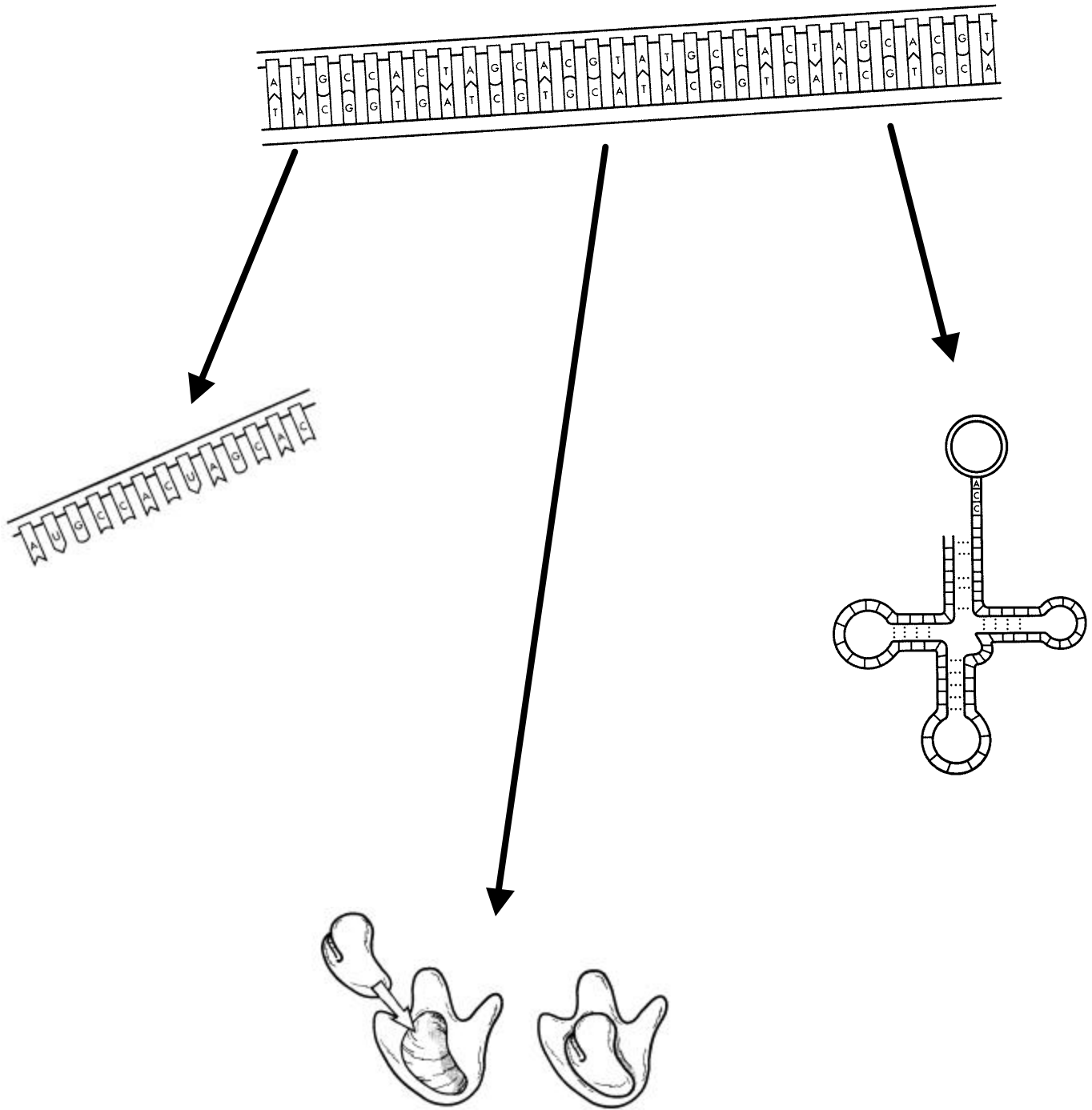
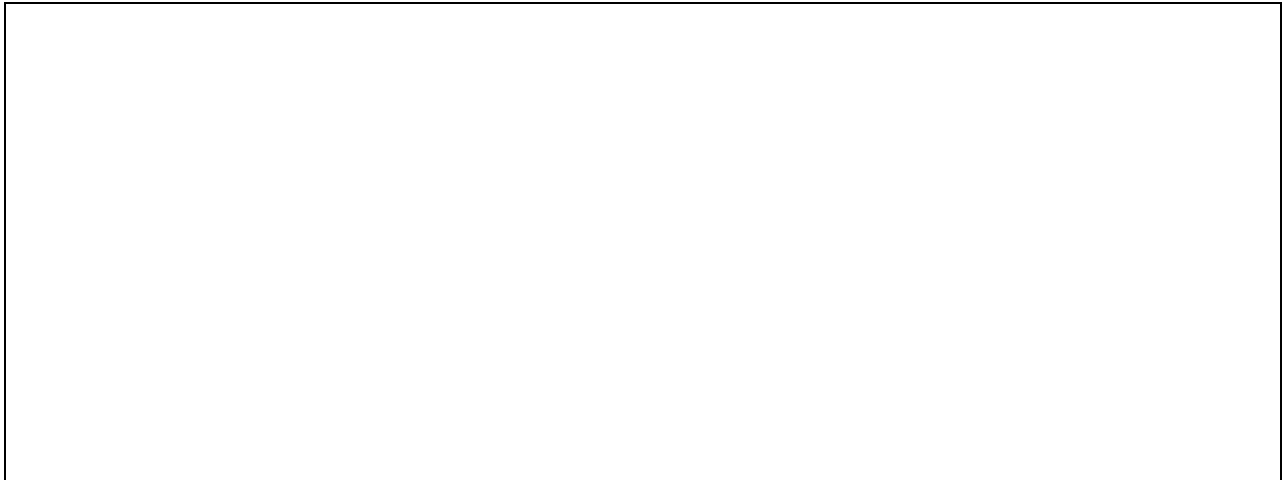


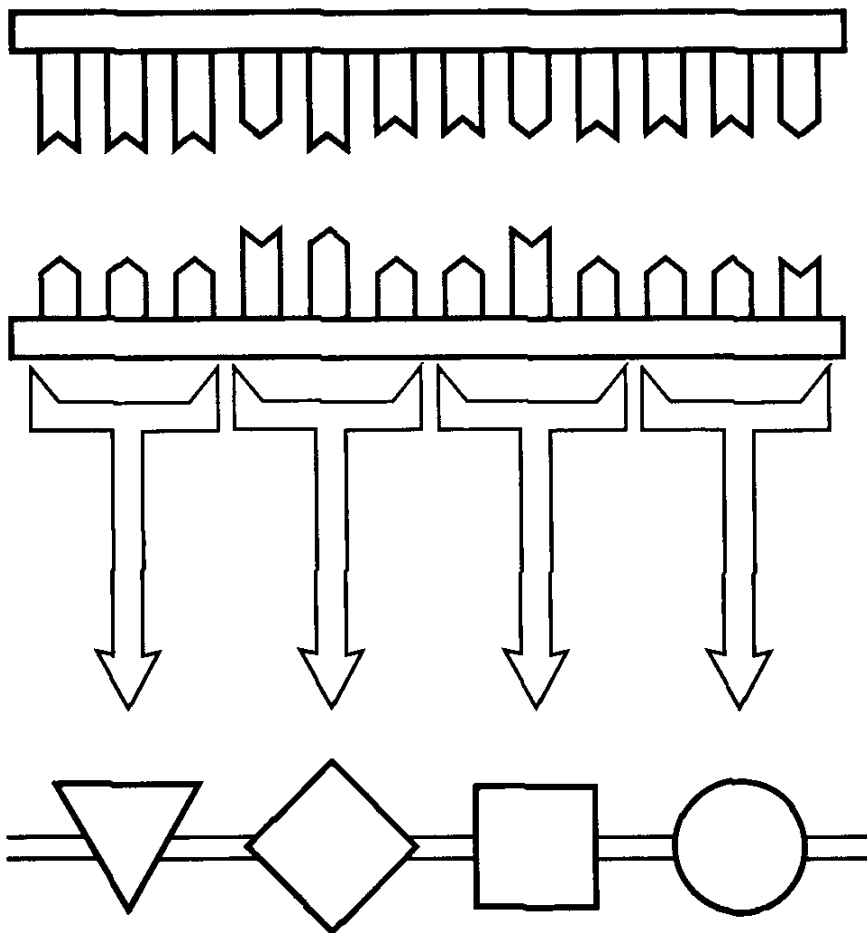
PROTEIN SYNTHESIS



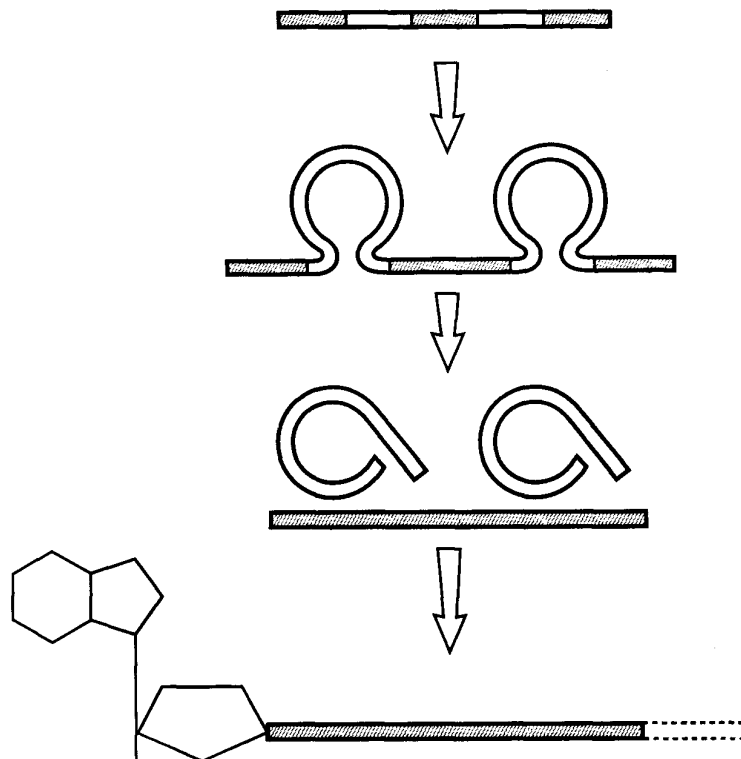
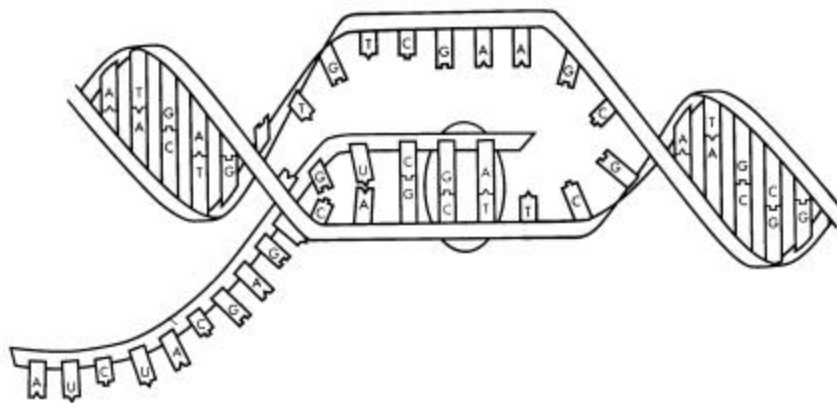
GENETIC CODE



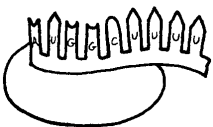
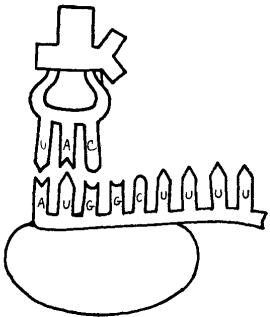
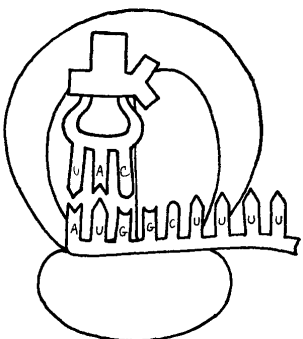
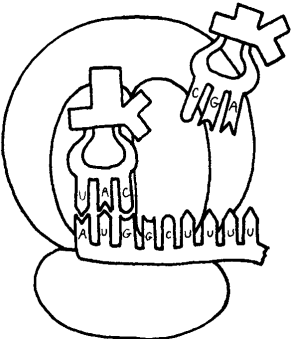
PROTEIN SYNTHESIS – OVERVIEW

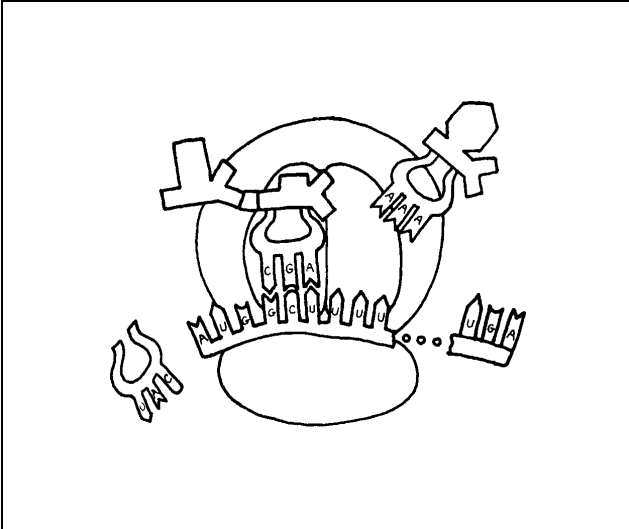


PROTEIN SYNTHESIS – TRANSCRIPTION

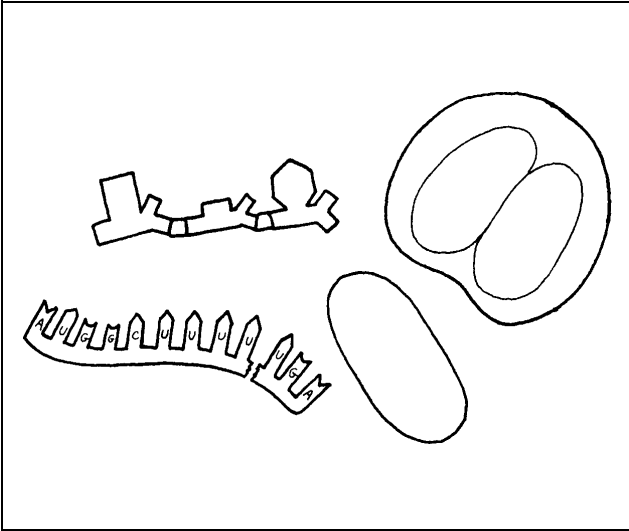
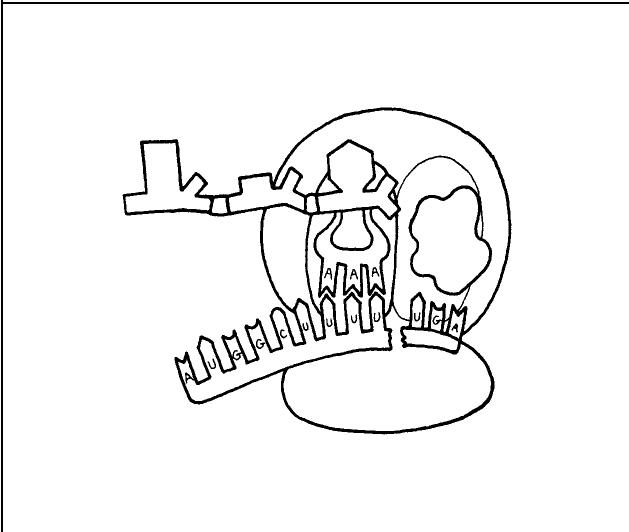


PROTEIN SYNTHESIS – TRANSLATION

| Initiation | |
|---|--|
|  | |
|  | |
|  | |
| Elongation | |
|  | |



Termination



QUESTIONS:

1. Complete the following chart comparing DNA and RNA.

| | 5-carbon sugar | Bases Present |
|------------|-----------------------|----------------------|
| DNA | | |
| RNA | | |

2. Complete the following chart comparing transcription and translation

| | Transcription | Translation |
|---|----------------------|--------------------|
| What molecules & cell organelles are involved | | |
| Where does the process occur within the cell | | |
| Product | | |
| Definition | | |

3. Define codon. _____

4. The genetic code is redundant but not ambiguous. Explain what this statement means.

5. Use Figure 17.4 page 299 to help you complete the following chart.

| DNA Sequence | mRNA Codon | tRNA Anticodon | Amino Acid |
|--------------|------------|----------------|-----------------------|
| AAA | | | |
| GTC | | | |
| | GGA | | |
| | | | Methionine or "Start" |
| GAT | | | |
| | GUG | | |

6. Define "**reading frame**" and explain why it is important in translation.

| | |
|------------|--|
| Definition | |
| Importance | |

7. Match the role or job with the correct structure.

- | | |
|-------------------------|--------------------------|
| A. Initiation sequence | B. Promoter |
| C. RNA polymerase | D. TATA box |
| E. Termination sequence | F. Transcription factors |

_____ Adds RNA nucleotides to exposed DNA bases

_____ Help RNA polymerase recognize and bind to promoter region

_____ Beginning of a gene

_____ Region of DNA where RNA polymerase binds and transcription begins

_____ End of a gene

_____ Short sequence in promoter where transcription factor binds

8. Listed below are the steps in transcription. Put them in the correct order.

_____ RNA molecule released

_____ RNA polymerase untwists and opens a short segment of DNA

_____ RNA polymerase adds nucleotides to the 3' end of the elongating strand of RNA

_____ RNA polymerase binds to the promoter region of the gene

_____ RNA polymerase reaches the termination site; transcription stops

9. Complete the following chart comparing mRNA and tRNA

| | tRNA | mRNA |
|--|-------------|-------------|
| What is the function of this molecule? | | |
| Where and how is this molecule produced? | | |
| Describe the structure of this molecule. | | |

10. There are 64 codons in the genetic code and there are only 45 distinct types of tRNA. These 45 types of tRNA are enough to translate all 64 codons. Explain how this is possible.

11. Describe the phenomenon known as wobble.

12. Complete the following information regarding ribosomes.

RIBOSOMES

| Structure | Composition |
|----------------------|--------------------|
| | |
| Binding Sites | Function |
| | |

13. What is the function of aminoacyl-tRNA synthetases?

List below are the steps involved in the attachment of the amino acid to its tRNA. Put them in the correct order.

_____ ATP loses phosphates

_____ AMP attaches to amino acid

_____ Enzyme active site binds to amino acid and ATP

_____ tRNA displaces AMP and binds to amino acid

The attachment of an amino acid to its tRNA molecule is an endergonic reaction. What is the source of energy that drives this reaction?

14. What is the role/job/function of the following during translation?

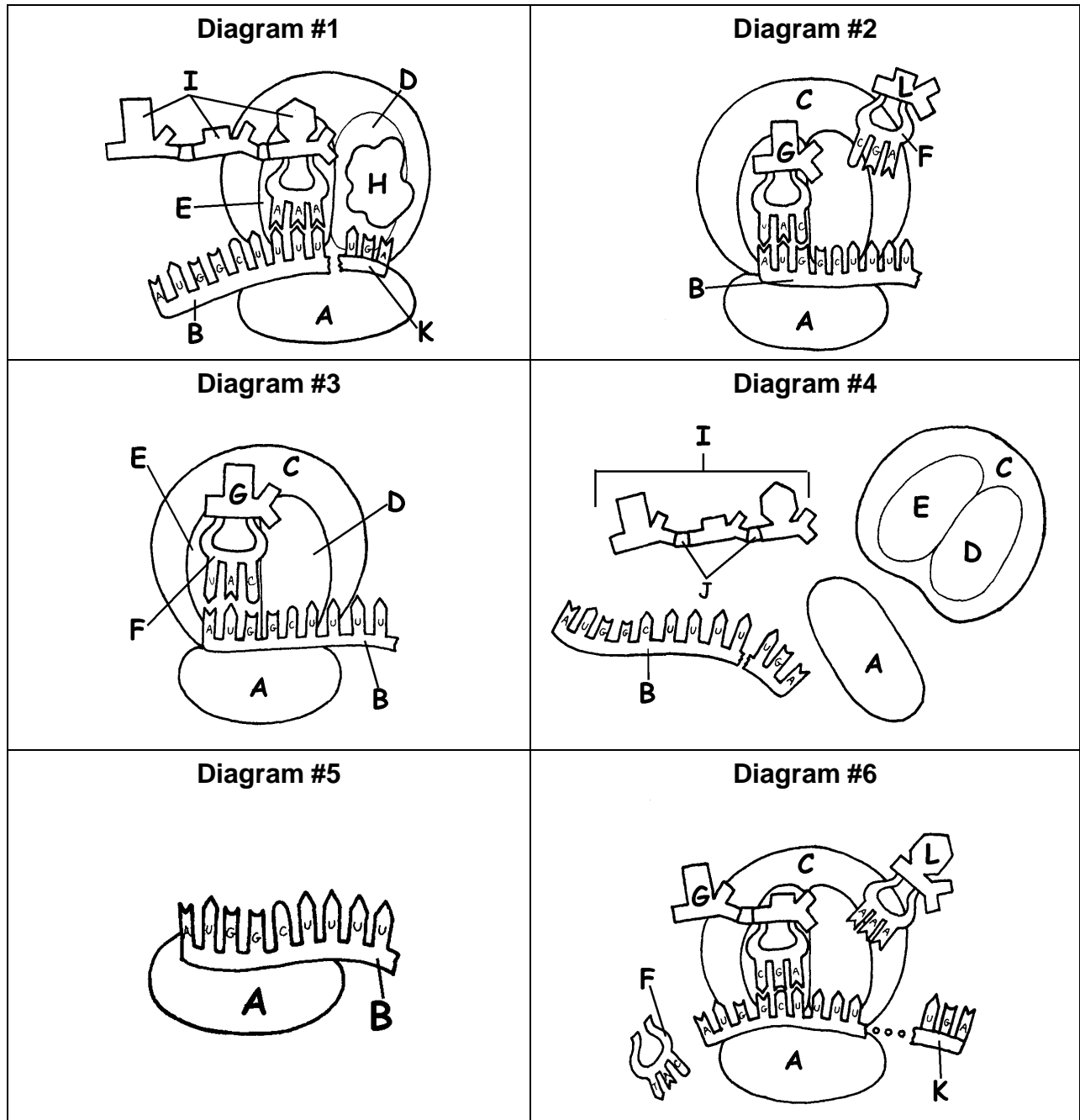
| Structure/Molecule | Role/Job/Function |
|----------------------|-------------------|
| Peptidyl transferase | |
| Release factor | |

15. Elongation and translocation require energy. What is the source of this energy?

16. What determines the primary structure of a protein?

Describe how a polypeptide can be modified before it becomes fully functional.

17. The series of diagrams below represent protein synthesis. Use these diagrams to answer the questions that follow.



- a. What is the correct order for the diagrams? _____

b. Which diagrams represent events that occur during:
Initiation? _____ Elongation? _____

Termination? _____

c. Match the molecule/structure with the correct letter from the diagrams.

_____ mRNA

_____ tRNA

_____ small ribosomal subunit

_____ large ribosomal subunit

_____ methionine

_____ amino acids

_____ peptide bond

_____ stop codon

_____ release factor

_____ A site

_____ P site

_____ Polypeptide

18. Identify the following as true of bound or free ribosomes.

_____ attached to outside of endoplasmic reticulum

_____ unattached, floating in cytosol

_____ generally make proteins destined for membrane inclusion or export

_____ generally make proteins for use within the cell

19. How are bound and free ribosomes similar?

20. What determines whether a ribosome will be free or bound?

21. Identify each of the following as true of prokaryotes or eukaryotes.

_____ lack nuclei

_____ cell compartmentalized

_____ transcription & translation segregated

_____ transcription not segregated from translation

_____ translation may begin before transcription is completed

_____ mRNA processed (modified) before translation

22. How are the ends of the mRNA modified during mRNA processing?

23. In general, what happens in RNA splicing?

24. Match the description or function with the correct structure or term

A. Base-pair deletion

B. Base-pair insertion

C. Base-pair substitution

D. Exons

E. Heterogenous nuclear RNA

F. Introns

G. Mutagens

H. Mutagenesis

I. Mutations

J. Ribozymes

K. SnRNPs

L. Spliceosome

_____ Precursor mRNA; original transcript

_____ Coding sequences in mRNA

_____ Noncoding sequences in mRNA

_____ Small nuclear ribonucleoproteins; participate in RNA splicing; complexes of proteins and small nuclear RNA

_____ Catalyzes RNA splicing; composed of pre-mRNA, SnRNPs, and proteins

_____ RNA molecules that act as enzymes

- _____ Permanent changes in DNA
- _____ Process that creates mutations
- _____ Agents that causes mutations
- _____ Type of mutation that involves the replacement of one base for another
- _____ Type of mutation that involves the insertion of one or more nucleotide pairs
- _____ Type of mutation that involves the removal of one or more nucleotide pairs
- _____ Frameshift mutations

25. A base-pair substitution can result in little or no change if it involves the 3rd base in a codon. Why?

26. Frameshift mutations can result in significant changes to the amino acid sequence in a polypeptide. Why?
