

## Steps to Reduce Cancer Risk

Although cancer is probably not something you worry about, there are steps you can take now to reduce your risk of developing cancer in the future.

1. Do not start smoking, and if you do smoke—stop.
2. Avoid areas where people smoke. Request nonsmoking areas in restaurants and other public areas. Breathing secondhand smoke is almost as dangerous as smoking itself.
3. Do not start using oral tobacco, such as chewing tobacco or snuff. If you do chew—stop.
4. Reduce your exposure to UV radiation in sunlight and tanning lamps.
5. Increase the amount of fiber and fresh vegetables in your diet.
6. Eat a balanced diet, including vitamins and minerals.
7. Reduce the amount of fat in your diet.
8. Avoid exposure to strong chemicals such as pesticides, herbicides, and solvents.
9. Test your home for radioactive radon.

Numbers one and four on this list are most important—and they're free! Following all these steps won't guarantee that you'll never get cancer—many factors are involved. But it will definitely reduce your risk of cancer and will help you live healthily. This will reduce your risk of other diseases and disorders too.



# Decoding the Message

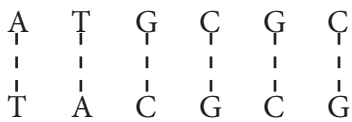
## DNA Replication

1. What is DNA replication? \_\_\_\_\_
2. Name the four bases found in DNA, and indicate which bases pair together.  
\_\_\_\_\_

3. During which phase of the cell cycle does DNA replication occur? \_\_\_\_\_

4. In what part of the cell does DNA replication occur? \_\_\_\_\_

5. Start with the following DNA strand:



If this strand were replicated, what would the new strand look like?



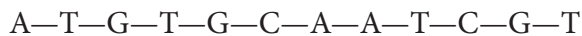
## Transcription

1. What is transcription? \_\_\_\_\_
2. Why is transcription necessary?  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

3. Name the four bases found in RNA, and indicate which bases pair together.  
\_\_\_\_\_

4. In what part of the cell does transcription occur? \_\_\_\_\_

5. Start with the following DNA strand. To keep things simple, you will transcribe only one strand of a double-stranded DNA molecule:



Perform transcription on this DNA strand to form a new RNA molecule. For example, the base G from the DNA strand will result in a C on the new RNA strand. Remember to pair your bases together correctly. Write the order of nucleotides in your RNA molecule below.

— — — — — — — — — —

You now have a short, single-stranded RNA molecule. In the next section, you will use this RNA to form a protein.

## Protein Synthesis

1. What type of RNA molecule did you make on the previous page? \_\_\_\_\_
2. In what part of the cell does protein synthesis occur? \_\_\_\_\_
3. What organelles are required for protein synthesis? \_\_\_\_\_
4. What type of RNA brings amino acids to be added to the protein chain? \_\_\_\_\_
5. Using your RNA strand from the previous page, form a protein molecule.
  - How many RNA bases make a codon? \_\_\_\_\_
  - What does a codon code for? \_\_\_\_\_
  - How many amino acids will there be in your protein molecule? \_\_\_\_\_
  - Use the table below to find the names of the amino acids in your protein molecule. To do this, locate the first letter of a codon in the left column on the chart. Then locate the second letter of the codon at the top of the chart. Finally, locate the third letter of the codon on the right side of the chart. The box where these three letters intersect reveals the name of the amino acid that codon codes for. For example, suppose you have the codon U—C—G. Locating these letters in the table shows that this codon codes for the amino acid serine.

Write, in order, the names of the amino acids in your protein.

RNA Codons for Amino Acids					
First letter	Second letter				Third letter
	U	C	A	G	
U	phenylalanine	serine	tyrosine	cysteine	U
	phenylalanine	serine	tyrosine	cysteine	C
	leucine	serine	stop	stop	A
	leucine	serine	stop	tryptophan	G
C	leucine	proline	histidine	arginine	U
	leucine	proline	histidine	arginine	C
	leucine	proline	glutamine	arginine	A
	leucine	proline	glutamine	arginine	G
A	isoleucine	threonine	asparagine	serine	U
	isoleucine	threonine	asparagine	serine	C
	isoleucine	threonine	lysine	arginine	A
	(start) methionine	threonine	lysine	arginine	G
G	valine	alanine	aspartate	glycine	U
	valine	alanine	aspartate	glycine	C
	valine	alanine	glutamate	glycine	A
	valine	alanine	glutamate	glycine	G

## Decoding the Message

### DNA Replication

1. What is DNA replication? the process of forming two identical DNA molecules from one original DNA molecule

2. Name the four bases found in DNA, and indicate which bases pair together.

Adenine pairs with thymine, and guanine pairs with cytosine.

3. During which phase of the cell cycle does DNA replication occur? interphase

4. In what part of the cell does DNA replication occur? the nucleus

5. Start with the following DNA strand:

```
A   T   G   C   G   C
|   |   |   |   |   |
T   A   C   G   C   G
```

If this strand were replicated, what would the new strand look like? It would look the same.

```
A   T   G   C   G   C
|   |   |   |   |   |
T   A   C   G   C   G
```

### Transcription

1. What is transcription? the process of making RNA from DNA

2. Why is transcription necessary?

DNA contains the code for making proteins, but DNA is contained in the nucleus. Proteins are

made on ribosomes in the cytoplasm. Transcription transfers DNA's code to RNA, which takes the

code to the ribosomes where it can be used to make proteins.

3. Name the four bases found in RNA, and indicate which bases pair together.

Adenine pairs with uracil, and guanine pairs with cytosine. (Uracil replaces the thymine found in DNA.)

4. In what part of the cell does transcription occur? the nucleus

5. Start with the following DNA strand. To keep things simple, you will transcribe only one strand of a double-stranded DNA molecule:

A—T—G—T—G—C—A—A—T—C—G—T

Perform transcription on this DNA strand to form a new RNA molecule. For example, the base G from the DNA strand will result in a C on the new RNA strand. Remember to pair your bases together correctly. Write the order of nucleotides in your RNA molecule below.

U—A—C—A—C—G—U—U—A—G—C—A

You now have a short, single-stranded RNA molecule. In the next section, you will use this RNA to form a protein.

Students may have difficulty with parts of this application. You may want to do it together as a class.

## Protein Synthesis

1. What type of RNA molecule did you make on the previous page? a messenger RNA (mRNA) molecule
2. In what part of the cell does protein synthesis occur? the cytoplasm
3. What organelles are required for protein synthesis? ribosomes
4. What type of RNA brings amino acids to be added to the protein chain? transfer RNA (tRNA)
5. Using your RNA strand from the previous page, form a protein molecule.
  - How many RNA bases make a codon? three
  - What does a codon code for? an amino acid
  - How many amino acids will there be in your protein molecule? four
  - Use the table below to find the names of the amino acids in your protein molecule. To do this, locate the first letter of a codon in the left column on the chart. Then locate the second letter of the codon at the top of the chart. Finally, locate the third letter of the codon on the right side of the chart. The box where these three letters intersect reveals the name of the amino acid that codon codes for. For example, suppose you have the codon U—C—G. Locating these letters in the table shows that this codon codes for the amino acid serine.

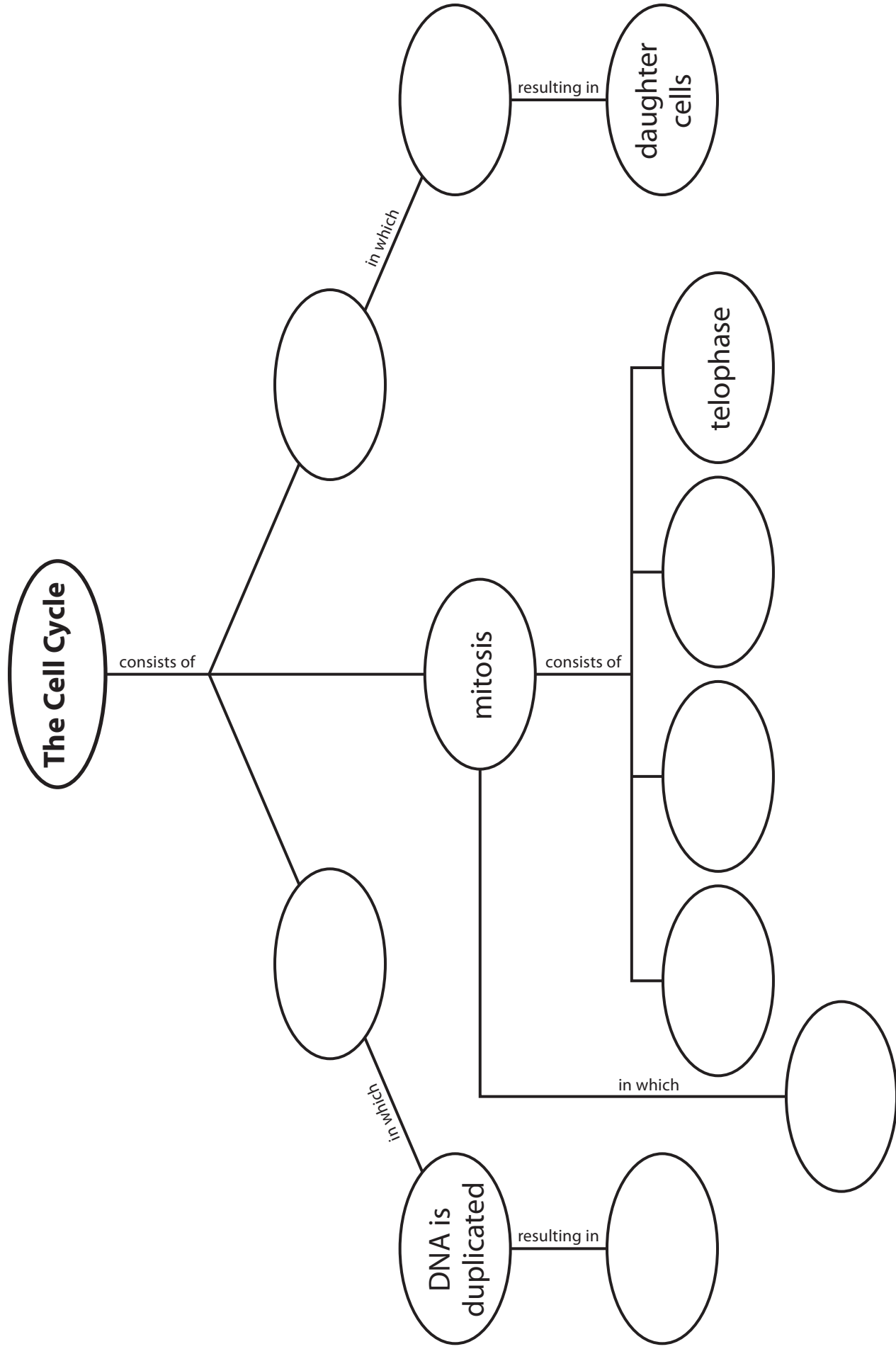
Write, in order, the names of the amino acids in your protein.

tyrosine—threonine—leucine—alanine

RNA Codons for Amino Acids					
First letter	Second letter				Third letter
	U	C	A	G	
U	phenylalanine	serine	tyrosine	cysteine	U
	phenylalanine	serine	tyrosine	cysteine	C
	leucine	serine	stop	stop	A
	leucine	serine	stop	tryptophan	G
C	leucine	proline	histidine	arginine	U
	leucine	proline	histidine	arginine	C
	leucine	proline	glutamine	arginine	A
	leucine	proline	glutamine	arginine	G
A	isoleucine	threonine	asparagine	serine	U
	isoleucine	threonine	asparagine	serine	C
	isoleucine	threonine	lysine	arginine	A
	(start) methionine	threonine	lysine	arginine	G
G	valine	alanine	aspartate	glycine	U
	valine	alanine	aspartate	glycine	C
	valine	alanine	glutamate	glycine	A
	valine	alanine	glutamate	glycine	G

Be sure students understand that this is a very simplified example. The process of protein synthesis is complex, and the smallest proteins contain at least 20 amino acids. The largest proteins contain over 25,000 amino acids!

# The Cell Cycle



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