Module 12: Gene Expression (DNA to Protein)

1. Describe the double helix. What forms the backbone? What forms the rungs?
2. Explain antiparallel orientation (5′ to 3′).
3. State Chargaff's Rules. If a DNA sample is 20% Adenine, what percent is Cytosine?
4. Diagram the flow: DNA → RNA → Protein.
5. Where does transcription occur? Where does translation occur?
6. What is the role of DNA polymerase? RNA polymerase? Ribosomes?
7. DNA replication is semi-conservative. Explain what this means.
8. Why is there a leading strand (continuous synthesis) and a lagging strand (Okazaki fragments)?
9. DNA template strand: 3′-TAC GGG AAA ACT-5′.
10. Transcribe to mRNA (5′→3′).
11. Translate to amino acids using a codon chart.
12. Explain the purpose of:
13. Introns vs. Exons
14. 5′ Cap and Poly-A Tail
15. Why might alternative splicing be advantageous?
16. The genetic code is nearly universal. How does this support common ancestry? How does it enable biotechnology (e.g., producing human insulin in bacteria)?