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Unit 1: Introduction

Chapter 1: Making biology relevant

Showing prospective employers that you accept responsibility

Chapter 2: The need for scientific reasoning

Chapter 3: Four views of the world

Viewing the world on a microscopic level

Viewing the world on an atomic level

Unit 2: What is Life?

Chapter 1: Explaining why things happen

Possible explanations

Hypothesis vs. theory

Proposing a hypothesis

Hypotheses predict things

Confirming a hypothesis

Chapter 2: How did the universe begin?

The Big Bang hypothesis

Predictions from the Big Bank hypothesis

Formation of the some

Formation of the earth

Chapter 3: The Early Earth

Origin of water
The early atmosphere

Chapter 4: The Origin of Life

The Oparin-Haldane hypothesis
Predictions from the Oparin-Haldane hypothesis
Miller and Urey's experiment supporting the Oparin-Haldane hypothesis

Chapter 5: What are the Necessary Components of Life: What Must Do or Have to Be Considered Alive?

It must have a waterproof place to construct life
It must take in energy
It must take in nutrients
It must grow
It must reproduce
It must respond to changes in its internal environment
It must adapt to long-term changes in the external environment

Unit 3: The Chemistry of Life

1. Slide Presentation A

Chapter 1: Carbon - the basis of life

Chapter 2: States of Matter

Why are there solids, liquids, and gases?
The intermolecular bond
Polar and nonpolar molecules

Chapter 3: The Intramolecular Bond

Ionic bond
Covalent bond
Polar covalent bond

Chapter 4: The Intermolecular Bond

The hydrogen bond
Van der Waals forces

Chapter 5: The Periodic Table

Electron shells
Electrons per shell

Chapter 6: Electronegativity

Chart of electronegativity
Determining the intramolecular bond from the electronegativity chart
Hydrocarbons

Chapter 7: Van der Waals Forces

Increasing the number of van der Waals bonds with longer molecules
Increasing the number of van der Waals bonds with cooling
Increasing the number of van der Waals bonds with pressure

Chapter 8: Nonpolar vs. Polar Molecules

Why water and oil don't mix
Micelle formation

2. Slide Presentation B

Chapter 9: Mathematics of Chemistry

Density
Rounding off
Reading graphs of water density
Water temperature in frozen lakes

Chapter 10: Making Nonpolar Molecules Polar

Attaching polar caps
Phospholipids
Replacing one hydrogen atom with an oxygen atom
Alcohols, aldehydes, ketones, ethers, carboxylic acids, and esters

Volatility and fragrance
Weak acids
Attaching oxygen atoms to each carbon atom

Chapter 11: Carbohydrates

Monosaccharides
Polysaccharides
Oxidation
Oxidation of hydrocarbons
Oxidation of carbohydrates

Chapter 12: Proteins

Amino acids
Polar and nonpolar amino acids
Protein folding
Protein binding site
Hemoglobin
Heme and iron
Collagen
Lipoproteins
Enzymes
Protein denaturation

Chapter 13: Nucleic Acids

Structure of RNA and DNA
Nucleic acids
Ribose and deoxyribose

Unit 4: The Cell Membrane

Chapter 1: Designing a waterproof environment

Requirement of life for water
Making a cell membrane waterproof
Making a waterproof membrane polar
Lipid bilayer
Designing a way to allow polar and nonpolar molecules through a membrane

Unit 5: Take in Nutrients

1. Slide Presentation A

Chapter 1: Getting nutrients into the cell

- Why molecules move
- Discovery of Brownian movement
- Hypothesis to explain Brownian movement
- Testing the hypothesis
- Einstein's contribution to understanding Brownian movement
- Bulk movement of solutes
- Diffusion

Chapter 2: Concentration Gradients

- The Law of Entropy
- Concentration gradients
- Reading graphs of solutes diffusing
- Reversing entropy requires energy
- Moving up a concentration gradient
- Concentrating solutes heats up solutes
- Speeding up diffusion: temperature
- Speeding up diffusion: smaller molecules
- Speeding up diffusion: higher concentration?
- Reading graphs of rate of diffusion

Chapter 3: Diffusion Across Cell Membranes

- Diffusion of small molecules: carbon dioxide and water
- Diffusion of ions and polar molecules
- Diffusion of large molecules
- Diffusion of nonpolar molecules

2. Slide Presentation B

Chapter 4: Semipermeable Membranes

Definition of semipermeable membrane
Membrane pores
Transport proteins
Reading graphs of ionic movement across semipermeable membranes
Facilitated transport
Reading graphs of facilitated transport
Energy requirements for facilitated transport
Osmosis
Aquaporin: transport protein for water
Aquaporin: transport proteins for gases?
Why transport proteins?
Maintaining concentration gradients of ions across cell membranes
Active transport
Energy requirement for active transport
Summary of movement across cell membranes

Chapter 5: Equilibrium

Equilibrium in a one chamber system
Equilibrium in a two chamber system
Definition of equilibrium
Hypertonic, hypotonic, and isotonic solutions
Equilibrium between hypertonic and hypotonic solutions
Movement of water to correct concentration gradients across semipermeable membranes
Water moves from hypotonic to hypertonic solutions
Electrochemical gradients
Active transport to maintain concentration and electrochemical gradients

Chapter 6: Osmosis

Reducing osmosis by making extracellular and intracellular fluids isotonic
Sodium-potassium pump
Red blood cells
Red blood cells in hypertonic salt solutions: cell crenation
Red blood cells and hypotonic salt solutions: cell lysis
Osmotic pressure
Measuring osmotic pressure
Reverse osmosis to desalinate water
Kidney dialysis

Coma due to excessive water drinking
Emergency treatment of water overdosage
Osmotic pressure in plants
Rigid cell walls in plants

Chapter 7: Taking in Water and Nutrients in Bulk

Pinocytosis
Phagocytosis

Unit 6: Take in Energy

Chapter 1: ATP

Chemical structure of ATP
Sources of energy to generate high energy electrons
Sunlight
Chemical bonds

Chapter 2: Classification of organisms by energy production

Traditional classification
Autotrophs: photoautotrophs and chemoautotrophs
Heterotrophs
Alternative classification
Automakers
Heteromakers

Chapter 3: Photoautotrophs

Components of sunlight
Chlorophyll
ATP and NADH
Chloroplasts and thylakoids.
Photosynthesis
Reaction center
Electron transport chain
Water molecules
Producing ATP
Producing NADPH
Making glucose using ATP and NADPH
Rubisco
The Calvin cycle

Chapter 4: Before photosynthesis

- Chemoautotrophs

- Photoautotrophs

- Cyanobacteria

Chapter 5: Pigments besides chlorophyll

- Chemical structure

- Examples

- Methicillin resistant staphylococcus aureus

Chapter 6: Heterotrophs

- Glycolysis

- Pyruvate dehydrogenase

- Mitochondrial aerobic respiration

- Krebs cycle

- Electron transport chain

- Oxidative phosphorylation

- Chemiosmosis

- Mitochondrial heat generation

Chapter 7: Sources of Acetyl CoA

- Glucose

- Fat

 - Mobilizing fat for energy

 - Nervous system

 - Endocrine system

- Animal fat vs. plant oils

Chapter 8: Fermentation

- Yeast cells

- Muscles during non-aerobic exercise

- White meat vs. dark meat

Chapter 9: Muscle Fatigue

- Hypotheses

 - Lack of glucose

 - Lack of oxygen

 - Toxic buildup

- Delivery of glucose to muscles

Delivery of oxygen to muscles
Removal of pyruvate
Removal of carbon dioxide

Unit 7: Grow

Chapter 1: Proteins

Functions of proteins
Synthesis of proteins
 The DNA code
 Reading the DNA code
 Messenger RNA
 Ribosomes
 Transfer RNA
 Synthesizing a polypeptide

Chapter 2: Regulating protein synthesis

Genes
Introns
Exons

Unit 8: Reproduce

Chapter 1: Cell Cycle

Chapter 2: Chromosome duplication

P53 protein
CDK and cyclin
Helicase
Primase
DNA polymerase
Okazaki fragments
Chromosomal capping

Chapter 3: Mitosis

Prophase
Metaphase
Anaphase
Telophase

Chapter 4: Meiosis

- Autologous chromosomes

- Haploid vs. diploid

- Purpose of meiosis

- Mistakes in meiosis

 - Chromosome number abnormalities

 - Translocations

Chapter 5: Comparing Mitosis with Meiosis

- Advantages of mitosis

- Advantages of meiosis

- Disadvantages of mitosis

Chapter 6: Examples of Mitotic Reproduction

- Vegetative Reproduction

- Strawberry plants

- Aspen trees

- Fungi

Chapter 7: Alleles

- Dominant

- Recessive

- Phenotype vs. Genotype

- Punnett squares

Chapter 8: Sex chromosomes

- Barr body

- Calico cat

- Pedigree trees

 - Sex-linked recessive

- Punnett squares

Chapter 9: Blood Cell Types

- Blood types

- Blood transfusions

Unit 9: Respond to Internal Changes (Homeostasis)

Chapter 1: Temperature

- Source of heat

- Monitoring of body temperature
- Response to hypothermia
- Response to hyperthermia
- Danger of hyperthermia
- Cold-blooded animals

Chapter 2: Water, Sodium, Potassium

- Water content of blood
- Monitoring water volume
- Anti-diuretic hormone
- Movement of water in plants

Chapter 3: Oxygen and carbon dioxide

- Lung structure
- Transporting oxygen in the blood
- Removing carbon dioxide by the blood
- Carbonic anhydrase
- Carbonated beverages
- Acidic saliva
- Monitoring carbon dioxide levels in the blood
- Monitoring oxygen levels in the blood
- Control of heart output

Chapter 4: Glucose

- Insulin
- Glucagon

Chapter 5: pH

- Sources of acid
- Removal of acid from the blood by the lungs
- Removal of acid from the blood by the kidneys

Unit 10: Respond to Environmental Changes

Chapter 1: Species

- Hypothesizing the origin of species
- Charles Darwin
- Predictions from Darwin's hypothesis
- Evidence supporting Darwin's hypothesis

Chapter 2: Carbon Dating

Chapter 3: Genetic Diversity

- Surviving in a changing environment

- Ways to increase genetic diversity

 - Sexual reproduction

 - Mutations

- Natural selection

 - Homologous structures

 - Analogous structures

 - Vestigial structures

- Measuring genetic relatedness

- Genetic engineering

Chapter 4: Response to a changing environment

- Adaptations

- Variations

- Speciation

 - Advantages

 - Mechanism

Chapter 5: Relationships Between Organisms

- Symbiosis

 - Commensalism

 - Mutualism

 - Parasitism

- Living Apart

 - Predators

 - Scavengers

Chapter 6: Environmental Terminology

- Population

- Community

- Ecosystem

- Ecology

- Habitat

- Niche

- Competition

- Herbivore

- Carnivore

Omnivore

Chapter 7: Food

Chains

Webs

Chapter 8: Cycles

Water cycle

Carbon cycle

Nitrogen cycle

Unit 11 Designing Experiments

Chapter 1: Hypothesis

Creating a hypotheses

Confirming a hypothesis

Chapter 2: General Causation

Experiment to prove general causation

Independent vs. dependent variable

The control group

Designing the experiment

Plotting the data

Chapter 3: Specific Causation

Checking each variable

Changing the suspected variable

Chapter 4: Mathematics

Percent increase

Exponents

Decimals

Translating math problems into English

Fractions

Percentages

Decimals

Converting Units

Fractions in the numerator

Dividing two fractions

Fractions in the denominator

The metric system