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Q1: Fill in the Blanks.

- 1) The three main steps of PCR are **Denaturing stage**, **Annealing stage** and **Extending stage**
- 2) The word “vaccine” originates from the Latin word **Vaaccinae**.
- 3) **Yeast** is the oldest microbes exploited by humans for their benefit.
- 4) Restriction endonucleases are also called as **Molecular Scissors**.
- 5) **Restriction Map** is a diagram or map of DNA molecule of an organism that shows specific sites of cleavage restriction sites.
- 6) A forensic technique used to identify individuals based on the variations in their DNA sequences is known as **DNA Finger Printing**
- 7) Restriction modification system is mainly composed of **Restriction endonulease** and **Methylase Enzyme**

QUESTION 1 : Write a short note on the following Vaccines and its types ? Biotechnology and its scope ?

ANSWER : **Vaccines :**

A vaccine is biological preparation that improve immunity to a particular disease.

- A vaccine typically contains an agent that resemble disease _ causing microorganism and is often made for weakened or killed form of the microbe.
- The term “ vaccine ” was coined by Louis pasture .
- The term vaccines was derived from “ vacca ” meaning cow, since Edward Jenner used cow pox virus to prevent smallpox infection.

Types of vaccines:

There are the different types of vaccines. Each types of vaccines is designed to teach your immunity system how to fight off certain kinds of germs _ and the serious disease they cause.

LIVE Attenuated vaccines :

Live Attenuated vaccine contain a version of the living microbe that has been weakened in the lab .so it cannot cause disease.

- Because live Attenuated vaccines is the closest thing to natural infection , these vaccines are good teacher of the immunity system.

Inactivated vaccines :

scientists produce inactivated vaccines by killing the disease _ causing microbe with chemicals, heat ,or radiation such vaccines are more stable and safer than live vaccines.

- Because the dead microbe can't mutate back to their causing state .

Subunits vaccines :

Instead of entire microbe , subunits vaccines include only the antigens that best stimulate the immunity system.

- In some case these vaccines use apitopes the very specific part of the antigens that antibodies are T cells recognize bind to .

BIOTECHNOLOGY :

BIOTECHNOLOGY is the technology applied to biology, molecular biology, genetic and many other sub field of biology.

➤ BIOTECHNOLOGY utilizes cellular and biomolecular processes to create technologies and products that helps and improves our lives and the nature

SCOPE OF BIOTECHNOLOGY :

HEALTH :

BIOTECHNOLOGY heals the world's by utilizing nature own toolbox and using our own genetic map up to heals and guidelines of research by reducing rates of infection disease, saving millions of children's lives changing the odds of serious, life threatening conditions affecting the millions around the world .

ENERGY :

BIOTECHNOLOGY uses the biological processes such as fermentation and harness biocatalyst such as enzymes, yeast and other microbes as become microscopic manufacturing plants, biotechnology fuels the world by streamlining the steps in CHEMICAL manufacturing of processes by 80 % more lowering the temperature.

QUESTION 3 : Explain in detail the restriction modification system ?

Answer : **RESTRICTION MODIFICATION SYSTEM :**

Restriction modification system are important COMPONENT of prokaryotic defense mechanism against invading genomes.

- They occur in a wide variety of unicellular organism including bacteria and archaea.
- They comprise to contrasting enzymatic activities Restriction endonuclease Methyltransferase.
- Phages or viruses invade all types of cells .
- Bacteria are one favorite target .
- The defense mechanism have been developed by bacteria to defend them selves .from these invasion.
- The system they possess for this defense is the restriction modification system.
- This system is composed of

. restriction endonuclease
Methylase enzyme .

➤ Each bacterial species in strain is there on combination or restriction in methylating enzymes.
Restriction modification system enzyme :

✓ RESTRICTION ENZYMES :

An enzyme that cut DNA at internal phosphodiester bonds different types exist in the most useful once for molecular biology(TPES 2) or those which cleave at a specific DNA sequence.

METHYLASE

an enzyme that add a methyl group of a molecule and restriction modification system of bacteria a methyl group is added to DNA at a specific site to protect the site from restriction endonuclease cleavage.

NUCLEASES ;

The enzyme that cleaves nucleic acids.

- Nucleases which belong to the class of enzymes called hydrolyses.
- Nucleases are further described by the addition of the prefix endogenous or exon to the name

ENDONUCLOSES :

Break the nucleic acid chains some where in the interior rather than at the ends of the molecule also called restriction endonuclease

EXONUCLOSES ;

Removing nucleotides from the ends of the molecule.

QUESTION 4 : What are the different types of restriction enzyme ? Recombinant DNA ,
Recombinant DNA technology and its application. ?

Answer :

Types of restriction enzymes :

There are following types of restriction enzymes discuss below .

Types 1 enzymes :

Types 1 enzyme are complex, multi subunit ,combination restriction, modification enzymes that cut the DNA at random far from their recognize sequences . orginally Through to be rare , we now know from the analysis of sequenced genomes that they are common .

Types 2 enzymes :

Types 2 enzymes cut the DNA at defined positions close to or within their reconization sequences . they produce discrete restriction fragments and distinct gel banding patterns , and they are the only classe use in the laboratory for routine DNA analysis and gene cloning . rather than forming a single family related proteins .

Types 2 G enzymes :

Types 2 G restriction enzymes, the third major kind of type 2 enzyme ,are large combination restriction and modification enzymes , 850 _ 1250 amino acid length , in which the two enzymatic activities are reside in the same protein chain . these enzymes cleave outside of their recongation sequences and can be classified as those that recognize continues sequences .

Recombinant DNA :

Recombinant DNA molecule are DNA molecule formed by laboratory methods of genetic recombination (such as molecular cloning) to bring together material from multiple sources creating sequences that would not otherwise found in the genome .

Recombinant DNA Technology :

Has also proven important to the production of vaccines and proteins therapies such as human insulin, interferon and human growth hormone .

APPLICATIONS :

Gene cloning has a drive range application where it has prove particularly useful has been in mapping out the human genome, the creation of transgenic animals, and the development of insect crops . it also pivatols to genetic tests carried out in forensic science and archaeology as well as in test for determining hereditary diseases and patients.

QUESTION 5 : As student of MLT how will you use restriction endonuclease in lab ?

Answer : **DNA restriction enzymes :**

If you've watched any crime show - ever - you know that DNA is used to place and/or eliminate suspects from the scene of a crime. Have you ever wondered how this thin, twisted molecule can be used to reveal so much about us?

Remember that the DNA 'ladder' is made of three big components: a phosphate backbone, a sugar (deoxyribose), and rungs made of nitrogenous base pairs. Each of the bases pair specifically with one other. A (adenine) pairs with T (thiamine), and G (guanine) pairs with C (cytosine). The ways in which these four little letters can be arranged are almost endless, and the sequence in which they are arranged sets us apart from other people.

Thanks to special proteins called restriction enzymes, we can definitively see how. Restriction enzymes are proteins that digest (cut) DNA at specific base sequences. Although exactly what sequence varies between restriction enzymes, the so-called recognition sites, sequences 'picked out' by the enzyme have something in common - they're palindromes, meaning they read the same forward and backward, just like some words you might know. Since we're looking at two-stranded DNA, the palindrome is a little different; it reads forward on one strand and backward on the complementary (paired) strand.

For example, a restriction enzyme called EcoRI recognizes the sequence GAATTC. Notice its complement: CTTAAG. EcoRI scans the length of the DNA molecule, and every time it finds this sequence, it makes a cut between the G and the A on both strands of the DNA. In most cases, the actions of restriction enzymes result in sticky ends - unpaired bases that hang over. Scientists can 'glue' other, complementary pieces of DNA to these ends with enzymes called 'ligases' to create whole new, tailored DNA sequences. This technique is often used to make medicines used in all kinds of therapy. Depending on how many times this sequence appears in a person's DNA, this results in two or many more fragments of different sizes.

DNA Mapping

Forensic scientists are able to take the DNA fragments that result from digestion by restriction enzymes, now called RFLPs (restriction fragment length polymorphisms), and create a DNA fingerprint. To do this, they use a technology called gel electrophoresis, which literally translates to 'carrying by electricity'.