

Section 1: From Genes to Proteins

- _____ 1. ribonucleic acid (RNA)
- _____ 2. uracil
- _____ 3. transcription
- _____ 4. translation
- _____ 5. gene expression

- a. the entire process by which proteins are made
- b. a molecule made of linked nucleotides
- 6. Transcription begins when [RNA / RNA polymerase] binds to the gene's promoter.
- 7. RNA polymerase adds complementary [DNA / RNA] nucleotides as it "reads" the gene.
- 8. In eukaryotes, transcription takes place in the [nucleus / cytoplasm].
- 9. What are two differences between transcription and DNA replication?

- c. the process of reading instructions on an RNA molecule to put together the amino acids that make up a protein
- d. the process of transferring a gene's instructions for making a protein to an RNA molecule
- e. a nitrogen base used in RNA instead of the base thymine found in DNA

10. What determines where on the DNA molecule transcription begins and where it ends?

11. RNA, messenger RNA

12. codons, genetic code

Study the following six steps in the synthesis of proteins. Determine the order. Write the number

- _____ 13. The codon in the vacant A site receives the tRNA molecule with the complementary anticodon. The tRNA carries the amino acid specified by the codon.
- _____ 14. Steps 2–5 are repeated until a stop codon is reached. The newly made protein is released into the cell.
- _____ 15. The tRNA at the P site detaches, leaves behind its amino acid, and moves away from the ribosome.
- _____ 16. Enzymes help form a peptide bond between the amino acids of adjacent tRNA molecules.
- _____ 17. The tRNA (with its protein chain) in the A site moves over to fill the empty P site. A new codon is present in the A site, ready to receive the next tRNA and its amino acid.
- _____ 18. An mRNA, two ribosomal subunits, and a tRNA carrying a modified form of the amino acid methionine bind together. The tRNA bonds to the "start" codon AUG.

Section 2: Gene Regulation and Structure

- 1. To break down lactose, Escherichia coli need three different _____, each of which is coded for by a different gene.
- 2. The three genes are located next to each other, and all are controlled by the same _____ site.
- 3. The piece of DNA that overlaps the promoter site and serves as the on-off switch is called a(n) _____.
- 4. The group of genes that codes for enzymes involved in the same function, their promoter site, and the operator all function together as a(n) _____.
- 5. The operon that controls the metabolism of lactose is called the _____.
- 6. A(n) _____ is a protein that binds to an operator and physically blocks RNA polymerase from binding to a promoter site.
- 7. What are enhancers? _____
- 8. Why is there more opportunity for gene regulation in eukaryotic cells than in prokaryotic cells? _____
- 9. Why have no operons been found in eukaryotic cells? _____
- 10. When can gene regulation occur in eukaryotic cells? _____
- 11. What are introns and exons? _____
- 12. What happens to mRNA that includes introns? _____
- 13. What might be the evolutionary advantage of genes being interrupted by introns? _____

- 14. Mutations can only be passed on to offspring if they occur in [gametes / body cells].
- 15. Mutations that change one or just a few nucleotides in a gene on a chromosome are called [random / point] mutations.
- 16. If a mutation causes a gene containing the nucleotide sequence ACA to become ACT, the mutation is called a [substitution / deletion] mutation.
- 17. If a mutation causes a sequence of nucleotides to change from ACGAGA to ACGGA, the mutation is called a(n) [insertion / deletion] mutation.
- 18. If a mutation causes a sequence of nucleotides to change from ACGAGA to ACGAGGA, the mutation is called a(n) [insertion / deletion] mutation.