

## *Exploring Creation with Biology, 3<sup>rd</sup> Edition – Errata File*

This file contains the corrections for the 5<sup>th</sup> Printing: October 2021, of the **Textbook**. The printing for the Textbook may not be the same as for the Solutions and Tests Manual and Student Notebook. Corrections for the Solutions and Tests Manual and Student Notebook are in separate files. (Updated 2024).

### Clarifications:

Page 10 – The answer to On Your Own question #1.1 can be found in the section “The Limitations of Science” following the questions.

Page 69 – in the paragraph following the definition of Amino acids, revise the first sentence to the following:

“There are about 20 different amino acids in the proteins that make up life. The shape and function of a protein are determined by the type, number, and order of amino acids linked together.”

Page 78 – Figure 2.36 was enhanced with labels and arrows to Phosphate group and Deoxyribose sugar. See the revised figure on the page at the end of this file.

Page 192 – Add the following clarification after the first full sentence:

“...so it doesn’t require energy. **Remember, this is called facilitated diffusion, a form of passive transport.** As ATP synthase rotates...”

Page 233 – labels were added to the graphic as shown on the page at the end of this file.

Page 268 – Insert the following clarification between the 3<sup>rd</sup> and 4<sup>th</sup> sentences of the first full paragraph as follows:

“is dominant or recessive). **A shaded circle or square indicates the individual shows the genetic trait being studied.** Look at Figure 7.11...”

Page 298 – at the top of the page ‘This’ refers to ‘**Complementary base pairing...**’

Page 300 – at the end of the explanation to the OYO 7.5 answer, add the following:

“This is a 1:1 (or 2:2) ratio, 1 purple-flower pea plant (*Ff*) for every 1 white-flower pea plant (*ff*) produced.”

Page 358 – In Table 9.1, two lines were edited for clarity. (same edit for page 667)

1. Change the first line of #9 to: Does it have protective external plates (**exoskeleton**)? Phylum Arthropoda.
2. Change the 2<sup>nd</sup> line of #14 to: Does it have three pairs of **legs on the thorax**? Class Insecta.

Page 441 – In the 3<sup>rd</sup> paragraph, 1<sup>st</sup> sentence, add the word ‘gametophyte’ after ...into a new plant...” so the sentence reads:

Remember that, like spores of fungi, haploid spores of plants can develop into a new plant **gametophyte** without fusing with another spore.

Page 565 – Change the 2<sup>nd</sup> bullet point to: “Two body segments: a cephalothorax (fused head and thorax) and abdomen.”

Page 649 – In the last sentence, change ‘individual’ to ‘**female.**’

### Corrections:

Page 66 – In the definition of Hydrophobic, change the word Latin to **Greek**.

Page 234 – In Infographic 6.1 in the circle at the top of page, change note beneath the green Interphase bar to \*DNA replicates during **S** phase.

Page 273 – In the Experiment step 5, the sample pedigree for earlobes can be found in Book Extras for this module, not in the Solutions Manual.

Page 284 – In the second paragraph, change misspelled word and pronunciation of pleiotrophy to **pleiotropy** (ply ´ah truh pee). [make the same spelling edit to page 706 in the index.]

Page 437 – Study Guide question 15. Change microscopic to **macroscopic (multicellular)**.

Page 569 – OYO question #14.10: change poison to venom (two times) and poisonous to venomous so the sentence reads:

“Most spiders have **venom** glands and produce **venom** that they inject into their prey. Does that mean that we must fear most spiders because they are **venomous**?”

Page 574 – In Figure 14.26 the last two photos were replaced as shown on the page at the end of this file.

Page 583 – make the same changes to **venom** and **venomous** in the answer to OYO 14.10.

## Nucleic Acids

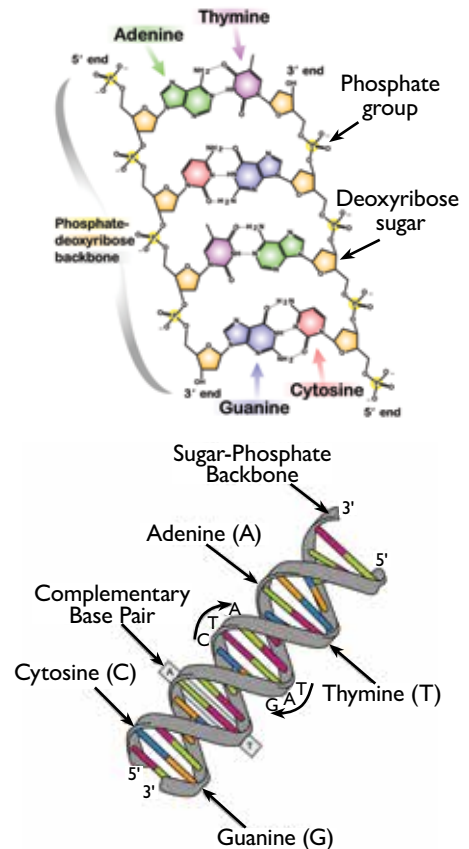
Our discussion of the chemistry of life would not be complete, of course, without a brief description of DNA, the molecule that forms the basis of life. If you thought proteins were complex, you haven't seen anything until you have studied DNA! DNA is one of two macromolecules in the category of nucleic acids. RNA is the second important nucleic acid, and you'll learn more about both in Module 6, but for now this will be an overview. Nucleic acids contain carbon, hydrogen, oxygen, nitrogen, and phosphorus. Just like polysaccharides are composed of many monosaccharides, nucleic acids have building block molecules they're composed of. The building blocks of DNA and RNA are called **nucleotides** (noo' klee uh tides). Let's focus on DNA by studying Figure 2.36.

### Nucleotides—The building blocks of DNA and RNA

DNA stands for deoxyribonucleic (dee' ox ee rye boh noo klay' ik) acid. It is a double chain of chemical units known as nucleotides. These two chains twist around one another in the double helix that is so familiar to most people who have studied any amount of biology. The nucleotides that make up these two chains are composed of three basic constituents: **deoxyribose** (a simple sugar that contains five carbons), a **phosphate group** (an arrangement of phosphorus, hydrogen, and oxygen atoms), and a **nitrogenous base**. A nucleotide's base can be one of four different types: **adenine** (ad' uh neen), **thymine** (thye' meen), **guanine** (gwah' neen), or **cytosine** (sy'e' toh seen).

In the top diagram of Figure 2.36, you can see that the phosphate groups link to the deoxyribose units, which support the bases. The two nucleotide chains are partially held together because the bases link together by hydrogen bonding in the same way water molecules form hydrogen bonds. (See the Chemical Bonds section in this module if you need to review this concept.) It is important to note that the attraction between the atoms in hydrogen bonding is about one-tenth as strong as the attraction between two atoms that have a true chemical bond (ionic or covalent) linking them. Notice that I said the weak hydrogen bonding is only partly responsible for holding the two nucleotide chains together. Recent research suggests that the fact that DNA nucleotides are hydrophobic and exist in the watery environment of the cell also plays a role in how the double helix maintains its shape. That is, until the cell needs it to separate. You'll learn more about that in Module 6.

Hydrogen bonding is important in DNA for another reason. Because hydrogen bonds are dependent on the molecules involved, only certain nucleotide bases can link together using hydrogen bonds. The nucleotide base adenine can only hydrogen bond to thymine. It cannot hydrogen bond to cytosine or guanine. In the same way, thymine can only hydrogen



**FIGURE 2.36**  
Schematic Representations  
of DNA

remember this because synthesis means to make something and that's just what happens in DNA replication—two DNA molecules are synthesized from one. The cell then enters the second gap phase or  $G_2$ . Most scientists agree that the cell's organelles are duplicated at this phase so the dividing cell has enough organelles for two cells. Now that the DNA, the centrioles, and all other organelles are duplicated, the cell is ready to begin mitosis. At this point, the cell is called a **parent cell** and at the end of mitosis there will be two **daughter cells** with identical genetic information.

You may have noticed the  $G_0$  stage on Figure 6.17. This phase is a duration in the cell cycle that some cells enter after mitosis. This is a non-dividing phase and is sometimes referred to as a rest phase. Some cells will never enter the  $G_0$  phase and others will enter back into the  $G_1$  phase after a period of time in the  $G_0$  phase. Still other cells, like heart muscle cells and nerve cells, stay in the  $G_0$  phase after they reach maturity. Once these types of cells are mature, they don't divide anymore. In other words, these cells never enter the cell cycle again but they continue to function as designed for the life of the organism. If you're wondering about the checkpoints on Figure 6.17, we'll talk about those at the end of the mitosis section.

### Mitosis

So, to summarize, the cell cycle is divided into two phases: interphase and the mitotic phase. The mitotic phase of the cell cycle is when the cell actually divides. Mitosis and **cytokinesis** both occur during the mitotic phase.

**Cytokinesis**—The process, usually following mitosis or meiosis, in which the cytoplasm of a cell is divided in two

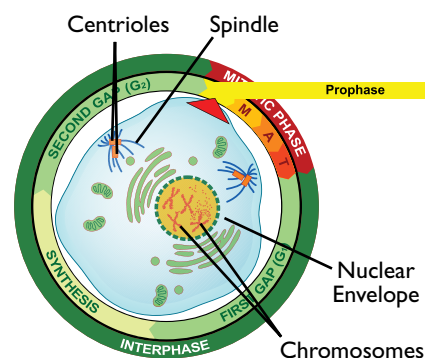
Mitosis is the process where the genetic material and the nucleus divides. Cytokinesis is the process where the cytoplasm divides, forming two daughter cells. The mitotic phase is divided into four main stages that happen continuously but have specific things that occur in each stage. The stages are **prophase** (P), **metaphase** (M), **anaphase** (A), and **telophase** (T), followed by cytokinesis.

You can remember the stages of mitosis using the acronym PMAT. Infographic 6.1 shows you the stages of mitosis; follow along with it as you read the next paragraphs.

### Prophase

The first stage of mitosis is called prophase. In prophase, several things happen. The duplicated chromosomes coil into their condensed form, and they attach to each other at the centromere. It's during prophase that the chromosomes are condensed enough to be seen with a microscope and take on the familiar X shape. Most of the time (interphase), chromosomes are uncoiled chromatin and aren't visible.

Also during prophase, each set of centrosomes migrates toward one end of the cell. Remember from Module 4 that centrosomes contain the centrioles that organize the centrosomes and help with cell division. Microtubules extend from the centrosomes in all directions, forming the **aster**. As the centrosomes migrate, microtubules from the aster grow, forming **spindle fibers**,



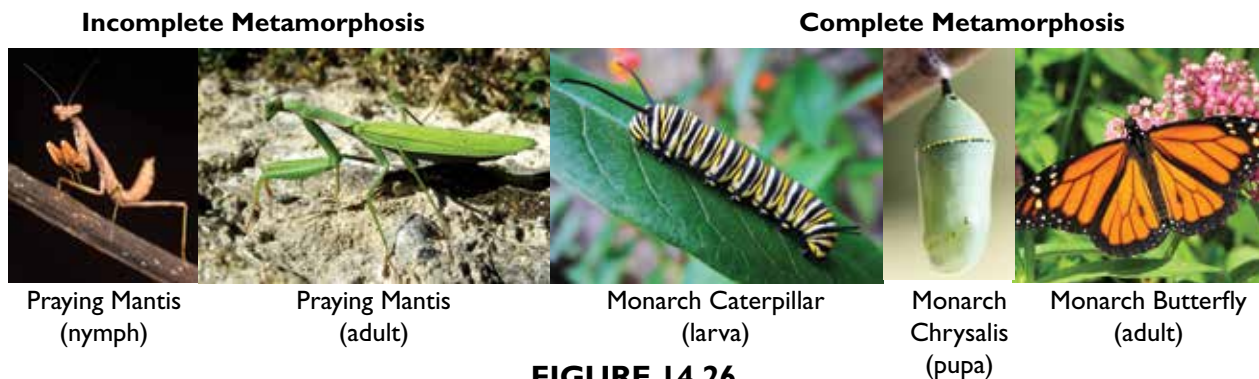
chrysalis. What you might not have been aware of until now is that the vast majority of insects go through this transformation process. Flies, for example, go through the same process. When they are in their larva stage, they are called maggots; and when they are in their pupa stage, they do not use a cocoon or chrysalis but rather a shell of exoskeleton.

In fact, if an insect does not go through the metamorphosis process described above, it goes through a similar one that involves only three stages. Thus, biologists classify the development of an insect as either **complete metamorphosis** or **incomplete metamorphosis**. A diagram showing both types of metamorphosis appears in Figure 14.25.

**Complete metamorphosis**—Insect development consisting of four stages: egg, larva, pupa, and adult

**Incomplete metamorphosis**—Insect development consisting of three stages: egg, nymph, and adult

When an insect develops through incomplete metamorphosis, it hatches from its egg stage into its **nymph stage**. In this stage, the insect looks like a miniature version of its adult form, but the proportions seem wrong. It lacks wings and reproductive organs. It molts several times during the nymph stage and, when it finally develops wings and reproductive organs, it is considered an adult. See Figure 14.26 for photo examples of each type of metamorphosis.



**FIGURE 14.26**  
Examples of Metamorphosis

Now please realize that there is nothing “incomplete” about incomplete metamorphosis. It is a full life cycle in which each stage of life is exquisitely designed. The term “incomplete” is simply used to signify that it has fewer stages than the other type of metamorphosis that is seen in class Insecta. Complete On Your Own questions 14.12–14.15 before reading on.

## ON YOUR OWN

- 14.12 An insect’s outer wings are incredibly tough. Most likely, what kind of wings are they?
- 14.13 You can suffocate an insect by wrapping up its body, except for the head, in plastic wrap. Why, if the mouth is exposed to air, does the insect still suffocate?
- 14.14 An insect cannot digest food in its stomach due to a lack of digestive enzymes. Which organ is most likely not working?
- 14.15 An insect goes through a nymph stage in its development. Does it undergo complete or incomplete metamorphosis?