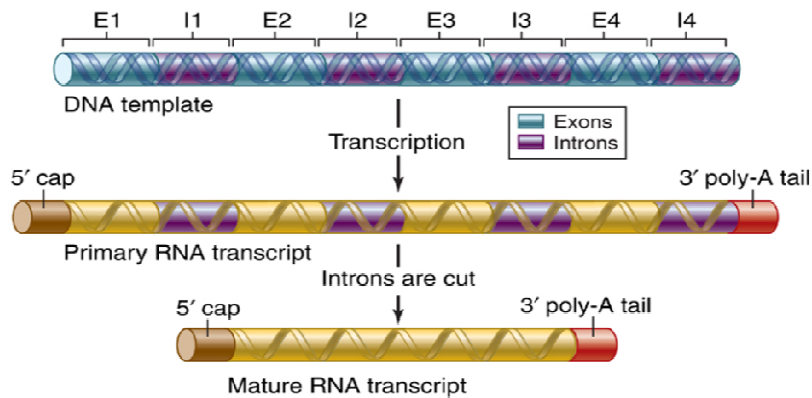


Chapter 15 – Genes and How They Work



1. What did the experiments of **Beadle** and **Tatum** show?

2. What was Beadle and Tatum's hypothesis regarding enzymes?

3. How has that hypothesis been modified?

4. Identify 3 genetic diseases that result in enzyme deficiency.

5. What is meant by the **central dogma of molecular biology**? How has the study of retroviruses affected this dogma?

6. What is a **codon**? _____

7. Of the 64 codons, 61 are used to specify _____. Three codons are used to _____

8. The codon AUG has a dual function. Explain.

9. Out of the work of a number of scientists, we have now determined that the *four* “letters” of the DNA “alphabet” translates to the *twenty* “letters” of the amino acid “alphabet”. Briefly explain how this works.

10. Explain the statement, "The genetic code is not quite universal."

11. Briefly describe the function of each of the following types of RNA.

a. **rRNA** _____

b. **mRNA** _____

c. **tRNA** _____

12. Give an overview of **transcription**.

13. Give an overview of **translation**.

14. The enzyme which transcribes the DNA is _____ .

The strand of DNA that is transcribed is called _____ .

The strand of DNA that is *not* transcribed is called _____ .

15. List the highlights of the three stages of **transcription**:

a. **Initiation** _____

b. **Elongation** _____

c. **Termination** _____

16. List the highlights of the three stages of **translation**:

a. **Initiation** _____

b. **Elongation** _____

c. **Termination** _____

17. Briefly describe the function of each of the following types of RNA.

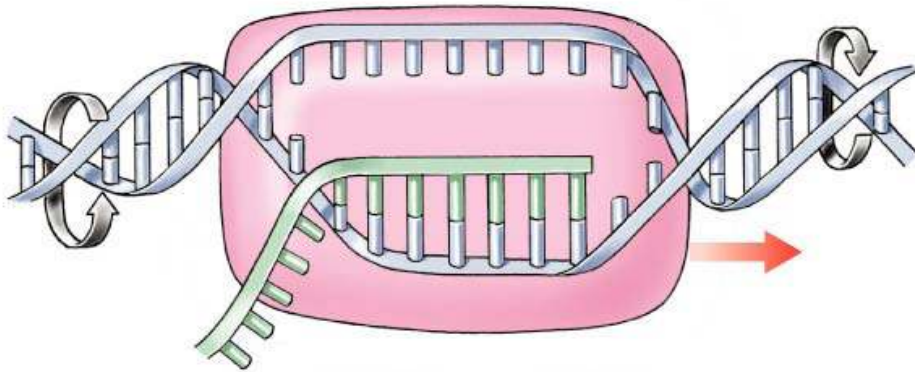
a. **snRNA** _____

b. **SRP RNA** _____

c. **miRNA (siRNA)** _____

18. Describe the significant differences between **transcription** in prokaryotes and eukaryotes.

19. Make notes on the following diagram to describe the model of a **transcription bubble**.



20. Describe what happens to the RNA transcript, in eukaryotes, before it leaves the nucleus.

21. What is the advantage of the **5' cap** and **3' poly-A tail**?

22. Distinguish between **exons** and **introns**.

23. The _____, a complex of _____, is responsible for the splicing, or removal, of introns.

24. Describe the mechanism for **pre-mRNA splicing**.

25. What does **alternative splicing** do for eukaryotic cells?

26. Identify the roles of the players of the translation process.

a. **Transfer RNA** _____

b. **Aminoacyl-tRNA synthetase** _____

c. **Ribosomes** _____

27. Why is tRNA considered a bifunctional molecule?

28. What is meant by the **tRNA charging reaction**?

29. The ribosome has 3 binding sites. Explain.

30. The ribosome has 2 functions. Explain.

31. In which 2 ways does prokaryotic translation initiation differ from eukaryotic translation initiation?

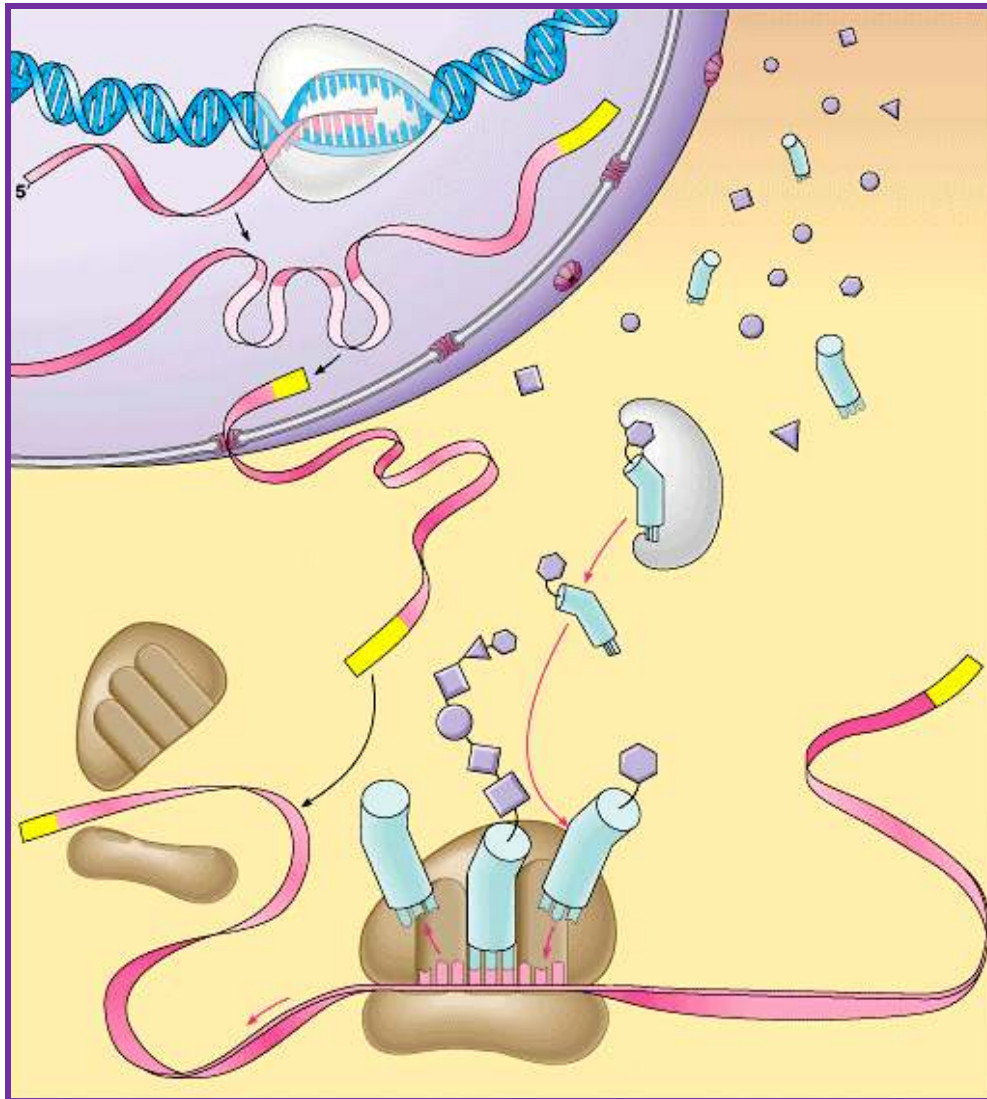
32. In the elongation step of translation, what is meant by **translocation** of the ribosome?

33. What is meant by **wobble pairing**?

34. Complete the following table.

Prokaryotic versus Eukaryotic Gene Expression		
Characteristic:	Prokaryotes	Eukaryotes
Introns		
Number of genes/mRNA		
Site of transcription and translation		
Initiation of translation		
Modification of mRNA after transcription		

35. Use the diagram to trace the flow of chemical information from a gene to its protein product. Label and explain.



36. What is a **point mutation**? _____

Discuss the following examples:

a. **Base substitution (missense) mutation** _____

Disease example: _____

b. **Nonsense mutation** _____

c. **Frameshift mutation** _____

d. **Triplet repeat expansion mutation** _____

Disease examples: _____

37. What is a **chromosomal mutation**? _____

Discuss the following examples:

a. **Deletion** _____

Disease example: _____

b. **Duplication** _____

c. **Inversion** _____

d. **Translocation** _____

Disease example: _____

38. Explain the following statement, "A simple definition of genes is difficult."
