**Name :- Afaque Ahmed**

**Reg No. :- 201000100110033**

**Roll No. :- 10000120003**

**Sem :- 7th**

**Subject :- Biology**

**1) Name one scientist who got Nobel Prize for work on yeast.**

**Ans-** Arthur Kornberg

**2. Who produced DNA in test tube?**

**Ans-** Arthur kornberg

**3. Williams Syndrome has missing genetic material on \_\_\_\_\_\_\_**

**Ans-** chromosomes

**4. Turner Syndrome is caused by missing or incomplete \_\_\_\_\_**

**Ans-** X chromosome

**5. Biosphere is**

**a. All living things and non-living components of the environment (water, air, soil, light) in a**

**particular area.**

**b. The environments that support life (soil, bodies of water and inner atmosphere)**

**c. The type of natural environment in which a particular species of organism lives**

**d. The role and position a species has in its environment; how it meets its needs for food and shelter, how it survives, and how it reproduces**

**Ans-** a) . All living things and non-living components of the environment (water, air, soil, light) in a particular area.

**6. Enzymes change the \_\_\_\_\_\_ of a chemical reaction**

**1. Type**

**2. Rate**

**3. Reactants**

**4. Product Yield**

Ans- 2)Rate

**7. When Galileo characterized science, he based it on his knowledge of \_\_\_\_\_\_\_\_.**

Ans- Nicolaus Copernicus' theory

**8. What is the structure of DNA?**

Ans- Double-helix

**9. Robert Hooke coined the term**

**1. Cell**

**2. Nucleus**

**3. Bacteria**

**4. Chromosome**

Ans- 1)Cell

**10. Father of Modern Genetics is**

**1. Aristotle**

**2. Mendel**

**3. Darwin**

**4. Newton**

Ans- 2)Mendel

**11. Write basic similarities and differences between prokaryotes and eukaryotes.**

**Ans**

Similarities:

1. Cell Membrane: Both prokaryotic and eukaryotic cells have a cell membrane that separates the cell's interior from its external environment.

2. Cytoplasm: Both types of cells contain cytoplasm, a semi-fluid substance that houses various cell structures and organelles.

3. DNA: Both prokaryotes and eukaryotes have genetic material in the form of DNA, which carries the cell's genetic information.

4. Ribosomes: Both types of cells contain ribosomes, which are responsible for protein synthesis.

Differences:

1. Nucleus:

- Prokaryotes: Lack a true nucleus; their DNA is located in a region called the nucleoid.

- Eukaryotes: Have a true nucleus enclosed in a nuclear membrane, separating DNA from the cytoplasm.

2. Membrane-Bound Organelles:

- Prokaryotes: Generally lack membrane-bound organelles. They have fewer specialized internal structures.

- Eukaryotes: Contain membrane-bound organelles such as the endoplasmic reticulum, Golgi apparatus, mitochondria, and more, each with specific functions.

3. Size:

- Prokaryotes: Typically smaller in size, with a diameter in the range of 1-5 micrometers.

- Eukaryotes: Generally larger, with cells that can vary in size from 10-100 micrometers.

4. Cell Division:

- Prokaryotes: Reproduce asexually through binary fission, a simple form of cell division.

- Eukaryotes: Undergo more complex forms of cell division, such as mitosis for somatic cells and meiosis for gametes.

5. Presence of Organelles:

- Prokaryotes: Lack membrane-bound organelles like mitochondria, endoplasmic reticulum, and Golgi apparatus.

- Eukaryotes: Contain various membrane-bound organelles responsible for specialized cellular functions.

6. Cell Wall Composition:

- Prokaryotes: Have a cell wall made of peptidoglycan, but composition may vary between different groups (e.g., bacteria and archaea).

- Eukaryotes: Some eukaryotic cells, like plant cells and fungi, have cell walls composed of different materials, such as cellulose and chitin.

7. Genetic Material:

- Prokaryotes: Typically have a single, circular DNA molecule.

- Eukaryotes: Have multiple linear DNA molecules contained in the cell's nucleus.

**12. What are enzymes? Name fastest enzyme present in human body.**

**Ans**

Enzymes are biological molecules that act as catalysts in living organisms. They are responsible for accelerating and regulating chemical reactions that are essential for various biological processes. Enzymes are highly specific, meaning each enzyme catalyzes a particular reaction or a group of closely related reactions. They work by lowering the activation energy required for a chemical reaction to occur, thus speeding up the reaction without being consumed in the process.

The fastest enzyme present in the human body is probably carbonic anhydrase. Carbonic anhydrase is an enzyme that catalyzes the conversion of carbon dioxide (CO2) and water (H2O) into bicarbonate ions (HCO3-) and hydrogen ions (H+). This enzyme is essential for the regulation of acid-base balance in the body and plays a crucial role in processes like respiration and maintaining blood pH. It is known for its rapid catalytic activity and is considered one of the fastest enzymes in the human body.

**13. Why do living systems need energy? Why there are more producers than consumers in an ecosystem?**

**Ans:**

Living systems, including all organisms, require energy for several fundamental reasons:

1. Metabolism: Metabolism refers to the chemical processes that occur within living organisms to maintain life. These processes include the conversion of food into energy, the synthesis of biomolecules, and the removal of waste products. All metabolic reactions require energy to proceed.

2. Growth and Repair: Organisms need energy to grow and repair their cells and tissues. This is essential for the development and maintenance of an organism's structure.

3. Reproduction: Reproduction is a vital aspect of life. It requires energy to produce offspring and ensure the continuation of a species.

4. Movement: Many organisms need energy for physical activities, such as locomotion. Muscles and other cellular processes require energy to function.

5. Homeostasis: Organisms must regulate their internal environment to survive. This process, known as homeostasis, requires energy to maintain stable conditions despite external changes.

6. Response to Environmental Stimuli: Organisms need energy to respond to environmental stimuli, such as detecting and reacting to changes in their surroundings.

As for the question of why there are more producers than consumers in an ecosystem, this relates to the concept of ecological efficiency. In an ecosystem, energy flows through trophic levels, starting with producers and progressing through consumers. Producers, such as plants and algae, are capable of photosynthesis, converting sunlight into chemical energy. They capture energy from the sun and store it as chemical energy in organic compounds like carbohydrates.

Consumers, on the other hand, obtain energy by consuming other organisms. Each trophic level typically loses energy as heat during metabolism and digestion. This means that as you move up the food chain from producers to primary consumers (herbivores) to secondary consumers (carnivores), there is less and less available energy. Consequently, to support a complex food web with a variety of consumers, there must be a larger base of producers to provide the necessary energy.

In summary, there are more producers than consumers in an ecosystem because producers capture and store energy from the sun efficiently through photosynthesis, whereas consumers obtain energy by consuming other organisms. The energy transfer between trophic levels results in a pyramid-shaped distribution, with more energy available at lower trophic levels, supporting a larger population of producers.

**14. Write the characteristics of model organisms.**

**Ans:-**

Model organisms are species that are extensively studied to understand fundamental biological processes, genetics, and various aspects of life. They serve as valuable tools in scientific research and have specific characteristics that make them suitable for these purposes. Here are some key characteristics of model organisms:

1. Genetic Simplicity: Model organisms often have relatively simple and well-understood genetics. This makes it easier to identify and study specific genes and their functions.

2. Short Generation Time: Model organisms typically have short generation times, allowing researchers to observe multiple generations quickly. This accelerates genetic studies and experiments.

3. High Reproductive Rate: These organisms reproduce rapidly, leading to large populations. This helps in statistical analysis and the study of genetic variations.

4. Accessibility: Model organisms are readily available and easy to maintain in the laboratory. They can be cultured or bred with relative ease.

5. Conserved Biological Processes: Model organisms share many fundamental biological processes with more complex organisms, making their findings applicable to a wide range of species.

6. Well-Annotated Genomes: Model organisms often have well-annotated genomes, providing comprehensive information about their genetic makeup.

7. Ample Genetic Variation: Some model organisms have naturally occurring genetic variations, which are valuable for studying gene function, inheritance, and genetic diseases.

8. Similarity to Human Physiology: Some model organisms have physiological similarities to humans, making them useful for studying diseases and medical treatments.

9. Well-Defined Developmental Stages: The development of model organisms is well characterized, allowing the study of developmental processes.

10. Scientific History: Many model organisms have a rich history of scientific research, with a large body of existing knowledge and resources available to researchers.

11. Ethical Considerations: Using model organisms can help reduce the need for experimentation on more complex and sentient animals, addressing ethical concerns.

Common examples of model organisms include fruit flies (Drosophila melanogaster), nematode worms (Caenorhabditis elegans), zebrafish (Danio rerio), mice (Mus musculus), yeast (Saccharomyces cerevisiae), and the roundworm (Arabidopsis thaliana), among others. Each of these organisms has unique characteristics that make them valuable tools for scientific research in different fields such as genetics, developmental biology, neurobiology, and molecular biology.

**17. What are genetic disorders? List different types of genetic disorders?**

**Ans:-**

Genetic disorders are a group of diseases or medical conditions caused by abnormalities or mutations in an individual's DNA, specifically in their genes or chromosomes. These disorders can be inherited from one or both parents or can occur as new mutations during an individual's lifetime. Genetic disorders can affect various aspects of health and can be caused by mutations in single genes (monogenic disorders) or by complex interactions of multiple genes (polygenic disorders). Here are different types of genetic disorders:

1. Single-Gene Disorders (Monogenic Disorders):

- Autosomal Dominant Disorders: These disorders result from a mutation in one copy of an autosomal (non-sex) chromosome. Examples include Huntington's disease and Marfan syndrome.

- Autosomal Recessive Disorders: In these disorders, both copies of an autosomal gene must be mutated for the condition to be expressed. Examples include cystic fibrosis and sickle cell anemia.

- X-Linked Disorders: These disorders are caused by mutations in genes on the X chromosome. They can affect males more often than females because males have only one X chromosome. Examples include hemophilia and Duchenne muscular dystrophy.

2. Chromosomal Disorders:

- Aneuploidy: This occurs when there is an abnormal number of chromosomes. Examples include Down syndrome (trisomy 21) and Turner syndrome (monosomy X).

- Structural Aberrations: These involve changes in the structure of chromosomes, such as translocations, deletions, and duplications. Examples include Philadelphia chromosome (associated with chronic myeloid leukemia) and Cri-du-chat syndrome.

3. Mitochondrial Disorders: These are caused by mutations in mitochondrial DNA (mtDNA) and affect the function of the mitochondria, the cell's powerhouses. Examples include Leigh syndrome and Leber's hereditary optic neuropathy (LHON).

4. Multifactorial Disorders (Complex Disorders):

- These disorders result from a combination of genetic and environmental factors. Examples include diabetes, heart disease, and certain types of cancer.

5. Polygenic Disorders:

- These are influenced by multiple genes working together. They often involve complex traits, such as height, intelligence, and susceptibility to common diseases like schizophrenia and autism.

6. Inborn Errors of Metabolism (IEM):

- These are a group of disorders caused by mutations in genes that encode enzymes, leading to metabolic imbalances. Examples include phenylketonuria (PKU) and maple syrup urine disease.

7. Genomic Disorders: Some genetic disorders involve abnormalities in the number or structure of whole chromosomes or chromosome segments. Examples include chromosomal duplications and deletions.

8. Mendelian Disorders with Atypical Inheritance Patterns:

- These are genetic disorders that do not follow classical Mendelian inheritance patterns, such as incomplete dominance or codominance. Examples include sickle cell trait and some forms of osteogenesis imperfecta.