Study Guidelines: **DNA and Protein Synthesis**

Name: \_\_\_\_\_\_\_\_\_\_\_\_

Period: \_\_\_ Seat: \_\_\_\_

The complexity of life is based upon the unassumingly simple instructions spelled out in the A’s, T’s, G’s and C’s found in DNA. Those instructions state exactly how to make specific types of proteins to build cells, organize them and even control the chemical reactions within.

1. Describe the function and purpose of DNA in your own words.

2. Read pages 246-248 then 1) Describe what happened during each of the following experiments and 2) Explain how the experiment contributed to proving DNA was genetic material and not protein

a. Griffith experiment b. Hershey/Chase experiment c. Chargaff’s experiments

3. a. Define prokaryote and eukaryote (we talked about it briefly in class. Look it up if you are

not sure)

b. Identify the location where DNA can be found in a prokaryote vs. a eukaryote.

4. Explain cell differentiation and its significance

5. a. Name the monomer of DNA b. Draw and label its 3 parts c. Name and categorize the 4 bases found as part of the monomers of DNA

6. a. Describe the structure of DNA including 1) the name of its shape 2) how many strands it’s made of 3) the locations of the bases and sugar-phosphate backbone 4) explain why the bases and sugar-phosphate backbone is oriented in that way 5) the role of covalent bonds and hydrogen bonds

b. What role did Rosalind Franklin play in figuring out the structure

of DNA?

c. What evidence did the picture to the right provide for figuring out

DNA structure?

7. a. Explain how to identify the 5’ end vs. the 3’ end of a DNA strand. b. Explain what is meant by the two DNA strands being antiparallel.

8. Describe Chargaff’s base pairing rules. Use those rules to create the matching DNA to this strand AACGTATCCGATCATTCA

9. a. Explain the purpose of DNA replication. b. When does it happen? c. Why is it considered semi-conservative?

10. a. Name each of the enzymes involved in DNA Replication and state their role/function in DNA replication b. Go to the class website “Quizlet” page and study them.

11. Describe how a DNA molecule gets unzipped

12. a. Explain how new nucleotides are added (do not talk about leading and lagging yet). b. Is this endergonic/exergonic, catabolic/anabolic and where is the energy coming from?

13. a. Identify the differences in how a leading strand vs. a lagging strand is made. (Don’t forget Okazaki fragments!!!)

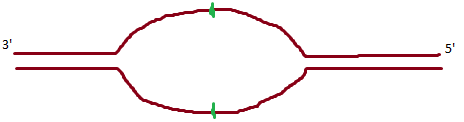
b. Explain why they are made differently (why aren’t they both just leading strands, made the same way?)

15. a. Identify the benefits of mutations. b. Identify the negative consequences of mutations

c. Describe how a mutation may a mutation occur.

16. Explain what a telomere is. What do you think are the benefits of scientist figuring out how to use telomerases?

17. Identify the origin of replication and label the missing 5’ and 3’ ends. Then, based on your understanding of DNA replication, draw in the leading and lagging strands towards each replication fork. (Hint: on each side of the replication fork identify the 5’ and 3’ directions for the new strand that is being built)



18. Create small cut out models of (1) helicase, (4) single binding proteins, (1) topoisomerase, (1) primase, (1) DNA polymerase III, (1) DNA polymerase I, (1) ligase, (1) RNA polymerase (we will use them in class with our DNA models) Hint: use different colors, shapes and sizes…and think of the size of the DNA model we use in class.

19. Explain why making a protein (Protein Synthesis) takes two steps instead of one.

20. Complete the chart DNA RNA

# of strands

bases

sugar

place(s) found in cell?

21. Complete the “Gene Expression-Transcription” handout

22. Define gene. Explain what genes code for and how a gene can be identified.

23. a. Fill in the blanks for the “central dogma” of life \_\_\_\_\_\_\_\_\_ 🡪 \_\_\_\_\_\_\_\_\_ 🡪 \_\_\_\_\_\_\_\_\_

b. Explain what it means in your own words

24. a. Transcribe the following DNA sequences

1) TACGGCCACTAGCCATAGTGCATA

2) TACAGACTACCCGATAAACTGACC

3) TACTTCAACGCGCGCTATTAGAAT

b. Identify the DNA sequence that will start all genes

25. a. Identify where in the cell transcription takes place & what the purpose of transcription is.

b. Name the 3 steps of transcription within the cell

c. Describe what happens during each step

26. Explain what happens during RNA processing to make pre-mRNA on step closer to mature mRNA (is this in prokaryotes, eukaryotes or both?)

27. Explain what happens during RNA splicing to finally make the pre-mRNA a mature mRNA (is this in prokaryotes, eukaryotes or both?)

28. Complete the “Gene Expression-Translation” handout.

29. a. Identify where in the cell translation takes place & what the purpose of translation is.

b. Explain what a codon is and what it codes for.

c. Transcribe then translate the following DNA sequences

1) DNA: TACGGGCCGCAACTACGATCAATT

mRNA:

amino acids:

of protein

2) DNA: TACTCGCACCCATGCGTACCGACT

mRNA:

amino acids:

of protein

30. Explain what determines the shape and size of a protein. (be as specific as you can be)

31. Describe the structure of a ribosome and how it helps it translate the mRNA

32. a. Describe the structure of tRNA

b. Explain the role of tRNA in translating mRNA

c. Identify the role of aminoacyl tRNA synthetase

33. a. Name the 3 steps of translation

b. Explain what happens during each step

34. Describe how proteins get to their correct destination within or out of the cell

35. Explain how transcription and translation are different between prokaryotes and eukaryotes.