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Question no 1 Answer:

- 1) Denaturation, Annealing, and extension
- 2) Vaccines
- 3) Yeast
- 4) Molecular scissors
- 5) Restriction Map
- 6) DNA finger printing
- 7) Restriction endonuclease, Methylase enzyme

Question no 2 Answer

Vaccine: The word “vaccine” originates from the Latin Variolae Vaccinae (cowpox) which Edward Jenner demonstrated in 1798 could prevent smallpox in humans.

A substance used to stimulate the production of antibodies and provide immunity against one or several diseases and either prevent (prophylactic vaccines) or, in some cases, treat disease (therapeutic vaccines)

Types of vaccines: There are four types of vaccines which are following

- 1) Live-attenuated vaccines
- 2) Inactivated vaccines or Dead vaccines
- 3) Subunit, recombinant, polysaccharide, and conjugate vaccines
- 4) Toxoid vaccines or genetically engineered.
- 5)

Biotechnology:

1. the exploitation of biological processes for industrial and other purposes, especially the genetic manipulation of microorganisms for the production of antibiotics, hormones, etc.

or

Is the manipulation of living organisms and organic material to serve human needs.
The science of using living organisms or the products of living organisms for benefit of humans and their surroundings.

For example ;

Yeast in bread making and alcohol production.

Use of beneficial bacteria (penicillin) to kill harmful organisms

Cloning of plants and animals

Artificial insemination.

Scope of biotechnology:

There has been increased activity and research between different agricultural areas with common research technique and goals.

Plant science

Animal science

Environmental science

Health/ Agri-Medicine

Plant science:

Improvements of varieties according to relevant agronomic features:

Productivity: (resistance to biotic stress: pests, viruses, pathogens, abiotic stress tolerance to drought, salinity herbicide tolerance. Plant-soil interaction, nutrient absorption, metabolism improvement, etc.

Nutrition improvement:

Vitamin enrichment, flavor enhancement.

Post-harvest physiology:

(Fruit ripening delay)

Ornamental plants improvement: structure, size, color, smell, fruit absence.

Phytoremediation:

Contaminants removal

Biofuels:

Bioenergy crops (1st, 2nd, 3rd, generation)

Biofactories:

Biopolymers, therapeutic proteins, biodegradable plastics, etc.

Natural diversity exploitation and biodiversity protection

Animal science:

Increased use of methods of in vitro fertilization and artificial insemination (pregnant) improve selected breed programs.

Transgenics (also known as recombinant DNA) is the transferal of a specific gene from one organism to another.

Scientists use reproductive cloning techniques to produce multiple copies of mammals that are nearly identical copies of other animals, including transgenic animals,

genetically superior animals, and animals that produce high quantities of milk or have some other desirable trait.

To date cattle, sheep, pigs, goats, horses, mules, cats, rats, and mice have been cloned, beginning with the first cloned animals, a sheep named Dolly, in 1996.

Environmental science:

Use of biotechnology techniques in environmental science for cleaning contaminants and protecting endangered species.

Bioremediation:

Use of natural organisms to clean contaminants

Immunoassay tests:

Are used to test for the presence of contaminants in soil, water and even blood.

Example: tire wash channels.

Health/ Agri- medicine:

Farming the creation of plants and animals capable of producing medical substances

The use of biological barriers to prevent the spread of harmful microorganisms that could contaminate food sources.

Question no 3 Answer:

Restriction of modification system:

The restriction modification system(RM system) is found in bacteria and other prokaryotic organisms, and provides a defense against foreign DNA, such as that borne by bacteriophages.

They occur in wide variety of unicellular organisms including bacteria and archaea.

They comprise two contrasting enzymatic activities ;

Restriction endonuclease (REase)

Methyltransferase (MTase)

Pages (or viruses) invade all types of cells.

Bacteria are one favorite target.

Defense mechanisms have been developed by bacteria to defend themselves from these invasions

The system they possess for this defense is the restriction-modification system

This system is composed of a

Restriction endonuclease

Methylase enzyme

Restriction enzyme:

An enzyme that cuts DNA at internal phosphodiester bonds; different types exist and the most useful ones for molecular biology (type 2) are those which cleave at a specific DNA sequence.

Methylase:

An enzyme that adds a methyl group to a molecule; in restriction-modification systems of bacteria a methyl group is added to DNA at a specific site to protect the site from restriction endonuclease cleavage

Question no 4 Answer:**Restriction types of enzyme:****Oxidoreductases:**

Transfer of O and H atoms between substance involved – oxidation and reduction reactions.

Transferase:

Transfer of a chemical group (Amino carboxyl, methyl, phosphoryl, or acyl group (from one substrate to another)

Isomerase:

The rearrangement of groups within a molecule

Ligases:

Formation of bonds between two molecules using energy derived from the breakdown of ATP.

Lyase enzymes:

Addition or removal of chemical group e.g. H₂O, CO₂ and NH₂) other than by hydrolysis to form a double bond

Hydrolases:

Bring about hydrolases: this is the breaking of chemical bonds with the addition of water. Exohydrolase enzymes cut the molecules at the end of the chain and endohydrolase enzymes do so in the middle of the chain.

Recombinant DNA:

DNA molecules formed by laboratory methods of genetic recombination (such as molecular cloning) to bring together genetic material from multiple sources

This DNA that has been formed artificially by combining constituent from different organisms.

Recombinant DNA technology:

Using recombination DNA technology we can isolate and clone single copy of a gene or of a DNA segment into an indefinite number of copies, all identical.

Simply defined, it is art of cutting and pasting genes.

Major applications of DNA tech

DNA Sequencing

Mutation studies

Transformation

Genetic engineering

Recombinant DNA libraries

Restriction enzymes site analysis
Polymerase chain reaction (PCR)

Question no 5 Answer:

In this experiment we will form a full restriction digestion. After overnight digestion, the reaction is stopped by addition of a loading buffer. The DNA fragments are separated by electrophoresis, a process that involves application of an electric field to cause DNA fragments to migrate into an agarose gel. The gel is then stained with a methylene blue stain to visualize the DNA bands and may be photographed

The laboratory will take approximately three days. The restrictions digestion take place overnight and can be kept in the freezer until the next class period when it will be use for gel electrophoresis. The gel may be stained overnight prior to photographing or recording results.

For each lab groups:

Four microtubes

Microtubes rack

20-ul micropipette (10-ul micropipette) and sterile tips.

Water proof pen

Beaker or foam cup with crushed ice for the following

20-ul of 0.4 ug/ ul landa DNA

2.5 ul BemHI restriction enzyme

2.5 ul EcoRI restriction enzyme

2.5 ul HindIII restriction enzyme

10 ul distilled water

Gloves

500- ml breaker (2 days)

Electrophoresis chamber (days 2)

Power supply (days 2)

20 ul 10x loading dye (days 2)

1.0% agarose gel (days 2)

Common materials:

Container with TBE solution (IX)

37°C water bath w/ floating rack.

60°C water bath or saucepan on a hot plate (days 2)

Cooler with crushed ice.