SCIENCE FOUNDATIONS

Cell theory

Difficulty level: Intermediate

Science Foundations

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Overview of the concept

This is how you explain that every living thing, from a tree to you, is made of cells, and that new cells only ever come from cells that already exist. A tree, a dog, and a person are all built from cells, and a cut heals because existing cells divide to make new ones. No new cell appears out of nowhere, which is why a wound closes from the cells around it. This one idea is the foundation of all biology, since every living thing follows it.



Rule

Cell theory: all living things are made of cells, the cell is the basic unit of life, and all cells come from pre-existing cells.

No cell appears from non-living matter, and every living thing is made of one or more cells.

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Worked examples

EXAMPLE 1

Q A scientist claims she watched a new cell appear out of pond water, with no cell there before it. Does cell theory agree?

SOLUTION

This is a question about what cell theory really says, so start with the one rule to remember: all cells come from pre-existing cells. A cell never appears out of nothing.

The pond water already had cells in it, too small to see, and the new cell came from one of those dividing. That is the third statement of cell theory, and it rules out spontaneous generation.

So no, cell theory does not agree with the claim. Every new cell comes from a cell that was already there.

EXAMPLE 2

Q A rod-shaped bacterium is a single cell living on its own. Is it covered by cell theory?

SOLUTION

This is a question about the first two statements of cell theory, so ask: is it made of cells, and is the cell the basic unit of life?

The bacterium is one single cell, and that one cell does everything the bacterium needs to live: it takes in food, it makes energy, and it divides to reproduce.

So yes, it is covered. All living things are made of cells, and the cell is the basic unit of life, even when the whole living thing is just one cell.

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Practice questions

1 **Which of these lists the three statements of cell theory?**

- **A** All living things are made of cells; the cell is the basic unit of life; all cells come from pre-existing cells
- **B** All living things are made of cells; cells can appear from nothing; the cell is the basic unit of life
- **C** All cells come from pre-existing cells; all living things are made of tissues; the cell is the basic unit of life
- **D** The cell is the basic unit of life; all cells have a nucleus; all living things are made of cells

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2 **Who first saw cells in a thin slice of cork and gave them the name cell?**

A Robert Hooke

B Theodor Schwann

C Matthias Schleiden

D Rudolf Virchow

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3 **Which scientist said that all animals are made of cells?**

A Theodor Schwann

B Robert Hooke

C Matthias Schleiden

D Rudolf Virchow

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4 Which scientist said that all plants are made of cells?

- A Matthias Schleiden
- B Robert Hooke
- C Theodor Schwann
- D Rudolf Virchow

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5 Which scientist added the statement that all cells come from pre-existing cells?

- A Rudolf Virchow
- B Robert Hooke
- C Theodor Schwann
- D Matthias Schleiden

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Is a mushroom made of cells?

A Yes

B No

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A virus can only copy itself inside a living cell. Does cell theory count a virus as a living thing made of cells?

A Yes

B No

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A cut heals because cells near the cut divide to make new cells. Which statement of cell theory does this show?

- A All cells come from pre-existing cells
- B All living things are made of cells
- C The cell is the basic unit of life
- D Cells can appear from nothing

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True or false: a cell is the smallest unit that can carry out the processes of life.

- A True
- B False

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Put these in order from smallest to largest: organ, cell, organism, tissue, organ system.

A Cell, tissue, organ, organ system, organism

B Organism, organ system, organ, tissue, cell

C Cell, organ, tissue, organ system, organism

D Tissue, cell, organ, organism, organ system

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ANSWER KEY

1. All living things are made of cells; the cell is the basic unit of life; all cells come from pre-existing cells
2. Robert Hooke
3. Theodor Schwann
4. Matthias Schleiden
5. Rudolf Virchow
6. Yes
7. No
8. All cells come from pre-existing cells
9. True
10. Cell, tissue, organ, organ system, organism

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