1. A rooster with gray plumage is mated with a hen with gray plumage several times and the phenotypes of their chicks are recorded.

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| **Phenotype** | **Number of Chicks** |
| Black | 13 |
| Gray | 33 |
| White | 14 |

1. What kind of inheritance pattern does plumage coloration follow? Justify your answer with a punnett square and explanation.
2. Hemophilia A is an X-linked, recessive disorder that prevents coagulation of blood when a wound is received. Individuals with this disorder can bleed to death even from minor cuts and scrapes if not given immediate medical attention. Neither Dean nor his wife, Elaine, has the bleeding disorder but they have already produced a son who died of hemophilia.
3. What is the probability that Dean and Elaine’s next child will have hemophilia?
4. Could this couple produce any daughters with hemophilia? Explain.
5. In carnations, crossing a true-breeding, red-flowered plant with a white-flowered plant produces an F1 generation that all have pink flowers. Crossing a true-breeding carnation that has normal leaves with another that is true-breeding for wrinkled leaves produced an F1 generation with 100% normal leaves. When two F1 generation offspring are crossed, 36 individuals with normal leaves and 12 individuals with wrinkled leaves are produced.
6. What inheritance pattern does flower color follow in carnations? Explain.
7. What inheritance pattern does leaf shape follow in carnations? Explain.
8. What are the phenotypic ratios of offspring for two plants that have pink flowers and are heterozygous for normal leaves?
9. Acondroplasia, a form of dwarfism, is an autosomal dominant genetic disorder. Individuals with the disorder have a normally proportioned head and torso, but the long bones in their legs fail to grow normally. This disorder is unique in that the homozygous dominant genotype is an embryonic lethal (this means that the baby never develops properly and ends in a miscarriage).
10. What is the chance that a heterozygous couple will produce a child with normal stature?
11. What is the chance that this same couple will produce a child with Achondroplasia?
12. Color pattern in a species of duck is determined by one gene with three alleles. Alleles Dp and DO are codominant, and allele d is recessive to both. How many phenotypes are possible in a flock of ducks that contains all the possible combinations of these three alleles?
13. Thomas Hunt Morgan is famous for his work investigating inheritance patterns of the *Drosophila* fruit fly. In Drosophila, eye color is a sex-linked trait while wing shape exhibits complete dominance.

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|  | **Eye Color** | **Wing Shape** |
| Dominant Allele | R = red eyes | vg+ = curved wings |
| Recessive Allele | r = white eyes | vg- = vestigial wings |

You perform a cross between a female fly (heterozygous for red eyes and for curved wings) and a male fly (white eyes and heterozygous for curved wings).

1. What is the probability of producing a male fly with white eyes and vestigial wings?
2. What is the probability of producing a female fly with red eyes and curved wings?
3. A black guinea pig crossed with an albino guinea pig produced 12 black F1 offspring. When the albino was crossed with a different black guinea pig, 7 blacks and 5 albinos were obtained.
4. What inheritance pattern is most likely being followed by guinea pig coat color? Support your answer with punnett squares and an explanation.
5. ABO blood type is controlled by multiple alleles and exhibits codominance for the AB blood type. Rh factor is another gene that contributes to blood type and determines whether your blood is “positive” or “negative”. This trait follows complete dominance in which individuals who are Rh- have inherited two recessive alleles. When a mother is Rh- and her baby is Rh+ during her second pregnancy, a syndrome called erythroblastosis fetalis can develop in which the mother’s Rh antibodies attack the baby’s blood and cause a hemolytic anemia. Unless the woman’s doctor catches this early the baby can die of internal hemorrhaging.

Eve knows that she has type A blood and is Rh-. She also knows that her father has type O blood. Eve’s husband, Mike, has type AB+ blood. Mike’s mother was Rh-.

1. List the potential blood types of this couple’s children.
2. Should Eve be concerned about erythroblastosis fetalis? Explain.