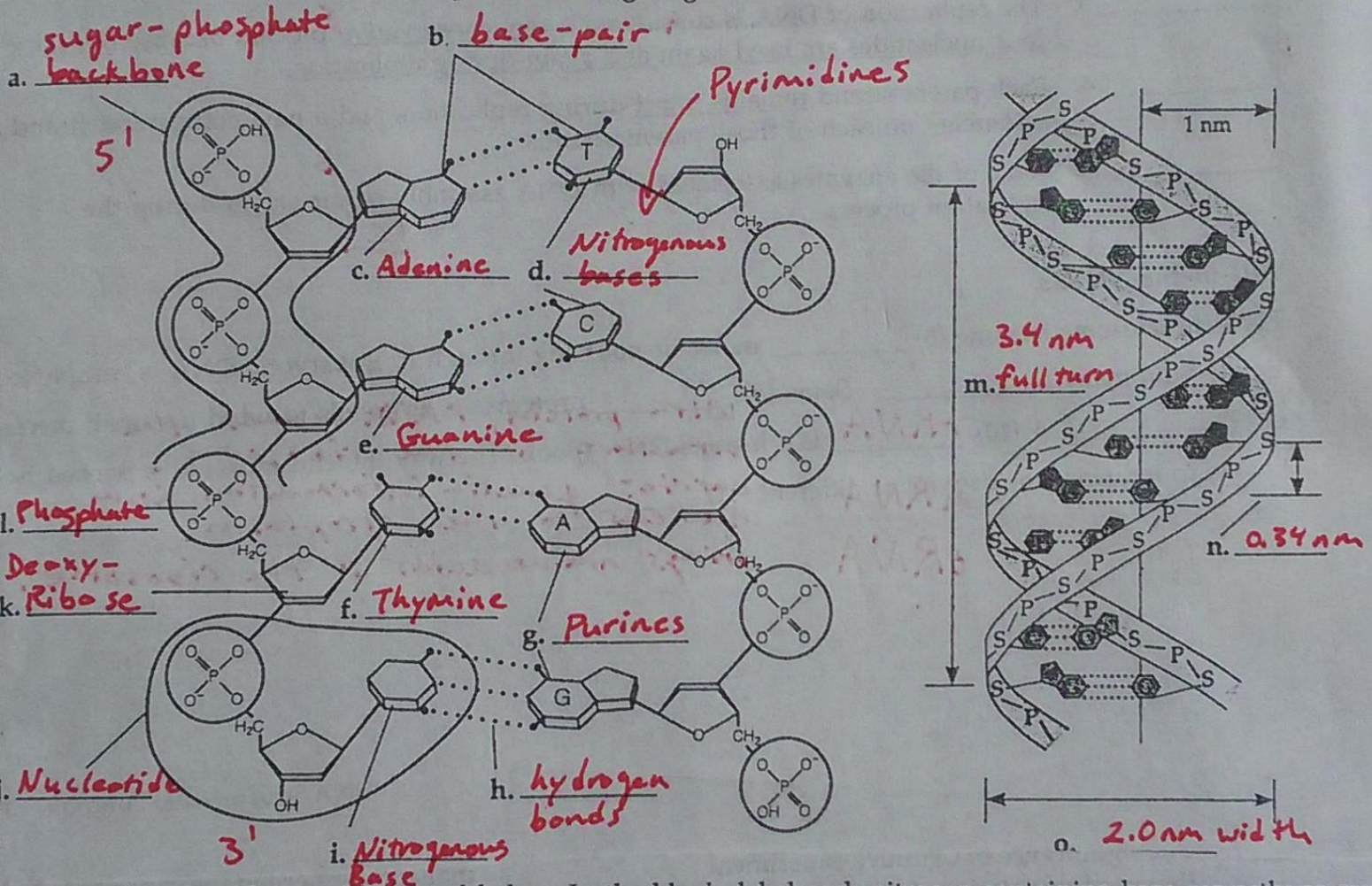
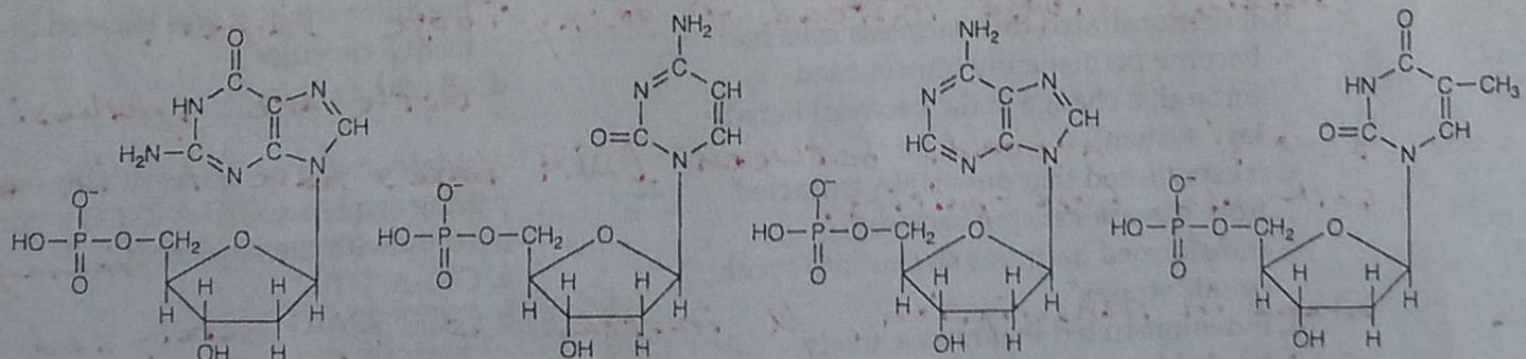
1. Complete the table below that traces the discovery of DNA function.

Investigators	*Year(s)*	*Contribution*
a. Miescher	1868	Isolated nucleic acid
b. Griffith	1928	Discovered the transforming principle in *Streptococcus pneumoniae*; live, harmless R cells were mixed with dead S cells, R cells became S cells
c. Avery (also MacLeod and McCarty)	1944	Used DNA-degrading and protein-degrading enzymes to show that the transforming principle was DNA.
d. Hershey and Chase	1952	used radioactive phosphorus and sulfur to show that viral hereditary molecules is DNA.

view the structure of DNA by labeling the following diagrams.



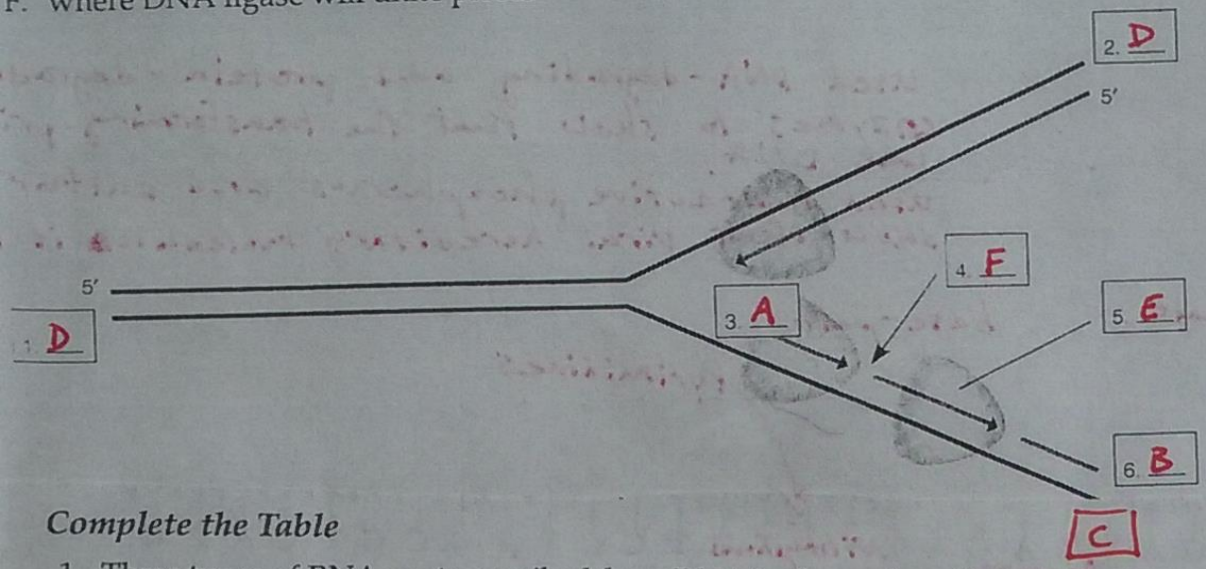
Four nucleotides are illustrated below. In the blank, label each nitrogen-containing base correctly as guanine, thymine, cytosine, or adenine. In the parentheses following each blank, indicate whether that nucleotide base is a purine (pu) or a pyrimidine (py). (See p. 115 for definitions.)



2. Guanine (Pu) 3. Cytosine (Py) 4. Adenine (Pu) 5. Thymine (Py)

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	rRNA	With protein, rRNA makes the structure of the ribosome.
b. Messenger RNA	mRNA	carries genetic information from nucleus to the cytoplasm.
c. Transfer RNA	tRNA	brings amino acids to the ribosome.

Short Answer

2. List three ways in which a molecule of RNA is structurally different from a molecule of DNA. RNA is single stranded, has Uracil instead of Thymine, and contains ribose instead of deoxyribose sugar.

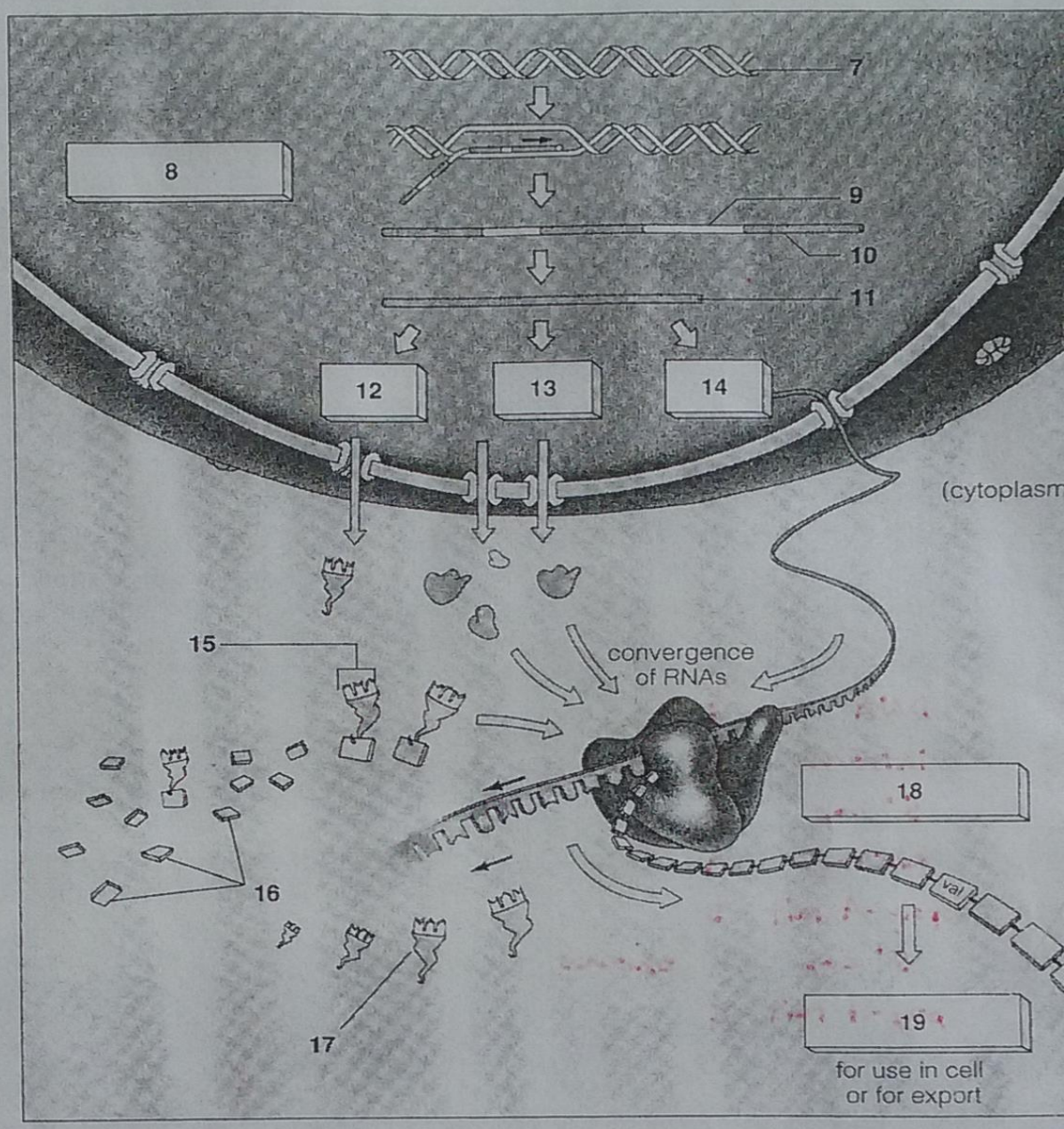
3. Cite two similarities in DNA replication and transcription. Both are synthesized 5′→3′, h-bonds between DNA bases have to be broken, both use base-pairing.

4. What are the three key ways in which transcription differs from DNA replication? No lagging strand in transcription, U instead of T, catalyzed by RNA polymerase instead of DNA polymerase.

Label and Match

A summary of the flow of genetic information in protein synthesis is useful as an overview. Identify indicated parts of the illustration below by filling in the blanks with the names of the appropriate s tures or functions. Choose from the following: DNA, mRNA, tRNA, polypeptide, rRNA subunits, in exon, mature mRNA transcript, new mRNA transcript, anticodon, amino acids, ribosome-mRNA com Complete the exercise by matching and entering the letter of the description in the parentheses follo each label.

7. DNA (H)
8. new mRNA transcript (J)
9. intron (E)
10. exon (A)
11. mature mRNA transcript (L)
12. tRNA (C)
13. rRNA subunits (G)
14. mRNA (B)
15. anticodon (K)
16. amino acids (D)
17. tRNA (F)
18. ribosome-mRNA complex (I)
19. polypeptide (M)



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

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

5. C
6. B
7. E
8. A
9. D

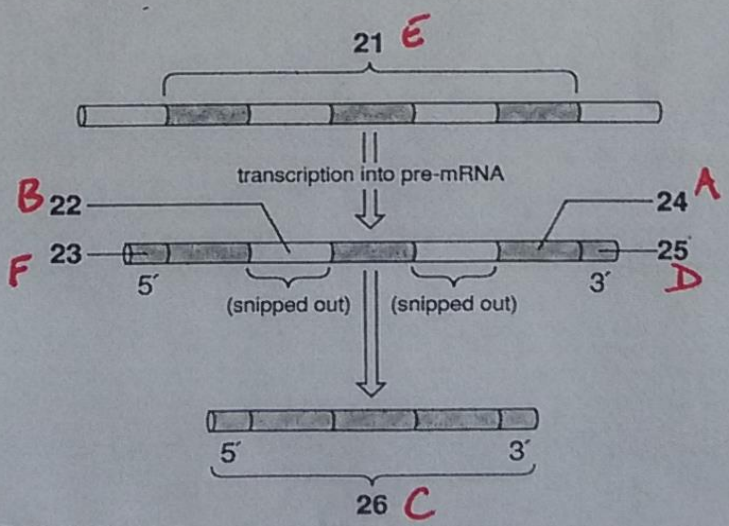
A. The RNA strand grows along exposed bases until RNA polymerase meets a DNA base sequence that signals "stop."
B. RNA polymerase binds with the DNA promoter region to open up a local region of the DNA double helix.
C. An RNA polymerase enzyme locates the DNA bases of the promoter region of one DN strand by recognizing DNA-associated proteins near a promoter.
D. RNA is released from the DNA template as a free, single-stranded transcript.
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 chai acids. Before the mRNA leaves the nucleus for its ribosome destination, an editing process occ tain portions of nonessential information are snipped out. Identify each indicated part of the below; use abbreviations for the nucleic acids. Complete the exercise by matching and enterin of the description in the parentheses following each label.

1. DNA (E)
2. introns (B)
3. 5' cap (F)
4. exons (A)
5. poly-A tail (D)
6. 5' cap exons poly-A tail (C)

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 s together
D. Acquiring of a poly-A tail by the modified mRNA transc
E. The region of the DNA template strand to be copied
F. Reception of a nucleotide cap by the 5′ end of mRNA (th thesized)



Matching

Choose the most appropriate answer for each.

1. F codon
2. B three at a time
3. G sixty-one
4. H the genetic code
5. C release factors
6. A ribosome
7. E anticodon
8. D the "stop" codons

A. Composed of two subunits, the small subunit with P and A amino binding sites as well as a binding site for mRNA
B. Reading frame of the nucleotide bases in mRNA
C. Detach protein and mRNA from the ribosome
D. UAA, UAG, UGA
E. A sequence of three nucleotide bases that can pair with a specific m codon
F. Name for each base triplet in mRNA
G. The number of codons that actually specify amino acids
H. Term for how the nucleotide sequences of DNA and then mRNA c spond to the amino acid sequence of a polypeptide chain

Complete the Table

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

Translation Stage	*Description*
a. Initiation	Special initiator tRNA loads onto small ribosomal subunit and recog small subunit binds with mRNA, and large ribosomal subunit joins s
b. Elongation	Amino acids are strung together in sequence dictated by mRNA cod mRNA strand passes through the two ribosomal subunits; two tRNA at P and A sites.
c. Termination	mRNA "stop" codon signals the end of the polypeptide chain; releas 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
AUG	UUC	UAU	UGU	AAU	AAA	GGA	UGG	CAG	UAG

(mRNA transcript)

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

UAC AAG AUA ACA UUA UUU CCU ACC GUC AUC

(tRNA anticodons)

13.6 in your text, page 3

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

Met phe Tyr Cys Asp Lys Gly Tryp Glu STOP

(amino acids)

	Transcription	Translation
Template	DNA template strand	mRNA
Location	Nucleus	cytoplasm (ribosomes)
Molecules involved	RNA polymerase, DNA, RNA	mRNA, tRNA, ribosomes
Enzymes involved	RNA polymerase	Ribsomes, aminoacyl tRNA synthetase
Control—start and stop	promoter	start codon + stop codon
Product	RNA	polypeptide
Product processing	introns removed, 5' cap 3' poly-A tail	polypeptide can be edited after translation
Energy source	ATP, GTP, UTP, CTP	GTP