Mutations—1

[1] Mutations

[2] To understand what mutations are, how they happen, and why they are important, we need to know about two kinds of cell division that happen inside of living organisms. / One kind of cell division is called mitosis--a highly complex process that happens all the time / as your body continually makes new cells for routine growth and repair. / The other kind is called meiosis, which happens during the process of reproduction. / Meiosis forms sperm and egg cells, which enable an organism to reproduce offspring.

[3] Just before mitosis, a cell—called the parent cell—makes a copy of each of the chromosomes in its nucleus. Then during mitosis, the identical sets of chromosomes separate into two cells—called daughter cells. These daughter cells are genetically identical to each other and to the parent cell. (When recording: stop while picture still looks like two cells)

[4] (When recording—don’t pause in the middle; keep moving)

Before meiosis, a cell also makes a copy of each of the chromosomes in its nucleus. During this process, sections of DNA can be exchanged between chromosomes. No new genetic information is added; it is just reorganized. At the end of this process, the cell has twice as much genetic material as it had before. Then the cell goes through two different divisions. In the first division, one cell becomes two, dividing the recently doubled chromosomes between two new cells. Each cell now has the same number of chromosomes as the original parent cell, but the genetic information has been rearranged. The second division is similar to mitosis because it divides the genetic material equally between two new cells. During this process, the two cells that resulted from the first division become four genetically unique cells with only half the genetic information as the parent cell.

[5] That’s the whole point of meiosis--to create egg and sperm cells that carry only half the genetic information of the original cell.

[6] Then when an egg joins with a sperm from another organism / (or a sperm joins with an egg from another organism), / the egg and sperm join together to give the new offspring a complete set of chromosomes.

[7] Sometimes mistakes happen during the process of cell division. / This can result in changes to an organism’s DNA. / These mistakes are called mutations.

[8] The kinds of mistakes that can happen during cell division are a little like typographical errors that you might make when you type. / For example, if you try to type the word pancake, but instead of typing a “c” you type a “v,” you have made a substitution error. Instead of the letter you meant to type, you typed a different letter in its place. / A deletion happens when you leave out a letter—like the “c” that is missing from pancake. / An insertion happens when you add in an extra letter—like this extra “a”

[9] These same three kinds of mistakes can happen to the nucleotide bases on the DNA ladder / and even to whole genes during cell division. / Sometimes genetic material is replaced, / sometimes it is left out, / and sometimes extra genetic material is inserted. We’ll learn more about how this happens in our next presentation.

[10] Mutations can be caused by things like cigarettes, alcohol, some drugs, too much exposure to the sun, environmental pollutants, and x-rays.

[11] Just like your computer has spell check to help you catch your mistakes, your cells have a proofreading mechanism called DNA polymerase that helps find and fix mutations. Although it finds and fixes many mistakes, some mutations still occur.

[12] A mutation may have no effect

[13] only a minor effect

[14] or a major effect depending on what type of mutation it is and where the change occurs.

[15] Whether or not a mutation is passed on to an organism’s offspring depends on whether it happens during mitosis or meiosis. / Since mitosis just makes new cells for routine growth and repair, mistakes that happen during this process would not be passed on to the next generation. / *But*, since meiosis is part of the process of reproduction, mistakes that happen during this process *would* be passed on to the next generation.

[16] To learn more about how mutations happen, / watch our next presentation.