Iqra National University Peshawar

**NAME; MUHAMMAD USMAN MIAN**

**ID; 14666**

**CLASS; MLT 4TH**

**SUBJECT MOLECULAR BIOLOGY**

**SUMBITTED TO; FAZLI ZAHIR MIAN**

**GMAIL;** **umian8889@gmail.com**

**Q1: Fill in the Blanks.**

1. The three main steps of PCR are **denaturation**, **annealing** and **extension**
2. The word “vaccine” originates from the Latin word **vaccinae**.
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 DNAsequences is known as **DNA fingerprinting.**
7. Restriction modification system is mainly composed of  **restriction endonuclease**  and **Methylase enzyme.**

**Q2: Write short notes on the following**

1. **Vaccines and its types**

**ANS: -**

 **VACCINE:**

* Vaccine is derived from the Latin word vaccinae
* A vaccine is a biological preparation that provide active acquired immunity to a particular infectious disease
* A vaccine typically contain an agent that resembles a disease causing microorganism and is often made from weakened or killed form of the microbe
* The agent stimulate the body immune system to recognize the agent as a threat, and destroy it.
* Vaccine can be prophylactic or therapeutic.

**TYPES OF VACCINE:**

* There are four major types of vaccine
1. Live-attenuated vaccine
2. Inactivated vaccine
3. Subnit, recombinant, polysaccharide, and conjugated vaccine
4. Toxoid vaccine
5. **Biotechnology and its scope**

**ANS: -**

**BIOTECHNOLOGY:**

* As the name indicate, boi-technology is a combination science of biology and technology
* Biotechnology is a technology that utilizes biological systems, living organisms or part of this to develop or create different products
* Baking bread is the example of processes that fall within the concept of biotechnology (use of yeast)
* Today biotechnology covers many different discipline.
* New technologies and products are developed every year within the field of medicine, agriculture, and industrial biotechnology.

**SCOPE OF BIOTECHNOLOGY:**

* Scope for biotechnology is a career option is immense as we live in exciting times where there are amazing discoveries, new applications and inventive products on the market every day.
* There are various organization that serve as great resource for those who are just entering the field of biotechnology.
* Biotechnologists are at the forefront of the continuous search to find new, sustainable food source.
* Professional in this fields can specialize in one or more subfields like genomics, proteomics, and bioinformatics.

**Q3: Explain in detail the Restriction modification system.**

**ANS:-**

**RESTRICTION MODIFICATION SYSTEM:**

* Restriction modification system are important component of prokaryotic defense mechanisms against in invading genomes.
* They occur in a wide variety of unicellular organisms, including bacteria and archaea.
* They comprise two contrasting enzymatic activities
* Restriction endonuclease
* Methyltransferase
* Page 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 two type of enzyme
* Restriction endonuclease
* Methylase enzyme
* Each bacterial species and strain has their own combination of restriction and methylating enzymes.

**Q4: What are Different types of retraction enzymes? Recombinant DNA, Recombinant DNA technology and its application**

**ANS: -**

**TYPES OF RESTRICTION ENZYMES;**

* There are six types of enzymes
1. **Oxidoreductases:**
* Transfer of O and H items between substances involved (oxidation and reduction reactions)
1. **Transferase:**
* Transfer of a chemical group fromone substrate to another.
1. **Isomerase:**
* The rearrangement of groups within a molecule
1. **Ligases:**
* Formation of bonds between two molecules using energy derived from the breakdown of ATP.
1. **Lyase enzymes:**
* Additionor removal of a chemical group. For example H2O, CO2 and NH2. Other than by hydrolysis to form a double bond
1. **Hydrolases:**
* Bring about hydrolysis; this is the breaking of chemical bonds with the addition 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 method of genetic recombination such as molecular cloning to bring togather genetic material from multiple sources
* This is DNA that has been formed artificially by combining constituents from different organisms

**RECOMBINANT DNA TECHNOLOGY:**

* Using recombinant DNA technology, we can isolate and clone single copy of a gene or a DNA segment into an indefinite number of copies, all identical.
* Simply defined, it is the art of cutting and pasting genes.

**APPLICATION OF RECOMBINAT DNA:**

* DNA sequencing
* Mutation studies
* Transformation
* Genetic engineering
* Recombinant DNA libraries
* Restriction enzymes site analyses
* Polymerase chain reaction.

**Q5: As students of MLT how will you use Restriction endonuclease in lab?**

**ANS: -**

* In the laboratory restriction enzymes (or restriction endonucleases) are used to cut DNA into smaller fragments.
* The cuts are always made at specific nucleotide sequences.
* Different restriction enzymes recognized and cut different DNA sequences.
* Restriction enzymes are found in bacteria
* Bacteria use restriction enzymes to kill viruses
* Like all enzymes, a restriction enzyme works by shape-to-shape matching. When it comes into contact with a DNA sequence that makes a part of the enzyme called recognition site.
* It wraps around the DNA and causes a break in both strands of the DNA molecules.
* Each restriction enzyme recognizes a different and specific recognition site, or DNA sequence.
* The enzymes attack the viral DNA and break it into useless fragments.
* Restriction enzyme are a basic tool for biotechnology research.
* They are used for DNA cloning and DNA fingerprinting.

\*\*\*The end\*\*\*