Application of biotechnology 1 assignment

Technology

Biotechnology is a field of applied biology that involves the use of living organisms and bioprocesses in engineering, technology, medicine and other fields requiring bioproducts. The concept encompasses a wide range of procedures for modifying living organisms according to human purposes. For thousands of years, humans have used selective breeding to improve production of crops and livestock to use them for food. In selective breeding, organisms with desirable characteristics are mated to produce offspring with the same characteristics. For example, this technique was used with corn to produce the largest and sweetest crops.

In the early twentieth century scientists gained a greater understanding of microbiology and explored ways of manufacturing specific products. Biotechnology has also led to the development of antibiotics. In 1928, Alexander Fleming discovered the mold Penicillium. It is use to treat bacterial infections in humans. The first use of biotechnology was used in fermentation. Throughout the use of agriculture, farmers have inadvertently altered the genetics of their crops through introducing them to new environments and breeding them with other plants one of the first forms of biotechnology.

Applications Biotechnology has applications in four major industrial areas, including health care (medical), crop production and agriculture, non food (industrial) uses of crops and other products (e. g. biodegradable plastics, vegetable oil, biofuels), and environmental uses. Biotechnology is also used to recycle, treat waste, clean up sites contaminated by industrial activities (bioremediation), and also to produce biological weapons. 1. Medicine a.

Genetic testing: Genetic testing involves the direct examination of the DNA molecule itself.

A scientist scans a patient’s DNA sample for mutated sequences. The tests can detect mutations associated with rare genetic disorders like cystic fibrosis, sickle cell anemia, and Huntington’s disease. Gene tests may not detect every mutation associated with a particular condition because many are as yet undiscovered Gene testing is used for: 1. Determining sex; 2. Forensic/identity testing; 3. Newborn screening; 4. Prenatal diagnostic screening. b. Human Genome Project: The Human Genome Project is an initiative of the U. S. Department of Energy.

It has helped us to determine the exact chemical sequence that constitutes the DNA in every cell of a human body. It has the following advantages: 1. Doctors could drip droplets of our genes into a biochip to figure out if we have cancer that could kill or a disease that would respond to a particular drug. 2. Scientists could analyse selective genes from parents and could design babies before conception. c. Cloning: Cloning in biology is the process of producing similar populations of genetically identical individuals that occurs in nature when organisms such as bacteria, insects or plants reproduce asexually.

It involves the removal of the nucleus from one cell and its placement in an unfertilized egg cell whose nucleus has either been deactivated or removed. There are two types of cloning: 1. Reproductive cloning. After a few divisions, the egg cell is placed into a uterus where it is allowed to develop into a fetus that is genetically identical to the donor of the original nucleus. 2.

Therapeutic cloning. The egg is placed into a Petri dish where it develops into embryonic stem cells, which have shown potentials for treating several ailments. 2. Agriculture a.

Crop yield: Using the techniques of modern biotechnology, one or two genes may be transferred to a highly developed crop variety to impart a new character that would increase its yield. However, while increases in crop yield are the most obvious applications of modern biotechnology in agriculture, it is also the most difficult one. Current genetic engineering techniques work best for effects that are controlled by a single gene. Many of the genetic characteristics associated with yield (e. g. , enhanced growth) are controlled by a large number of genes, each of which has a minimal effect on the overall yield.

There is, therefore, much scientific work to be done in this area. b. Reduced vulnerability of crops to environmental stresses: Crops containing genes that will enable them to withstand biotic and abiotic stresses may be developed. For example, drought and excessively salty soil are two important limiting factors in crop productivity. Researchers have also created transgenic rice plants that are resistant to rice yellow mottle virus (RYMV). In Africa, this virus destroys majority of the rice crops and makes the surviving plants more susceptible to fungal infections. . Reduced dependence on fertilizers, pesticides and other agrochemicals: Most of the current commercial applications of modern biotechnology in agriculture are on reducing the dependence of farmers on agrochemicals. For example, Bacillus thuringiensis (Bt) is a soil bacterium that produces a protein with insecticidal qualities. Crops have also been genetically engineered to acquire tolerance to broad-

spectrum herbicide. Multiple applications of numerous herbicides were routinely used to control a wide range of weed species detrimental to agronomic crops. 3.

Bioremediation and biodegradation Biotechnology is being used to engineer and adapt organisms especially microorganisms in an effort to find sustainable ways to clean up contaminated environments. The elimination of a wide range of pollutants and wastes from the environment is an absolute requirement to promote a sustainable development of our society with low environmental impact. Biological processes play a major role in the removal of contaminants and biotechnology is taking advantage of the astonishing catabolic versatility of microorganisms to degrade/convert such compounds.

Marine environments are especially vulnerable since oil spills of coastal regions and the open sea are poorly containable and mitigation is difficult. In addition to pollution through human activities, millions of tons of petroleum enter the marine environment every year from natural seepages. Despite its toxicity, a considerable fraction of petroleum oil entering marine systems is eliminated by the hydrocarbon-degrading activities of microbial communities.