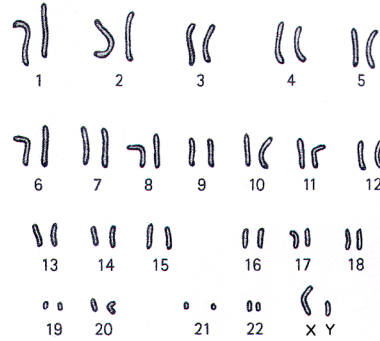
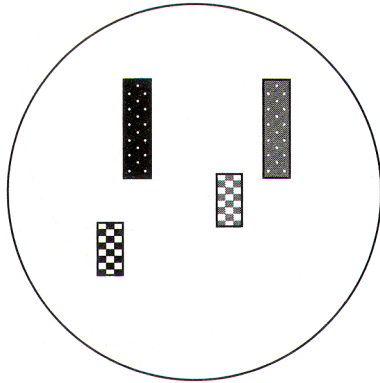


Conceptual Biology

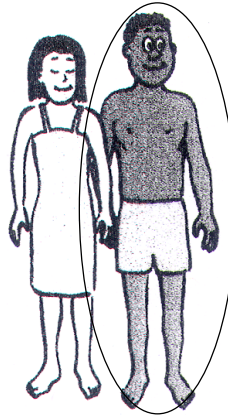
Chapter 16: Genetics

Chromosomes

1. On the left are some chromosomes from a diploid cell. On the right are chromosomes from a human cell.



- a. How many chromosomes are in the diploid cell? 4
- b. After the diploid cell goes through meiosis, how many chromosomes will there be in the resulting cells? 2
- c. How many chromosomes are in the human cell? 46
- d. Two kinds of cells that are produced through meiosis in humans are eggs and sperm.
- e. The human chromosomes above belong to one of the two people shown here. Circle the correct person.



f. How do you know?

There is an X and a Y chromosome, so the chromosomes must be from the man.

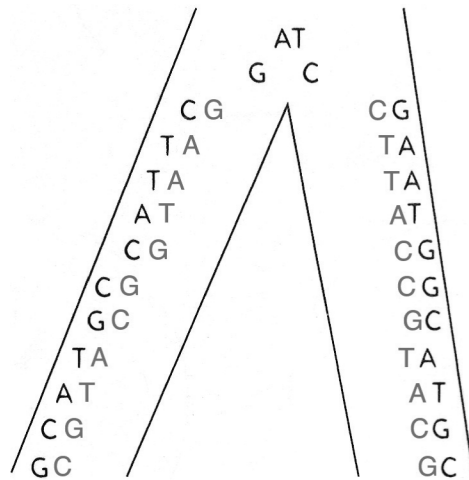
Conceptual Biology

Chapter 16: Genetics
DNA Replication

1. The following is a piece of DNA:

AT
GC
CG
TA
TA
AT
CG
CG
GC
TA
AT
CG
GC

The strand is unwound, so that the DNA can be replicated. Fill in the nucleotides on the new strands.



Jean's genes are mostly what make Jean Jean.

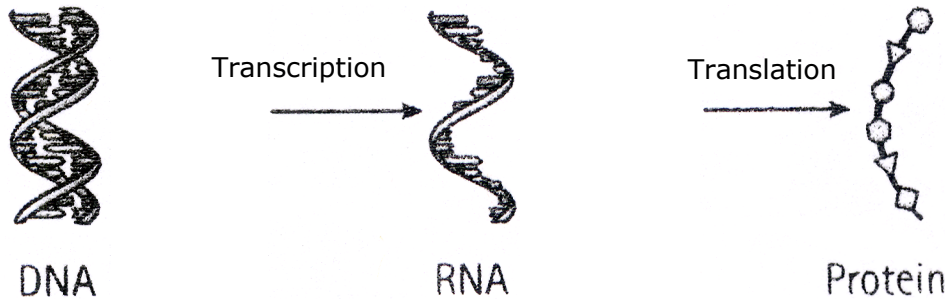


Chapter 16: Genetics

Conceptual Biology

Transcription and Translation

1. The figure below shows how information from DNA is used to build a protein. Write the names of the appropriate processes above the arrows.



2. Transcription takes place in the cell's nucleus.

During transcription, DNA is used to make a molecule of messenger RNA or mRNA.

3. If the following strand of DNA is transcribed, what are the nucleotides found on the transcript?

U A C C A G U A U G C A U G U U A C (mRNA transcript)

A T G G T C A T A C G T A C A A T G

4. Translation takes place in the cell's cytoplasm. Translation is performed by organelles called ribosomes.

5. Divide the transcript from your answer to Question 3 into codons. Then, figure out the sequence of amino acids that is assembled in the ribosome. Use the genetic code table on the next page.

Transcript U A C C A G U A U G C A U G U U A C

Codons UAC-CAG-UAU-GCA-UGU-UAC

Amino acids Tyr-Gln-Tyr-Ala-Cys-Tyr



Chapter 16: Genetics
Transcription and Translation continued

Conceptual Biology



		Second base				
		U	C	A	G	
U	UUU } Phenylalanine UUC } (Phe)	UCU } Serine UCC } (Ser)	UAU } Tyrosine UAC } (Tyr)	UGU } Cysteine UGC } (Cys)	U	
	UUA } Leucine UUG } (Leu)	UCA } UCG }	UAA } Stop UAG } Stop	UGA } Stop UGG } Tryptophan (Trp)	C A G	
	C	CUU } Leucine CUC } (Leu)	CCU } Proline CCC } (Pro)	CAU } Histidine CAC } (His)	CGU } Arginine CGC } (Arg)	U C A G
		CUA } CUG }	CCA } CCG }	CAA } Glutamine CAG } (Gln)	CGA } CGG }	
A		AUU } Isoleucine AUC } (Ile)	ACU } Threonine ACC } (Thr)	AAU } Asparagine AAC } (Asn)	AGU } Serine AGC } (Ser)	U C A G
		AUA } AUG } Met or start	ACA } ACG }	AAA } Lysine AAG } (Lys)	AGA } Arginine AGG } (Arg)	
	G	GUU } Valine GUC } (Val)	GCU } Alanine GCC } (Ala)	GAU } Aspartic GAC } acid (Asp)	GGU } Glycine GGC } (Gly)	U C A G
		GUA } GUG }	GCA } GCG }	GAA } Glutamic GAG } acid (Glu)	GGA } GGG }	

Conceptual Biology

Chapter 16: Genetics

Genetic Mutations

1. Define the following terms:

Genetic mutation _____ a change in the sequence of nucleotides in an _____
organism's DNA

Point mutation _____ the substitution of one nucleotide for another _____

Nonsense mutation _____ a mutation that produces a stop codon in the _____
middle of a protein coding sequence

Frameshift mutation _____ the insertion or deletion of nucleotides that _____
causes the sequence of amino acids in a protein to be completely changed

2. Translate the following mRNA sequence into amino acids. You can use the genetic code table on the back of this page.

AAU GUC CCG ACC AAA GCU
asparagine valine proline threonine lysine alanine

3. What point mutation in the sequence above could cause the substitution of the amino acid serine for asparagine?

A change from AAU to AGU in which a point mutation changes the second "A" to "G"
would result in a serine amino acid instead of asparagine.

4. How could a change in a single nucleotide in the sequence above result in a nonsense mutation?

A change from AAA to UAA in which the first "A" becomes a "U" would produce a
stop codon and thus a nonsense mutation.

5. The insertion or deletion of one or two nucleotides causes a frameshift mutation. Why doesn't the insertion or deletion of three nucleotides cause a frameshift mutation as well?

The insertion of three nucleotides causes the insertion of an amino acid (and may
change a few amino acids as well, depending on where the insertion occurs). It does
not completely change the sequence of amino acids in the protein the way a
frameshift mutation does. The same holds true for the deletion of three nucleotides.
This is because a codon consists of three nucleotides.

Conceptual Biology

		Second base					
		U	C	A	G		
First base	U	UUU } Phenylalanine	UCU } Serine	UAU } Tyrosine	UGU } Cysteine	Third base	U
		UUC } (Phe)	UCC } (Ser)	UAC } (Tyr)	UGC } (Cys)		C
		UUA } Leucine	UCA } (Ser)	UAA } Stop	UGA } Stop		A
		UUG } (Leu)	UCG }	UAG } Stop	UGG } Tryptophan (Trp)		G
C	C	CUU } Leucine	CCU } Proline	CAU } Histidine	CGU } Arginine	U	
		CUC } (Leu)	CCC } (Pro)	CAC } (His)	CGC } (Arg)	C	
		CUA } (Leu)	CCA }	CAA } Glutamine	CGA }	A	
		CUG }	CCG }	CAG } (Gln)	CGG }	G	
A	A	AUU } Isoleucine	ACU } Threonine	AAU } Asparagine	AGU } Serine	U	
		AUC } (Ile)	ACC } (Thr)	AAC } (Asn)	AGC } (Ser)	C	
		AUA } (Ile)	ACA }	AAA } Lysine	AGA } Arginine	A	
		AUG } Met or start	ACG }	AAG } (Lys)	AGG } (Arg)	G	
G	G	GUU } Valine	GCU } Alanine	GAU } Aspartic acid(Asp)	GGU } Glycine	U	
		GUC } (Val)	GCC } (Ala)	GAC }	GGC } (Gly)	C	
		GUA } (Val)	GCA }	GAA } Glutamic acid (Glu)	GGA }	A	
		GUG }	GCG }	GAG }	GGG }	G	