# Lab Manual and Workbook for Physical Anthropology Seventh Edition

**Answer Key**

**Note: Internet addresses change. Addresses given below were checked and found to be current when written for this 8th edition.**

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# Introduction to Science and Critical Thinking

## Exercise I.1

1. As it is stated:
   1. This argument is at the level of hypothesis, as it has not yet been tested.
   2. Any experiment that would first change the appearance of an organism and then produce offspring from that organism to see if those changes appear in the offspring would qualify as an experiment to test Lamarck’s hypothesis. One example might be to remove the tails of mice and then allow those mice to reproduce to see if the offspring have tails. Of course, as we know, the offspring would have tails, as they are controlled by genetics, and not by use, disuse, or removal.
   3. The dependent variables in the previous experiment would include starting with mice with tails and then removing the tails.
   4. The independent variable is the subject of the hypothesis, and in the previous experiment, would be the offspring of the mice with the tails removed.
2. Many different experimental designs are possible for this answer. One might include an experiment that tests which seed company sells seeds that grow the tallest plants (or plants with the most tomatoes, or the most resistant to disease, etc.). If we pick the seeds that grow the tallest plants:
   1. The hypothesis is that the seeds from Company A grow taller than those from Company B.
   2. The dependent variables include (but are not limited to):
      1. The seeds chosen
      2. Amount of water
      3. Amount of fertilizer (if any)
      4. Type of soil
      5. Amount of sunlight
      6. Temperature
   3. The independent variable is the height of the resulting plants.
3. Anecdotal evidence is not the same as scientific evidence. Anecdotal information is based on reports of individual events in which the variables are not controlled. To rise to the level of scientific evidence, the dependent variables must be controlled and the result repeatedly tested.

# Chapter 1 Cellular Genetics

## Exercise 1.1

1. If the following sequence of bases is found on one DNA strand:

A A C G T T C C G

T T G C A A G G C would be the other DNA sequence.

1. In Figure 1.8, the student should identify chromosome pairs 1 to 22 as autosomes, and X and Y (though there is no Y chromosome) as the sex chromosomes.
   1. This is a female, as there are two X chromosomes and no Y chromosomes.
   2. The abnormality is that there are three #21 chromosomes when there are two in a normal individual.
   3. This is trisomy 21 or “Down syndrome.”
2. Figure 1.9 is abnormal.
   1. This is a male, as there is one X and one Y chromosome.
   2. This sequence is abnormal in that there are three copies of chromosome #18.
   3. Trisomy 18 (also called Edwards syndrome) is referenced in many places on the Web, including: <https://ghr.nlm.nih.gov/condition/trisomy-18> The condition causes a small, abnormally shaped head, intellectual disabilities, heart and other organ abnormalities, and other severe problems. Many infants die within the first month of life.

## Exercise 1.2 Sources of Variability

1. If adenine is changed to thymine in the amino acid code CTA, the resulting amino acid would be CTT. As shown on page 23 of the Lab Manual, CTA codes for the amino acid aspartic acid. The change to CTT would code for glutamic acid.
2. If a point mutation occurred so that the second thymine was changed to cytosine in TTT (which codes for lysine):
   1. If it was changed to TCT, the result is arginine.
3. If the base sequence of the 10 alleles is:

CAG GGC GGG GTC CCT CTC CAG GAG CAT TGC

The complementary DNA code is:

GTC CCG CCC CAG GGA GAG GTC CTC GTA ACG

The complementary mRNA code for the original sequence is:

GUC CCG CCC CAG GGA GAG GUC CUC GUA ACG

The tRNA code for the sequence is:

CAG GGC GGG GUC CCU CUC CAG GAG CAU UGC

4.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **DNA** | **Comp. DNA** | **mRNA Code** | **tRNA Code** | **Amino Acid** |
| CAG | GTC | GUC | CAG | Valine |
| GGC | CCG | CCG | GGC | Proline |
| GGG | CCC | CCC | GGG | Proline |
| GTC | CAG | CAG | GUC | Glutamine |
| CCT | GGA | GGA | CCU | Glycine |
| CTC | GAG | GAG | CUC | Glutamic acid |
| CAG | GTC | GUC | CAG | Valine |
| GAG | CTC | CUC | GAG | Leucine |
| CAT | GTA | GUA | CAU | Valine |
| TGC | ACG | ACG | UGC | Threonine |

## Exercise 1.3 DNA Typing

1. The unknown sample matches the samples taken from the injured woman (S1) in each locus.
2. In this sample, each locus within the DNA sample matched the former husband (S2) and in no locus did it match the woman (S1).
3. In the third sample (Figure 1.20), the DNA matches neither the woman (S1) nor the former husband (S2), so it must have come from a third person.
4. The DNA tests from the different locations show that the blood came from three different individuals. The first sample was taken from a gate, and came from the woman. The stain on the floor of the former husband’s home came from the former husband, and the knife had blood from a third person. From this evidence alone, the former husband cannot be implicated in the injury to the woman, and the knife seems unlikely to be related to this incident (strictly on the basis of this DNA evidence).
5. Mitochondrial DNA was used to identify the remains of the czar’s family. Mitochondrial DNA is in the mitochondria of cells of the body (except red blood cells), and, because it is not part of the nucleus, it is passed from generation to generation in the female line. The males and females of the line will contain the same mitochondrial DNA (barring mutations). Because Czarina Alexandria (the wife of the czar) shared a common female ancestor with England’s Prince Philip, her mitochondrial DNA would be the same as Prince Philip, and all of Czarina Alexandria’s children would share that DNA as well.
6. Mitochondrial DNA will not distinguish between the daughters of the czar because they would all share the same mitochondrial DNA. If someone had been able to identify nuclear DNA from a reliable source associated with each daughter and if nuclear DNA could still be obtained from the remains, a match might be possible, but no such source was identified. The daughters were presumptively identified by age, stature, and other means.