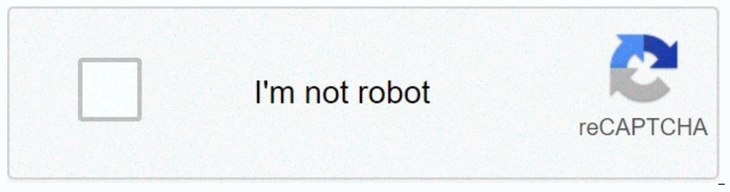

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Dna structure and function study guide answers

The goal: describe the experiments, data and conclusions that were crucial to discovering the structure of DNA. Use this page to test your understanding of the content. Nuclear Vocabulary Nucleotide Nitrogen Base Purin Pyrimidine Sugar Pentose Phosphate Research Group Guide Questions clearly describe the overall structure of nucleic acids. Write one sentence that clearly illustrates the link between nucleotide and nucleic acid. Compare and contrast DNA and RNA. Distinguish between the 3'-5' edges of nucleic acid. Answer such questions: If 22% of the organism's DNA contains adenine's noloutides, how many THYMINE thymine knockleotides does DNA contain? Guanin, guanine. Cytosine, cytosine. Given a handful of knockleotides, be able to build a proper model of DNA. BIO 1673 Research Guide, Unit 1, Section 1.3 1.3 - DNA and reproduction in the next unit will need to understand the source of genetic variation. This stems from two processes: changes in DNA called mutations, and sexual reproduction. This section of unit introduces you to the basic concepts that you need to understand the material in Unit 2. I. DNA and how it works A. DNA structure and function is short for deoxyribonucleic acid, a large and complex molecule found in all living cells. His job is to carry information between generations. In the diagram above, the box on the left represents a cell that is going to be divided. It could be a single-celled organism or a single cell in a multi-celled organism. The first thing he needs to do is make a copy of her DNA. This process is called replication. Now that there are two copies, the cell divides, with one copy of the DNA going to each of the new cells (boxes on the right). Now the new generation of cells contains the same genetic information as the parent generation. DNA is found in two places in eukaryotic cells: A. The nucleus - containing most genes that control cell b. mitochondria and plasticides - contain non-nuclear genes that control the functioning and reproduction of these subcellular components in eukaryotes, nuclear DNA and protein form long structures called chromosomes. Each species has a typical number of chromosomes. Each chromosome is a distorted double strand of DENA composed of under-units called knockleotides. Each knockoutide consists of sugar, phosphate and a nitrogen base. There are 4 nitrogenous bases in DNA: adenine (A), cytosine (C), thyme (T) and guanine (G). Look at the diagrams on page 290. They show how the noloutides are together to create a DNA. RNA (ribonoclaic acid) is another complex molecule found in all cells. It is also made from manoclautides, but the sugar is different and has the nitrogen base uracil (U) instead of thyme (T). Below: Each DNA molecule consists of two cases of the deformed knockoutides around each other; Each box represents one box Below: Each DNA molecule can be divided into functional areas called genes and each chromosome is divided into functional areas called genes. Each chromosome contains thousands of genes, and each gene contains hundreds to thousands of knockoutides. Each gene determines the structure of one or more polypeptide chains (or proteins). Each protein performs a specific function in the cell. The chart below gives an example of the relationship between gene, protein and function. Insulin gene fibrin gene collagen protein insulin fibrin collagen function of protein hormone (chemical messenger) blood clotting structure in bones, muscles, skin, and other organs we need to go back a little bit to find out how DNA does its job of carrying information between generations. Each gene contains many 3-knockleotide sequences called triplet codes. Each triplet code tells the cell which amino acid to add to a newly built protein. This diagram shows part of a gene and the appropriate section of protein that codes for: gene: threesome code threesome code code threesome code 6 6 protein: amino acid amino acid amino acid Example: threesome code GUC CCC UCU 6 6 amino acid valin proline serine message that the threesome code we show here has uracil (U) instead of thyme (T). That's because the dana is first copied to RNA before the cell reads the code to get instructions for making proteins. So the dictionary of the genetic code you see in the textbook on page 308 (Fig. 17.4) is written in the alphabet RNA knockoutide. You won't have to memorize that dictionary, if you have to use it on the test, we'll provide a copy. To read the dictionary, start with the trio code. Locate the first knockoutide in the column on the left. Then locate the second knockoutide in a row across the top, and finally the third knockoutide in the column on the right. Look in the box where these intersect to find the amino acid. In this dictionary, amino acid names are abbreviated to three letter abbreviations to save space. You do not need to memorize the names of the genetic code amino acids (based on nucleotides RNA A,U, G,C) made up of every possible trio (64) that can be made by combining these four nucleotides in different ways. Each of the 64 triplet codes for either 1) the starting time, 2) the stoper, or 3) amino acid. Search the dictionary of the genetic code again (page 308). There's only one starting point, Aug. That tells the cell to start a new protein. It is also code for amino acid from thythynin. There are three possible stop codes: UAA, UAG, and UGA. Each of these tells the cell that it has reached the end of the protein and it should stop adding more amino acids. The rest of the trio only code for amino acids. Because there are 61 threesomes for amino acids and only 20 amino acids, most amino acids have more One threesome code. If you didn't have other biology courses, the genetic code could be confusing. Sometimes it helps to use language as an analogy. Think of knockleotides as letters, triplet codes as words, and genes as sentences. One of the most important facts we have regarding the evolutionary history of life on Earth is that all living things use the same genetic code. If we didn't have a genetic relationship with each other it would be very, very unlikely that we all used the same genetic code. B. Differences in DNA 1. Between species the amount of DNA per species has a slightly different amount of DNA in its cells. Human denna in each cell contains about 100,000 genes, but the dena in a bacterial cell can contain up to 4,000 genes. B. Differences in the sequencing of a knockoutide each species produces different proteins or different amounts of the same proteins. This explains why species can share the same genetic code but be different from each other. Their physical structure is due to the types and quantities of proteins encoded by their DNA. A good analogy would be a comparison of two languages. English and French use the same alphabet. But we combine the letters in different ways to make our words. 2. Between people within a gender each person within a species receives slightly different combinations of allel (allel is one form of a particular gene). The chart below gives two examples of how it works in humans. B and b are two different allels, or forms of the eye color gene (you can learn more about how it works in unit 2). All human beings have two allels for eye color, one that came from their mother and one that came from their father. Depending on the combination they got, they may have brown or blue eyes. Humans have two allies for the blood type, but we have different combinations of allel ones, so we're different from each other. The same condition exists in many of our genes. Genes Allel Genotypes Phenotypes Eye Color B - Brown b - Blue BB Bb bb Brown Eyes Brown Eyes Blue Eyes Blue Eyes Blood Type IA IAIA I IA I IA IB IB IB i i Type A Type AB Type B Type B Type B Type O 3. Between cell types within a person if all cells and a single organism get the same DNA, how the cells can differ from each other. What makes a muscle cell different from a liver cell? And what does a liver cell change from a blood cell? The answer is that not all genes are active all the time in all cells. Different genes are expressed or delayed, depending on cell function. So an organism can have different types of cells even though each of its cells contains the same set of genes. Here's an example: Both the liver and pancreatic cell have the genes for insulin and fibrin. In the liver cell, the insulin gene is turned off (delayed) and therefore liver cells Make insulin. But their gene for fibrin is activated(pronounced), and they make fibrin. The condition in the pancreatic chamber is reversed. C. Overview: Each type of cell use: The same genetic code as 20 amino acids and multicellular organisms are made of different types of cells because each cell type expresses and inhibits different groups of genes all members of the species: there is the same set of genes in their cells that can have different cell types by activating or eliminating different subsyst sets of different genes and varying in their DNA nucleotide sequence causing differences in their number and structure of genes; This explains the physical and functional differences between species read: the nucleus contains a genetic library of a non-oceriotic cell page 117 and a dependent evolutionary adaptation of population... On page 245 gardens outside Lirer Sea produce un-Mandelian genes... On pages 283-84, the genetic code must have evolved... On pages 308-309, what is a garden? On pages 325 II. Reproduction when they reproduce (make new people) organisms should transfer a copy of their DNA to each offspring. In asexual reproduction, offspring are produced by a single parent, so each offspring has a copy of the same DNA as their single parent. In sexual reproduction each offspring receives half of their own squirt from each of two parents, so each offspring is genetically different from both parents and usually other offspring of the same parents. Sexual reproduction is more complex than asexual, because to prevent the number of chromosomes from doubling each generation, organisms need to make special cells with half the normal chromosome number, yet contains one full set of genes. The process used to do this is called myosis. Myosis starts in ovarian or testicular diploid cells. Diploid cells have two full sets of chromosomes - one from the organism's mother and one from his father. Myosis separates the chromosomes into two whole sets. But during the process, the original chromosomes that came from the parents shuffle and are randomly treated to the newly formed cells (this is a source of genetic mutation and will be covered in more detail in Unit 2). The cells with only one set of chromosomes are called haploid. Then a male haploid cell joins in with a female haploid cell during fertilization to produce a new person named zygote. Because the zygote contains two full sets of chromosomes it's diploid. Read: Mitoti Axis Distributes Chromosomes... On pages 220-221, offspring acquire genes from their parents... Pages 234-235 sexual life cycles produce genetic variation... Pages 243-245 III. DNA mutations don't stay constant for long. Permanent changes in DNA structure are called mutations. They are a major source of genetic variation and allow evolution to occur. One single mutation may have little or no effect The man he's in. But the cumulative impact of mutations over millions of years has resulted in the biodiversity that exists on Earth now. DNA structure can vary by two factors: 1) errors in replication or 2) direct damage caused by radiation or chemicals. Replication is the process by which another copy of DNA is made before the cell is divided. Because there are so many knockleotides in Danna, there are plenty of opportunities for mistakes to make. Even with cell error-correcting enzymes, mistakes happen occasionally. The second cause of mutations is direct damage. Or energy in the form of radiation (like ultraviolet light from the sun) or some chemicals can break down the DNA molecules so they don't work right. Because all life is based on the same genetic code, which is married by DANA, we are all susceptible to the same harmful effects. Not all mutations affect organisms in the same way - there are three possible effects. The first is that the mutation is harmful. It decreases the evolutionary capacity of the organism (reduces the organism's ability to survive and reproduce). Most mutations are considered harmful because they disrupt normal functioning. The second possible effect is beneficial. In this case the mutation increases the fitness of the individual. Beneficial mutations are considered very rare. And lastly, a mutation can be neutral, so, it doesn't cause a change in fitness. Read: Changes in Chromosome Number... Pages 279-280 (Stop human disorders.) ENZYMES PROOFING DNA... On pages 299-300, spot mutations can affect protein structure... On pages 322-323 you should be able to define these terms: DNA mitosis and DNA replication outside of the archdiocid code genetic code allel sexual reproduction meiosis mutation you should be able to interpret and explain the contents of these diagrams or tables: 13 9 13.10 14.3 16.3 16.5 17.23 17.25 You should be able to answer these questions: 1. Where is DNA found in ocritic cells? 2. Specify the function of DNA. 3. Describe the molecular structure of DNA. 4. Explain the link between: A. Genes and DNA b. Nocleotides and DNA c. Genes and nocleotides d. Genes and Proteins 5. What living things use the genetic code? 6. Explain the genetic basis of the differences A. Between species B between people within species C between cell types within 7 individuals. What does the danna have to do with reproduction? 8. Compare asexual and sexual reproduction. 9. What causes mutations? 10. Discuss the difference between beneficial, harmful and neutral mutations. 11. What is the cumulative effect of mutations over millions of years? This page was last updated: Sept. 2003 Send comments to akeddy@austincc.edu akeddy@austincc.edu