

BIO1140 Midterm 2 Questions:

DNA: The Molecule of Heredity

1. A nucleotide is made of three parts: a phosphate group, a five carbon sugar, and a nitrogen containing base
2. In a single strand of DNA, the phosphate group binds to the deoxyribose sugar of the next group.
3. The 5' end of a single DNA strand contains a free phosphate, while the 3' end contains a free sugar.
4. Chromosomes consist of what two substances: histone proteins & DNA
5. DNA was not thought to be the genetic blueprint originally; instead many scientists hypothesized that proteins contained the genetic code and blueprint of life. (They were later proven wrong.)
6. Purines have 2 rings, and pyrimidines have 1 ring.
7. Check each of the following statements that are true with regard to Griffith's experiments.
 - a. true Griffith discovered transformation in bacteria.
 - b. Mice injected with non-encapsulated bacteria quickly became sick and died.
 - c. Encapsulated bacteria can become "naked" bacteria.
 - d. true Bacteria that are naked tend to be harmless.
 - e. true Naked bacteria can develop a capsule only after exposure to the DNA of encapsulated bacteria.
 - f. Griffith's transforming factor was the protein in the capsule.
 - g. Heating the encapsulated bacteria preventing transformation of the naked variety.
 - h. true Transformation allows bacteria to acquire new genes.
 - i. true Enzymes that destroyed DNA would prevent transformation.
8. Check each of the following statements that are true with regard to the Hershey-Chase experiment.
 - a. true DNA was labeled with radioactive phosphorous.
 - b. Protein was not labeled.
 - c. Radioactive sulfur was found in the offspring phages after they emerged from the cell.
 - d. true Phage proteins were not transmitted to host cell or to offspring.

9. Chargaff's rule states that the DNA of any species contains equal amounts of adenine & thymine and also equal amounts of cytosine & guanine

10. Wilkins and Franklin studied the structure of DNA using X-rays and determined that the shape of the molecule was a _____

11. James Watson and Francis Crick amended Franklin and Wilkins's conclusions and determined that the shape of the molecule was instead a double helix

12. In DNA, thymine is complementary to adenine; cytosine is complementary to guanine

13. In a strand of DNA, the percentage of thymine is 30%. What is the percentage of cytosine in the same DNA strand? 20%

14. Number the steps of DNA replication in the correct order (1, 2, 3)

- 2 Polymerase travels down the DNA parent strand from the 3' to 5' direction.
- 1 DNA unwinds
- 3 Ligase binds okazaki fragments together

15. Why is DNA replication called "semi-conservative"?

Because of strand of the newly replicated DNA consists of DNA from the parent strand.

16. What enzyme unwinds or unzips the parent strand? DNA helicase

17. The junction between separated strands is called the _____

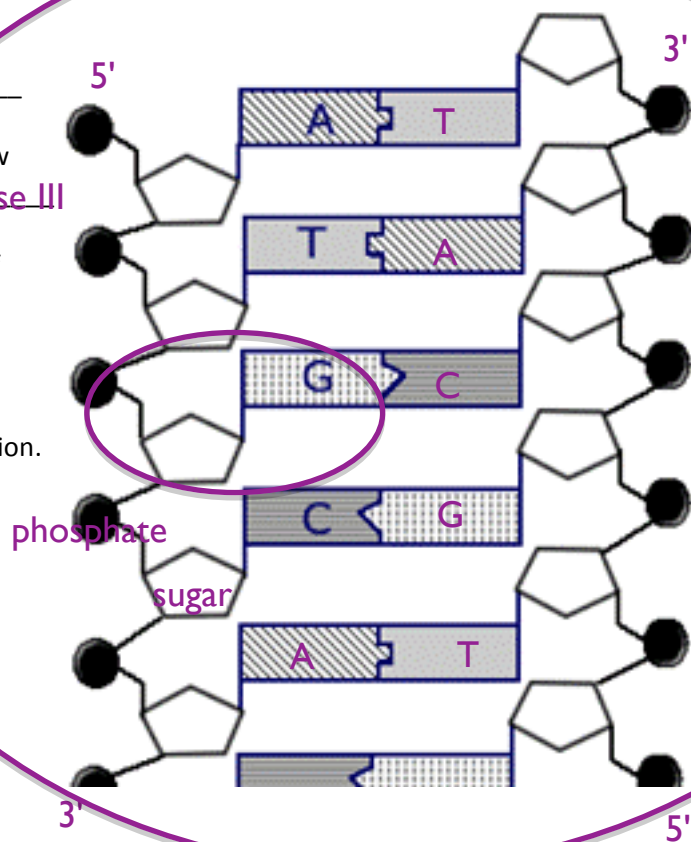
18. What enzyme synthesizes the new DNA strand? DNA polymerase III

19. What enzyme binds fragments of DNA on the lagging strand? DNA ligase

20. DNA polymerase only travels in the 5 to 3 direction.

21. On the diagram:

Label the 3' and 5' ends.



Circle a nucleotide.

Label the sugar and phosphate.

Label the bases that are not already labeled

22. The two sides of the DNA helix are held together by hydrogen bonds

23. Write out the complete name for DNA: deoxyribonucleic acid

24. Name the scientist(s) responsible for each of the following discoveries.

<u>Griffiths</u>	Bacterial transformation
<u>Chargaff</u>	The base-pair rule
<u>Avery-McCleod-Mccarty</u>	DNA was the hereditary material of viruses
<u>Franklin and wilkins</u>	The shape of DNA was a helix
<u>Watson and Crick</u>	The shape of DNA was a double helix

25. A permanent change in the sequence of bases is called

a(n): mutation

What process can prevent these errors from

occurring? proof-reading by DNA polymerase

Transcription/Translation/Cell Cycle

- Describe the location of each process and the products:
 - Transcription **occurs in the nucleus = product is an mRNA copy**
 - Translation **cytoplasm/ribosomes = product is protein**
- Describe the role of the following:
 - Codon
 - Promoter
 - Termination codon
- If the DNA strand is ATGTGTAGTGCGAGTTGA, what is the amino acid sequence?
- If the above sequence changed the T in the underlined codon to an A – how would the amino acid sequence change?
- What kind of mutation is this? **deletion**
- If this sequence encoded a signal peptide – what would the result be of the mutation?
- Which of the following happens in the lumen of the ER?
 - Methylation
 - Glycosylation**
 - Degradation
 - Acetylation
- If there were a deficiency in Adenyl Cyclase (produces cAMP), what would happen to the *lac* operon given an environment of limited glucose and high concentrations of galactose?
- If there was a deficiency in ubiquitination mechanisms, what would happen to cell cycles?