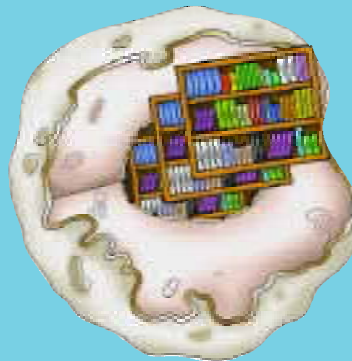


DISCUSSION  
GUIDE



2

# How cells and germs use instructions





# Shoetime!

How  
cells and  
germs use  
instructions

## MATERIALS NEEDED

1. A pair of shoes, with shoelaces.
2. Two chairs.
3. A table.

**Objective:** To create an understanding of the role of clear, correct instructions for carrying out an activity. This game sets the foundation for understanding how germs and cells follow chemical instructions.

## GUIDELINES

1. **Place a chair on the table.** Climb up and sit on it. The height helps all participants to observe your feet. Place the other chair so that it is facing away from you.
2. **Give instructions, saying:** “In this demonstration, I am an imaginary person living on the moon, and I do not know how to put on shoes.” Invite any participant to give you instructions on how to put on and lace a pair of shoes. Tell him or her to be as simple and precise as possible, and that you will follow the instructions literally.
3. **Invite** the participant to sit in the chair facing away from you. Once he or she is seated, remove your shoes and place them before your feet in a disorderly way

(that is, keep the left shoe next to the right foot, or let the heels face forward, or let the soles face upward, and so on).

4. **Follow** the participant’s instructions exactly.

**Note:** If the instructions are vague or too general, then ‘misinterpret’ them. If the instruction is, “Keep the shoes next to your feet”, then place the left shoe near the right foot, and the right shoe near the left foot; or place a shoe pointing the wrong way; place the other shoe with the sole facing up; and so on.

5. **Repeat** the exercise until two to three participants have tried giving you instructions on how to wear the shoes. If a player’s instructions are clear and correct, follow them.
6. **Remember:** The objective of the exercise is achieved once you have demonstrated how simple sounding but vague instructions can lead to messy and incorrect results.

## How do people pass instructions to each other in real life?

DG2

**Objective:** To introduce the concept of a written 'manual' of instructions. To introduce the word **manual**.

### GUIDELINES

1. Ask participants to remember occasions when they had to follow instructions to perform some task. Make a list on a flip chart sheet.

**Tip:** Urge participants to think of oral instructions as well as written instructions.

2. **Ask** participants if they know a word which describes a book of written instructions. The word **manual** should emerge from this discussion. Write it on the flip chart sheet.



### INFORMATION

1. Instructions can be oral or written.
2. A book of written instructions is called a manual.
3. Examples of written instructions include the following:
  - How to use a video recorder
  - How to use a computer
  - Doctor's prescription
  - Recipe
  - Peer educator's manual

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## What happens in your mouth when you see a hot plate of nyama choma?

**Objective:** To create the understanding that the body's cells follow 'instructions' to carry out their tasks.

### GUIDELINES

1. **Ask:** What happens in your mouth when you see a plate of nyama choma? Allow participants to give their answers. There is no need to record the answers.
2. Once **saliva** has emerged as the answer, ask participants what makes saliva. (**Answer:** Saliva cells in the saliva glands).
3. **Ask:** Where do saliva cells find instructions for making saliva? Write answers on a flip chart sheet. Typical answers include the brain, blood, the nerves, and the cells themselves.
4. **Explain:** Each cell in our body carries small chemical 'manuals' within itself. The cell that makes saliva finds the instructions in its chemical 'manual' on how to make saliva.

5. Discuss some different body functions for which 'manuals' are required. Examples: Making hair grow, healing wounds, digesting food, producing a baby, breathing, excreting waste, fighting disease. Explain that there are thousands of such functions, with a chemical manual exists for each of them.
6. **Explain** that if all these thousands of manuals were to be translated into Kiswahili and published as books, they would form a stack extending half the distance from the earth to the moon.

### INFORMATION

1. All cells carry out their functions by following the instructions in tiny chemical manuals that they contain.
2. The body's cells perform thousands of functions. Each function requires a manual of chemical instructions.
3. If all the chemical 'manuals' in a cell were to be published as books, they would form a stack going from the earth half the distance to the moon.



## How many manuals does a microorganism have?

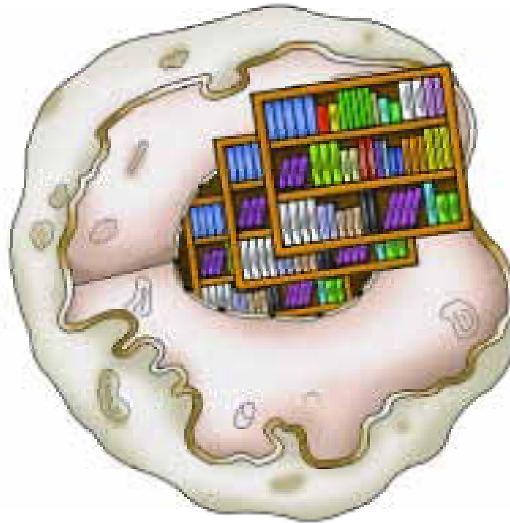
DG2

**Objective:** To create an understanding of DNA, which contains all the chemical manuals of the human body. To introduce the word **library**.

### GUIDELINES

1. **Ask:** How many of these thousands of manuals do you think would be there inside a cell whose main job is to make saliva? Let participants make guesses.
2. **Explain:** Each cell in the body contains a complete copy of all the manuals needed by the human body. These chemical manuals exist inside a chemical library in the center of each cell. Introduce the word **library**.
3. **Explain:** The chemical library is called DNA, which stands for **Deoxyribonucleic Acid**. **Note:** It is advisable not to introduce this technical term unless participants insist.

**Note:** Some participants may feel confusion between the 'brain' and the 'manuals'. Doesn't the brain control the



body's every activity? **Explain** that the brain is like a supervisor. For example, if a man tells his driver to go to the school and pick up his children, will he also give detailed instructions to that driver on how to drive? Similarly, the brain may tell the mouth that some tasty food is waiting to be digested, but it will not pass on detailed instructions on how to make saliva. For that, the cell will refer to its own 'manual'.

### INFORMATION

1. All of the body's chemical 'manuals' exist in a library in the nucleus or center of the cell. This library is known as DNA.
2. DNA stands for **Deoxyribonucleic Acid**.
3. Each cell contains a complete copy of the body's entire DNA library, even if it may use only one of the 'manuals', such as how to make saliva.

How cells and germs use instructions

## Does HIV have its own chemical 'manual' like the human body's cells do?

### INFORMATION

1. HIV has its own chemical 'manual'. The manual contains instructions on how to make HIV.
2. When HIV infects a person, it breaks into certain white blood cells, and leaves its manual within that cell's DNA library.
3. Over the years, as more and more white blood cells begins following HIV's instruction manual, they make millions of HIV, and the person develops AIDS. Until then, he or she is infected with HIV but not sick with AIDS.
4. It can take between 2 and 15 years before an HIV positive person develops AIDS.

**Objective:** To create a basic understanding of how HIV uses its 'manual' to harm the body.

### GUIDELINES

1. **Test:** Is HIV a cell? (**Correct answer:** HIV is a virus, not a cell.)



2. **Test:** What is the size of HIV? What is the size of the average human cell? (**Correct answer:** HIV is 100 nm; the average human cell is 200,000 nm in size.)
3. **Ask:** Does HIV too have a manual? If so, what are the instructions in the manual? Let participants express their views.
4. **Explain:** HIV carries a 'manual' with instructions on how to make HIV.
5. **Explain:** When HIV infects a person, it seeks certain white blood cells and breaks into them. Once inside, it gets rid of its outer chemical shell. All that remains is the 'man-

ual' with instructions on how to make HIV. This manual is inserted into the white blood cell's own DNA 'library'. **Note:** Do not yet use the words Helper T Cell, CD4 cells, or T4 cells.

6. **Explain:** It is like inserting a manual called *How to make a nuclear bomb* into a public library. The day someone opens the manual and follows the instructions, a dangerous bomb will be created.
7. **Explain:** As long as HIV's manual has not been opened by too many white blood cells, **the individual is infected with HIV but not sick**. Between 2 and 15 years later, as more and more white blood cells follow the instructions in HIV's manual, they make millions of HIVs and **the person develops AIDS**. The white blood cells stop doing their normal work and turn into 'factories' making HIV.
8. **Explain:** A number of factors affect how long HIV's manual will lie unopened in a white blood cell, ranging from health, nutrition, other infections, risk behavior, stress, and attitude.