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Z00102

PPT Slide Lec 1 To 28

Admin:

Merged date 11-20

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Regards: Zarva Chaudhary

Principles of Animal life 1

Concept of Zoology

Topic no 1



Concept of Zoology

Contents

1. Defining Zoology
2. Essence of Zoology
3. Brief History of Zoology
4. What We Study in Zoology?

Concept of Zoology

1. Defining Zoology

- Branch of biology which deals with the study of animal life.
- Gr. *zoon*, animal and *logos*, to study

Concept of Zoology

2. Essence of Zoology

- Fascinating animal life
- Domestic pets to wildlife
- Beautiful aquatic animals
- **Questions?**
- How and where they live?
- What they eat?
- What they do?

Concept of Zoology

3. History of Zoology

- As old as history of man
- Greeks and Romans documented animal life
- Muslim Scientists gave many discoveries in the field of zoology
- Modern Scientists revolutionized the science of zoology

Concept of Zoology

4. What we Study in Zoology

- All aspects of animal life:
- Living in natural environment
- Different activities
- Structure and function up to molecular level
- Caring about diseases
- Getting benefits using modern techniques.

end

Principles of Animal life 1

Significance of Zoology

Topic no 2

Significance of Zoology

Contents

1. Significance of Zoology
2. Understanding life
3. Improving health
4. Improving food quality
5. Improving environment

Significance of Zoology

1. Significance of Zoology

- Zoology is as significant as important is human and other animal life on this earth.
- Helping mankind to improve environment, health and food quality.

Significance of Zoology

2. Understanding Animal life

- Helping understand basic features of animal life
- What are different types of animals living on earth
- How life is sustaining on earth

Significance of Zoology

3. Improving Health

- Prevention from diseases
- Curing the diseases
- Healthy life style

Significance of Zoology

4. Improving Food Quality

- Animals with more meat
- Increased production of poultry products
- More fish
- Better quality products
- Transgenic animals

Significance of Zoology

5. Improving Environment

- Protecting biodiversity
- Cleaning the environment from pollutants
- Avoiding the pollutants....biocontrol

end

Applications of Zoology

Topic no 3

Applications of Zoology

Contents

1. Medical Research
2. Agriculture
3. Environmental Health

Applications of Zoology



1. Medical Research

- Disease diagnosis
- Mechanisms of diseases
- Prevention and treatment
- Pharmacology

Applications of Zoology

• Disease Diagnosis

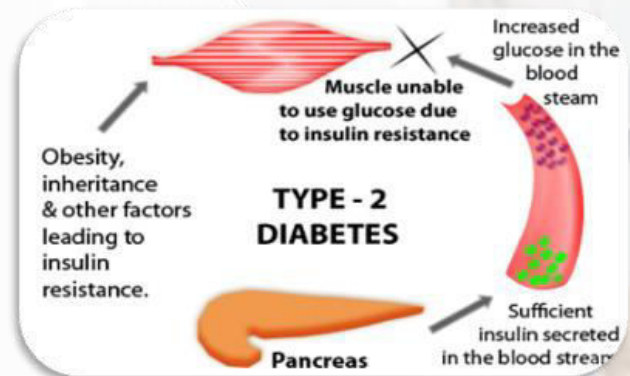


The process of identifying a disease using its signs and symptoms.

Applications of Zoology

- **Mechanism of Disease**

To understand how a person is affected by a disease and what are underlying mechanism for being ill.



Applications of Zoology

- **Prevention and control**



The branch of medicine concerned with the uses, effects, and modes of action of drugs.

Applications of Zoology

• Pharmacology



The study of uses, effects, and modes of action of drugs.

Applications of Zoology

2. Agriculture

- Pests and pest control
- Animal husbandry
- Aquaculture
- Apiculture
- Sericulture

Applications of Zoology

- **Pests and Pest Control**

Biocontrol

Chemical control



Applications of Zoology

- **Animal Husbandry**

The farming of animals to produce foods such as meat, eggs, and milk.



Applications of Zoology



- **Aquaculture**

The rearing of aquatic animals or the cultivation of aquatic plants for food



Applications of Zoology

- **Apiculture**

Apiculture is the maintenance of bee colonies, commonly in man-made hives.



Applications of Zoology



• Sericulture

Silk production from silkworms



Applications of Zoology



3. Industry

- Vaccines
- Antibodies
- Growth hormones
- Leather



Applications of Zoology



4. Environmental Role

- Biodiversity
 - Habitat protection
 - National parks
 - Game reserves
- Aesthetic Values
 - Safari parks
 - Zoo
- Pollution control
 - bioremediation

Principles of Animal life 1

One World View

Topic no 5

One-World View

Contents

1. One-world View
2. Genetic Unity
3. Common Structural Organization
4. Common Evolutionary Forces
5. Common Environment

One-World View

1. One-World View

- Life is very diverse but same structural and functional model
- Life shares same properties

One-World View

2. Genetic Unity

- All life based DNA
- DNA has same chemical composition
- It carries genetic information
- Genetic code is almost similar

One-World View

3. Common Structural organization

- Cell is the fundamental unit of life
- It makes all the structure of living organisms
- All functions are also performed by the cell

One-World View

4. Common Evolutionary forces

- Genetic drift
- Inbreeding
- Selection
- Gene flow
- Mutations

One-World View

5. Common Environment

- All organism living on earth
- All interact with environment
- All get food from environment

end

Principles of Animal life 1

Topic no 6

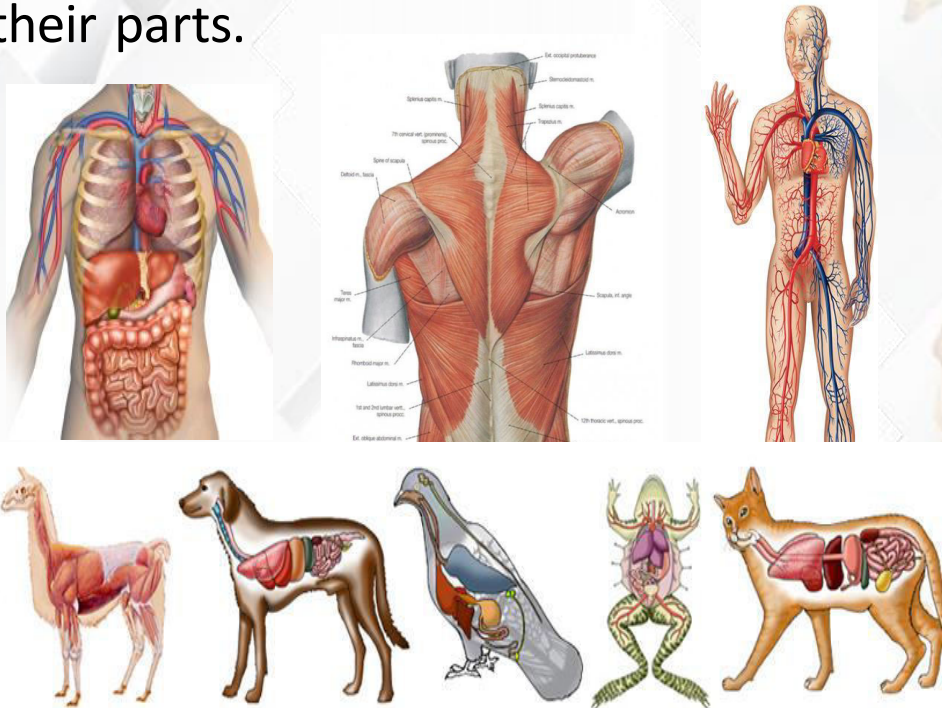
Specializations in Zoology

Heading

1. Anatomy
2. Physiology
3. Cytology/ Cell biology
4. Molecular biology
5. Genetics
6. Histology
7. Embryology
8. Parasitology
9. Ethology
10. Ecology
11. Paleontology
12. Systematics

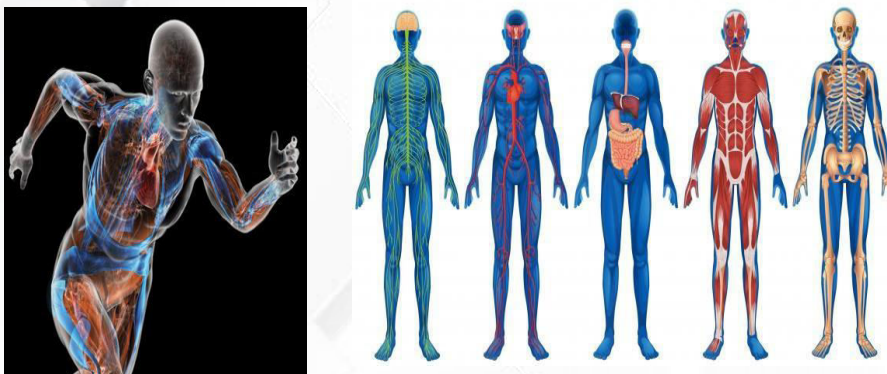
1. Anatomy

- Study of the structure of complete organisms and their parts.



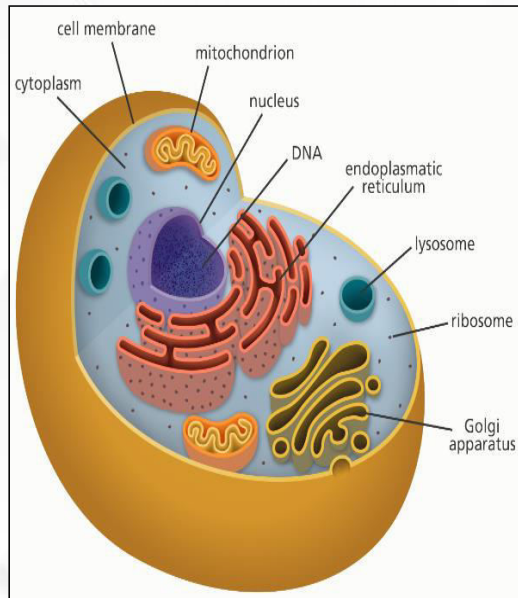
2. Physiology

- Study of the function of organisms and their parts.



3. Cell biology (Cytology)

- Study of the structure and function of cell and its components.

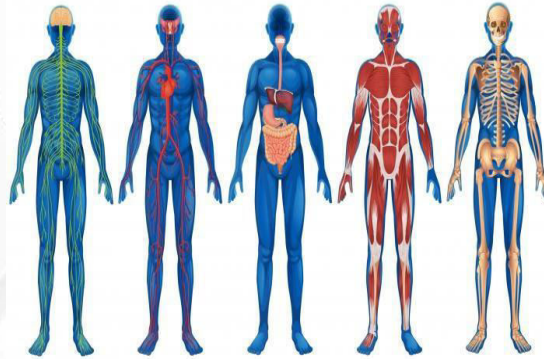


4. Molecular Biology

- Studying the structure and function of the macromolecules (e.g. proteins and nucleic acids, Lipids) essential to life.

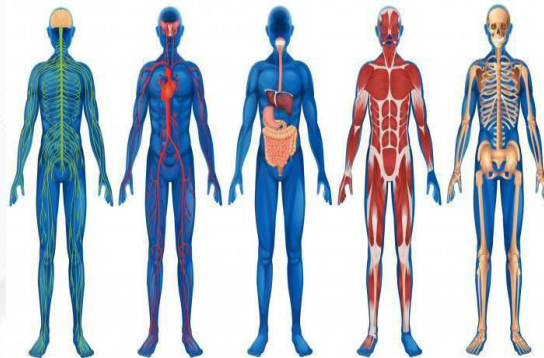
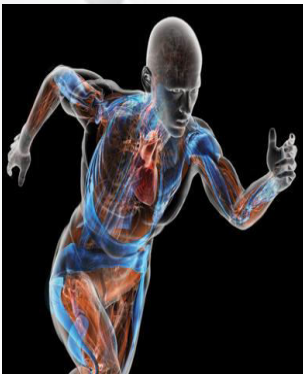
Histology

- Study of the function of organisms and their parts.



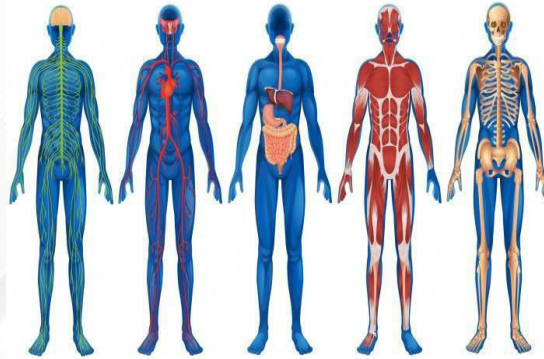
Embryology

- Study of the function of organisms and their parts.



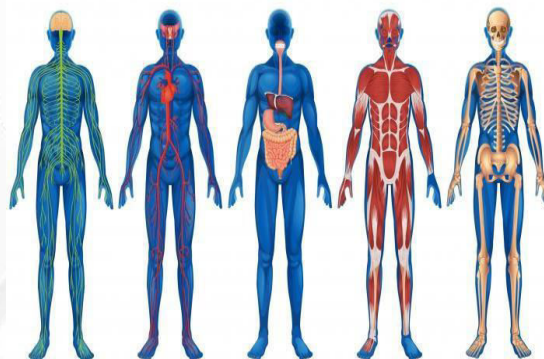
Genetics

- Study of the mechanisms of transmission of traits from parents to offspring



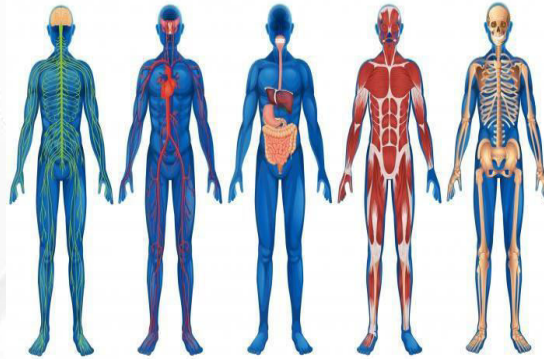
Physiology

- Study of the function of organisms and their parts.



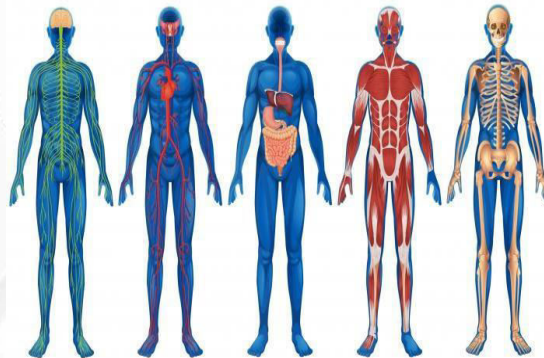
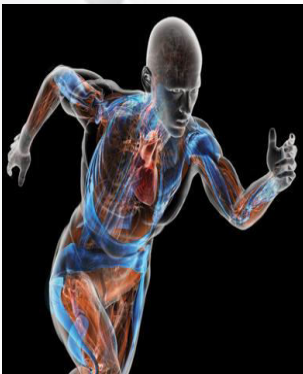
Physiology

- Study of the function of organisms and their parts.



Physiology

- Study of the function of organisms and their parts.



Principles of Animal life 1

Principles of Animal life 1

Topic no 7

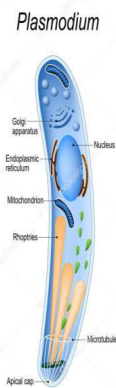
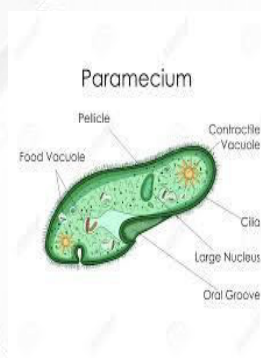
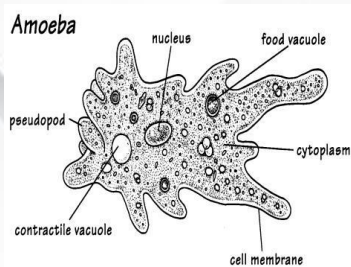
Specializations in Zoology-II

Specialization on the basis of animal group

1. Protozoology
2. Nematology
3. Entomology
4. Malacology
5. Ichthyology
6. Herpetology
7. Ornithology
8. Mammalogy

1. Protozoology

- Protozoology is the study of protozoa
 - Characterization
 - Taxonomy
 - Medical importance



2. Nematology

- Nematology is the scientific discipline concerned with the study of nematodes, or roundworms.



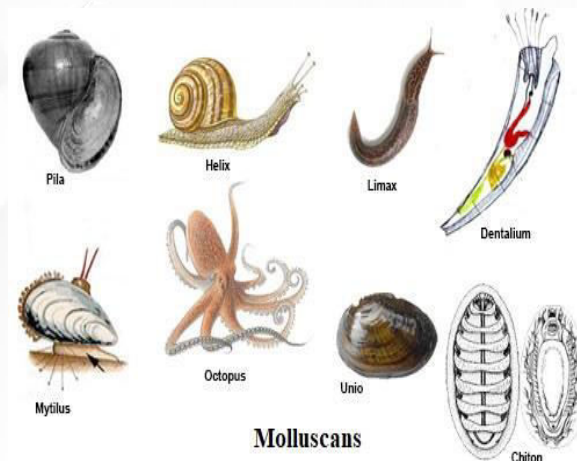
3. Entomology

- Entomology is a branch of zoology which deals with the study of insects.



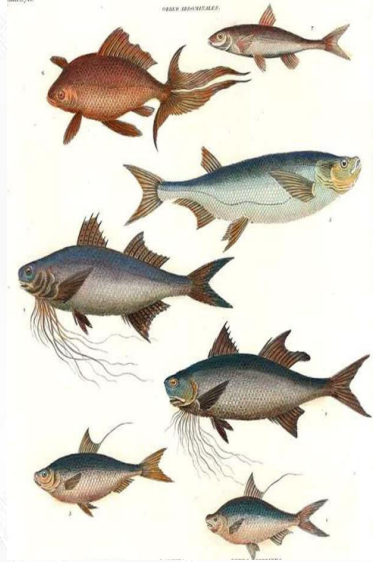
4. Malacology

- Malacology is the branch of invertebrate zoology that deals with the study of the mollusca.



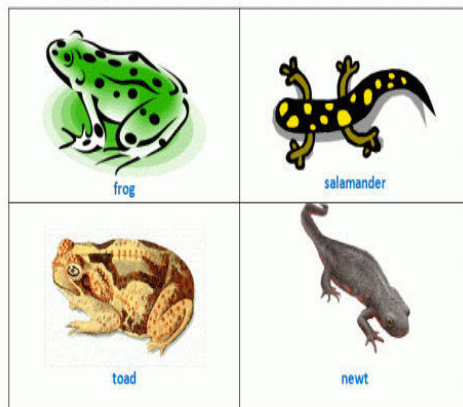
5. Ichthyology

- Ichthyology is the branch of zoology concerned with the study of fishes.



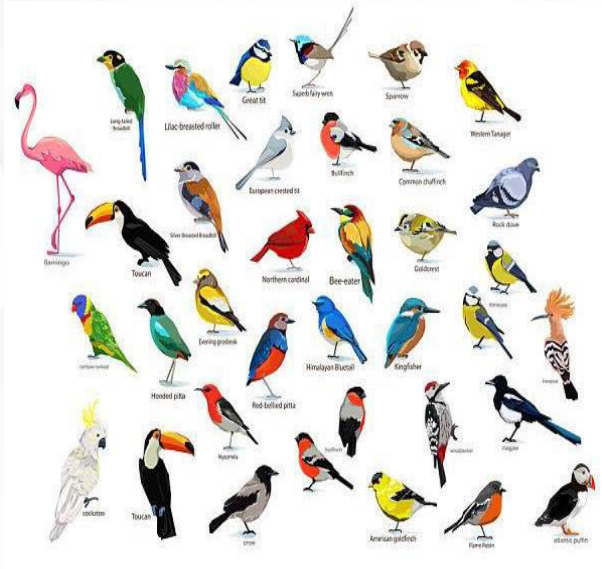
6. Herpetology

- Herpetology is the branch of zoology that deals with the study of amphibians and reptiles.



7. Ornithology

- It is the branch of zoology concerned with the study of birds



8. Mammalogy

- It is the branch of zoology that deals with the study of mammals.



Animal Diversity

Topic no 8

Animal Diversity

Contents

1. Diversity
2. Current Diversity of Life Earth
3. How to study diversity

Animal Diversity

1. Diversity

- The number of different types of animals living on this earth is called biodiversity of animals

Animal Diversity

2. Current Diversity of Life on earth

- 1.74 millions have been documented so far
- Estimates range up to 30 million species
- More accurate is between 8.7 ± 1.3 million
- About 80% species have to be discovered yet
- >99% species have become extinct

Animal Diversity

3. Animal Diversity

Major/Component group		Described	Total estimate
Chordates		64,788	~80,500
↳	Mammals	5,487	~5,500
↳	Birds	9,990	>10,000
↳	Reptiles	8,734	~10,000
↳	Amphibia	6,515	~15,000
↳	Fishes	31,153	~40,000
↳	Agnatha	116	unknown
↳	Cephalochordata	33	unknown
↳	Tunicata	2,760	unknown

Ref. Chapman, A. D. (2009). Numbers of Living Species in Australia and the World (PDF) (2nd ed.). Canberra: Australian Biological Resources Study. pp. 1–80.

Animal Diversity

3. Animal Diversity

Invertebrates	~1,359,365	~6,755,830
↳ Hemichordata	108	~110
↳ Echinodermata	7,003	~14,000
↳ Insecta	~1,000,000 (965,431–1,015,897)	~5,000,000
↳ Arachnida	102,248	~600,000
↳ Crustacea	47,000	150,000
↳ Mollusca	~85,000	~200,000
↳ Annelida	16,763	~30,000
↳ Nematoda	<25,000	~500,000
↳ Platyhelminthes	20,000	~80,000
↳ Cnidaria	9,795	unknown
↳ Porifera	~6,000	~18,000
↳ Other Invertebrates	12,673	~20,000

Ref. Chapman, A. D. (2009). Numbers of Living Species in Australia and the World (PDF) (2nd ed.). Canberra: Australian Biological Resources Study. pp. 1–80.

Animal Hierarchy (I)

Topic no 9

Animal Hierarchy (I)

Contents

1. Taxonomy
2. Classification of Animals
3. Hierarchy of Classification
4. Species
5. Genus

Animal Hierarchy (I)

1. Taxonomy

- It is the branch of science which that deals with the naming and classification of organisms

Animal Hierarchy (I)

2. Classification of Animals

- Arrangement of animals into different groups and subgroups on the basis of relatedness

Animal Hierarchy (I)

3. Hierarchy of relatedness

- Kingdom
- Phylum
- Class
- Order
- Family
- Genus
- Species

Animal Hierarchy (I)

4. Species

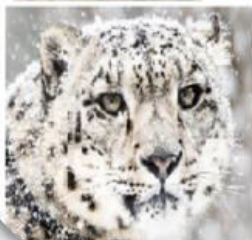
- Species is a group of animals which can interbreed and produce fertile offspring
- e.g., dogs, cats, elephants

Animal Hierarchy (I)

5. Genus

- Closely related species form a genus
- Genus is written with capitalized letter
- e.g., *Panthera* is genus of wild cats

Animal Hierarchy (I)



5. Genus

- Genus *Panthera*
- Lion
- Tiger
- Jaguar
- Leopard
- Snow Leopard

Animal Hierarchy (II)

Topic no 10

Animal Hierarchy (II)

Contents

1. Family
2. Order
3. Class
4. Phylum
5. Kingdom
6. Domain
7. Taxon
8. Hierarchy Examples

Animal Hierarchy (II)

1. Family

- Closely related genera form a family
- e.g.
 - Hominidae
 - Felidae

Animal Hierarchy (II)

2. Order

- Closely related families form an order
- e.g.,
 - Carnivora
 - Primates

Animal Hierarchy (II)

3. Class

- Similar orders are grouped together form a class
- e.g.,
 - Amphibia
 - Reptilia
 - Aves
 - Mammalia

Animal Hierarchy (II)

4. Phylum

- It is the principal category of classification
- Ranked above the class
- Classes with some common features are grouped to form a phylum
- e.g.,
 - Chordata
 - Echinodermata

Animal Hierarchy (II)

5. Kingdom

- It is the highest rank of classification
- All the living organisms are distributed into five kingdoms
- Monera
- Protista
- Fungi
- Plantae
- Animalia

Animal Hierarchy (II)

6. Domain

- Life is divided into three domains
- Archaea
- Bacteria
- Eukarya

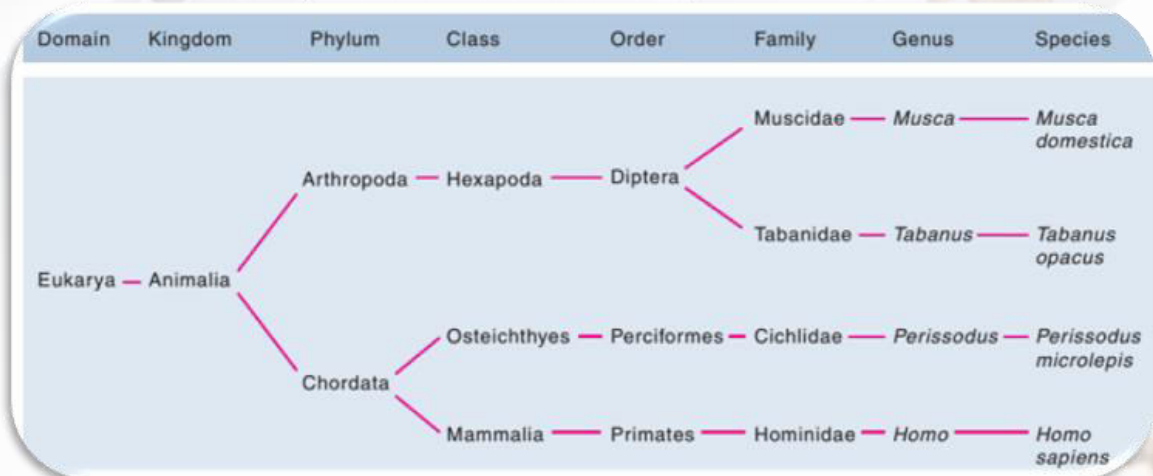
Animal Hierarchy (II)

7. Taxon

- A taxonomic group of any rank
 - Species
 - Genus
 - Family

Animal Hierarchy (II)

8. Hierarchy examples



Ref. Miller and Harley. Zoology. 5th Edition. p.5

World Resources (I)

Topic no 11

World Resources (I)

Contents

1. Resources
2. Natural Resources
3. Types of Natural Resources
4. Renewable Resources
5. Non-Renewable resources

World Resources (I)

1. Resource

- Any kind or stock or material that can be used for working effectively

World Resources (I)

2. Natural Resources

- These are the resources which exist without the involvement of mankind
- This include all the valuable characteristics of nature
- magnetic gravitational force, sunlight, atmosphere, water, plants animals etc.

World Resources (I)

3. Types of Natural Resources

- Two main types:
- Renewable resources
- Non-renewable resources

World Resources (I)

4. Renewable Resources

- Constantly available
- Reasonably replaced or recovered
- Water
- Sunlight
- Air
- Biomass

World Resources (I)

5. Non-Renewable Resources

- Those which once exhausted are no more available
- They are not replaced or recovered
- Oil
- Gas
- Minerals

Principles of Animal life 1

World Resources (II)

Topic no 12

World Resources (II)

Contents

1. Threats to resources
2. Solutions

World Resources (II)

1. Threats to Resource

- Over exploitation
 - Mineral reserves are limited
 - Oil reservoir limited
 - Loss of biodiversity
- Pollution

World Resources (II)

2. Solution

- Conservation
- Alternative resources
- Recycling
- Population control

end

Principles of Animal life 1

Population of the World

Topic no 13

Population of the World

Contents

1. Current Population of the World
2. Growth Rate
3. History and Future
4. Impact on Resources

Population of the World

1. Currently Population of the World

- 7.7 billion
- Most of the population living in less developed countries
- The number of people in less developed countries will increase in future

Population of the World

2. Growth Rate

- Current population growth rate is 1.07%
- It means 82 million per year
- In 1960's it was 2%
- Decreasing since then
- 2023.. Less than 1%
- 2052.. Less than 0.5%
- 2076..Less than 0.25%
- 2100..... 0.09%

Population of the World

3. History and Future

- 70,000BC..... 1000 to 10,000 people
- 10,000BC..1-15 million
- 1400.....350 million
- 1959.....3 billion
- 1999.....6 billion
- 2037.....9 billion
- 2055.....10 billion

Population of the World

4. Impact on Resources

- World resources are limited
- More population.... more resources required
- Man will be requiring more food, shelter and health facilities

end

Principles of Animal life 1

The Scientific Method: Observations

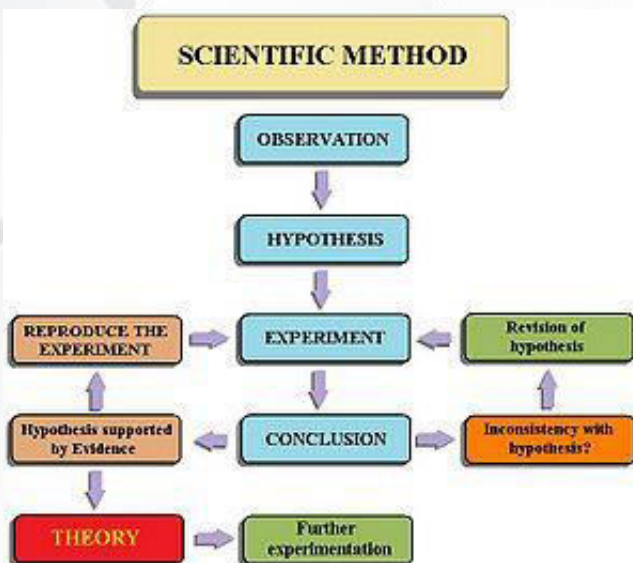
Topic no 14

The Scientific Method: Observations

Contents

1. The scientific method
2. Making observations
3. Data
4. Types of data

The Scientific Method: Observations



1. The scientific method

“A series of steps followed by scientists to answer a specific natural problem”.

- It is based on facts and measurable evidences.

The Scientific Method: Observations

2. Making observations

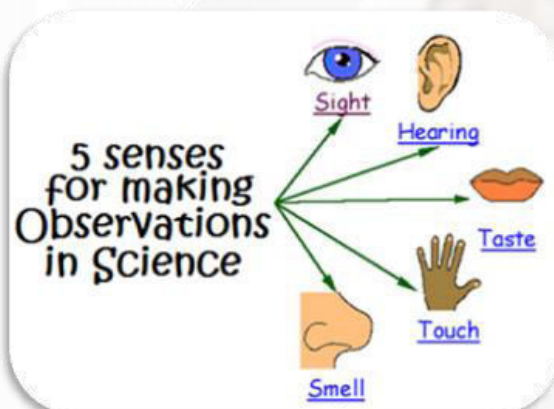
- Collecting information about specific problem.



The Scientific Method: Observations

2. Making observations

- Collecting information about specific problem.



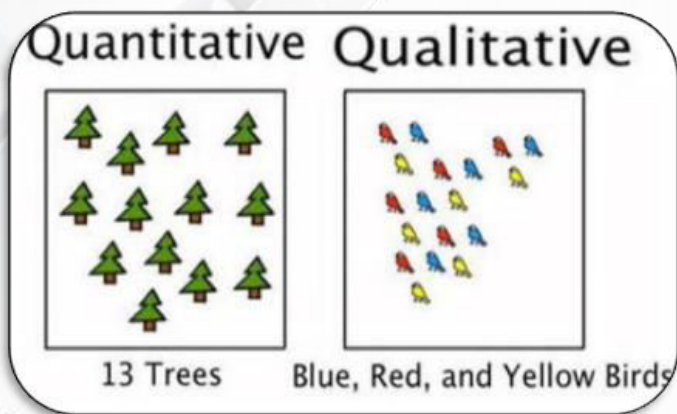
The Scientific Method: Observations

3. Data

- The information obtained from observations
- Scientific instruments may be used.

The Scientific Method: Observations

4. Types of data



- Quantitative data
 - Height
 - Weight
 - Temperature
- Qualitative data
 - Shape
 - Colour

The Scientific Method: Observations

4. Types of data

Quantitative Data

are made with instruments such as rulers, balances, graduated cylinders, beakers, and thermometers.

These results are measurable.

(numbers)



Qualitative Data

use your senses to observe the results.



Principles of Animal life 1

The Scientific Method: Hypothesis

Topic no 15

The Scientific Method: Hypothesis

Contents

1. Making hypothesis
2. Experiment
3. Variables
4. Control group
5. Conclusion

The Scientific Method: Hypothesis

Deductive Reasoning:

Sparrow has feathers,
All birds have feathers
Therefore
"The sparrow is also a bird"

Inductive Reasoning:

Rahat fell ill because of
contaminated water
Therefore
"All contaminated eatables
will cause illness"

1. Making a hypothesis

"A reasonable explanation to the natural question".

- Obtained data
- Previous knowledge
- Deductive reasoning
- Inductive reasoning

The Scientific Method: Hypothesis

2. Experiment

- Hypothesis is tested by experiments
- Experimental group
- Control group



The Scientific Method: Hypothesis

3. Variables

“parameters in experiment that may change”

- Independent variable
- Dependent variable
- Controlled variables

How length of daylight in 24 hour affects reproductive behavior of mice

The Scientific Method: Hypothesis

4. Results and Conclusion

- If results support hypothesis, they must be communicated to other scientists

Principles of Animal life 1

The Scientific Method: Theory

Topic no 16

The Scientific Method: Theory

Contents

1. Defining theory
2. Formation of a theory
3. Criteria of a theory
4. Examples of theories

The Scientific Method: Theory

1. Defining theory

“A tested and widely accepted model that helps to explain and predict natural facts and which is based on observations, experiments and reason”

- Generalized term very different from commonly known things.

The Scientific Method: Theory

2. Formation of theory

- Repeated experimentation by many scientist
- More related hypothesis accepted

The Scientific Method: Theory

3. Criteria of a theory

- Observable
- Repeatable
- Predictive/ Explanatory
- Always provisional
- Example: Theory of evolution

The Scientific Method: Scientific Law

Topic no 17

The Scientific Method: Scientific Law

Contents

1. Defining law
2. Characteristics of scientific law
3. When a theory becomes law?
4. Authenticity of Law
5. Examples of scientific law

The Scientific Method: Scientific Law

1. Defining Law

“A scientific law is a statement based on repeated experimental observations that describes some aspect of the nature”

- It is applied under certain conditions

The Scientific Method: Scientific Law

2. Characteristics of scientific law

- Represented by certain statements
- Have certain formulas
- Experimental results can be predicted by formula

The Scientific Method: Scientific Law

3. When a theory become law

- If the experiments agree with the theory
- No contradictory opinion is there

The Scientific Method: Scientific Law

4. Authenticity of scientific law

- Universal acceptance
- Can not be challenged unless solid experimental evidences given.



The Scientific Method: Scientific Law

5. Examples of scientific law

- Law of segregation
- Law of independent assortment
- Hardy-Weinberg law

Principles of Animal life 1

Experimental versus Evolutionary Sciences

Topic no 18

Experimental versus Evolutionary Sciences

Contents

1. Questions about living organisms
2. Proximate causes
3. Ultimate causes
4. Experimental science
5. Evolutionary science

Experimental versus Evolutionary Sciences

1. Question about living organisms

- How cell divides?
- How genetic information synthesize proteins?
- Why specific number of chromosomes?
- Why some animals live together while others solitary?

Experimental versus Evolutionary Sciences

1. Questions about living organisms

- All these questions may be divided into two categories:
- Proximate causes
- Ultimate causes

Experimental versus Evolutionary Sciences

2. Proximate causes

- Also called immediate causes.
- An event immediately responsible for causing.
- Related to functioning of biological system for a particular time and space.
- E.g., metabolic and physiological functions

Experimental versus Evolutionary Sciences

3. Ultimate causes

- Causes which produced system and its characteristic through evolutionary time
- It also called the real reason.
- E.g., Evolutionary forces that caused birds to acquire migratory behavior.

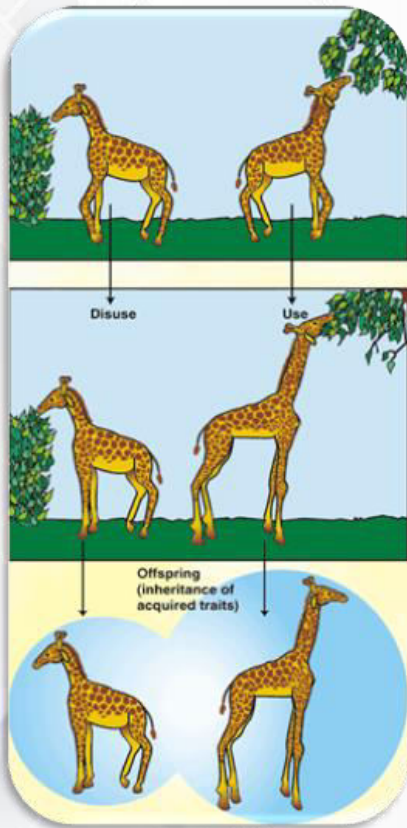
Experimental versus Evolutionary Sciences



4. Experimental science

- Biological science that address the questions of proximate causes.
- It proceeds through experiments.
- E.g., process of maintaining body temperature, process of cell division

Experimental versus Evolutionary Sciences



5. Evolutionary science

- Biological science that address the questions of ultimate causes.
- It proceeds through comparative methods
- E.g., comparison of hemoglobin structure of human and fish.

Principles of Animal life 1

Origin of Life:
Origin of Living Organisms

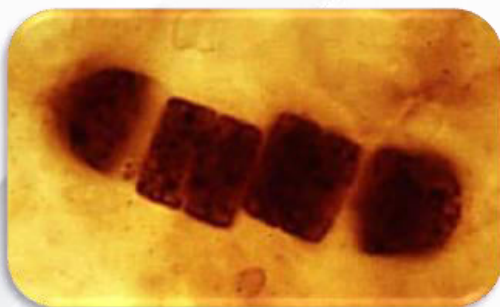
Topic no 20

Origin of Life: Origin of Living Organisms

Contents

1. First living organism
2. Cellular control
3. RNA world hypothesis
4. Protein world
5. Natural selection
6. Origin of prokaryotes
7. Origin of eukaryotes

Origin of Life: Origin of Living Organisms



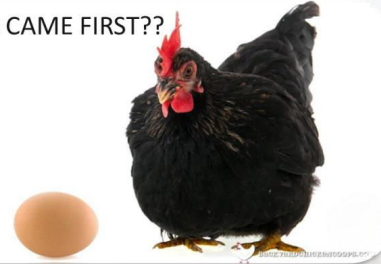
1. First Living organism

- Polymers formed a Protocell
- Simple self replicating system
- Fossil record shows 3.8bya
- Cyanobacteria like organisms

Origin of Life: Origin of Living Organisms

2. Cellular control

WHO CAME FIRST??

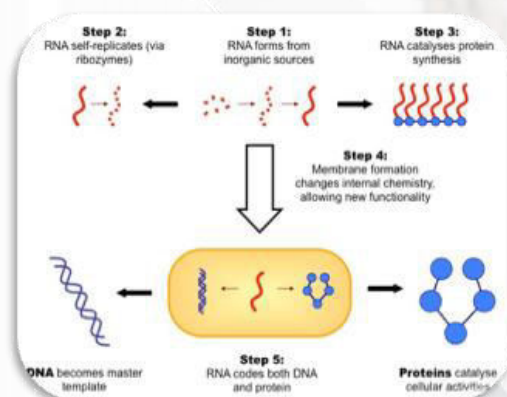


- RNA world hypothesis
- Protein world hypothesis

Origin of Life: Origin of Living Organisms

3. RNA world Hypothesis

- RNA as enzymes
- RNA as Genetic material



Origin of Life: Origin of Living Organisms

4. Protein world hypothesis

- Proteins were having dominant role in cell control

Origin of Life: Origin of Living Organisms

5. Natural selection

- Natural selection on the self replicating systems.
- The more replication....
The more successful
- Began to evolve
- Genetic code and Protein synthesis

Origin of Life: Origin of Living Organisms

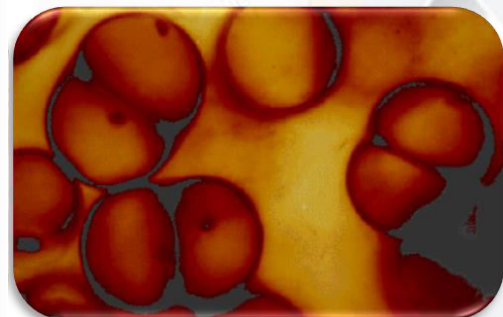
6. Origin of prokaryotes

- Oldest fossil 3.8 bya
- Life evolved about 4.0 bya
- Simple bacteria like
- Primary heterotrophs

Origin of Life: Origin of Living Organisms

7. Origin of eukaryotes

- Evolved 1.5bya
- Membrane bound nucleus
- Membrane bounded organelles



Chemistry of Life

Topic no 21

Chemistry of Life

Contents

1. Elements
2. Compounds
3. Types of bonding
4. Acids, bases and buffers

Chemistry of Life

1. Elements

- A species of atom having the same number of protons in their atomic nuclei.
- About 25 elements make living organisms

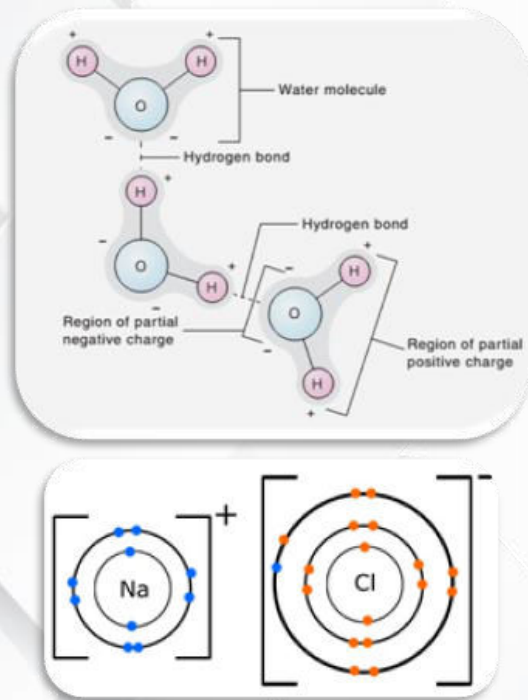
Chemistry of Life

2. Compounds

- Formed by atoms of two or more elements.
- Organic molecules
- Inorganic molecules
- E.g., Water, glucose, amino acids, fatty acids, nucleotides

Chemistry of Life

3. Types of bonding



- Atoms and molecules are held together by chemical bonding.
- Mainly three types of bonds:
 - Covalent bond
 - Hydrogen bond
 - Ionic bond

Chemistry of Life

4. Acids, bases and buffers

- Acids release H ions
 - Amino acids, fatty acids, hydrochloric acid
- Bases release OH ions
 - Nitrogen bases
- Buffer stabilize pH

Chemistry of Life

4. Acids, bases and buffers

- Buffers stabilize the internal environment of cell. (pH 7.35- 7.45)
- Too much fluctuation in pH can destroy cell.
- E.g., Carbonic acid-bicarbonate system

Principles of Animal life 1

The Molecules of Life: Biomolecules

Topic no 22

The Molecules of life: Biomolecules

Contents

1. Biomolecules
2. Characteristics of Biomolecules
3. Chemical Bonding in Biomolecules
4. Functions of Biomolecules
5. Types of Biomolecules

The Molecules of life: Biomolecules

1. Biomolecules

“Biomolecules are the molecules produced by cell or living organisms”

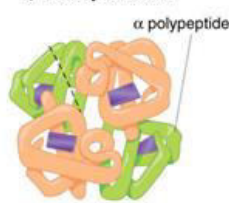
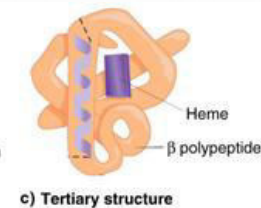
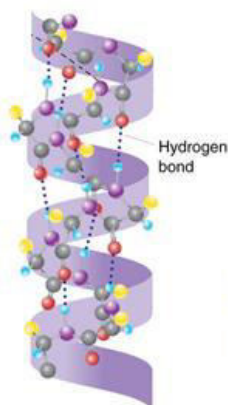
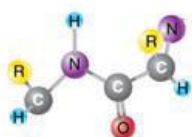
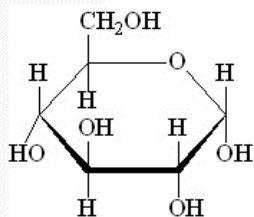
- Large biomolecules include proteins, glycogen and starch
- Small biomolecules include monosaccharides, amino acids and intermediates of different metabolic pathways.

The Molecules of life: Biomolecules

2. Characteristics of Biomolecules

- They make all forms of life
- Chemically they are consist of carbon, hydrogen, oxygen, nitrogen, sulfur phosphorus
- Biomolecules have specific structure

The Molecules of life: Biomolecules



3. Chemical Bonding in Biomolecules

- Atoms in biomolecules are held together mainly by covalent interaction.
- Others include hydrogen bonding, ionic bonding, van der Waal forces

The Molecules of life: Biomolecules

4. Functions of Biomolecules

- Basic building blocks of living organisms
- Source of energy
- Performing biochemical reactions
- Storing genetic information
- Maintaining homeostasis

The Molecules of life: Biomolecules

5. Types of Biomolecules

- Mainly four classes
 - Carbohydrates
 - Proteins
 - Lipids
 - Nucleic acids

end

Carbohydrates: Chemical Composition and Occurrence

Topic no 23

Carbohydrates: Chemical Composition and Occurrence

Contents

1. Defining Carbohydrates
2. Chemical Composition
3. Occurrence
4. Classification of Carbohydrates

Carbohydrates: Chemical Composition and Occurrence

1. Defining Carbohydrates

“Carbohydrates are polyhydroxy aldehydes, ketones or complex molecules giving aldehyde or ketone on hydrolysis”

- Most abundant biomolecules on earth
- Part of diet in most parts of the world

Carbohydrates: Chemical Composition and Occurrence

2. Chemical Composition

- Principally they are made up of C, H and O.
- N, S, P may also present in derivatives.
- General formula is: $(\text{CH}_2\text{O})_n$
- Also called hydrated carbons
 - hydrogen and oxygen (2:1)

Carbohydrates: Chemical Composition and Occurrence



3. Occurrence

- Bakery items: bread, cakes, pastries etc.
- Dairy products: milk, yogurt, ice cream
- Vegetables and fruits: all vegetables, fruits, cereals (wheat, rice, corn), legumes
- Candies, soft drinks, desserts
- Meat also contain some amount

Carbohydrates: Chemical Composition and Occurrence

4. Classification

- Three main classes
 - Monosaccharides
 - Disaccharides/Oligosaccharides
 - Polysaccharides

Different classes of carbohydrates: Monosaccharides

Topic no 24

Different classes of carbohydrates: Monosaccharides

Contents

1. Monosaccharides
2. Physicochemical Properties
3. Types on the Basis of Size
4. Types on the Basis of Functional Group
5. Chain Ring structures
6. Importance

Different classes of carbohydrates: Monosaccharides

1. Monosaccharides

“The simplest carbohydrates which can not be further hydrolyzed into simpler carbohydrates”

- Glucose is the most common type of monosaccharides

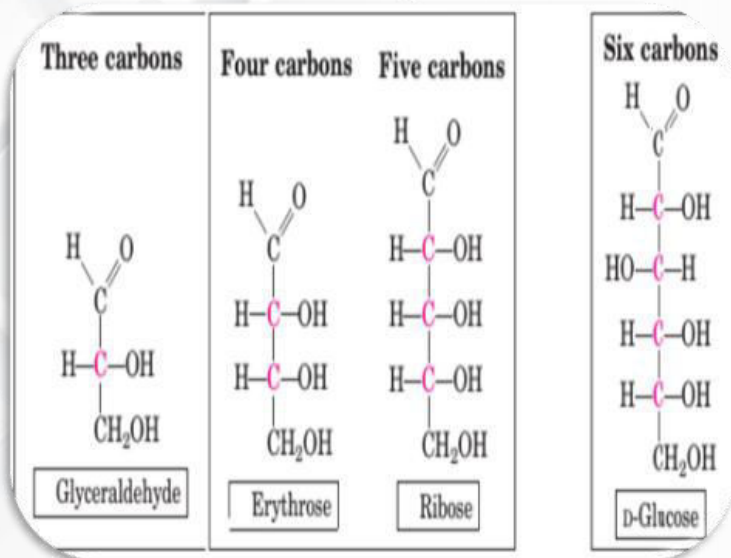
Different classes of carbohydrates: Monosaccharides

2. Physicochemical Properties

- Sweet in taste
- Readily soluble in water
- Crystalline at room temperature
- They are reducing sugar

Different classes of carbohydrates: Monosaccharides

3. Types on the Basis of Size

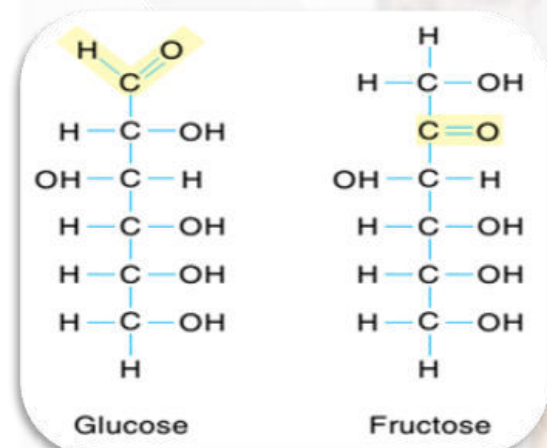


- Normally 3-7 carbons
- Triose (3C)
- Tetrose (4C)
- Pentose (5C)
- Hexose (6C)
- Heptose (7C)

Different classes of carbohydrates: Monosaccharides

4. Types on Basis of Functional Group

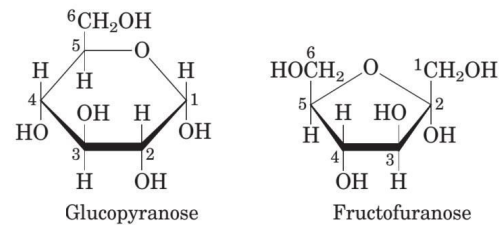
- Aldoses
- Ketoses



Different classes of carbohydrates: Monosaccharides

5. Chain and Ring Structures

- Carbon atoms form linear chain
- Four or more carbon form a ring structure
- Pyranose
- Furanose



Different classes of carbohydrates: Monosaccharides

5. Importance

- As a source of energy
 - Glucose as energy source (C-H bond)
- As a building material for large carbohydrates
 - Cellulose
 - Starch
 - Glycogen

Different Classes of Carbohydrates: Disaccharides

Topic no 25

Different classes of carbohydrates: Disaccharides

Contents

1. Disaccharides
2. Some Common Disaccharides
3. Isomers
4. Glycosidic Bond

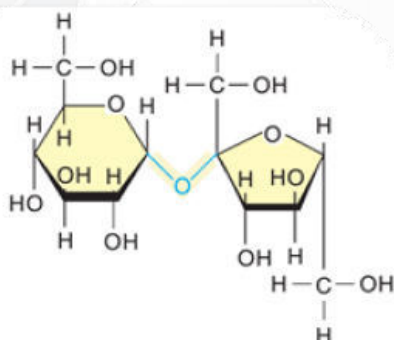
Different classes of carbohydrates: Disaccharides

1. Disaccharides

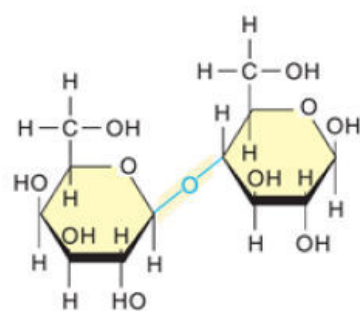
“Two monosaccharides combine together to form a disaccharide”

- Soluble in water
- Less sweet in taste
- Crystalline solids
- Some reducing, some non-reducing
- $C_x(H_2O)_y$

Different classes of carbohydrates: Disaccharides



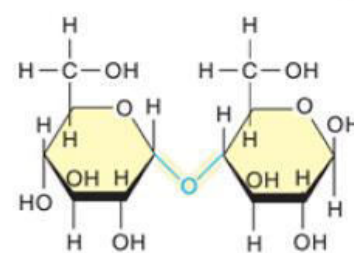
Glucose Fructose
Sucrose



Galactose Glucose
Lactose

2. Some Common Disaccharides

- Sucrose
- Lactose
- Maltose



Glucose Glucose
Maltose

Different classes of carbohydrates: Disaccharides

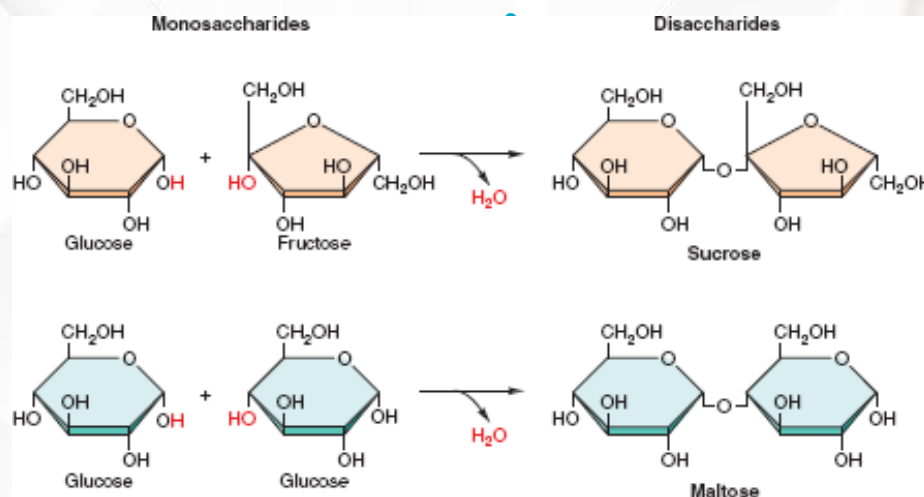
3. Isomerism

- Molecules with same molecular formula but different structural formula
- All disaccharides are isomers of each other.
- Molecular formula $C_{12}H_{22}O_{11}$

Different classes of carbohydrates: Disaccharides

4. Glycosidic Bond

- The bond joining monosaccharide subunits.



Different Classes of Carbohydrates: Polysaccharides

Topic no 26

Different classes of carbohydrates: Polysaccharides

Contents

1. Polysaccharides
2. Physicochemical Properties
3. Some Common Polysaccharides
4. Role in Living Organisms

Different classes of carbohydrates: Polysaccharides

1. Polysaccharides

“When many monosaccharides join together through glycosidic bond, they form a polysaccharide”

Different classes of carbohydrates: Polysaccharides

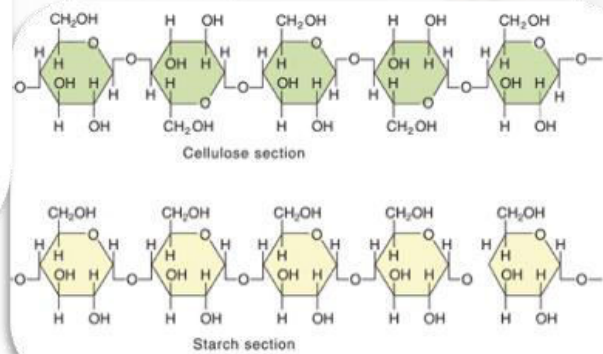
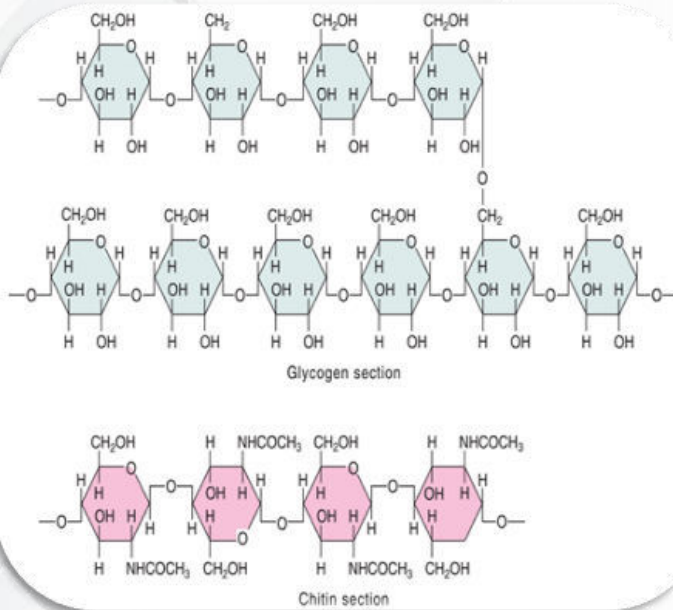
2. Physicochemical Properties

- Not sweet in taste
- Very little solubility in water
- Non reducing
- General formula $C_x(H_2O)_y$ or $(C_6H_{10}O_5)_n$

Different classes of carbohydrates: Polysaccharides

3. Common Polysaccharides

- Glycogen
- Starch
- Cellulose
- Chitin



Different classes of carbohydrates: Polysaccharides

4. Role in Living Organisms

- Fuel storage:
 - Glycogen
 - Starch
- Structural role:
 - Chitin
 - Cellulose

end

Carbohydrates as Energy Source and Structural Support

Topic no 27

Carbohydrates as Energy Source and Structural Support

Contents

1. As Energy Source:
 - a) Monosaccharides
 - b) Disaccharides
 - c) Polysaccharides
2. As Structural Support
 - a) Chitin
 - b) Cellulose
 - c) Glycocalyx
 - d) Extracellular material

Carbohydrates as Energy Source and Structural Support

1. As Energy Source

- Main source of daily energy needs
- Provide 60-65% of energy
- 225-325 gram per day

Carbohydrates as Energy Source and Structural Support

1. As Energy Source

a) Monosaccharides

- Glucose is primarily synthesized by plants during photosynthesis.
- It is most important source of energy for all organisms.
- Fructose and Galactose also provide energy

Carbohydrates as Energy Source and Structural Support

1. As Energy Source

a) Disaccharides

- Important sugar which provide energy
- Sucrose from sugar cane and sugar beet.
- Lactose present in milk sugar
- Maltose is present in sweet potatoes, candies
- Broken down by intestinal enzymes into monosaccharides

Carbohydrates as Energy Source and Structural Support

1. As Energy Source

a) Polysaccharides

- Starch
 - Digested into glucose.
- Glycogen
 - Quickly breaks to provide glucose in cells and blood
- Cellulose
 - Broken down into glucose

Carbohydrates as Energy Source and Structural Support

2. As structural support

- **Chitin**
- Exoskeleton of different arthropods. e.g. insects, crustaceans
- Provide support
- Protection from predators

Carbohydrates as Energy Source and Structural Support

2. As structural support

- **Cellulose**
- Providing strength to cell wall of plants

Carbohydrates as Energy Source and Structural Support

2. As structural support

- **Glycocalyx**
- Making a whorl outer to cell membrane.
- Make recognition sites
- Work as protective factor

Carbohydrates as Energy Source and Structural Support

2. As structural support

- **Extracellular material**
- Hold the cells together
- Present in:
 - Fluid of joints
 - Vitreous humor
 - Tendons
 - Ligaments
 - Skin

end

Lipids: Chemical Composition and Occurrence

Topic no 28

Lipids: Chemical Composition and Occurrence

Contents

1. Defining Lipids
2. Chemical Composition
3. Occurrence
4. Types of Lipids
5. Classification of Lipids

Lipids: Chemical Composition and Occurrence

1. Defining Lipids

- A diverse group of biomolecules which are water insoluble
- Non-polar
- Readily soluble in organic solvent

Lipids: Chemical Composition and Occurrence

2. Chemical Composition

- Like carbohydrates lipids are mainly made up of C, H and O.
- N, S, P also present.
- Much smaller amount of oxygen than carbohydrates.
- They have highest number of C-H bonds

Lipids: Chemical Composition and Occurrence



3. Occurrence

- Dairy: Milk, cheese, butter, cream, yogurt, margarine
- Meat, fish eggs,
- Dry fruits: peanut, almond, walnut,
- Cooking oils: sunflower, soybean, corn, olive oil
- Fried foods

Lipids: Chemical Composition and Occurrence

4. Importance

- Richest source of energy
- All cellular membranes
- Hormones
- Protection
- Insulation
- Cell signaling

4. Types of Lipids

- Important types include
 - Triglycerides
 - Phospholipids
 - Steroids

end