Practice Test 03 — Answer Key

Module 7: Genetics (DNA, RNA, Protein Synthesis)

Part A: Multiple Choice

1. **D** — Amino acids are the building blocks of proteins, not nucleotides.
2. **C** — A pairs with T in DNA.
3. **B** — Hydrogen bonds hold complementary bases together.
4. **B** — Each new molecule has one original (old) strand and one newly synthesized strand.
5. **C** — Helicase unwinds/unzips the double helix.
6. **B** — DNA → RNA → Protein is the Central Dogma.
7. **B** — Transcription produces an mRNA molecule.
8. **A** — Transcription occurs in the nucleus.
9. **D** — Uracil replaces Thymine in RNA.
10. **B** — DNA 3'-TAC GGA-5' → mRNA 5'-AUG CCU-3' (T→A, A→U, C→G, G→C).
11. **C** — Translation produces a polypeptide (protein).
12. **C** — Translation occurs at the ribosome.
13. **B** — A codon is a three-nucleotide sequence on mRNA.
14. **C** — tRNA brings the correct amino acid to the ribosome.
15. **C** — A silent mutation changes DNA but not the amino acid (due to code redundancy).
16. **C** — Frameshift mutations shift the entire reading frame, changing every codon after the mutation.

Part B: Fill in the Blank

1. **Deoxyribose**; **Ribose**
2. **DNA Polymerase**
3. **Nonsense**
4. **Transcription**
5. **Promoter**
6. **Amino acids**

Part C: Short Answer

1. **DNA vs RNA — Three Differences:**
    - DNA is double-stranded; RNA is single-stranded.
    - DNA contains deoxyribose sugar; RNA contains ribose sugar.
    - DNA uses thymine (T); RNA uses uracil (U).
2. **Roles in Protein Synthesis:**
    - **mRNA** (messenger RNA): Carries the genetic code from DNA in the nucleus to the ribosome in the cytoplasm.
    - **tRNA** (transfer RNA): Reads the mRNA codons and brings the matching amino acid to the ribosome.
    - **rRNA** (ribosomal RNA): Forms the structural and catalytic core of the ribosome where translation takes place.
3. **Sequence Conversion:**
    - DNA coding strand: ATG-CCC-GAT
    - mRNA (same as coding strand, with U): **AUG-CCC-GAU**
    - Amino acids: **Met (Start) — Pro — Asp**
4. **Frameshift vs Substitution:** A frameshift mutation (insertion or deletion) shifts the entire reading frame of the mRNA. Every codon after the mutation is changed, likely altering every amino acid in the resulting protein. A substitution only changes one codon and may even be silent. This is why frameshifts are usually more damaging.