

BIO1140 Midterm 2 Answers

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: DNA & protein.
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. 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. Bacteria that are naked tend to be harmless.
 - e. 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. Transformation allows bacteria to acquire new genes.
 - i. 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. 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. 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 A & T and also equal amounts of G & C.
10. Wilkins and Franklin studied the structure of DNA using X Rays and determined that the shape of the molecule was a helix.

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"? half of the old stand is saved

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

17. The junction between separated strands is called the replication fork

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

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

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

21. On the diagram:

Label the 3' and 5' ends. - look for the free phosphate (black circle)

Circle a nucleotide. three things, phosphate, sugar and base

Label the sugar and phosphate. - 5 sided, phosphate is circular

Label the bases that are not already labeled A - T, G - C

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.

Griffith Bacterial transformation

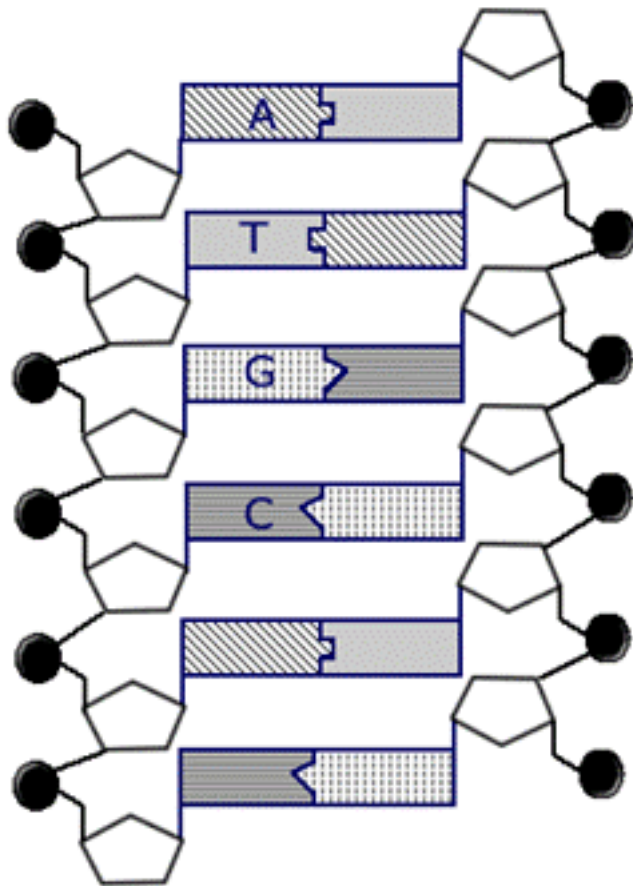
Chargaff

The base-pair rule

Avery DNA

was the hereditary material of viruses Wilkins & Franklin

DNA was a helix Watson & Crick 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? proofreading

Transcription/Translation/Cell Cycle

1. Describe the location of each process and the products:
 - a. Transcription – **nucleus - mRNA**
 - b. Translation – **cytosol – polypeptides/proteins**
2. Describe the role of the following:
 - a. Codon – **to code for an amino acid**
 - b. Promoter – **control transcription and bind to RNA polymerase**
 - c. Termination codon – **stop translation**
3. If the DNA strand is ATGTGTGCGAGTTGA, what is the amino acid sequence?
 - a. **Met-Cys-Ala-Ser-Stop**
4. If the above sequence changed the T in the underlined codon to an A – how would the amino acid sequence change?
 - a. **Serine → Arginine**
5. What kind of mutation is this?
 - a. **Point**
6. If this sequence encoded a signal peptide – what would the result be of the mutation?
 - a. **The change in amino acid could alter the structure of the signal peptide, thereby limiting its recognition by the signal recognition particle and prevent translocation/protein targeting into the ER.**
7. Which of the following happens in the lumen of the ER?
 - a. Methylation
 - b. Glycosylation**
 - c. Degradation
 - d. Acetylation
8. 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?
 - a. **The *lac* operon can only function when there is galactose around to alleviate repression from the *lac* repressor AS WELL AS sufficient levels of cAMP to bind to the CAP complex that would ultimately activate the gene. If there is a deficiency in adenyl cyclase – a mediator in the formation of cAMP – then even though there is decreased glucose levels and galactose around, without cAMP – it cannot bind to CAP and therefore will not activate the *lac* operon.**
9. If there was a deficiency in ubiquitination mechanisms, what would happen to cell cycles?
 - a. **Cell cycles would exhibit arrest at specific stages because p27 would not be degraded and would continue to exhibit its inhibitory effect on CDKs – preventing cells from reaching specific checkpoints that would allow it to continue replication/DNA synthesis.**