



Benchmarks for Lesson Plan: Seeing the Cell as a System (9-12)

CENTRAL BENCHMARKS

5C Cells (9-12)#2

Within the cell are specialized parts for the transport of materials, energy capture and release, protein building, waste disposal, information feedback, and even movement. In addition to these basic cellular functions common to all cells, most cells in multicellular organisms perform some special functions that others do not.

11A Systems (9-12)#1

A system usually has some properties that are different from those of its parts, but appear because of the interaction of those parts.

RELATED BENCHMARKS

5B Heredity (9-12)#6

The many body cells in an individual can be very different from one another, even though they all descended from a single cell and thus have essentially identical genetic instructions. Different parts of the instructions are used in different types of cells, influenced by the cell's environment and past history.

5C Cells (6-8)#3

Within cells, many of the basic functions of organisms—such as extracting energy from food and getting rid of waste—are carried out. The way in which cells function is similar in all living organisms.

5C Cells (9-12)#1

Every cell is covered by a membrane that controls what can enter and leave the cell. In all but quite primitive cells, a complex network of proteins provides organization and shape and, for animal cells, movement.

5E Flow of Matter and Energy (6-8)#3

Energy can change from one form to another in living things. Animals get energy from oxidizing their food, releasing some of its energy as heat. Almost all food energy comes originally from sunlight.

6A Human Identity (6-8)#1

Like other animals, human beings have body systems for obtaining and providing energy, defense, reproduction, and the coordination of body functions.

6C Basic Functions(6-8)#1

Organs and organ systems are composed of cells and help to provide all cells with basic needs.

6C Basic Functions (6-8)#2

For the body to use food for energy and building materials, the food must first be digested into molecules that are absorbed and transported to cells.

Seeing the Cell as a System (9-12) *(continued)*

6C Basic Functions (6-8)#3

To burn food for the release of energy stored in it, oxygen must be supplied to cells, and carbon dioxide removed. Lungs take in oxygen for the combustion of food and they eliminate the carbon dioxide produced. The urinary system disposes of dissolved waste molecules, the intestinal tract removes solid wastes, and the skin and lungs rid the body of heat energy. The circulatory system moves all these substances to or from cells where they are needed or produced, responding to changing demands.

9E Reasoning (6-8)#6

An analogy has some likenesses to but also some differences from the real thing.

11A Systems (K-2)#3

When parts are put together, they can do things that they couldn't do by themselves.

11A Systems (3-5)#1

In something that consists of many parts, the parts usually influence one another.

11A Systems (3-5)#2

Something may not work as well (or at all) if a part of it is missing, broken, worn out, mismatched, or misconnected.

11A Systems (6-8)#1

A system can include processes as well as things.

11A Systems (6-8)#2

Thinking about things as systems means looking for how every part relates to others. The output from one part of a system (which can include material, energy, or information) can become the input to other parts. Such feedback can serve to control what goes on in the system as a whole.

11A Systems (6-8)#3

Any system is usually connected to other systems, both internally and externally. Thus a system may be thought of as containing subsystems and as being a subsystem of a larger system.

11A Systems (9-12)#1

A system usually has some properties that are different from those of its parts, but appear because of the interaction of those parts.

11A Systems (9-12)#2

Understanding how things work and designing solutions to problems of almost any kind can be facilitated by systems analysis. In defining a system, it is important to specify its boundaries and subsystems, indicate its relation to other systems, and identify what its input and its output are expected to be.

11C Constancy and Change (6-8)#5

Symmetry (or the lack of it) may determine properties of many objects, from molecules and crystals to organisms and designed structures.

Seeing the Cell as a System (9-12) *(continued)*

12A Values and Attitudes (9-12)#2

View science and technology thoughtfully, being neither categorically antagonistic nor uncritically positive.

12D Communication Skills (6-8)#3

Locate information in reference books, back issues of newspapers and magazines, compact disks, and computer databases.

12D Communication Skills (9-12)#6

Participate in group discussions on scientific topics by restating or summarizing accurately what others have said, asking for clarification or elaboration, and expressing alternative positions.