ANSWER IN ENGLISH

Measuring Up – Workbook - Lesson #13 “Viruses”

**You will learn that viruses are not considered living things because of their structures and the way they reproduce. You will see how viral reproduction occurs, sometimes leading to diseases such as influenza and a cold.**

**Viral diseases** are caused by a virus that takes control of a cell that it has infected.

A **nucleic acid** is the genetic material of a virus.

A **capsid** is a protein coat that surrounds the nucleic acid of a virus.

**Viral reproduction** is the process by which a virus produces new viruses by infecting a cell.

A **host cell** is the cell that a virus infects.

During the **lytic cycle**, a virus enters a cell, replicates itself, and then destroys the cell as newly formed viruses break free.

In the **lysogenic cycle**, a virus stays inside a cell but does not make new viruses. Instead, the DNA of the virus is inserted into the host’s chromosome.

**Guided Instruction: Directions** – Read the following information and answer the questions

Have you ever had chicken pox, the flue, or a cold? If you have, then your body was infected by a virus that caused you to get sick. Chicken pox, the flu, and a cold are **viral diseases**. The viruses that cause these diseases are extremely small. In fact, about 6 billion viruses could fit inside a single drop of blood. Viruses are so small that they were never seen until the late 1930’s. Nonetheless, scientists suspected that viruses existed even though they had never seen one.

By the late 1880’s, scientists knew that certain diseases were caused by something much smaller than anything that they could see. Whatever caused these diseases remained hidden because microscopes were not yet powerful enough to see the tiny particles. Then in the 1930’s scientists developed microscopes that were powerful enough to finally discover this hidden world. These microscopes revealed that a virus has a simple structure. A protein coat surrounds a **nucleic acid**. Recall that nucleic acids contain genetic information. The protein coat is called a **capsid**. Within the capsid is the nucleic acid, either in the form of RNA or DNA, but not both.

GUIDED QUESTION: (1) Why did viruses remain unseen for so long?

GUIDED QUESTION: (2) What are two biomolecules that viruses contain?

Some viruses have another structure called an envelope that surrounds the capsid. Viruses come in different shapes (see next page), depending on the molecules that make up the capsid and envelope and whether they contain DNA or RNA.

Viruses may seem to be living things because they contain biomolecules such as nucleic acids and proteins. However, viruses are not considered part of the living world for several reasons. Viruses do not fit within the cell theory. They are not made of cells and do not reproduce to make new cells. In addition, viruses do not carry on cellular processes such as growth and digestion. In fact, a virus cannot even function on its own. Moreover, the only way a virus can reproduce is by infecting a cell.

GUIDED QUESTION: (3) Why are viruses not considered to be living things?

When a virus infects a cell, it can turn the cell into a factory to make more viruses. **Virus reproduction** involves a virus infecting a cell to make new viruses. The cell that a virus infects is called a **host cell**. The virus attaches to the surface of a host cell and then injects its nucleic acid into the cell. Once the viral nucleic acid has entered, it takes control of the cell.

GUIDED QUESTION: (4) What is a **host cell**?

If the nucleic acid the virus has injected is DNA, the DNA makes a copy of itself. This viral DNA also makes RNA, which in turn is used to make proteins. The DNA, RNA, and proteins are all made specifically for the virus and not for the host cell. Viral DNA that is made in the host cell becomes surrounded by proteins that form the capsid. As a result, a new virus has been assembled inside the host cell. Hundreds of viruses can be made within one cell. These viruses then burst open the cell and destroy it. Each new virus can then infect another cell to repeat the cycle. This cycle of viral infection, replication, and cell destruction is called the **lytic cycle**. The process is summarized in the illustration below (See workbook page 87).

GUIDED QUESTION: (5) What happens to the **host cell** in the **lytic cycle**?

Viruses that contain RNA as their nucleic acid can also start the lytic cycle. In this case, the RNA that the virus injects into the host cell first directs the synthesis of DNA. The discovery that RNA makes DNA went against a central principle in biology that says DNA always makes RNA and that RNA in turn makes proteins. In 1970, scientists discovered an enzyme that can be used by RNA to make DNA. Such an enzyme is used by the human immunodeficiency virus (HIV), more commonly referred to as the AIDS virus. The viruses that cause colds, and influenza, or the flu, also contain RNA.

GUIDED QUESTION: (6) What do the viruses that cause AIDS, colds, and the flu have in common?

Sometimes, when a virus infects a host cell, it may stay inside the cell but not make new viruses. In this case, the virus enters the **lysogenic cycle**. In this cycle, the nucleic acid that the virus injects becomes part of the DNA of the host cell. Every time the host cell’s DNA copies itself, the viral DNA is also copied. The illustration below summarizes the lysogenic cycle. (See workbook bottom of page 87)

GUIDED QUESTION: (7) What happens to the host cell during the **lysogenic cycle**?

The viral DNA may remain inactive as part of the host cell’s DNA for a long time. However, the viral DNA may become active at any time. When this happens, the viral DNA frees itself from the host cell’s DNA. Once free, the viral DNA can begin the lytic cycle. This is how HIV operates when it infects a human cell. The virus can be part of either the lysogenic cycle or the lytic cycle. When HIV enters the lytic cycle, it destroys white blood cells that fight disease. As a result, the body is more susceptible to other infections.

Preventing a virus from causing a disease is not as easy as preventing bacteria from causing a disease. Bacteria can be destroyed with antibiotics, but antibiotics do not kill viruses. Instead, the best prevention against a viral disease is a vaccination. Vaccination provides the body with a head start, should the virus infect the body. Vaccination was the means used to eliminate polio, which is a devastating disease caused by a virus. Before the polio vaccine became available, people who were infected often became paralyzed. Hopefully, someday there will be a vaccination for other viral diseases such as AIDS, and certain types of cancer.

SHORT ANSWER QUESTIONS: Directions – Answer the following questions

1. What does a virus need in order to reproduce?
2. How can a viral disease be prevented?
3. What happens during the lytic cycle?
4. What happens during the lysogenic cycle?
5. What two biomolecules can carry the genetic information for a virus?

APPLY THE TEKS: Directions – Read the paragraph, study the diagram, and answer the questions.

Both viruses and bacteria can cause disease. The table below compares these two disease-causing agents. (See table in workbook page 89)

1. How does this table illustrate the difference in the way viruses and bacteria reproduce?
2. How does the metabolism of bacteria differ from that of viruses?
3. Identify two ways in which viruses and bacteria are similar.
4. Bacteria were observed long before viruses were first seen. What information in this table explains the reason for this?

STAAR PRACTICE: Directions – Read each question and choose the best answer.

1. All living things are part of the cell theory. Why are viruses not included as part of the cell theory?
   1. They do not contain genetic information.
   2. They are smaller than any living things.
   3. They are not capable of producing new viruses on their own.
   4. They lack internal structures found in cells, such as nuclei.
2. A virus has a very simple structure. Which of the following is part of this viral structure?
   1. Organelles
   2. Cell wall
   3. Host cell
   4. Nucleic acid
3. A doctor gave one of his patients an antibiotic. Which disease was this doctor treating?
   1. Influenza
   2. Food poisoning
   3. Cold
   4. Chicken pox
4. The lytic cycle involves several steps. The last step that completes the lytic cycle occurs when –
   1. The host cell bursts
   2. The virus injects its nucleic acid
   3. New viruses begin to be made
   4. The viral DNA becomes part of the host cell’s DNA
5. Which of the following happens as part of both the lytic cycle and the lysogenic cycle?
   1. New viruses are made
   2. The host cell dies
   3. The entire virus infects the cell
   4. The virus injects its nucleic acid into the host cell.

CUMULATIVE REVIEW: Directions – Read each question and choose the best answer.

1. Respiration involves an energy conversion. In respiration, energy that is stored in nutrients is converted into –
   1. DNA
   2. Proteins
   3. ATP
   4. Enzyme
2. In addition to being involved in the lytic cycle and the lysogenic cycle, DNA is also involved in –
   1. The Krebs cycle
   2. The cell cycle
   3. Photosynthesis
   4. Growth
3. Which of the following does not carry out homeostasis?
   1. Prokaryote
   2. Eukaryote
   3. Cell
   4. Virus
4. Which process converts light energy into chemical energy?
   1. Photosynthesis
   2. Glycolysis
   3. Fermentation
   4. respiration