

1. What is the function of the histone proteins that are part of DNA structure?

\_\_\_\_\_

2. In transcription, \_\_\_\_\_ acts as a template for \_\_\_\_\_ synthesis.  
After helicase unzips DNA, what enzyme adds RNA bases to form the 3 types of RNA?

\_\_\_\_\_

3. What are the 3 types of RNA, and what are their functions?

\_\_\_\_\_

\_\_\_\_\_

tRNA has an \_\_\_\_\_ that specifies a particular amino acid and pairs up with mRNA codons.

4. In translation, information from \_\_\_\_\_ is used to make a \_\_\_\_\_.

5. What are the four bases in RNA? \_\_\_\_\_

\_\_\_\_\_ substitutes for \_\_\_\_\_ during base pairing when making an RNA strand from a DNA strand.

6. \_\_\_\_\_ is a start codon that specifies methionine.

The stop codons \_\_\_\_\_, \_\_\_\_\_, or \_\_\_\_\_ signal the end of a protein.

	U	C	A	G		
First position (5' end)	U	UUU Phe UUC UUA Leu UUG	UCU Ser UCC UCA UCG	UAU Tyr UAC UAA Stop UAG Stop	UGU Cys UGC UGA Stop UGG Trp	U C A G
	C	CUU Leu CUC CUA CUG	CCU Pro CCC CCA CCG	CAU His CAC CAA Gln CAG	CGU Arg CGC CGA CGG	U C A G
	A	AUU Ile AUC AUA AUG	ACU Thr ACC ACA ACG	AAU Asn AAC AAA Lys AAG	AGU Ser AGC AGA Arg AGG	U C A G
	G	GUU Val GUC GUA GUG	GCU Ala GCC GCA GCG	GAU Asp GAC GAA Glu GAG	GGU Gly GGC GGA GGG	U C A G

GENETIC CODE

Figure from Google Images

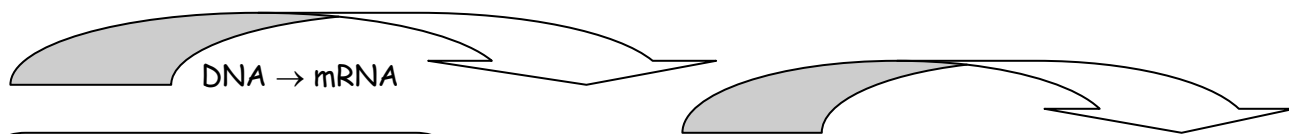
[http://img.sparknotes.com/figures/1/132e5720f3b37836571a1aeb9d163ac3/genetic\\_code.gif](http://img.sparknotes.com/figures/1/132e5720f3b37836571a1aeb9d163ac3/genetic_code.gif)

Amino acid names:

- Ala = alanine
- Arg = arginine
- Asn = asparagine
- Asp = aspartate
- Cys = cysteine
- Gln = glutamine
- Glu = glutamate
- Gly = glycine
- His = histidine
- Ile = isoleucine
- Leu = leucine
- Lys = lysine
- Met = methionine
- Phe = phenylalanine
- Pro = proline
- Ser = serine
- Thr = threonine
- Trp = tryptophan
- Tyr = Tyrosine
- Val = valine

7. Synthesis and Structure of a 5 Amino Acid Protein

Fill in complementary DNA template strand bases. Fill in mRNA bases. Fill in mRNA codons (rewrite bases in mRNA column horizontally). Fill in tRNA anticodons. Use the Genetic code on the previous page to figure out the amino acids coded for by mRNA.



Double Helix		mRNA → protein			
DNA coding strand	DNA template strand	mRNA	mRNA codons	tRNA anticodons	Amino acid
T					
A					
C					
A					
G					
C					
C					
C					
A					
C					
G					
A					
A					
G					
T					
A					
T					
T					

8. If both DNA strands are read simultaneously, \_\_\_\_\_ proteins are made.  
(the same or different) Why? \_\_\_\_\_

9. What are the two main parts of the cell cycle? \_\_\_\_\_

10. Name the 3 divisions of interphase and tell what happens during each one.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

11. After helicase unzips DNA, what enzyme adds DNA bases to form a new strand of DNA?  
\_\_\_\_\_

12. DNA Replication

Fill in complementary DNA bases on the new DNA strands.

*DNA double helix*

DNA Parent Strand	DNA Parent Strand
A	T
T	A
C	G
G	C

*DNA helix unwound. New strands being replicated.*

DNA Parent strand	DNA New strand	DNA New strand	DNA Parent strand
G			C
G			C
C			G
T			A
A			T
T			A
A			T
A			T
T			A
G			C

13. The new DNA helix consists of a parent strand and a new strand. This is called \_\_\_\_\_ replication.

14. Define mitosis. \_\_\_\_\_

15. Define cytokinesis. \_\_\_\_\_

16. List the phases of mitosis and explain what happens in each one.

---



---



---



---

17. Explain the following mutations:

Deletion \_\_\_\_\_

Insertion \_\_\_\_\_

Duplication \_\_\_\_\_

Translocation \_\_\_\_\_

Aneuploidy \_\_\_\_\_

18. Define these cancer terms:

in situ \_\_\_\_\_

invasion \_\_\_\_\_

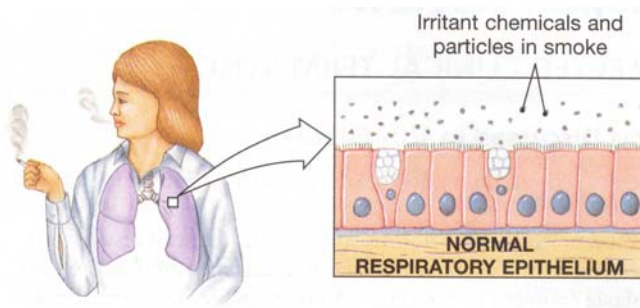
metastasis \_\_\_\_\_

dysplasia \_\_\_\_\_

anaplasia \_\_\_\_\_

This figure comes from the 6<sup>th</sup> edition of Martini's textbook - chapter 4, page 141.

This figure is not in the 7<sup>th</sup> edition. The terms are identified in ch 4 on page 138 of the 7<sup>th</sup> edition.

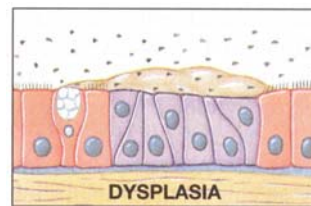


**NORMAL RESPIRATORY EPITHELIUM**

Reversible

**DYSPLASIA** - reversible change in normal shape, size and organization of tissue cells

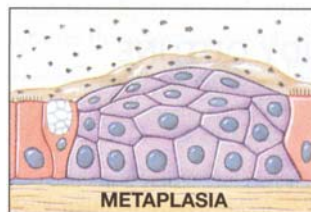
The cilia of respiratory epithelial cells are damaged and paralyzed by exposure to cigarette smoke. These changes cause the local buildup of mucus and reduce the effectiveness of the epithelium in protecting deeper, more delicate portions of the respiratory tract.



Reversible

**METAPLASIA** - reversible structural change that alters the character of a tissue

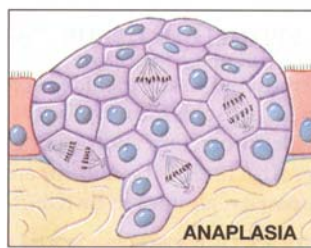
The stressed respiratory surface converts to a stratified epithelium that protects underlying connective tissues, but does nothing for other areas of the respiratory tract.



Irreversible

**ANAPLASIA** - irreversible change in size and shape of tissue cells

The tissue cells become cancerous tumor cells.



1. help DNA coil up into chromosomes
2. DNA, mRNA; RNA polymerase
3. mRNA - takes information from DNA; uses it to make proteins  
rRNA - makes ribosome subunits; zips mRNA to tRNA  
tRNA - takes amino acids in cytoplasm to mRNA / anticodon
4. mRNA; protein
5. adenine, guanine, cytosine, uracil / uracil; thymine
6. AUG / UAA, UAG, UGA

DNA coding strand	DNA Template strand	mRNA	mRNA codons	tRNA anticodons	Amino acid
T	A	A	AUG	U	Met
A	T	U		A	
C	G	G		C	
A	T	U	UCG	A	Ser
G	C	C		G	
C	G	G		C	
C	G	G	GGU	C	Gly
C	G	G		C	
A	T	U		A	
C	G	G	GCU	C	Ala
G	C	C		G	
A	T	U		A	
A	T	U	UCA	A	Ser
G	C	C		G	
T	A	A		U	
A	T	U	UAA	A	STOP End of protein
T	A	A		U	
T	A	A		U	

8. different proteins - because the bases in the second (template) strand are different than the bases in the first (coding) strand.
9. interphase; mitotic phase (mitosis)
10. G<sub>1</sub> - cell growth; S - synthesis (replication) of DNA; G<sub>2</sub> - protein synthesis
11. DNA polymerase

DNA Parent	NEW DNA	NEW DNA	DNA Parent
G	C	G	C
G	C	G	C
C	G	C	G
T	A	T	A
A	T	A	T
T	A	T	A
A	T	A	T
A	T	A	T
T	A	T	A
G	C	G	C

13. semiconservative
14. division of nucleus
15. division of cytoplasm to form two new cells
16. prophase - centrioles move toward poles of cell (early);  
microtubules attached to centromeres of chromosomes (late)  
metaphase - chromosomes line up on metaphase plate  
anaphase - sister chromatids are pulled apart; cleavage furrow begins in late anaphase  
telophase - cleavage furrow deepens as chromosomes are pulled further apart;  
at the end, cytokinesis divides the cell into two daughter cells
17. deletion - loss of one or more nucleotides  
insertion - addition of one or more nucleotides  
duplication - repeat of part of chromosome  
translocation - exchange of genetic material between nonhomologous chromosomes  
aneuploidy - less than or more than the normal number of chromosomes
18. in situ - cancer has not gone beyond the epithelium  
invasion - spread of cancer cells from tumor into surrounding tissue  
metastasis - spread of cancer cells to a distant location  
dysplasia - precancerous; abnormal growth of cells that is reversible  
anaplasia - cells revert to an immature or a less differentiated form;  
irreversible change in size and shape of tissues