Molecular genetics

1. DNA Nucleotide [pic] Nucleotides consist of three parts --- a pentose sugar, a nitrogen-containing base, and a phosphate group. A pentose sugar is a five-sided sugar. Deoxyribose has a hydrogen atom attached to its #2 carbon atom (designated 2'), and ribose has a hydroxyl group atom there. Deoxyribose-containing nucleotides are the monomers of DNA RNA Nucleotide [pic] The left picture shows the nucleotide unit of RNA. Nucleotides differ from nucleosides in that they have phosphate groups. Nucleotides can exist in the mono-, di-, or tri-phosphorylated forms.

The most common site of phosphorylation of nucleotides found in cells is the hydroxyl group attached to the 5'-carbon of the ribose. Nucleotide units line up forming the backbone of RNA / DNA. 1A. Typical DNA Molecule DNA is a complex molecule that is found in all living organisms. Constructing DNA models is a great way to learn about DNA structure, function and replication. DNA contains the genetic information for the reproduction of life. Its structure is that of a twisted double helix that is composed of long strands of alternating sugars and phosphate groups, as well as nitrogenous bases (adenine, thymine, guanine and cytosine).

The basic unit of structure for a DNA molecule is the nucleotide. A nucleotide is composed of a phosphate, a deoxyribose sugar molecule, and a nitrogen-containing base (A, T, C, or G). The instructions carried on DNA are used to make proteins from amino acids in the cytoplasm. RNA must first make a copy of DNA in the nucleus before the proteins can be built by ribosomes in the cytoplasm. 1B. Typical RNA Molecule RNA has larger grooves, which makes it vulnerable to attacks by enzymes. B form defines the helix geometry of DNA. The body destroys enzymes that cling to DNA.

It can be though damaged by exposure to ultra violet rays. General Comparison Though both DNA and RNA consist of repetitive units of nucleotides, the difference is in their sugar component, as described below. That apart, RNA has a far greater range of nucleic acid bases as opposed to DNA’s about four. This gives RNA the unique ability to assume different shapes and functions. Though DNA performs the more important part of laying down the benchmark and determines genetic characteristics. In simple terms we could see DNA as having two strands, while RNA has a single one.

Thus we can see that the two have a symbiotic relationship but different destinies. They are both critically important, yet evolve differently. Deoxyribose sugar in DNA reacts less on account of C-H bonds. It is stable in Alkalaine conditions, as DNA contains smaller grooves where the damaging enzymes can get attached, which makes it difficult for these to attack it. Ribose sugar on the other hand is more reactive because of C-OH (hydroxyl bonds). It is not at all stable in alkaline conditions, as RNA has larger grooves, which makes it vulnerable to attacks by enzymes.

B form defines the helix geometry of DNA. The body destroys enzymes that cling to DNA. It can be though damaged by exposure to ultra violet rays. Both DNA and RNA are nucleic acids, but have a few basic differences, as explained above. Unlike DNA, RNA structures do not consist of self-complementary sequences that allow parts of the RNA to fold and form its own pairs and make double. They in fact consist of short helices packed together into protein like structures. 2. DNA Replication The original DNA

unwinds and unzips then the DNA polymerase hooks up with the DNA nucleotides by the Base Pair Rule.

The end product is two identical DNA molecules with 1/2 original DNA and 1/2 new DNA, the process is called Semi-conservative Replication. 3. Explain Central Dogma Transcription. Transcription is the making of an RNA molecule off a DNA template. Translation is the construction of an amino acid sequence (polypeptide) from an RNA molecule. Although originally called dogma, this idea has been tested repeatedly with almost no exceptions to the rule being found (save retroviruses). DNA unwinds and unzips at the gene of interest.

RNA polymerase hooks up with free RNA nucleotides by the Base Pair Rule then the gene becomes a mRNA. Messenger RNA (mRNA) is the blueprint for construction of a protein. Ribosomal RNA (rRNA) is the construction site where the protein is made. Transfer RNA (tRNA) is the truck delivering the proper amino acid to the site at the right time. RNA polymerase opens the part of the DNA to be transcribed. Only one strand of DNA (the template strand) is transcribed. RNA nucleotides are available in the region of the chromatin (this process only occurs during Interphase) and are linked together similar to the DNA process.

Translation The mRNA is being read by the ribosome codon by codon, Each codon is three bases Also each codon has an anticodon which matches up with its codon by the Base Pair Rule. There is also an amino acid with each anticodon The anticodon and the amino acid are carried by somehting called a tRNA In the ribosome, it connects the codons and anticodons, but it also

connects the amino acids together with a peptide bond The connected amino acids form a polymer and a chain of amino acids is the protein