



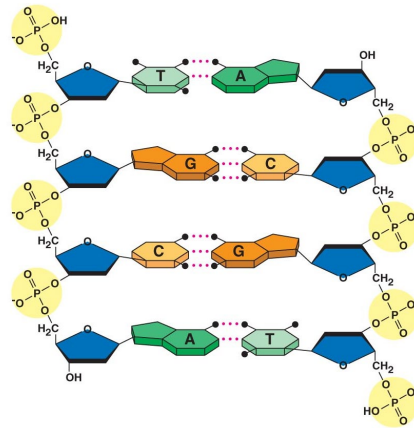
Name _____

Date _____

Worksheet on DNA, RNA, and Protein Synthesis

1. The letters “DNA” stand for _____.
2. DNA is composed of smaller subunits know as _____.
3. The three parts of a nucleotide are _____, _____, and _____.
4. The four nitrogen bases that are found in DNA are _____, _____, _____ and _____.
5. Two of the nitrogen bases are single ring structures known as _____. These two bases are _____ and _____.
6. The other two bases are double ring structures known as _____. These two bases are _____ and _____.
7. _____ and _____ are the two scientists that discovered the structure of the DNA molecule.
8. DNA looks like a ladder twisted into a shape known as a _____.
9. The two molecules that make up the sides of the ladder or the side portion of a DNA molecule are _____ and _____.
10. The molecules that meet across the middle, forming the steps of the “ladder” are known as _____.
11. Which nitrogen bases always pair with one another?
12. According to Chargaff’s rules, the percentages of _____ are equal to those of thymine and the percentages of _____ are equal to those of guanine in th DNA molecule.
13. The nitrogen bases are held together in the center of the molecule by _____.
14. True or False? According to the principle of base pairing, hydrogen bonds could form only between adenine and cytosine.
15. The type of sugar found in DNA is _____.
16. If the sequence on the right hand side of the DNA molecule was TAGGCTCA, the complimentary side would have a sequence of _____.

17. Label the parts of the drawing below. Include all of these terms: nucleotide, phosphate, sugar, nitrogen base, hydrogen bond, covalent bond, purine, pyrimidine, hydroxyl group, the 5' end, the 3' end, adenine, thymine, cytosine, and guanine.



18. The process in which DNA builds an exact duplicate of itself is known as _____.
19. What is the primary function of DNA?
20. Why is it so important that the DNA molecule be able to make copies of itself?
21. During replication, the two nucleotide chains _____ and each chain serves as a _____ for a new nucleotide chain. The sites where DNA replication and separation occur are called _____.
22. During replication, enzymes called _____ untwist the double helix, separating the two parental strands. The point at which the two chains separate is known as the _____.
23. Enzymes called _____ move along the separated strands assembling the new chains of DNA.
24. True or False? The replication of DNA begins at one end of the molecule and proceeds to the other end.
25. True or False? DNA replication occurs simultaneously at many sites along the molecule speeding up the process of replication.
26. When replication is complete, two _____ copies of the DNA molecule have been produced and the cell is ready to begin _____.
27. True or False? Each DNA molecule resulting from replication has one original strand and one new strand.

28. The process of replication is very accurate. There is about _____ error in every _____ bases. A change in the nucleotide sequence is known as a _____. These errors may be caused when enzymes fail to “proofread “ properly, or they may be caused by outside sources such as _____.
29. The letters “RNA” stand for _____.
30. In RNA, adenine always pairs with the nitrogen base known as _____.
31. List three ways that DNA is different from RNA:
- a)
 - b)
 - c)
32. There are three kinds of RNA. _____ carries the information from the nucleus to the ribosomes in the cytoplasm. _____ reads the message and binds to the specific _____ to make the protein. _____ is the most abundant form of RNA and makes up ribosomes.
33. The process of making a strand of RNA from a strand of DNA is called _____.
34. _____ are the primary enzymes that synthesize RNA copies from DNA. These enzymes bind to specific regions of the DNA molecule called _____. This marks the beginning of the section of the DNA molecule that will be _____. In eukaryotic cells, the section of DNA being transcribed is a _____. Transcription continues until RNA polymerase reaches the end of the gene, a sequence of nucleotides known as the _____.
35. Many RNA molecules from eukaryotic genes have sections called _____ edited out of them before they become functional. The remaining pieces called _____ are then spliced together.
36. Proteins are made in the cytoplasm by cellular structures called _____.
37. Proteins are composed of smaller subunits called _____ of which there are _____ different kinds. The functionality of the protein depends on its unique _____ which is determined by its amino acid sequence.
38. The sequence of nucleotides in mRNA is _____ into a sequence of _____.
39. A group of 3 nitrogen bases forms a _____.
40. Each codon is the code for one particular _____. There are _____ different combinations of nitrogen bases when taken in sequences of three at a time.
41. True or False? All amino acids are specified by only one codon.

42. Below is a chart of characteristics found in either DNA or RNA or both. Use check marks to indicate which are found in DNA and which are found in RNA.

Characteristic	Found in DNA	Found in RNA
Ribose present		
Deoxyribose present		
Phosphate present		
Adenine present		
Thymine present		
Uracil present		
Guanine present		
Cytosine present		
Double stranded		
Single stranded		
Remains in the nucleus		
Moves out of the nucleus		

43. _____ occurs in the ribosomes in the cytoplasm. The DNA in the nucleus tells the ribosomes which proteins to make and how to make them. In the nucleus, _____ transcribes _____. The RNA is then sent to the cytoplasm in the form of _____. A combination of three _____ is used as a code for each _____. This group of three bases is called a _____. Each codon calls for one _____. It takes many amino acids to form a protein. These amino acids are found _____ and are transported to the ribosomes by _____. The tRNA has a cloverleaf shape. At one end of the tRNA is a sequence of three nucleotides that are complementary to the mRNA; this is called an _____. At the opposite end of the tRNA is the attachment site for the _____. The amino acids are linked together by _____.
44. Ribosomes are found in two locations within a cell. They may be floating free in the cytosol or they may be attached to the endoplasmic reticulum. What types of proteins are made by:
- free ribosomes
 - bound ribosomes

45. The assembly of a polypeptide begins when a ribosome attaches to the _____ on mRNA. This codon is always _____. This codon attaches to the anticodon _____ on a _____ molecule. The tRNA then brings the amino acid _____ to the ribosome to start the synthesis of the protein. Subsequent amino acids are added one at a time and are bound together by _____. Eventually the ribosome reaches a _____ codon, bringing _____ to an end.

46. Below is a list of the mRNA codons for each amino acid.

Alanine: GCU	Histidine: CAU	Serine: UCU
Arginine: CGU	Isoleucine: AUU	Threonine: ACU
Asparagine: AAU	Leucine: UUA	Tryptophan: UGG
Aspartic Acid: GAU	Lysine: AAA	Tyrosine: UAU
Cysteine: UGU	Methionine: AUG	Valine: GUU
Glutamic Acid: GAA	Phenylalanine: UUU	Terminator: UAA
Glycine: GGU	Proline: CCC	

If the sequence on the DNA molecule calls for a protein with the following DNA codons, (1) what would be the sequence on the mRNA, (2) what would be the sequence on the tRNA, and (3) what would be the amino acid sequence of the protein being made?

DNA → TAC TTA CAA ACC ATA ATT

mRNA →

tRNA →

Amino Acids:

47. What would be the effect if one of the bases were deleted in the very first mRNA codon?

48. What would happen if there was a substitution of one base for another in one of the mRNA codons?

49. Mutations that occur at one single nitrogen base are referred to as _____ mutations. A mutation involving the insertion or deletion of a nucleotide is called a _____ mutation.