

# Study Guide: DNA, RNA, and Proteins

1. What is the structure of DNA called? **Double Helix**
2. What is the relationship between DNA, genes & chromosomes?  
**Chromosomes are made of DNA, and Genes are small pieces of DNA.**
3. Explain the contributions of the following scientists: Watson & Crick, & Rosalind Franklin.
  - a. **Watson & Crick- discovered the structure**
  - b. **Franklin- made the first picture.**
4. What are the complementary base pairs in DNA? Write the 1 letter symbol & spell them out.
  - a. **A-T; C-G**
5. What are the complementary base pairs in RNA? Write the 1 letter symbol & spell them out.
  - a. **A-U; C-G**
6. Use a chart to compare and contrast RNA and DNA in terms of structure, sugars, and bases.

	DNA	Both	RNA
Structure	2 strands	Made of Nucleotides	1 strand
Sugar	Deoxyribose		Ribose
Bases	A-T, C-G		A-U, C-G

7. List the three types of RNA and explain the function of each.
  - a. **mRNA: carries the DNA message from the nucleus to the cytoplasm (codon)**
  - b. **rRNA: combines with proteins to form the ribosome**
  - c. **tRNA: carries amino acids to the ribosome so that proteins can be made (anticodon)**
8. Who discovered the structure of DNA?
  - a. **Watson and Crick**
9. If a sequence of codons on a DNA strand is AAC TAG GGT, what is the corresponding sequence in a strand of mRNA? What tRNA sequence would pair up to this mRNA?
  - a. **mRNA: UUG AUC CCA tRNA: AAC UAG GGU**
10. What is the process by which a DNA molecule is copied?  
Replication
11. Draw & label the 3 parts of a nucleotide.
  - a. **Sugar, nitrogenous bases, & phosphate group**

12. What process forms messenger RNA? What process forms proteins?

a. **Transcription; Translation**

13. What does structure III in the picture represent?

a. **Protein**

14. What process is illustrated in the figure?

a. **Translation**

15. A DNA segment is changed from-  
AATTAG- to- AAATAG. What kind of  
mutation is this?

a. **Point (substitution)**

16. Give 3 examples of things that can cause a mutation.

a. **spontaneous mistakes in base pairings**

b. **radiation**

c. **chemicals**

d. **high temperatures**

17. Give 2 examples of beneficial mutations.

a. **Sickle cell vs. Malaria**

b. **Hypermobility (double jointed)**

c. **Lactose tolerance**

18. What type of bond holds the nitrogenous bases together?

a. **Hydrogen**

19. What type of bond holds the amino acids together?

a. **Polypeptide**

20. What are the building blocks of proteins?

a. **Amino Acids**

21. What is made in the process of DNA replication? What is made during transcription?

a. **A new DNA molecule; mRNA molecule**

22. Why is DNA replication called a semi-conservative process?

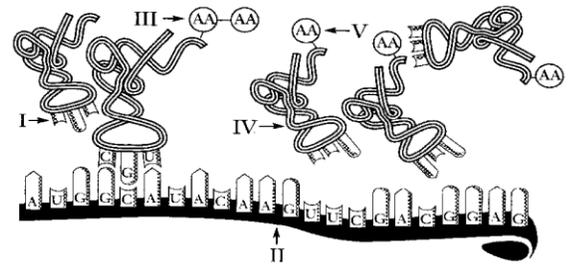
a. **We have one parent strand and one daughter strand.**

23. What is the start codon? What amino acid does it code for?

a. **AUG- Methionine**

24. Which type of RNA contains the anticodon? Which type contains the codon?

a. **tRNA; mRNA**



25. What is the charge of DNA?

a. Negative

26. What process could be used to separate the DNA molecule?

a. Electrophoresis

27. When extracting DNA from a strawberry, why is the cold layer of alcohol needed? Why did we need to smash the strawberry first?

a. Clump it together

b. Break open the cell

28. Describe the process of DNA replication. Be sure to include all of the enzymes and their roles.

Helicase- unzips the helix

Polymerase- Adds new base pairs

Ligase- stitches the DNA molecule back together.

29. Describe the processes of transcription and translation. Including enzymes and also take note of where each process happens. (pg.15)

a. DNA Helicase- unzips the helix

b. RNA polymerase- Adds RNA bases

c. DNA ligase- stitches the DNA molecule back together

d. See page 20 for Protein synthesis (translation & transcription) diagram!!!!

30. Complete the set for each of the following lines:

DNA	ATGTAAGCGTAGCTGTGA
mRNA	
tRNA	
AA	

DNA	ATGGCCGATATGCAATGA
mRNA	
tRNA	
AA	

DNA	ATGC AAAATGCGTGTTAG
mRNA	
tRNA	
AA	

DNA	ATGACTCTCGTGTGATAG
mRNA	
tRNA	
AA	

\*\* Know the following:

1. Central Dogma of Biology= DNA → mRNA → Protein
2. Review the labs and procedures of the labs.
3. Review the web quest on Gel Electrophoresis.