

**MIDDLE SCHOOL**

**Biotechnology**

**What is Biotechnology?**

**Teacher Background**:

Biotechnology is the use of living organisms or their products to modify human health and the human environment. (Pamela Peters, from Biotechnology: A Guide To Genetic Engineering. Wm. C. Brown Publishers, Inc., 1993.) Although biotechnology was not used as a term until 1917, humans have been working with, using and studying living organisms to modify their health and environments for thousands of years.

**Goal**: To comprehend the term biotechnology

**Objectives**: Students will…

* Match up biotechnology events with the dates that they occurred
* Compare their answers to an answer key
* Come up with a definition for biotechnology
* Predict what changes biotechnology will bring in the future

**Materials**:

* Copies of the Biotechnology Timeline Match-up (either in pairs or individually)
* Scissors
* Copies of the Answer Key and Question Sheet

**Time Required:** 45 – 60 minute class period

**Standards Met:**

* History and Nature of Science: Science as human endeavor

**Procedure**:

* Write the word biotechnology on the board.
* Ask the students if they know what it means. Have they heard of it before and if so, where?
* Wordsmith the word. What does bio mean? Technology? Ology?
* Students may work individually, in pairs or in small groups.
* Pass out copies of the timeline
* Students cut apart the events and the dates on the dotted line.
* Reading the events, they should hypothesize on when they occurred and match that date to the event square, continuing until every event has a date.
* When the class is finished, discuss which events were difficult to match and which were easier. Why was this so?
* Pass out the answer key so that the students can check their work.
* Students should answer the two questions.
* Have a class discussion about their answers.
* Read them the definition of biotechnology from several sources.

**Assessment:**

* Participation in the Timeline Match-up
* Completion of two questions
* Participation in class discussions

<http://www.tccbiotech.org/files/documents/Biotech_Timeline.pdf>

**What is Biotechnology?: Timeline Match-up**

* Cut apart the sections on the dotted lines.
* Match the years to the events that occurred.

Events

|  |  |  |
| --- | --- | --- |
| •Glofish is first G.M. pet  • CC (Carbon Copy) the cat is cloned  MCj04345910000[1]  •Mapping of the Human Genome is completed  MCj01981900000[1]  •Vaccine to  prevent  Cervical Cancer | •Watson and Crick describe DNA as a double helix  MCj04368160000[1] | •Animals are domesticated  •Crops are cultivated  •Yeast and Bacteria are used to ferment cheese, wine and bread  MCj04129660000[1]  MCj04129660000[1] |
| • Schleiden and Schawnn state the cell theory- “All living things are made up of cells”  MCj03010720000[1] | •Diabetes is treated with genetically engineered insulin  •First G.M. vaccine- Hepatitis B  MCj02375950000[1] | •Nanotechnology is coined 10 -9  •Cohen & Boyer cut and splice DNA  •Restriction enzymes discovered.  MCj04325940000[1] |
| •Human Genome project is funded by Congress  •Flavr Savr tomato, resistant to rotting, is approved by FDA  •Dolly, the sheep, is cloned  MCj04136320000[1] | •First use of the term Biotechnology  •DNA is discovered to be hereditary material  •Flemming discovers penicillin  MCj04135380000[1] | •Pasteur creates pasteurization and discovers the Rabies vaccine  •Mendel studies genetics  •Darwin writes “Origin of Species”  MCj04118900000[1] |

Years

|  |  |  |
| --- | --- | --- |
| Before 1600 | 1800 - 1850 | 1850 - 1900 |
| 1900 - 1950 | 1950 - 1970 | 1970 - 1980 |
| 1980 - 1990 | 1990 - 2000 | 2000 - Present |

**What is Biotechnology?: Timeline Match-up**

**Answer Key**

Before 1600- •Animals are domesticated •Crops are cultivated

•Yeast and Bacteria are used to ferment cheese, wine and bread

1800 – 1850- • Schleiden and Schawnn state the cell theory, “All living things are made up of cells”

1850 – 1900- •Pasteur creates pasteurization and discovers the Rabies vaccine •Mendel studies genetics •Darwin writes “Origin of Species”

1900 – 1950- •First use of the term Biotechnology •DNA is discovered to be hereditary material •Flemming discovers penicillin

1950 – 1970- •Watson and Crick describe DNA as a double helix

1970 - 1980- •Nanotechnology is coined (10 -9 )•Cohen & Boyer cut and splice DNA•Restriction enzymes discovered

1980 – 1990- •Diabetes is treated with genetically engineered insulin •First genetically modified vaccine- Hepatitis B

1990 – 2000- •Human Genome project is funded by Congress •Flavr Savr tomato, resistant to rotting, is approved by FDA •Dolly, the sheep, is cloned

2000 – present- • CC (Carbon Copy) the cat is cloned •Mapping of the Human Genome is completed •Vaccine to prevent Cervical Cancer

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Based on the events above, what do you think defines biotechnology?

What do you think will happen with biotechnology in the future?

**What is Biotechnology?: Vocabulary**

|  |  |  |
| --- | --- | --- |
| **Word** | **Definition** | **Drawing** |
| bio | life |  |
| tech | Create and invent for industrial or commercial goals. |  |
| ology | the study of |  |
| modify | change |  |
| genetically engineered | The alteration of DNA by humans |  |