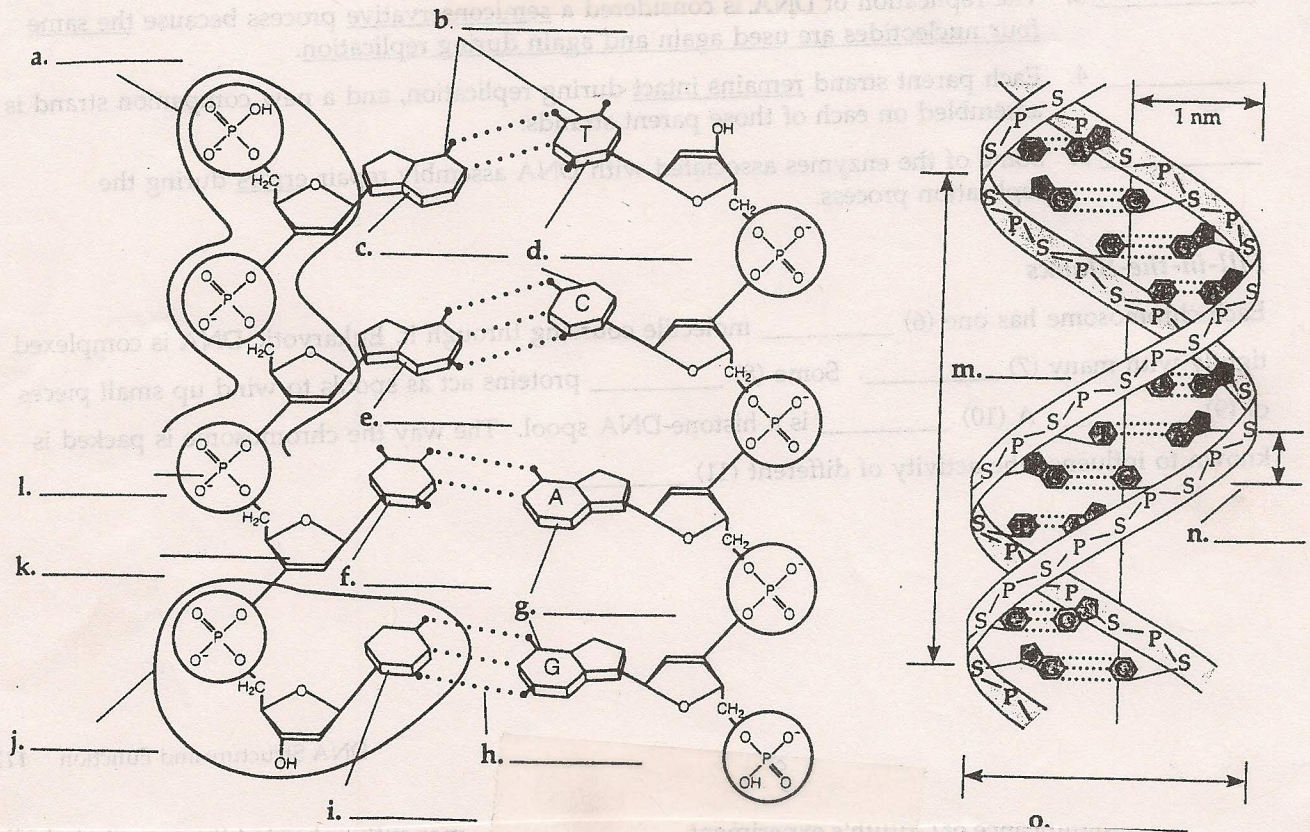


FROM DNA TO PROTEINS

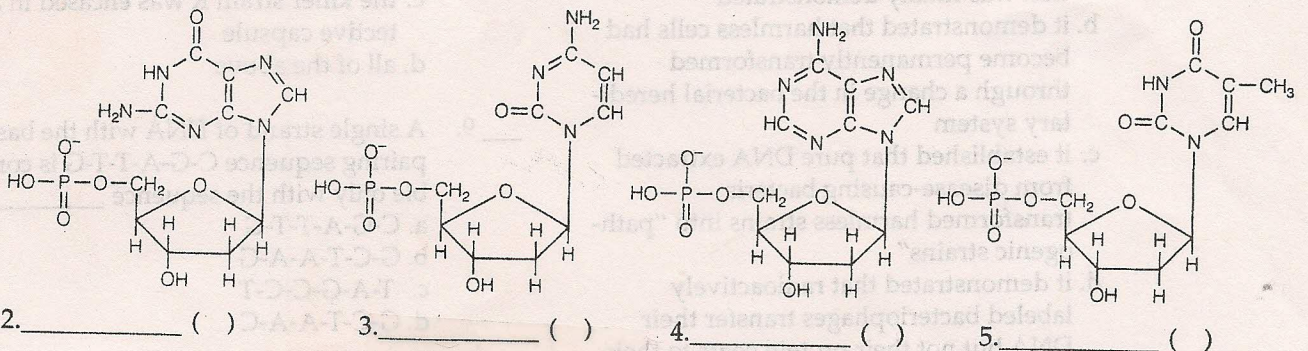
1. Complete the table below that traces the discovery of DNA function.

Investigators	Year(s)	Contribution
a. Miescher	1868	
b.	1928	Discovered the transforming principle in <i>Streptococcus pneumoniae</i> ; live, harmless R cells were mixed with dead S cells, R cells became S cells
c. Avery (also MacLeod and McCarty)	1944	
d. Hershey and Chase	1952	

Review the structure of DNA by labeling the following diagrams.

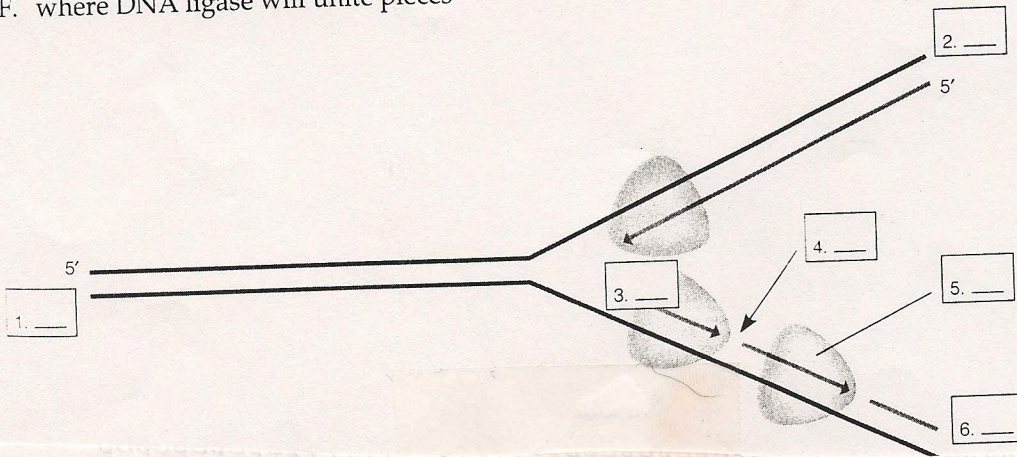


Four nucleotides are illustrated below. In the blank, label each nitrogen-containing base correctly as guanine, thymine, cytosine, or adenine. In the parentheses following each blank, indicate whether that nucleotide base is a purine (pu) or a pyrimidine (py). (See p. 115 for definitions.)



This module describes some of the ins and outs of DNA replication. Look at the diagrams carefully. Then see if you can match each of the numbers in the boxes on the diagram below with one of the lettered choices. Choices may be used more than once.

- A. 5' end of daughter strand
- B. 3' end of daughter strand
- C. 5' end of parental strand
- D. 3' end of parental strand
- E. DNA polymerase
- F. where DNA ligase will unite pieces



Complete the Table

1. Three types of RNA are transcribed from DNA in the nucleus (from genes that code only for RNA). Complete the following table, which summarizes information about these molecules.

RNA Molecule	Abbreviation	Description/Function
a. Ribosomal RNA		
b. Messenger RNA		
c. Transfer RNA		

Short Answer

2. List three ways in which a molecule of RNA is structurally different from a molecule of DNA. _____

3. Cite two similarities in DNA replication and transcription. _____

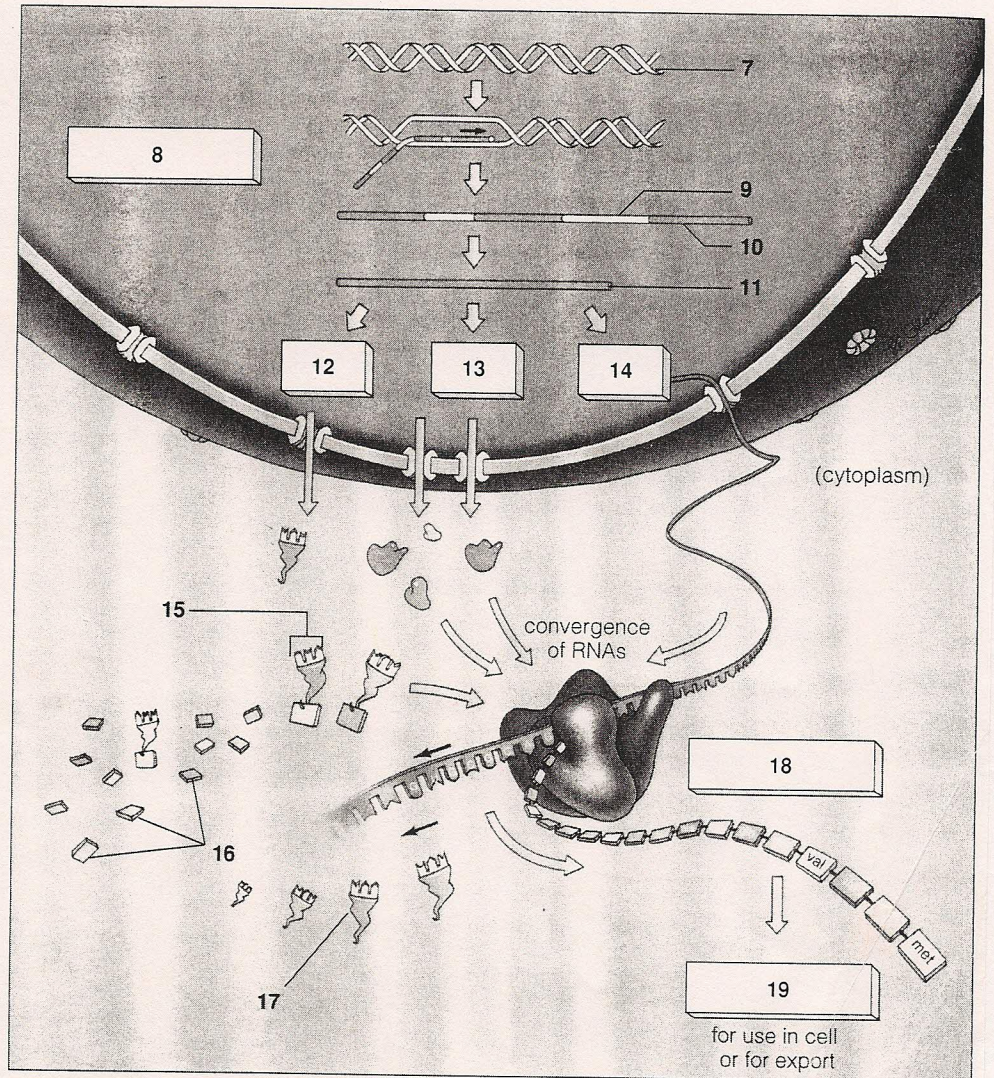
4. What are the three key ways in which transcription differs from DNA replication? _____

Label and Match

A summary of the flow of genetic information in protein synthesis is useful as an overview. Identify the indicated parts of the illustration below by filling in the blanks with the names of the appropriate structures or functions. Choose from the following: DNA, mRNA, tRNA, polypeptide, rRNA subunits, intron, exon, mature mRNA transcript, new mRNA transcript, anticodon, amino acids, ribosome-mRNA complex.

Complete the exercise by matching and entering the letter of the description in the parentheses following each label.

7. _____ ()
8. _____
_____ ()
9. _____ ()
10. _____ ()
11. _____
_____ ()
12. _____ ()
13. _____
_____ ()
14. _____ ()
15. _____ ()
16. _____
_____ ()
17. _____ ()
18. _____
_____ ()
19. _____ ()



- A. Coding portion of mRNA that will translate into proteins
- B. Carries a modified form of the genetic code from DNA in the nucleus to the cytoplasm
- C. Transports amino acids to the ribosome and mRNA
- D. The building blocks of polypeptides
- E. Noncoding portions of newly transcribed mRNA
- F. tRNA after delivering its amino acid to the ribosome-mRNA complex
- G. Join when translation is initiation
- H. Holds the genetic code for protein production
- I. Place where translation occurs
- J. Includes introns and exons
- K. A sequence of three bases that can pair with a specific mRNA codon
- L. Snipping out of introns, only exons remaining
- M. May serve as a functional protein (enzyme) or a structural protein

Sequence

Arrange the steps of transcription in correct chronological sequence. Write the letter of the first step next to 5, the letter of the second step next to 6, and so on.

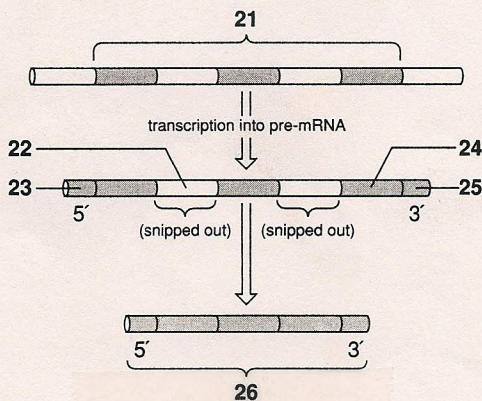
5. ___ A. The RNA strand grows along exposed bases until RNA polymerase meets a DNA base sequence that signals "stop."
6. ___ B. RNA polymerase binds with the DNA promoter region to open up a local region of the DNA double helix.
7. ___ C. An RNA polymerase enzyme locates the DNA bases of the promoter region of one DNA strand by recognizing DNA-associated proteins near a promoter.
8. ___ D. RNA is released from the DNA template as a free, single-stranded transcript.
9. ___ E. RNA polymerase moves stepwise along exposed nucleotides of one DNA strand; as it moves, the DNA double helix keeps unwinding.

Label and Match

Newly transcribed mRNA contains more genetic information than is necessary to code for a chain of amino acids. Before the mRNA leaves the nucleus for its ribosome destination, an editing process occurs as certain portions of nonessential information are snipped out. Identify each indicated part of the illustration below; use abbreviations for the nucleic acids. Complete the exercise by matching and entering the letter of the description in the parentheses following each label.

1. _____ ()
2. _____ ()
3. _____ ()
4. _____ ()
5. _____ ()
6. _____ ()
- _____ ()

- A. The actual coding portions of mRNA
- B. Noncoding portions of the newly transcribed mRNA
- C. Presence of cap and tail, introns snipped out and exons spliced together
- D. Acquiring of a poly-A tail by the modified mRNA transcript
- E. The region of the DNA template strand to be copied
- F. Reception of a nucleotide cap by the 5' end of mRNA (the first synthesized)



Matching

Choose the most appropriate answer for each.

- | | |
|--------------------------|--|
| 1. ___ codon | A. Composed of two subunits, the small subunit with P and A amino acid binding sites as well as a binding site for mRNA |
| 2. ___ three at a time | B. Reading frame of the nucleotide bases in mRNA |
| 3. ___ sixty-one | C. Detach protein and mRNA from the ribosome |
| 4. ___ the genetic code | D. UAA, UAG, UGA |
| 5. ___ release factors | E. A sequence of three nucleotide bases that can pair with a specific mRNA codon |
| 6. ___ ribosome | F. Name for each base triplet in mRNA |
| 7. ___ anticodon | G. The number of codons that actually specify amino acids |
| 8. ___ the "stop" codons | H. Term for how the nucleotide sequences of DNA and then mRNA correspond to the amino acid sequence of a polypeptide chain |

Complete the Table

9. Complete the following table, which distinguishes the stages of translation.

<i>Translation Stage</i>	<i>Description</i>
a.	Special initiator tRNA loads onto small ribosomal subunit and recognizes AUG; small subunit binds with mRNA, and large ribosomal subunit joins small one.
b.	Amino acids are strung together in sequence dictated by mRNA codons as the mRNA strand passes through the two ribosomal subunits; two tRNAs interact at P and A sites.
c.	mRNA "stop" codon signals the end of the polypeptide chain; release factors detach the ribosome and polypeptide chain from the mRNA.

Completion

10. Given the following DNA sequence, deduce the composition of the mRNA transcript:

TAC AAG ATA ACA TTA TTT CCT ACC GTC ATC

 (mRNA transcript)

11. Deduce the composition of the tRNA anticodons that would pair with the above specific mRNA codons as these tRNAs deliver the amino acids (identified below) to the P and A binding sites of the small ribosomal subunit.

_____ _____
 (tRNA anticodons)

12. From the mRNA transcript in exercise 10, use Figure 12.7 of the text to deduce the composition of the amino acids of the polypeptide sequence.

_____ _____
 (amino acids)

	Transcription	Translation
Template		
Location		
Molecules involved		
Enzymes involved		
Control—start and stop		
Product		
Product processing		
Energy source		