

**Activity 1.3.4 From DNA to Genes****Purpose**

As you have learned in previous activities, DNA is comprised of nitrogenous base pairs. These base pairs signal how an organism looks, acts, and functions to a degree.

The complete set of an organism's DNA is referred to as a genome. Many genomes are further segmented into chromosomes that contain genes. Genes are the basic units of heredity that you studied in previous courses. Genes in turn contain instructions for making proteins that perform many life functions and make up many cellular structures. Organisms have varying amounts of DNA. See Table 1 for a list of common species and their genome size.

**Table 1. Common Species' Genomes**

Species	Genome Size, Mb**
Bread wheat* ( <i>Triticum aestivum</i> )	17,100
Human ( <i>Homo sapien</i> )	3,000
Mouse ( <i>Mus musculus</i> )	2,900
Swine* ( <i>Sus scrofa</i> )	2,700
Maize ( <i>Zea mays</i> )	2,300
Chicken ( <i>Gallus gallus</i> )	1,200
Tomato* ( <i>Solanum lycopersicum</i> )	1,000
Potato ( <i>Solanum tuberosum</i> )	840
Grape ( <i>Vitus spp.</i> )	490
Strawberry ( <i>Fragaria spp.</i> )	240
Fruit fly ( <i>Drosophila melanogaster</i> )	165
Yeast ( <i>Saccharomyces cerevisiae</i> )	12
Bacteria ( <i>Escherica coli</i> )	4.6
*Genome not completed, estimation only. **Mb (megabase) = 1,000,000 base pairs	

The entire genome is contained in nearly every cell in the body. The base pairs in the human genome are divided into 24 chromosomes that carry an estimated 30,000 genes among them. The average gene consists of 3,000 base pairs, but can vary greatly. The largest known human gene is 2.4 million bases. Not all base pairs code for genes. A large portion of DNA is noncoding and appears to have no direct function. Can you find coded genes among the base pairs?

**Materials****Per student:**

- 3 highlighters, different colors
- Pen
- *Agriscience Notebook*

## Procedure

You will determine how DNA instructs an organism how to look and act. Use your knowledge of the structure of DNA to predict the visual characteristics of a fictitious organism.

### Part One – Decoding DNA

- Use the information in Table 2 to develop a key to indicate what each color highlighter codes for.

**Table 2. Genes**

Feature	Stalk	Leaf	Flower
Expression	Blue	Square	Green
DNA code	agccgctgaa	ttatccacta	atctccacct
Color Key			

- Use the information on the DNA segment provided to identify specific genes. When you locate a gene, use the corresponding color to designate the gene.

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gatcctccat atacaacggt atctccacct caggttaga tctcaacaac ggaaccattg
ccgacatgag acagttaggt atcgtcgaga gttacaagct aaaacgagca gtagtcagct
ctgcatctga agccgctgaa gttctactaa gggtgataa catcatccgt gcaagaccaa
gaaccgcaa tagacaacat atgtaacata ttaggatat acctcgaaaa taataaacg
ccacactgtc attattataa ttagaaacag aacgcaaaaa ttatccacta tataattcaa
  
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**Figure 1. DNA Segment (300bp)**

### Part Two – Recoding Organisms

Write the genetic sequence for each gene in order for our organism to exhibit an alternative physical trait.

**Table 3. Alternative Traits**

Feature	Stalk	Leaf	Flower
Expression	Orange	Oval	Grey
Difference	<i>gccg</i> must be <i>tgga</i>	<i>tcca</i> must be <i>gttc</i>	<i>acct</i> must be <i>tgga</i>
Sequence	<u>atggactgaa</u>	<u>ttagttccta</u>	<u>atctcctgga</u>

## Conclusion

- How can you identify specific genes in the DNA sequence?  
Looked at the sequence of the letters
- Why is understanding where genes are located within the DNA sequence important?  
So you know where to find the DNA sequence
- When might the DNA sequence of an organism be of interest to a scientist?  
So they know segments of the DNA when altering with DNA