Name: MOD: Date:

GENE MUTATIONS

Use the textbook chapter 13.3 (page 238)

Gene Mutation	

What are the causes of gene mutations?

Spontaneous Mutations	Induced Mutations

Effect of Mutations on Protein Activity

Point Mutation	Frameshift Mutation

Nonfunctional Proteins

How do gene mutations lead to nonfunctional proteins?	

Mutations Can Cause Cancer

How do gene mutations cause cancer?	

Check Your Progress

List some common causes of spontaneous and induced mutations.	

Explain how a frameshift mutation may disrupt a gene's function.	

Discuss how a mutation in a tumor suppressor gene and in proto-oncogenes disrupts the cell cycle.	

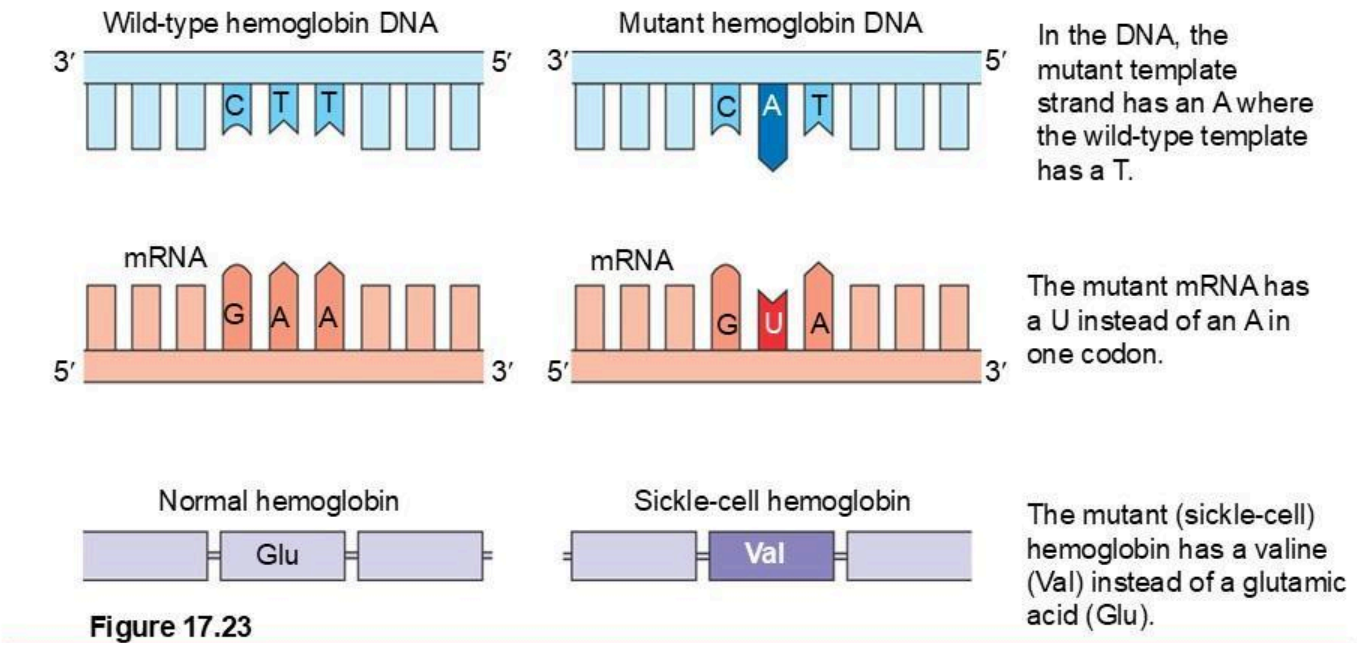
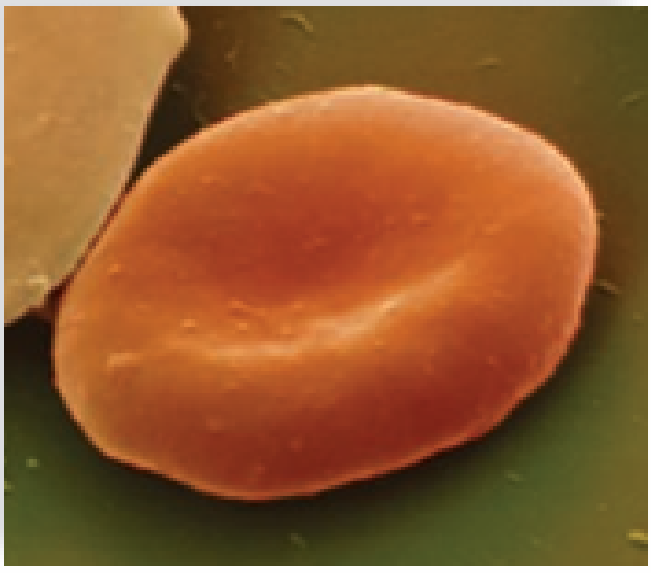


Figure 17.23

The Molecular Basis of Sickel Cell Disease The allele that causes sickle-cell disease from the normal allele by a change in a single base pair, a point mutation. The top row of this figure shows the template strand of the gene for one of the polypeptides making up the proteins hemoglobin. Where the normal allele has the base thymine, the sickle cell allele has the base adenine. This alters the one of the codons in the mRNA transcribed from the gene, with the result that the amino acid valine appears in the polypeptide. In individuals who are homozygous for the mutant allele, the sickling of red blood cells caused by the altered hemoglobin produces multiple symptoms associated with sickle-cell disease.



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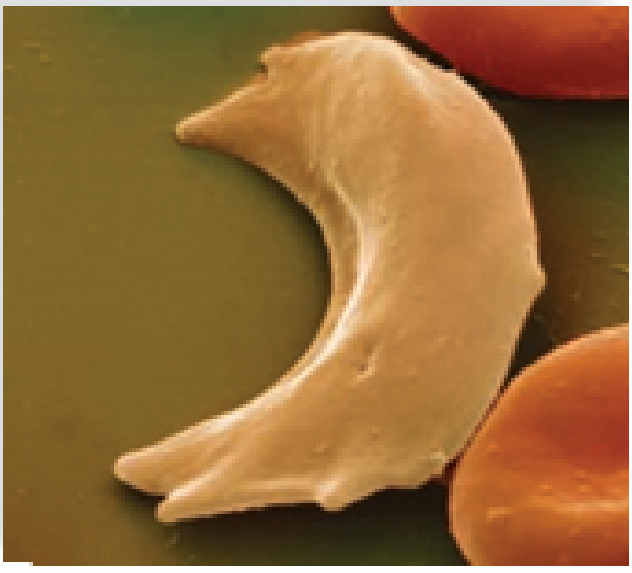

7,400×

Substitution

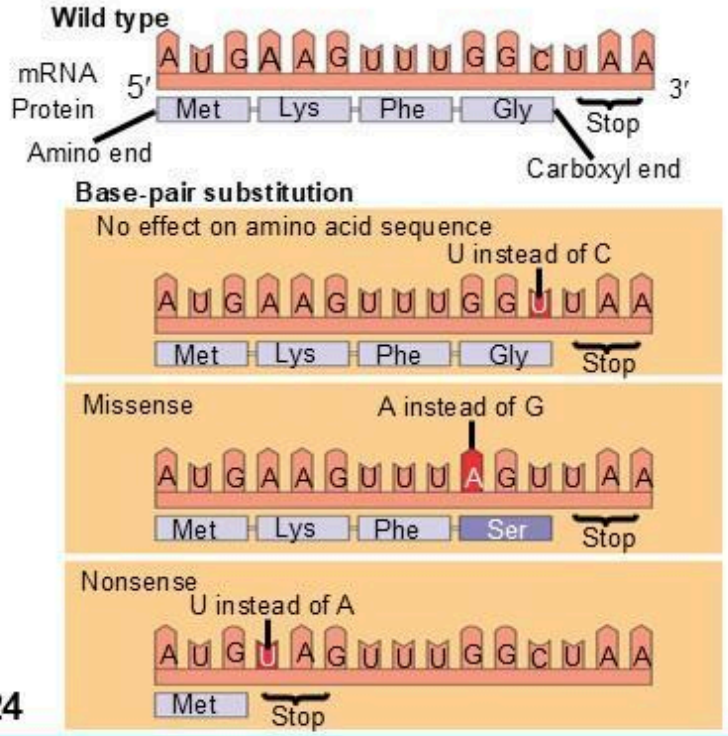

Figure 17.24

Frameshift Mutation

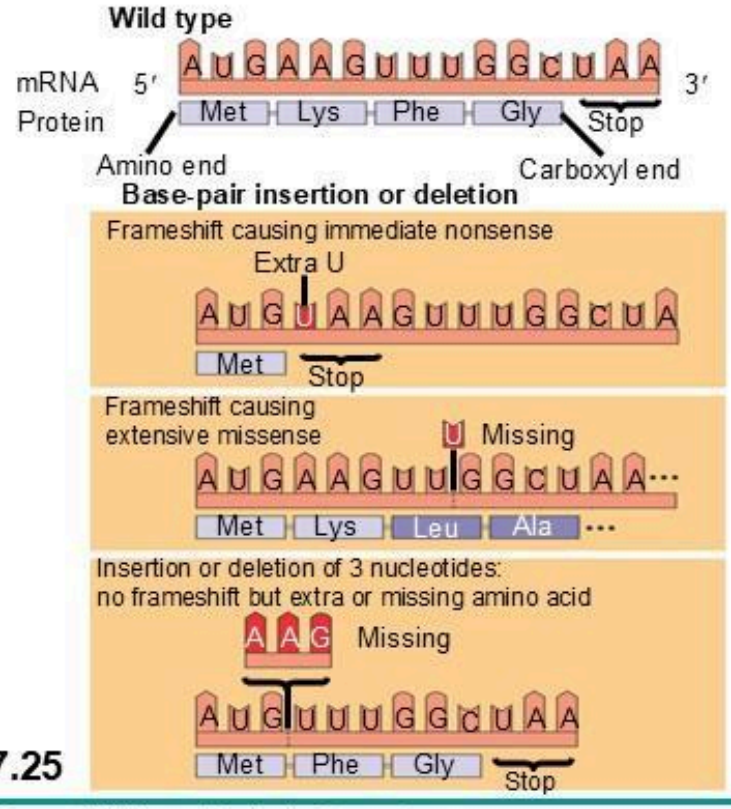
Wild type
mRNA
5′
A U G A A G U U U G G C U A A
3′
Protein
Met
Lys
Phe
Gly
Stop
Amino end
Carboxyl end
Base-pair insertion or deletion
Frameshift causing immediate nonsense
Extra U
A U G U A A G U U U G G C U A
Met
Stop
Frameshift causing extensive missense
U
Missing
A U G A A G U U G G C U A A ···
Met
Lys
Leu
Ala
···
Insertion or deletion of 3 nucleotides:
no frameshift but extra or missing amino acid
A A G
Missing
A U G U U U G G C U A A
Met
Phe
Gly
Stop

Figure 17.25