Sample pages Apologia Health and Nutrition

EXPLORING CREATION WITH HEALTH AND NUTRITION

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Earth will come to an end and you will go on to your eternal reward. Until then, pursuing health is good stewardship of the life you have been given.

God has designed you to have enough energy and strength for tasks He gives you. You can direct your appetites, deal with stress, and defeat most infections with the natural package you live in. Within just a few years, you will be solely responsible for big decisions about how to stay healthy as long as possible. The choice will be yours.

Some young adults decide just to let life happen. It's as if they think they are from some other planet where people only need 4 hours of sleep each night and can sit comfortably in the same place all day. They think junk food doesn't make them tired, social media brings them all the friends they will ever need, entertaining themselves is the most important thing they do, and whatever feels good at the time is the best choice. Falling into these bad habits usually results in regret. Ideally, you can have both feet planted firmly in reality and avoid many of the errors of those around you. Pursuing good health and nutrition is simply doing the best you can with what you've got! A good place to start is to know yourself better. First, we will examine your *nature*, those inherited characteristics that you carry. We'll save *nurture* and its effects on you for later.

GENETICS

Imagine some older relative approaches you at a family reunion, lifts an eyebrow, and says, "Do you know how much you look like your Uncle Ernie?"

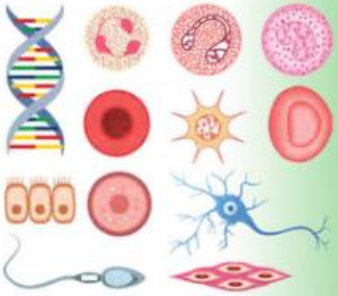
Uncle Ernie? You know Uncle Ernie died before you were born. You had no idea you looked like him. You pick up a faded black-and-white photo of Ernie. Perhaps it is the way his eyes squinted when he smiled or the way his hair stood up. You probably don't see much resemblance between yourself and Uncle Ernie, but your relatives do. That's genetics. You are unique to the world, but you carry the genetic predispositions and appearance of your ancestors. These inherited characteristics are called traits. Genetics is the study of these traits, carried on chromosomes (tiny structures full of information), which are passed from generation to generation.

Chromosomes

Your body is made up of trillions of microscopic, basic building blocks of life called cells. Almost every cell contains a nucleus, a central area enclosed by a membrane. Inside this nucleus are 46 chromosomes, which are long, fragile strands of deoxyribonucleic acid (DNA) covered with protective coating. Forty-six chromosomes are found in every nucleus in almost every cell in your body! If all of the DNA strands in a single cell were placed end to end, the DNA would be about 2 yards long.

Figure 1.3 shows various human cells. Notice that each one has a nucleus, a central dark area, where the DNA is stored. In the upper left corner is a drawing of a section of DNA.

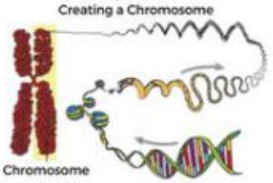
Figure 1.3
DNA and the Human Cell Nucleus



DNA (top left) is stored in the nucleus, the central dark area in each of these human cells.

When you examine cells under the microscope, you don't often see chromosomes because most of the time they are unwound and spread out thinly in the nucleus. During cell division, though, as 1 cell splits into 2, the chromosomes become tightly wound (figure 1.4) and form structures that are visible under the microscope. The word *chromosome* means "colored body."

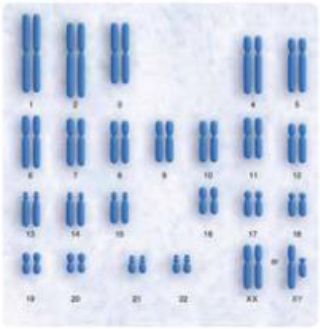
Figure 1.4
Creating a Chromosome



A long DNA strand twists up to form a visible chromosome.

Once chromosomes have become visible, a photo can be taken of the cell nucleus that contains them. The photo can be printed, and a technician can cut up the photo and arrange the chromosomes by size and shape for closer study. Figure 1.5 is a drawing of such a study.

Figure 1.5
Human Chromosomes Arranged by Size and Shape



Right away, it's clear that the 46 chromosomes match up into 23 homologous (ho-moll'-luh-gus) pairs—chromosomes that look similar but have subtle differences—because one chromosome in each pair comes from the person's mother and the other comes from the father.

Let's go back to the beginning. Each person's life begins as a single cell that forms at conception, when the father's sperm unites with the mother's egg. Most cells in the human body have *23 pairs* of chromosomes; but reproductive cells—sperm and eggs—divide their pairs and have only *23 single* chromosomes each. Whether the person gets the right or left chromosome of each pair from each parent is random.

Figure 1.5 shows that the chromosomes that would be pair 23 do not always fit the pattern of similarity. The 23rd pair determines the gender of the individual. A female has XX for the 23rd pair. A male has XY.

Because males have an X and a Y, the sperm cells they form contain 22 regular chromosomes and either an X or a Y chromosome. The egg cell of the mother contains the 22 regular chromosomes and always contains an X. If the sperm carries an X, the conceived child will have XX and be a girl. If the sperm carries a Y, the child will be male with XY for his 23rd chromosome pair.

Because the chromosomes come in pairs, each cell contains 2 copies of human genetics. The copies are slightly different from each other, often resulting in 2 versions of human traits.

No one else shares your exact genetic combination. Identical twins begin with exactly the same chromosomes, but studies have found that these twins have subtle genetic differences. Your sisters and brothers will receive a different assortment of chromosomes from your parents than you did. For example, perhaps you have your mother's right chromosome in pairs 5, 6, and 7, and your brother has her left

chromosomes in those pairs. With different siblings getting right or left chromosomes, you can see how genetically diverse even one family can be!

The single cell that was you at your very beginning divided again and again until it formed your body, now made up of around 60 *trillion* cells. Before each cell divided, the DNA had to be copied so that both new cells could each have all 46 chromosomes.

DNA Structure

The DNA is shaped like a twisted train track, as seen in figure 1.4. This shape is called a double helix. The outside strands are made of a special sugar (deoxyribose) joined together by phosphates. Between the sugar strands are crossbars, like railroad ties, of 2 joined nucleobases. A single nucleobase, with the section of sugar track it is attached to, is called a nucleotide.

Only 4 nucleobases are used in DNA, which means that genetic information is passed in a language—a code—that has only 4 letters to choose from! This might seem too simple, but don't be fooled. It's more complicated than it looks at first. Everything depends upon the order of the nucleobases and where the first letter for that information starts on the chromosomes.

Let's look at some analogies. In English, even though the words *face* and *cafe* have the same letters, the order of the letters makes the words very different. In DNA, if the nucleobases are switched from the original order, the resulting code may contain an error.

Also, you know where to start a thought in English because punctuation and word spacing provide clues. If you looked at a squeezed-together sequence of words like *initiateinfractionrightaway*, you might see *action right away* and miss *infraction*. If a DNA code is read starting at the wrong place, essential parts of it might be missing.

The code includes the recipes for attaching amino acids together to make proteins that are essential throughout life. However, most of the length of the code is for control of the cellular processes. For example, switches must be built to start protein manufacture and later turn off the systems when the needs are met. Sophisticated controls begin cell division or change the function of the cell as it ages.

The Human Genome

The genome is the sequence of the 3.1 billion nucleobases in human DNA, which scientists painstakingly read and recorded in a colossal undertaking called the Human Genome Project, completed in 2003. Figure 1.6 shows a bookcase that contains the first printed copy of the human genome. It fills more than a hundred books, each a thousand pages long, in type so small as to be barely legible.

We've recorded the 3.1 billion letters of the genome, but that doesn't mean we understand it! The complexity and intricacy of this language will take years to decipher, if it ever *is* deciphered fully.

The genome is the typical order of nucleobases on one of each of the homologous pairs of chromosomes. That means that the genome letters are not exactly a list of *your* nucleobases on *your* DNA, but the genome comes close to what any person has, since most people carry 99.9% of the same code. This, of course, makes sense given our common origin from the Garden of Eden. Scientists hope that what we learn from the genome will help treat diseases.

"On Your Own" questions are scattered through each module. You should be able to answer the questions by the

Figure 1.6
Human Genome in Print

One shelf won't do! The human genome in print fills more than 100 thousand-page books.

Inside the student notebook

On Your Own

1.1 How many copies of genome-length DNA would be in a nucleus in a typical human cell?

1.2 Which attribute do all these relatives have in common? Aunt Dorothy knits sweaters. Uncle Chester is a dentist. Cousin Charlie builds models. Aunt Martha decorates cakes at a bakery. Uncle Pete repairs sewing machines.

1.3 Why might thin lips and small eyes not show up in every generation?

1.4 Identical twins share nearly identical inherited characteristics. How could you come to valid conclusions about nature and nurture by studying groups of identical twins?

William and Andrew are identical twins. Or is it Andrew and William?

Project 1.1: Nature Versus Nurture

Some famous families have striking natural abilities. Karl Wallenda was born into a family of German circus tightrope walkers. He began performing on the tightrope at age 6. He and his family performed daring stunts all over Europe. In 1928, they came to the United States to perform in New York, but the safety net they used was lost in the journey. They performed anyway, without a net, and the crowd was awestruck. Wallenda's children and grandchildren, and later their spouses, joined Ringling Bros. and Barnum & Bailey Circus. They became known as The Flying Wallendas and continued to work without a net. Unfortunately, many family members died or were injured in falls in their daring performances through the years. Karl Wallenda seemed immortal until he died from a fall at age 71. His great-grandson, Nik, continued the family legacy and became the first aerialist to cross the widest part of Niagara Falls on a tightrope in 2012 and the Grand Canyon in 2013.

Nik Wallenda Crossing Niagara Falls, Karl Wallenda

Nik Wallenda is Karl Wallenda's great-grandson. The State of New York insisted upon the safety cable behind him.

You could argue that there was some nature but lots of nurture in the Wallenda family circus act. After all, what family do you know who has their 6-year-old walking a high rope in the back yard? Certainly, the opportunity to learn the family trade from the best in the business and to perform at an early age contributed to the Wallenda family's success. Yet the Wallendas have undeniable natural gifts in physical balance and emotional daring.

This is a research project.

1. Investigate one of the following families.
   - Music: Johann Sebastian Bach and his father, uncles, and sons
   - Music: Brothers Ira and George Gershwin
   - Vocal talent: Nat King Cole and daughter Natalie Cole
   - Football: Archie Manning and his sons, Peyton, Eli, and Cooper
   - Baseball: Brothers Matty, Felipe, and Jesús Alou, and Felipe's son, Moisés
   - Medicine: William Worrall Mayo and his sons, who founded the Mayo Clinic
   - Writing: Sisters Anne, Emily, and Charlotte Brontë
   - Writing: Screenplay writers Carl Reiner and son Rob Reiner
   - Acting: Tony Curtis and daughters Jamie Lee Curtis and Kelly Curtis
   - Acting: Kirk Douglas and sons and grandson
   - Acting: Henry Fonda and children Peter and Jane Fonda
   - Car racing: Brothers Jerry, Bobby, and Al Unser, and Al's son Al
   - Other: Another famous family of interest to you, or a family among your friends and acquaintances with an unusual natural ability

Project 1.3: Building on Temperament Strengths & Weaknesses

1. Review your temperaments test page once more. Using your textbook's figure 1.9 as a word bank for your dominant temperament, list 5 strengths and 5 weaknesses you see in yourself.

My Strengths	My Weaknesses

2. Look at figure 1.9 again. This time list 2 strengths and 2 weaknesses from your *secondary* temperament.

My Secondary Strengths	My Secondary Weaknesses

3. For this part of the self-analysis, look at the 4 temperaments in figure 1.9, and then choose 8 strengths that you do not see in yourself but would like to develop. The strengths can be from any temperament. Would you like to be calm under pressure? Would you like to be more excellent in your work?

4. List those 8 strengths in the appropriate column. In the second column list 8 people you know with those particular strengths. In the third column come up with an action step you could take in your life to develop each characteristic. In the last column record the date you accomplish the action step below.

For instance, if you are sanguine with a tendency to waste money, the phlegmatic person's thrift might help you. Or maybe you lack confidence in front of people. You might write something like this:

Strength	Person	Action Step	Date
Thrift	my friend Joe	ask how he got such a good deal on that laptop	
confidence	Aunt Barb	ask what she thinks about when she does public speaking	
Thoroughness	my brother	go through my math problems twice like he does	
Spontaneity	youth pastor	keep Sunday evenings free so I can get together with others from my church for fun	

Project 1.4: My Natural Preferences

As you read through your textbook, record your natural preferences here.

My Laterality

Dominant hand (circle one): right or left

Dominant foot (circle one): right or left

Dominant eye (circle one): right or left

If not all the same, I am cross-dominant, with opposite laterality in my _____.

My Circadian Rhythm

I am a (morning or night) person.

I usually get about _____ hours of sleep each night.

The most difficult part of the day for me is _____.

I deal with this part of the day by _____

My Food Preferences

Breakfast: _____

Lunch: _____

Snack: _____

Dinner: _____

How I Relax

_____

_____

My Average Daily Minutes of Challenging Physical Activity

_____ minutes

_____