LKPD
BIOTECHNOLOGY

Name :

Class :

Learning Outcomes

Students are expected to be able to work together in the application of biotechnology to support human survival through food production.

Learning objectives

After this lesson, students are expected to be able to:

1. Analyze the basic principles of biotechnology.
2. Analyze the differences between conventional biotechnology and modern biotechnology.
3. Classifying examples of the application of biotechnology in everyday life.

Pancasila Student Profile

1. Independent
2. Critical reasoning
3. Mutual cooperation

Learning Description

Learning Activities (120 minutes)

Instructions

1. Each student must read the material carefully.
2. Discuss any existing questions or problems through discussion with the group.
3. If there are questions or things you don't understand, ask the teacher for help to explain them.

Biotechnology

INTRODUCTION

Biotechnology is a branch of science in the field of biology that studies the application of organisms, systems and biological processes to industrial products and services for the benefit of humans (Purwianingsing, 2009). Alternatively, it can be defined as technology that uses biological systems (biological processes) to obtain goods and services that are beneficial to human welfare. Biotechnology uses cultured bacteria, yeast, fungi, algae, plant or animal cells as components of various industrial processes. Biotechnology is currently experiencing rapid development and plays a very important role in solving various problems related to agriculture and nutrition. With the rapid development of science and technology, biotechnology has become one of the biological scientific fields that students need to master (Riani et al, 2017) .

In general, biotechnology is divided into traditional biotechnology and modern biotechnology. Conventional biotechnology is biotechnology that utilizes microorganisms (organisms) to modify materials and the environment to obtain optimal products. Examples are making tempeh, tape, making bread, and composting waste. Today's modern biotechnology is based on the use of human skills to manipulate living organisms to produce products according to human desires, for example through genetic engineering techniques. Genetic engineering is a technique for producing DNA molecules that contain desired new genes or new combinations of genes, also called manipulation of living organisms (Sutarno, 2014).

Biotechnology

Activity 1. Match the application of biotechnology according to the field.

Field Agriculture	Metal Separation 
Field Farming	Hydroponics Plant tissue isolation method 
Reproduction Human	Cloning Artificial insemination Embryo transfer 
Field Mining	Test-tube baby 
Industry Food	Antibiotics, Vaccine & Skincare 
Pharmaceutical industry & Medicine	Tempeh, Tofu & Chees 

Conventional Biotechnology

Activity 2

Fill in Conventional Biotechnology below. Write the name of the product, basic ingredients and microorganisms used and answer the questions correct !

1. **Complete the table below**

No	Types of products	Product Name and Basic material	Microorganisms used
1		Tempeh is made from soybeans	
2		Cheese is made from milk	
3		Tape is made from cassava	
4		Soy sauce is made from black soybeans	

Conventional Biotechnology

Activity 2
Fill in Conventional Biotechnology below. Write the name of the product, basic ingredients and microorganisms used and answer the questions correct !

2. Based on the table you have filled ,discuss questions in below !

1 . Analyze why these changes can occur?
Answer:

2. Based on the questions above, conclude 4 characteristics of convectional biotechnology!
Answer :

Modern Biotechnology

Activity 3

State whether the questions below are true or false regarding the characteristics of modern biotechnology

State	True / False
UTILIZING MICROORGANISM	
USING GENETIC ENGINEERING , RECOMBINANT DNA AND CELL FUSION	
USING FERMENTATION AND PRINCIPLES OF MICROBIA UTILIZATION SIMPLE	
PRODUCT EXAMPLES: VACCINES AND CHEESE	

REFERENCE

Purrwaningsih, S. (2009). Populasi Bakteri Rhizobium di Tanah Pada Beberapa Tanaman Dari Pulau Buton, Kabupaten Muna, Propinsi Sulawesi Tenggara. Jurnal Tanah Trop., 14(1): 65-70.

Riani, S., Hindun, I., & Krisno Budiyanto, M. A. (2017). Pengembangan Media Pembelajaran Berbasis Multimedia Interaktif Untuk Meningkatkan Pemahaman Materi Bioteknologi Modern Siswa Kelas Xii Sma. Jurnal Pendidikan Biologi Indonesia, 1(1), 9–16.

Sutarno.(2014). Analisis EfisiensiPemasaran Kedelai Di Kabupaten Wonogiri. e journal.utp.ac.id Agrineca. Diakses pada 23 November 2023 .