

CHAPTER 12, 17.1—17.3: DNA to Protein, Genetic Diseases

1. What was Beadle and Tatum's hypothesis regarding enzymes?

2. How has that hypothesis been modified?

3. What occurs during transcription?

4. What occurs during translation?

5. Briefly explain how Marshall Nirenberg and Heinrich Matthaei "cracked the genetic code?"

6. What is the genetic code and why is said to be universal?

7. List several features about the genetic code.

8. Give an example of what happens if reading frames are altered?

9. List the highlights of the three stages of transcription.

a. Initiation _____

b. Elongation _____

c. Termination _____

10. What happens to the transcript RNA before it leaves the nucleus?

11. Identify the roles of the players of the translation process.

a. Transfer RNA – _____

b. Aminoacyl-tRNA synthetase – _____

c. Ribosomes – _____

12. Identify and briefly describe the steps of translation. Initiation... Elongation... Termination...

13. What is the advantage of polyribosomes?

14. Give an example of how a polypeptide gets into the ER for additional processing.

15. How does protein synthesis differ between prokaryotes and eukaryotes?

16. Define point mutations.

17. Define mutations that are:

a. Missense – _____

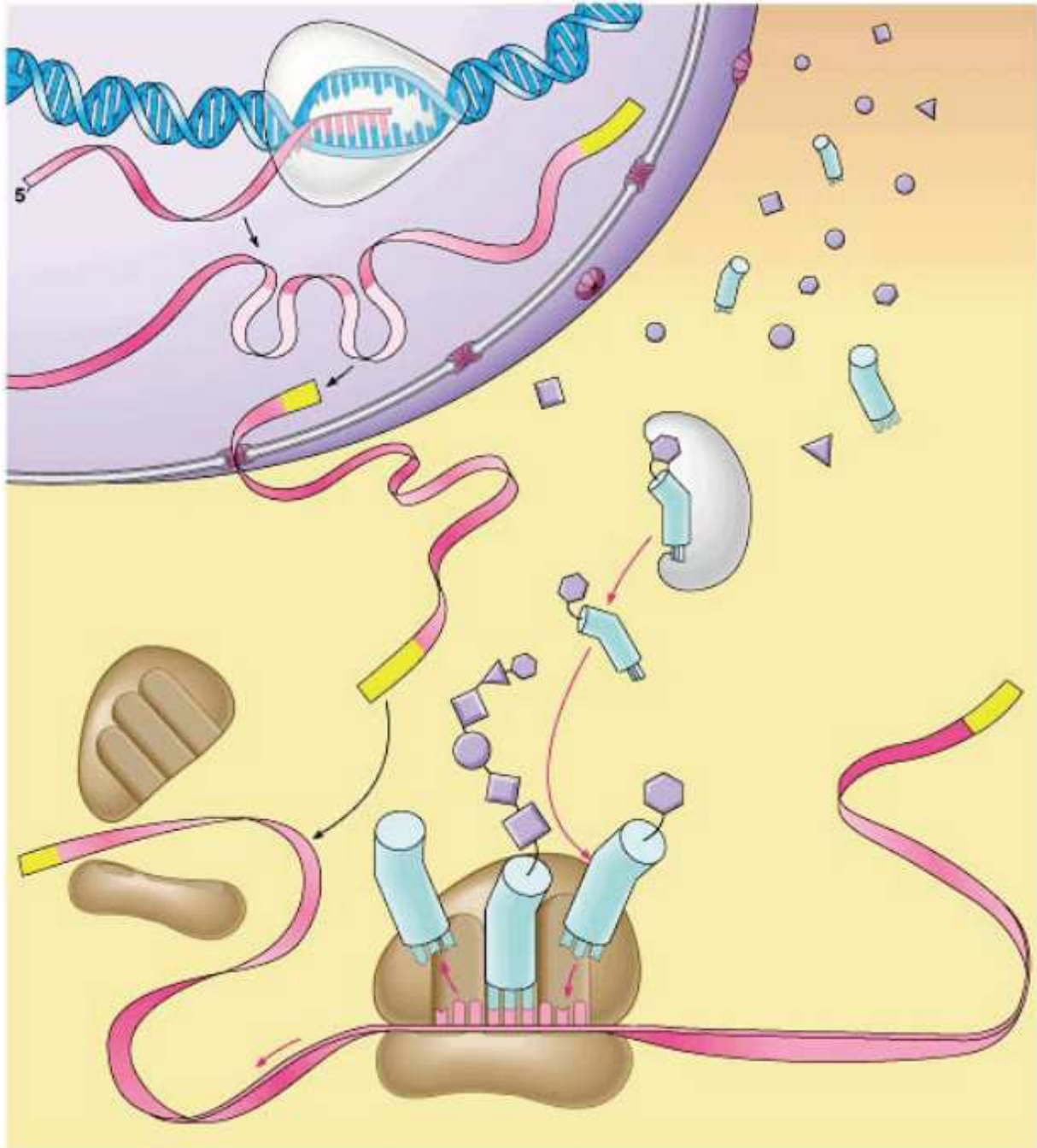
b. Nonsense – _____

c. Insertion or deletion – _____

18. What are the differences between spontaneous and induced mutations.

19. What is THE significance of mutations.

20. Use the diagram to trace the flow of chemical information from the gene to the protein product.



END OF CHAPTER 12 MULTIPLE CHOICE

1. Which of the following is not a difference between RNA and DNA?
 - A) RNA has uracil; DNA has thymine.
 - B) RNA has ribose; DNA has deoxyribose.
 - C) RNA has five bases; DNA has four.
 - D) RNA is a single polynucleotide strand; DNA is a double strand.
 - E) RNA is relatively smaller than human chromosomal DNA.

2. Normally, *Neurospora* can synthesize all 20 amino acids. A certain strain of this mold cannot grow in minimal nutritional medium, but grows only when the amino acid leucine is added to the medium. This strain
 - A) is dependent on leucine for energy.
 - B) has a mutation affecting the biochemical pathway leading to the synthesis of proteins.
 - C) has a mutation affecting the biochemical pathway leading to the synthesis of all 20 amino acids.
 - D) has a mutation affecting the biochemical pathway leading to the synthesis of leucine.
 - E) has a mutation affecting the biochemical pathways leading to the syntheses of 19 of the 20 amino acids.

3. An mRNA has the sequence 5'-AUGAAAUCCUAG-3'. What is the template DNA strand for this sequence?
 - A) 5'-TACTTTAGGATC-3'
 - B) 5'-ATGAAATCCTAG-3'
 - C) 5'-GATCCTAAAGTA-3'
 - D) 5'-TACAAATCCTAG-3'
 - E) 5'-CTAGGATTTTCAT-3'

4. The adapters that allow translation of the four-letter nucleic acid language into the 20-letter protein language are called
 - A) aminoacyl-tRNA synthetases.
 - B) transfer RNAs.
 - C) ribosomal RNAs.
 - D) messenger RNAs.
 - E) ribosomes.

5. At a certain location in a gene, the non-template strand of DNA has the sequence GAA. A mutation alters the triplet to GAG. This type of mutation is called
- silent.
 - missense.
 - nonsense.
 - frame-shift.
 - translocation.
6. Transcription
- produces only mRNA.
 - requires ribosomes.
 - requires tRNAs.
 - produces RNA growing from the 5' end to the 3' end.
 - takes place only in eukaryotes.
7. Which statement about translation is not true?
- It is RNA-directed polypeptide synthesis.
 - An mRNA molecule can be translated by only one ribosome at a time.
 - The same genetic code operates in almost all organisms and organelles.
 - Any ribosome can be used in the translation of any mRNA.
 - There are both start and stop codons.
8. Which statement about RNA is not true?
- Transfer RNA functions in translation.
 - Ribosomal RNA functions in translation.
 - RNAs are produced by transcription.
 - Messenger RNAs are produced on ribosomes.
 - DNA codes for mRNA, tRNA, and rRNA.
9. The genetic code
- is different for prokaryotes and eukaryotes.
 - has changed during the course of recent evolution.
 - has 64 codons that code for amino acids.
 - has more than one codon for many amino acids
 - is ambiguous.
10. A mutation that results in the codon UAG where there had been UGG is
- a nonsense mutation.
 - a missense mutation.
 - a frame-shift mutation.
 - a large-scale mutation.
 - unlikely to have a significant effect.