Practice Test 05 — Answer Key

Module 9: Inheritance

Part A: Multiple Choice

1. **B** — An alternate form of a gene is an allele.
2. **B** — Two identical alleles (AA) = homozygous dominant.
3. **B** — The physical appearance (what you observe) is the phenotype.
4. **B** — Two different alleles (Aa) = heterozygous.
5. **C** — Tt × tt → 50% Tt (tall), 50% tt (short). Probability of short = 50%.
6. **A** — Aa × Aa → 1 AA : 2 Aa : 1 aa. Only 1/4 (aa) shows recessive phenotype.
7. **C** — Incomplete dominance produces an intermediate (blended) phenotype.
8. **B** — Blood type AB is codominance; both A and B antigens are expressed simultaneously.
9. **B** — Genes on the X chromosome produce sex-linked traits.
10. **B** — Males have only one X, so a single recessive allele on the X is expressed (no second X to mask it).
11. **C** — A pedigree tracks traits across generations in a family.
12. **B** — In a pedigree, filled-in circles = affected females; filled-in squares = affected males.
13. **B** — RW × RW → 1 RR (Red) : 2 RW (Pink) : 1 WW (White). This is the hallmark of incomplete dominance.
14. **C** — aa is homozygous recessive (two copies of the recessive allele).
15. **B** — Gregor Mendel is the "Father of Genetics" based on his pea plant experiments.
16. **C** — X^C X^c × X^C Y → Sons: 50% X^C Y (normal), 50% X^c Y (color blind). So 50% of sons will be color blind.

Part B: Fill in the Blank

1. **Pea** (Pisum sativum)
2. **Phenotype**; **Genotype**

3. **Recessive**
4. **Dihybrid**
5. **Polygenic**

Part C: Short Answer

1. **Punnett Square: Aa × Aa**

	A	**a**
A	AA	Aa
a	Aa	aa

   - **Genotypic ratio:** 1 AA : 2 Aa : 1 aa
   - **Phenotypic ratio:** 3 dominant : 1 recessive

2. **Incomplete Dominance vs. Codominance:**

   - **Incomplete dominance:** The heterozygous phenotype is a blend of the two homozygous phenotypes. Example: Red × White snapdragons → Pink offspring.
   - **Codominance:** Both alleles are fully expressed simultaneously in the heterozygote. Example: Blood type AB (I^A I^B) where both A and B antigens appear on the red blood cell surface.
   - Key difference: Incomplete dominance blends the phenotypes; codominance displays both phenotypes at the same time.

3. **Color Blindness Cross: X^c Y × X^C X^c**

	X^C	**X^c**
X^c	X^C X^c (carrier daughter)	X^c X^c (color blind daughter)
Y	X^C Y (normal son)	X^c Y (color blind son)

   - Probability of daughters being color blind: **50%** (1 out of 2 daughters)
   - Probability of sons being color blind: **50%** (1 out of 2 sons)

4. **Definitions:**

- **Allele:** An alternate form of a gene (e.g., T for tall, t for short).
- **Genotype:** The genetic makeup of an organism (e.g., Tt, AA, aa).
- **Phenotype:** The observable physical traits of an organism (e.g., tall, short, brown eyes).
- **Dominant:** The allele that is expressed in the heterozygote. Only one copy is needed to show the trait (e.g., T in Tt).
- **Recessive:** The allele that is masked in the heterozygote. Two copies are needed to show the trait (e.g., t in tt).