radioactive ^32P, which represented the DNA, was transferred to the progeny bacteriophages, indicating that DNA, not protein, is the genetic material.

Silent features of DNA polymerase.

1. **High processivity:** Can catalyze continuous DNA synthesis without dissociation.
2. **Proofreading activity:** Possesses 3' to 5' exonuclease activity to correct errors during replication.
3. **Template-directed synthesis:** Utilizes a DNA template for accurate nucleotide incorporation.
4. **Fidelity:** Exhibits high accuracy in selecting and incorporating complementary nucleotides.
5. **Replication speed:** Can synthesize DNA at a rapid rate, enabling efficient replication.
6. **Specificity:** Recognizes and binds to specific DNA sequences for initiation and elongation of replication.
7. **Stability:** Exhibits stability at high temperatures, enabling use in various applications, including PCR and DNA sequencing.

What are major and minor grooves, the values and number of nucleotides in major grooves.

The pairing and coiling of the two strands create a major groove and minor groove on the surface of the helix. Two helices within region 4 form a common DNA-binding motif called a helixturn-helix. One of these helices inserts into the major groove and interacts with bases in the –35 region.

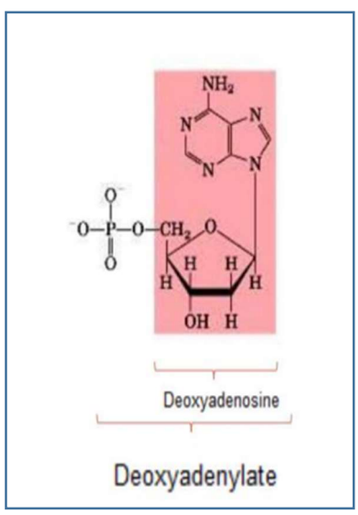
Which molecule is called adapter molecule during protein synthesis and why?

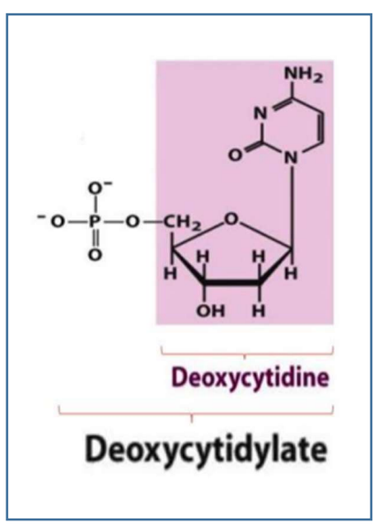
Transfer RNA (tRNA) is called an adapter molecule during protein synthesis because it bridges the gap between the genetic code carried by mRNA and the amino acids that make up proteins. tRNA has an anticodon sequence that recognizes and pairs with mRNA codons, ensuring the correct amino acid is incorporated into the growing polypeptide chain.

How psoralen is activated:

Psoralen is activated by exposure to ultraviolet A (UVA) radiation. Upon UVA irradiation, psoralen absorbs the energy and undergoes a photochemical reaction, forming covalent cross-links with DNA. This activated form of psoralen intercalates into DNA, leading to DNA damage and subsequent biological effects.

What is structure of deoxyadenosine and deoxycytosine after addition of phosphate group?





Protein synthesis in cell, give names of three stages:

Protein synthesis is the creation of proteins by cells that uses DNA, RNA, and various enzymes. The three stages of protein synthesis in a cell are transcription, RNA processing, and translation.

Differentiate between ribose and deoxyribose:

Ribose and deoxyribose are both five-carbon sugars found in nucleotides. The key difference lies in the presence or absence of an oxygen atom. Ribose has a hydroxyl group (-OH) attached to the 2' carbon, while deoxyribose lacks this oxygen, resulting in a hydrogen atom (-H) instead. This distinction impacts the stability and function of DNA and RNA.

mutations occurs in DNA:

Mutations occur in DNA when there are changes or alterations in the nucleotide sequence. These changes can be caused by various factors such as errors during DNA replication, exposure to mutagens (chemicals or radiation), or genetic recombination processes.

Why Cisplatin is cytotoxic and act as chemotherapeutic agent:

Cisplatin is cytotoxic and acts as a chemotherapeutic agent because it forms covalent bonds with DNA, causing DNA crosslinking and inhibiting DNA replication and transcription. This leads to cell cycle arrest and ultimately triggers apoptosis, resulting in the death of cancer cells.

Characteristics of genetic material:

1= Genetic material carries and stores the hereditary information of an organism. 2= It replicates faithfully during cell division to ensure the transmission of genetic information to daughter cells. 3= It is subject to mutation, allowing for genetic variation. 4= It governs the development, growth, and functioning of an organism. 5= It exhibits a universal genetic code, allowing for the synthesis of proteins.

Define NER and BER:

NER (Nucleotide Excision Repair) is a DNA repair mechanism that removes bulky DNA lesions, such as UV-induced photoproducts or chemical adducts. BER (Base Excision Repair) is a DNA repair pathway that corrects damaged or modified bases, such as those caused by oxidation or alkylation.

How the deletion, insertion point mutations affect the message of DNA sequence.

Deletion mutations involve the loss of one or more nucleotides, causing a shift in the reading frame. This results in the alteration or loss of the genetic message, often leading to a nonfunctional or truncated protein. Insertion mutations add extra nucleotides, also causing a reading frame shift and disruption of the genetic message, which can lead to dysfunctional or nonfunctional protein production.

Promoter, oligomer, Multimer:

1. **Promoter:** A DNA sequence that initiates transcription by providing a binding site for RNA polymerase and transcription factors.
2. **Oligomer:** A short polymer composed of a few repeating units, often used to refer to small DNA or protein sequences.
3. **Multimer:** A complex formed by the association of multiple copies of a molecule, such as a DNA or protein, creating a larger structure with repeated subunits.

Primary, secondary, tertiary, quaternary structure of protein explain.

1. **Primary structure:** The linear sequence of amino acids in a protein, held together by peptide bonds.

2. **Secondary structure:** Localized folding patterns such as alpha helices and beta sheets, stabilized by hydrogen bonds between amino acids.
3. **Tertiary structure:** Overall 3D folding of the protein, formed by interactions between distant amino acids, including hydrogen bonds, disulfide bonds, hydrophobic interactions, etc.
4. **Quaternary structure:** Arrangement of multiple protein subunits (polypeptide chains) and their interactions to form a functional protein complex.

Explain the direct and indirect method of killing DNA template.

Direct damage takes place when DNA or water bound to it absorbs the radiation. Indirect damage takes place when water molecule or any other molecule surrounding the DNA absorb the radiation and form reactive species that then damage the DNA.

Or

The direct method of killing a DNA template involves physically damaging or disrupting the DNA molecule. The indirect method involves inhibiting essential processes for DNA replication or transcription, rendering the template inactive.

How Histones stable in chromatin:

Histones are stable in chromatin due to their strong interactions with DNA. They have positively charged amino acids that bind tightly to the negatively charged phosphate backbone of DNA. Additionally, histones form complexes with each other, creating a compact and stable structure that helps maintain the integrity of chromatin.

Components of RNA:

The components of RNA include nucleotides, which consist of a ribose sugar, a phosphate group, and one of four nitrogenous bases: adenine (A), cytosine (C), guanine (G), or uracil (U).

Component of DNA:

The components of DNA are nucleotides, which consist of a deoxyribose sugar, a phosphate group, and one of four nitrogenous bases: adenine (A), cytosine (C), guanine (G), or thymine (T).

Initiation in prokaryotes:

In prokaryotes, initiation refers to the beginning stage of transcription. It involves the binding of RNA polymerase to the promoter region of DNA, forming a closed complex. This is followed by the transition to an open complex, allowing for RNA synthesis to begin.

types of bond in DNA:

The types of bonds in DNA include covalent bonds, which link the nucleotides in the sugar-phosphate backbone, and hydrogen bonds, which pair the complementary nitrogenous bases (adenine with thymine, and guanine with cytosine).

How chromatin exist in histone protein:

Chromatin exists in association with histone proteins, which help in compacting and organizing the DNA. DNA wraps around histones, forming nucleosomes, which further coil and fold to create higher-order chromatin structures.

Semi-conservative model of DNA:

The semi-conservative version of DNA replication states that during DNA replication, every new DNA molecule contains one strand from the authentic DNA molecule (the template strand) and one newly synthesized complementary strand. This model changed into proposed via Watson and Crick and has been experimentally verified.

Replication error by Aflatoxin?

Aflatoxin, a toxin produced by certain molds, can lead to replication errors in DNA. It specifically forms covalent adducts with guanine bases, causing mispairing during replication. This can result in mutations, DNA damage, and potentially contribute to the development of cancer.

Name of standard amino acid protein:

The standard amino acids found in proteins are: alanine, arginine, asparagine, aspartic acid, cysteine, glutamine, glutamic acid, glycine, histidine, isoleucine, leucine, lysine, methionine, phenylalanine, proline, serine, threonine, tryptophan, tyrosine, and valine.

Claude experiments:

Claude's experiments were a series of studies conducted by Nobel laureate Albert Claude that demonstrated the existence of subcellular structures called organelles within cells, such as mitochondria, endoplasmic reticulum, and Golgi apparatus, using electron microscopy and cell fractionation techniques.

Why we called the 5 atom DNA sugar deoxyribose?

The 5-atom sugar in DNA is called deoxyribose because it lacks an oxygen atom at the 2' position compared to ribose, the sugar found in RNA. This absence of oxygen gives rise to the prefix "deoxy" in deoxyribose.

Describe Albert kelner experiment:

Kelner irradiated bacteria with lethal UV doses, isolating surviving mutants. Despite care, he observed varying survivor numbers. Dark-post UV treatment led to low survival, while light exposure resulted in high survival rates.

Explain DNA helicase:

DNA helicase is an enzyme that unwinds the double-stranded DNA helix during processes like replication and repair. It separates the two strands, allowing other enzymes to access and replicate or repair the DNA.

Function of nucleic acid:

Nucleic acids, such as DNA and RNA, play crucial roles in storing and transmitting genetic information. They also participate in protein synthesis, regulation of gene expression, and various cellular processes essential for life and inheritance.

What is meant by suffix and write three names of ase:

A suffix is a word component added to the end of a base word to modify its meaning or form a new word. Three examples of words with the suffix "-ase" are: "amylase" (enzyme that breaks down starch), "lipase" (enzyme that breaks down lipids), and "protease" (enzyme that breaks down proteins).

DNA repair mechanism.

DNA restore mechanisms are critical for preserving the integrity of the genome. Several DNA restore mechanisms exist, together with base excision repair (BER), nucleotide excision repair (NER), mismatch restore (MMR), homologous recombination (HR), and non-homologous quit joining (NHEJ). These mechanisms correct diverse sorts of DNA damage, making sure correct DNA replication and cellular viability.