Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Biotechnology - Notes

**What Does Bio Mean?**

* Bio means \_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_ ; therefore, biotechnology is the application of living processes to technology.

**Historical Applications of Biotechnology**

* Living organisms have been used for centuries to alter and improve the quality and types of food for \_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_

* Examples: \_\_\_\_\_\_\_\_ (make bread rise); bacteria to ferment sauerkraut, bacteria to produce dozens of types of \_\_\_\_\_\_\_\_\_\_ and other dairy products, \_\_\_\_\_\_\_\_\_\_ for livestock animals, etc.

**Improving Plant and Animal Performance**

* Humans have improved on nature’s support of plant and animal growth since they discovered that they could plant seeds and it would result into a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Improvement by Selection**

* As domestication occurred thousands of years ago with the dog, horse, sheep, goat, and ox, improvement by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ soon followed.
* Improvement by selection: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* As people bought, sold, bartered, and traded, they could get animals that had desirable characteristics, such as speed, gentleness, strength, color, size, and milk production.
* By mating animals with characteristics that humans preferred, the offspring of those animals would tend to exhibit their characteristics that humans preferred.
* The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of these animals would exhibit the characteristics of their parents and further intensify their characteristics.
* By accident, the owner was practicing selective breeding.
* Selective breeding: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Improvement by Genetics**

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, an Austrian monk, discovered the effect of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ on plant characteristics.
* Example: Corn, \_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_\_\_\_: is the science of heredity
* \_\_\_\_\_\_\_\_\_\_\_\_\_: the transmission of characteristics from an organism to its offspring through genes in reproductive cells
* Genes: components of \_\_\_\_\_\_\_\_\_\_\_ that determine the individual characteristics of living things.
* Generation: refers to the \_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_\_\_\_: common parents
* In 1866, Mendel discovered that certain characteristics occurred in pairs, for example, short and tall in pea plants.
* He also discovered that one of those characteristics \_\_\_\_\_\_\_\_\_\_ over the other.
* Example: If tall was dominant, then tall plants crossed with tall plants or short plants mostly produced tall plants, but some plants could still be short.
* It was observed that short characteristics could be hidden in tall plants in the form of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Such recessive genes could not express themselves in the form of a short plant unless both genes in the plant cells were the recessive gene for shortness.

**Improving Plants and Animals**

* Scientists have learned to improve plants, animals, and microbes by manipulating the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of cells.
* In 1988, California scientists made the first outdoor tests of a product called ice-minus.
* Ice-minus: product containing bacteria that have been genetically altered to retard \_\_\_\_\_\_\_\_\_\_\_\_\_ formation on plant leaves.
* Synthetic chemicals are now available to protect fruit crops when temperatures fall \_\_\_\_\_\_ to \_\_\_\_\_\_ degrees below what would normally damage the fruiting process.
* In animal science, the hormone \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (BST) has been long known for its stimulation of increased milk production in cows.
* It was not available for commercial use until \_\_\_\_\_\_\_\_\_\_\_ were altered to produce the hormone.

\*\*\*Most cooperatives and milk plants do not accept milk that has BST in milk or even allow farmers to use it on their cows.\*\*\*

* Porcine Somatotropin (PST): increases \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in swine
* This is another example of hormone production by genetically altered bacteria.
* Every time that humans or animals are exposed to a disease, there are individuals that do not become \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Sometimes an entire population is found to be resistant to a disease that is highly contagious to other populations of the same species.
* In some instances, the disease resistance is due to a single \_\_\_\_\_\_\_\_\_\_ that has \_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_.
* It is now possible to identify the location of a resistant gene on a chromosome and to isolate it.
* The new genetic material can be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ successfully to the chromosomes of an organism that is susceptible to the disease.
* A genetically altered individual is capable of passing the disease resistance to its \_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* It is possible to alter the genetic material in plants to improve them.
* Example; \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 🡪 destroys plants in potato fields
* A gene has been created to produce a substance in the leaves that is toxic to the beetle.

**Safety in Biotechnology**

* Federal and State governments \_\_\_\_\_\_\_\_\_\_\_\_\_ biotechnology research and development very closely.
* A lot of fear has been expressed about the perceived dangers of genetically modified organisms, therefore, appropriate \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and \_\_\_\_\_\_\_\_\_\_\_\_ have been developed as biotechnology has evolved.
* Examples: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (EPA)
* Products are tested in laboratories, greenhouses, and other enclosures before being approved for testing outdoors.
* Under these conditions the efficiency, \_\_\_\_\_\_\_\_\_\_\_\_\_\_, control, and environmental impact of new organisms are determined.
* If the new organism poses an unmanageable threat, it can be destroyed.
* Customer resistance to new food products developed through biotechnology has been demonstrated since the first of these foods arrived at supermarkets.
* Example: Customers demand that milk from cows treated with \_\_\_\_\_\_\_ should be labeled.
* Even though the FDA says there is no \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ between cows’ milk treated with BST and cows’ milk that are untreated, consumers are still concerned.
* Today, you can \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ship milk with added \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or milk from a cow that has been treated with an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Ethics in Biotechnology**

* Ethics is a system of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that defines what is right and wrong in society.
* The ability to manipulate the genetics of living organisms raises important ethical questions about how the technology should be used.
* For example, should humans be cloned from the strongest athletes or the smartest scholars?
* Would it be right to sell cloned embryos to parents who are carries for a known genetic defect so that they might have children who are free of the defect?
* These concerns and discussions should be brought forth as they can help scientists and consumers decide how\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ related to biotechnology should be handled.