Global Warming

What is climate and climate change?

The statistics of the atmosphere and the change of those statistics over a period of time.

What are the causes of climate change?

Earth's Position : Angle of Earth's axis Shape of Earth's orbit around sun Solar Energy (sunspots) Volcanic Activity (gas & ash filter sun's rays) Movement of the Continents (Pangaea affected the global pattern of winds & ocean currents)

What is Ozone?

A form of oxygen that has three oxygen atoms in each molecule instead of the usual two.

What is Trophospheric Ozone?

"bad ozone"; secondary pollutant - not emitted directly regional air pollutant: cannot trace the source of original ozone national level: 10-15 ppb; high episodes common in the summer 100-200% increase in last century - industrial rev.

Air Pollution

What is Air Pollution?

Various chemicals (gases, liquids, solids) present on the atmosphere in high enough levels to be harmful to humans, other organisms, or material.

Sulfur Oxides

Sulfur oxides (SOx) - particularly sulfur dioxide, a chemical compound with the formula SO2. SO2 is produced by volcanoes and in various industrial processes.

Air Pollution (cont)

Nitrogen Oxides

Nitrogen oxides, particularly nitrogen dioxide, are expelled from high temperature combustion, and are also produced during thunderstorms by electric discharge.

Carbon Monoxide

CO is a colorless, odorless, toxic yet non-irritating gas.

Volatile organic compounds

VOCs are a well-known outdoor air pollutant. They are categorized as either methane (CH4) or non-methane (NMVOCs).

Chlorofluorocarbons

Harmful to the ozone layer; emitted from products are currently banned from use.

Secondary Sources of Air Pollution

Stationary sources include smoke stacks of power plants, manufacturing facilities (factories) and waste incinerators, as well as furnaces and other types of fuel-burning heating devices.

Photochemical Smog

Brownish-orange haze formed by chemical reactions involving sunlight, nitrogen oxide, and hydrocarbons.

Types of Ecosystems

Temperate Deciduous Forests

are dominated by trees that lose their leaves each year. They are found in areas with warm, moist summers and mild winters.

Types of Ecosystems (cont)

Shortgrass Prairie

Westernmost grasslands of the Great Plains, characterized by infrequent rainfall, low humidity, and high winds; dominated by shallow-rooted, sod-forming grasses

Tundra

ype of biome where the tree growth is hindered by low temperatures and short growing seasons.

Taiga

also known as boreal forest or snowforest, is a biome characterized by coniferous forests consisting mostly of pines, spruces and larches.

Savanna

A savanna or savannah is a grassland ecosystem characterised by the trees being sufficiently widely spaced so that the canopy does not close. The open canopy allows sufficient light to reach the ground to support an unbroken herbaceous layer consisting primarily of grasses.

Chapparal

It is shaped by a Mediterranean climate (mild, wet winters and hot dry summers) and wildfire, featuring summer-drought tolerant plants with hard sclerophyllous evergreen leaves, as contrasted with the associated soft-leaved, drought deciduous, scrub community of Coastal sage scrub, found below the chaparral biome.

Alpine

Alpine climate is the average weather (climate) for a region above the tree line. This climate is also referred to as a mountain climate or highland climate.

Biomolecules

Biomolecule

A biomolecule is any molecule that is produced by a living organism, including large macromolecules such as proteins, polysaccharides, lipids, and nucleic acids, as well as small molecules such as primary metabolites, secondary metabolites, and natural products.

Types of biomolecules

Small molecules: Lipids, polysacch-arides, glycolipids, sterols, glycerolipids Vitamins Hormones, neurotransmitters Metabolites

Saccharides

Monosaccharides are the simplest form of carbohydrates with only one simple sugar. They essentially contain an aldehyde or ketone group in their structure.

Disaccharides

are formed when two monosaccharides, or two single simple sugars, form a bond with removal of water. They can be hydrolyzed to yield their saccharin building blocks by boiling with dilute acid or reacting them with appropriate enzymes.[1] Examples of disaccharides include sucrose, maltose, and lactose.

Polysaccharides

are polymerized monosaccharides, or complex carbohydrates. They have multiple simple sugars. Examples are starch, cellulose, and glycogen.

Lignin

Lignin is a complex polyphenolic macromolecule composed mainly of beta-O4-aryl linkages.

Biomolecules (cont)

Lipids

Lipids (oleaginous) are chiefly fatty acid esters, and are the basic building blocks of biological membranes.

Amino acids

Amino acids contain both amino and carboxylic acid functional groups. (In biochemistry, the term amino acid is used when referring to those amino acids in which the amino and carbox-ylate functionalities are attached to the same carbon, plus proline which is not actually an amino acid).

Protein structure

The particular series of amino acids that form a protein is known as that protein's primary structure. This sequence is determined by the genetic makeup of the individual. It specifies the order of side-chain groups along the linear polype-ptide "backbone".

Agriculture

Agriculture Definition

Agriculture is the cultivation of animals, plants, fungi, and other life forms for food, fiber, biofuel, medicinals and other products used to sustain and enhance human life.

Crop cultivation systems

Cropping systems vary among farms depending on the available resources and constraints; geography and climate of the farm; government policy; economic, social and political pressures; and the philosophy and culture of the farmer

Agriculture (cont)

Monocultures

Further industrialization led to the use of monocultures, when one cultivar is planted on a large acreage. Because of the low biodiversity, nutrient use is uniform and pests tend to build up, necessitating the greater use of pesticides and fertilizers.

Polycultures

Multiple cropping, in which several crops are grown sequentially in one year, and intercropping, when several crops are grown at the same time, are other kinds of annual cropping systems known as polycultures.

Livestock production systems

Livestock production systems can be defined based on feed source, as grassl-and-based, mixed, and landless.[94] As of 2010, 30% of Earth's ice- and water-free area was used for producing livestock, with the sector employing approximately 1.3 billion people.

Selective Breeding

During the second half of the 20th century, producers using selective breeding focused on creating livestock breeds and crossbreeds that increased production, while mostly disregarding the need to preserve genetic diversity. This trend has led to a significant decrease in genetic diversity and resources among livestock breeds, leading to a corresponding decrease in disease resistance and local adaptations previously found among traditional breeds.

Agriculture (cont)

Mixed Production Systems

Grassland based livestock production relies upon plant material such as shrubland, rangeland, and pastures for feeding ruminant animals. Outside nutrient inputs may be used, however manure is returned directly to the grassland as a major nutrient source.

Production practices

Tillage is the practice of plowing soil to prepare for planting or for nutrient incorporation or for pest control. Tillage varies in intensity from conventional to no-till. It may improve productivity by warming the soil, incorporating fertilizer and controlling weeds, but also renders soil more prone to erosion, triggers the decomposition of organic matter releasing CO2, and reduces the abundance and diversity of soil organisms.

Pest Control

Pest control includes the management of weeds, insects, mites, and diseases. Chemical (pesticides), biological (biocontrol), mechanical (tillage), and cultural practices are used. Cultural practices include crop rotation, culling, cover crops, intercropping, composting, avoidance, and resistance. Integrated pest management attempts to use all of these methods to keep pest populations below the number which would cause economic loss, and recommends pesticides as a last resort.

Agriculture (cont)

Water Management

Water management is needed where rainfall is insufficient or variable, which occurs to some degree in most regions of the world.[92] Some farmers use irrigation to supplement rainfall. In other areas such as the Great Plains in the U.S. and Canada, farmers use a fallow year to conserve soil moisture to use for growing a crop in the following year.[105] Agriculture represents 70% of freshwater use worldwide.

Population Profiles

What Factors Affect Birth Rates and Fertility Rates

Importance of children as a part of the labor force. Urbanization. Cost of raising and educating children. Availability of reliable birth control methods.

Population

Is considered to be the breeding group for an organism. Characteristics include: Birth rate, death rate, rate of natural increase and age-sex distribution.

Total fertility rate (TFR)

In a population, the number of births per woman

Population Profile

Population Profiles for Developing and Developed Countries -snapshot of population at a given time

Minimal Viable Population

The smallest population size at which a species is able to sustain its numbers and survive.

Population Profiles (cont)

calculate rate of population increase2

rate = births–deaths/N

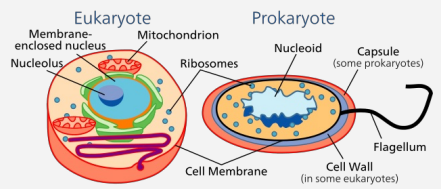
Carrying Capacity

largest number of individuals of one species that an ecosystem can support over time

Golgi Apparatus

A warehouse for receiving, sorting, shipping and even some manufacturing products of the ER such as proteins are modified and stored then sent to other destinations.

Comparison of Prokaryotes vs. Eukaryotes



A eukaryote is any organism whose cells contain a nucleus and other structures (organelles) enclosed within membranes.

A prokaryote is a single-celled organism that lacks a membrane-bound nucleus (karyon), mitochondria, or any other membrane-bound organelles.

Function of the Cell Membrane

Purpose	The cell membrane also plays a role in anchoring the cytoskeleton to provide shape to the cell, and in attaching to the extracellular matrix and other cells to help group cells together to form tissues.
Permeable	The cell membrane is selectively permeable and able to regulate what enters and exits the cell, thus facilitating the transport of materials needed for survival.
Movement	The movement of substances across the membrane can be either "passive", occurring without the input of cellular energy, or "active", requiring the cell to expend energy in transporting it.
Passive Osmosis	Some substances (small molecules, ions) such as carbon dioxide (CO2) and oxygen (O2), can move across the plasma membrane by diffusion, which is a passive transport process.

Function of the Cell Membrane (cont)

Protein Channels	Nutrients, such as sugars or amino acids, must enter the cell, and certain products of metabolism must leave the cell.
Endocytosis	Endocytosis is the process in which cells absorb molecules by engulfing them.
Exocytosis	Just as material can be brought into the cell by invagination and formation of a vesicle, the membrane of a vesicle can be fused with the plasma membrane, extruding its contents to the surrounding medium.

Cell Structure

Fluid mosaic model	Biological membranes can be considered as a two-dimensional liquid in which lipid and protein molecules diffuse more or less easily.
Lipid bilayer	Lipid bilayers form through the process of self-assembly.

Cell Structure (cont)

Cytoskeleton	The cytoskeleton is found underlying the cell membrane in the cytoplasm and provides a scaffolding for membrane proteins to anchor to, as well as forming organelles that extend from the cell.

Composition

Carbohydrates	Plasma membranes also contain carbohydrates, predominantly glycoproteins, but with some glycolipids (cerebrosides and gangliosides).
Proteins	The cell membrane has large content of proteins, typically around 50% of membrane volume[11] These proteins are important for cell because they are responsible for various biological activities.
Lipids	The cell membrane consists of three classes of amphipathic lipids: phospholipids, glycolipids, and sterols. The amount of each depends upon the type of cell, but in the majority of cases phospholipids are the most abundant.[10] In RBC studies, 30% of the plasma membrane is lipid.

Lipid Bilayer

Lipid Bilayer	The lipid bilayer is a thin polar membrane made of two layers of lipid molecules. These membranes are flat sheets that form a continuous barrier around all cells.
Ion Transp-orter	A transmembrane protein that moves ions across a plasma membrane against their concentration gradient, in contrast to ion channels, where ions go through passive transport.
Asymmetry	In many naturally occurring bilayers, the compositions of the inner and outer membrane leaflets are different. In human red blood cells, the inner (cytoplasmic) leaflet is composed mostly of phosphatidylethanolamine, phosphatidylserine and phosphatidylinositol and its phosphorylated derivatives.
Phases	At a given temperature a lipid bilayer can exist in either a liquid or a gel (solid) phase. All lipids have a characteristic temperature at which they transition (melt) from the gel to liquid phase.

Osmosis

Osmosis Definition

> Osmosis is the spontaneous net movement of solvent molecules through a partially permeable membrane into a region of higher solute concentration, in the direction that tends to equalize the solute concentrations on the two sides.

Osmotic Pressure

> To be the minimum pressure required to maintain an equilibrium, with no net movement of solvent.

Permeability

> Permeability depends on solubility, charge, or chemistry, as well as solute size.

Plasmolysis

> Plasmolysis is the process in which cells lose water in a hypertonic solution.

Suppose an animal or a plant cell is placed in a solution of sugar or salt in water.

> If the medium is hypotonic relative to the cell cytoplasm — the cell will gain water through osmosis. If the medium is isotonic — there will be no net movement of water across the cell membrane. If the medium is hypertonic relative to the cell cytoplasm — the cell will lose water by osmosis.

Adenosine triphosphate

Adenosine triphosphate (ATP) is a nucleoside triphosphate used in cells as a coenzyme.
It is often called the "molecular unit of currency" of intracellular energy transfer.

Proteins

Are the most diverse carbon compounds in living organisms. Proteins are polymers of amino acids. At least 20 amino acids are used to build proteins and all have same basic structure. Function of protein is influenced by its overall shape.

Cell Theory

Polypeptide chain

> Each of these consists of a linear sequence of amino acids connected end to end.

Chromatin

> The combination of DNA and proteins that constitutes eukaryotic chromo-somes; often used to refer to the diffuse, very extended form taken by chromo-somes when a cell is not dividing.

Smooth Endoplasmic Reticulum (smooth ER)

> Located in cytoplasm Found in all Eukaryotic cells Stores and supplies lipids for cell.

RNA

> A type of nucleic acid consisting of a polynucleotide made up of nucleotide monomers with a ribose sugar and the nitrogenous bases adenine, guanine, uracil, & cytosine; usually single stranded; functions in protein synthesis, genes regulation, & as the genome of some viruses.

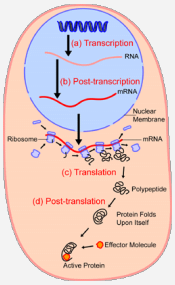
Rough Endoplasmic Reticulum

> The surface of the rough endoplasmic reticulum (often abbreviated RER or Rough ER) is studded with protein-m-anufacturing ribosomes giving it a "rou-gh" appearance (hence its name).

Prokaryotic Cell Structure

A prokaryotic cell has three architectural regions:
On the outside, flagella and pili project from the cell's surface. These are structures (not present in all prokaryotes) made of proteins that facilitate movement and communication between cells.
Enclosing the cell is the cell envelope – generally consisting of a cell wall covering a plasma membrane though some bacteria also have a further covering layer called a capsule. It also prevents the cell from expanding and bursting (cytolysis) from osmotic pressure due to a hypotonic environment.
Inside the cell is the cytoplasmic region that contains the genome (DNA), ribosomes and various sorts of inclusions. Prokaryotes can carry extrachromosomal DNA elements called plasmids, which are usually circular. Plasmids encode additional genes, such as antibiotic resistance genes.

Protein Synthesis

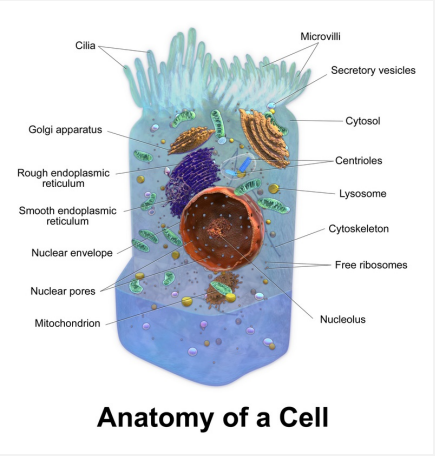


Cells are capable of synthesizing new proteins, which are essential for the modulation and maintenance of cellular activities. This process involves the formation of new protein molecules from amino acid building blocks based on information encoded in DNA/RNA. Protein synthesis generally consists of two major steps: transcription and translation.

Eukaryotic Cell Structure

Plants, animals, fungi, slime moulds, protozoa, and algae are all eukaryotic.
The plasma membrane resembles that of prokaryotes in function, with minor differences in the setup. Cell walls may or may not be present.
The eukaryotic DNA is organized in one or more linear molecules, called chromosomes, which are associated with histone proteins. All chromosomal DNA is stored in the cell nucleus, separated from the cytoplasm by a membrane. Some eukaryotic organelles such as mitochondria also contain some DNA.
Eukaryotes can move using motile cilia or flagella. Eukaryotic flagella are less complex than those of prokaryotes.

Anatomy of a Cell



Anatomy of a Cell

Exclusive Eukaryotic Features

Cell nucleus

> A cell's information center, the cell nucleus is the most conspicuous organelle found in a eukaryotic cell. It houses the cell's chromosomes, and is the place where almost all DNA replication and RNA synthesis (transcription) occur.

Mitochondria and Chloroplasts

> the power generators: Mitochondria are self-replicating organelles that occur in various numbers, shapes, and sizes in the cytoplasm of all eukaryotic cells. Mitochondria play a critical role in generating energy in the eukaryotic cell.

Endoplasmic reticulum

> is a transport network for molecules targeted for certain modifications and specific destinations, as compared to molecules that float freely in the cytoplasm.

Lysosomes and Peroxisomes

> Lysosomes contain digestive enzymes (acid hydrolases). They digest excess or worn-out organelles, food particles, and engulfed viruses or bacteria.

Centrosome

> the cytoskeleton organiser: The centrosome produces the microtubules of a cell – a key component of the cytoskeleton.

Exclusive Eukaryotic Features (cont)

Vacuoles

> Vacuoles store food and waste. Some vacuoles store extra water. They are often described as liquid filled space and are surrounded by a membrane.

Eukaryotic and prokaryotic

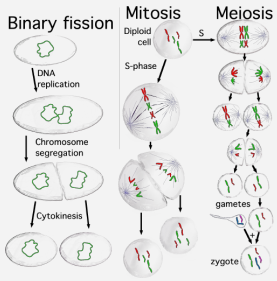
Ribosomes

> The ribosome is a large complex of RNA and protein molecules. They each consist of two subunits, and act as an assembly line where RNA from the nucleus is used to synthesise proteins from amino acids.

Cellular Processes

Between successive cell divisions, cells grow through the functioning of cellular metabolism. Cell metabolism is the process by which individual cells process nutrient molecules.
Metabolism has two distinct divisions: catabolism, in which the cell breaks down complex molecules to produce energy and reducing power, and anabolism, in which the cell uses energy and reducing power to construct complex molecules and perform other biological functions.
Complex sugars consumed by the organism can be broken down into a less chemically complex sugar molecule called glucose. Once inside the cell, glucose is broken down to make adenosine triphosphate (ATP), a form of energy, through two different pathways.

Cell Division



Hypertonic, Isotonic, and Hypotonic Diagrams