

The Characteristics of Life

Scientists have argued for centuries over the basic characteristics that separate life from non-life. Some of these arguments are still unresolved. Despite these arguments, there do seem to be some generally accepted characteristics common to all living things. Anything that possesses all these characteristics of life is known as an **organism**.

1. CONTAIN ONE OR MORE CELLS

Scientists know that all living things are organized. The smallest unit of organization of a living thing is the **cell**. A cell is a collection of living matter enclosed by a barrier known as the plasma membrane that separates it from its surroundings. Cells can perform all the functions we associate with life.

Cells are organized and contain specialized parts that perform particular functions. Cells are very different from each other. A single cell by itself can form an entire living organism. Organisms consisting of only a single cell are called unicellular. A bacterium or a protist like amoebas and paramecia are unicellular. However, most of the organisms you are familiar with, such as dogs and trees, are multicellular. Multicellular organisms contain hundreds, thousands, even trillions of cells or more. Multicellular organisms may have their cells organized into tissues, organs, and systems. Whether it is unicellular or multicellular, all structures and functions of an organism come together to form an orderly living system.

Functional cells are not found in nonliving matter. Structures that contain dead cells or pieces of cells are considered dead. For example, wood or cork cut from a tree is made up largely of cell walls. The cells are no longer functional.

1. All living things are _____.
2. What is the simplest level at which life may exist? _____
3. Are all cells alike? _____
4. All cells perform various jobs or _____.
5. What surrounds a cell and separates it from its environment? _____
6. Give an example of a multicellular organism. _____
7. Give an example of a unicellular organism. _____

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2. REPRODUCTION

Another characteristics of life is **reproduction**, the production of offspring. Organisms don't live forever. For life to continue, organisms must replace themselves. Reproduction is not essential for the survival of an individual organism. However, it is essential for the continuation of an organism's species. A **species** is a group of similar-looking organisms that can interbreed and produce fertile offspring. If individuals in a species never reproduced, it would mean an end to that species' existence on Earth.

8. Define reproduction. _____
9. Reproduction is NOT essential for the survival of an individual _____ but is essential for the survival of the _____.
10. What is meant by extinction?

3. GROWTH AND DEVELOPMENT

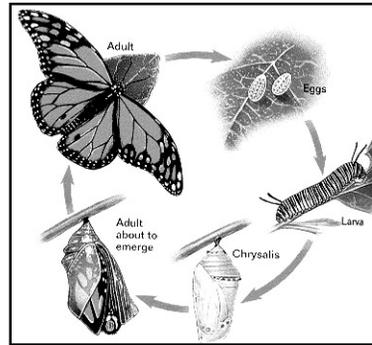
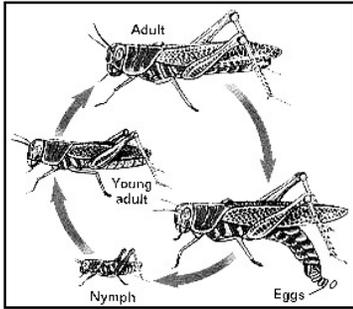
Adults don't always look like the babies of a species. All organisms begin their lives as single cells. Over time, these organisms grow and take on the characteristics of their species. **Growth** results in an increase in the amount of living material and the formation of new structures.

All organisms grow, and different parts of organisms may grow at different rates. Organisms made up of only one cell may change little during their lives, but they do grow. On the other hand, organisms made up of numerous cells go through many changes during their lifetimes. Think about some of the structural changes your body has already undergone in your short life. All of the changes that take place during the life of an organism are known as its **development**.

11. What do all organisms begin life as? _____
12. Do unicellular organisms GROW? _____
13. Do unicellular organisms DEVELOP? _____.
14. Do multicellular organisms GROW? _____.
15. Do multicellular organisms DEVELOP? _____.

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16. Identify which graphic BEST shows **growth** and which BEST shows **development**.



4. OBTAIN AND USE ENERGY

Energy is the ability to make things change. Energy is important because it powers life processes. It provides organisms with the ability to maintain balance, grow, reproduce, and carry out other life functions. Some organisms obtain energy from the foods they eat or, in the case of plants and several other types of organisms, the foods that they produce. Organisms that get energy from the food they eat are called heterotrophs. Organisms that use energy from the sun to make their own food (which they then use for energy) are called autotrophs. The process is called photosynthesis.

Energy doesn't just flow through individual organisms; it also flows through communities of organisms, or ecosystems, and determines how organisms interact with each other and the environment.

17. Define energy. _____
18. Why is energy important to a living organism?

19. What is the name of the process that plants use to make their own food using energy from the sun? _____

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5. RESPOND TO ENVIRONMENT / MAINTAIN HOMEOSTASIS

Living things live in a constant connection with the environment, which includes the air, water, weather, temperature, any organisms in the area, and many other factors. These external environmental factors act as **stimuli** and can cause a **response** from living things. Organisms need to respond to the changes in order to stay alive and healthy. For example, if you go outside on a bright summer day, the sun may cause you to squint. A specialized leaf of the Venus' flytrap senses the light footsteps of a soon-to-be-digested green bottle fly. The plant responded to this environmental stimulus by rapidly folding the leaf together.

An organism must respond to changes in the internal environment as well. Internal conditions include the level of water, nutrients, and minerals inside the body. It also refers to body temperature and hormone levels. Adjustments to internal changes help organisms maintain a stable internal environment. The regulation of an organism's internal environment to maintain conditions suitable for life is called **homeostasis**. For example, you have a "thermostat" in your brain that reacts whenever your body temperature varies slightly from 37°C (about 98.6°F). If this internal thermostat detects a slight rise in your body temperature on a hot day, your brain signals your skin to produce sweat. Sweating helps cool your body.

The ability of mammals and birds to regulate body temperature is just one example of homeostasis. Mechanisms of homeostasis enable organisms to regulate their *internal* environment, despite changes in their *external* environment.

20. What are three environmental factors (stimuli) that organisms respond to?

21. What are two internal factors that organisms respond to?

22. Give two examples of how living things respond to changes in their environment. _____
23. Describe homeostasis.

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Identify the characteristic of life that is illustrated by each statement.

24. _____ "Our cat had a litter of kittens yesterday."
25. _____ "Eat a good breakfast and you will be able to run longer."
26. _____ "When the car pulled in the driveway, my cat ran and hid under the porch."
27. _____ "The owl's vision allows it to see the movement of mice on even the darkest night."
28. _____ "Single-celled organisms live in the pond behind school."
29. _____ Your body normally maintains a temperature of 98.6°F.
30. _____ A giraffe uses its long neck to eat from the high branches of a tree.

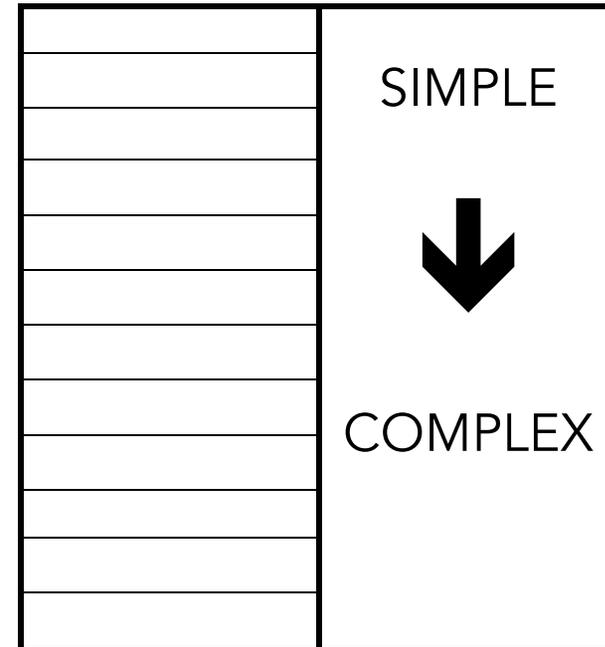
Match each LEVEL to its MEANING.

- | | |
|------------------------|---|
| ____ 31. Atom/Molecule | A. all living & nonliving things on earth |
| ____ 32. Organ | B. smallest level at which life exists |
| ____ 33. Population | C. a group of one kind of organism living in an area |
| ____ 34. Biome | D. a group of similar cells working together |
| ____ 35. Cell | E. several populations of organisms living together |
| ____ 36. Organelle | F. a living thing that may be unicellular or multicellular |
| ____ 37. Community | G. a group of similar tissues working together like the heart or lungs |
| ____ 38. Ecosystem | H. all the living and nonliving things living in a similar environment |
| ____ 39. Tissue | I. parts of a cell such as the nucleus |
| ____ 40. Organism | J. smallest part of an element or compound |

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Arrange the following levels of organization in order from simplest to most complex --- ecosystem, atom, population, organ, molecule, biome, tissue, cell, organelle, system, organism, community.

LEVELS OF ORGANIZATION



Identify the following as either a stimulus or a response.

41. the recess bell ringing in an elementary school _____
42. your mouth watering at the sight of food on a plate _____
43. a sudden drop in air temperature _____
44. a flu virus entering your body _____
45. "butterflies" in your stomach before giving a speech _____