Ch 1:

What features are common to all living organisms: Evolution, emergent properties, structure and function, cells, DNA, genetic code, metabolism, interaction with environment

Ch 2:

How electrons behave when they absorb or lose energy: They move to higher or lower shells

Characteristics of polar bonds: one atom is more electronegative and the atoms do not share the electrons equally.

Characteristics of non-polar covalent bonds: the atoms share the electrons equally

Types of different non-covalent bonds: ionic, hydrogen, hydrophobic, van der waals

Non-covalent bonds are: weak

Why water is so special: all organisms are mostly made of water and live in an environment dominated by water

Ch 3:

What are the 7 functional groups found in large organic molecules? Hydroxyl, Carbonyl, Carboxyl, Amino, Sulfhydryl, Phosphate, Methyl

How are polymers assembled from monomers and disassembled? Polymers form through dehydration- a dehydration reaction occurs when two monomers bond together through the loss of a water molecule to form a polymer, polymers are disassembled to monomers by hydrolysis.

Polymer: a unit consisting of covalently bonded pearls (monomers)

What are the monomers for macromolecules? Polysaccharides are made of monosaccharides

Special name for the covalent bonds of macromolecules: glycosidic linkages

Protein functions: defense, storage, transport, cellular communication, movement, and structural support

4 classes of Amino acids: nonpolar, polar, positive, and negative

Amino acid structure: carboxyl and amino groups

Nucleotide characteristics: consists of a nitrogenous base (ATCGU), a pentose sugar, and one or more phosphate groups

Nucleic acid characteristics: polymers called polynucleotides made of monomers called nucleotides

Ch 4:

Prokaryotic cells: do not have a nucleus or membrane-bound organelles, and DNA is contained in nucleoid.

Eukaryotic cells: DNA in nucleus, membrane-bound organelles, large

Protein assortment in attached ribosomes: ribosome produces polypeptide chain into the rough ER. The chain either remains in the rough ER or moves on to the golgi complex, and then into secretory vesicle, lysosome, or plasma membrane.

Protein assortment in free ribosomes: ribosome produces polypeptide chain directly into the cytosol. The chain either remains in the cytosol, or it is imported into the nucleus, mitochondrion, chloroplast, or peroxisome.
Endosymbiont theory: An early ancestor of eukaryotic cells engulfed a nonphotosynthetic prokaryotic cell, which formed an endosymbiont relationship with its host
Lysosomes: deal primarily with extracellular, cell-surface, and other proteins
Proteasomes: Proteasomes deal primarily with proteins that were synthesized within the cell such as transcription factors and cyclins
Cytoskeletal elements: a network of thick, thin, and intermediate fibers extending throughout the cytoplasm that organize the cell's structures and activities, anchoring many organelles
Cell junctions: Plasmodesmata, Tight, Desmosomes, Gap
Plasmodesmata: channels that perforate plant cell walls
Animal cell junctions: Tight, Desmosomes, Gap

Ch 5:
Fluid mosaic model: Cellular membranes are fluid mosaics of lipids and proteins. The two faces of the membrane are asymmetrical.
Membrane proteins: Transport, enzymatic activity, attachment to the cytoskeleton and extracellular matrix (ECM), cell-cell recognition, intercellular joining, signal transduction
Integral proteins: penetrate the hydrophobic interior of the lipid bilayer
Peripheral proteins: loosely bound to the surface of the membrane on either monolayer
Role of cholesterol in maintaining animal cell membranes: At warm temperatures, restrains movement of phospholipids. At cool temperatures, it maintains fluidity by preventing tight packing.
Semipermeable structure of membranes: allows some substances to cross it more easily than others
Asymmetrical nature of membranes: The two sides of a cell membrane face different environments and carry out different functions.
Passive transport: diffusion, osmosis, facilitated diffusion,
Active transport: primary, secondary, co, bulk

Ch 6:
Catabolic vs anabolic reactions: Catabolism releases energy and anabolism consumes it.
Exergonic reactions: Exergonic is catabolic (releases energy) and the change of G is negative.
Endergonic reactions: Endergonic is anabolic (consumes energy) and the change of G is positive.
ATP drives endergonic reactions by: phosphorylation, transferring a phosphate group to some other molecule, such as a reactant
Enzymes catalyze reactions by: Activation energy is the energy needed to initiate a reaction. Enzymes alter the energy by lowering the activation energy barrier without affecting the free energy change.

Factors that can affect the function of enzymes: General environmental factors, such as temperature and pH 2, and chemicals that specifically influence it (urea)
Regulatory mechanisms for enzyme function: Enzyme inhibitors. Competitive Inhibitors bind to active site and compete with the substrate. Noncompetitive inhibitors bind to another part and change the shape, making the active site less effective.
Regulatory mechanisms for allosteric interactions: Occurs when a regulatory molecule binds to a protein at one site and affects the protein's function at another site
Regulatory mechanisms for activator and inhibitory factors:
Regulatory mechanisms for cooperativity: Allosteric, amplifies enzyme activity, binding of substrate to active site to increase binding of other substrates to other active sites.
Regulatory mechanisms for feedback: Negative - the metabolic end shuts down the pathway and prevents a cell from wasting chemical resources by synthesizing more product than needed. Positive - product stimulates its own formation

Ch 7:
Cellular respiration reactions: Redox reactions
Cellular respiration locations: Glycolysis, Pyruvate oxidation, Citric acid cycle, Oxidative phosphorylation
Output of ATP: 32mol
Oxidative phosphorylation: accounts for almost 90% of the ATP generated by cellular respiration
Substrate level phosphorylation: a smaller amount of ATP is formed in glycolysis and the citric acid cycle
Chemiosmosis and how it forms: OP accounts for 90% of ATP generated by cellular respiration. 32mol ATP made per mol of glucose. ATP synthase uses the exergonic flow of H+ to drive phosphorylation of ATP (chemiosmosis).
Lactate fermentation: pyruvate is reduced by NADH, forming lactate
Alcohol fermentation: pyruvate is converted to ethanol in The first step releases CO2 from pyruvate, and the second step reduces acetaldehyde to ethanol

Ch 10:
Mitosis process: chromosomes consisting of chromatin are duplicated and the sister chromatids split and move into 2 nuclei.
Interphase: G1 first gap, S synthesis (chromosomes and centrosome duplicated), G2 second gap
M phase: the mitotic phase that contains mitosis and cytokinesis
G1 checkpoint: is environment favorable, is the cell big enough
G2 checkpoint: non dividing, where the cell goes if it isn't allowed past G1
M checkpoint: pulls duplicated chromosomes apart (are all chromosomes properly attached to mitotic spindle?)

Ch 11:

Haploid: Also called a gamete, single set of chromosomes, n=23. If ovum is unfertilized it has an X, sperm can have either X or Y. The only type of human cells produced by meiosis.
Diploid: 2 sets of chromosomes, 2n, 46 total chromosomes
Zygote: The union of gametes (an ovum fertilized by a sperm), 2n=46
Homologous chromosomes: 1 maternal and 1 paternal chromosome that are similar but not identical
Autosomes: The X and Y chromosomes
Meiosis results in: 4 haploid cells and halves the total number of chromosomes.
Reductional division is: Meiosis 1 (PMAT) homologs pair up and separate, results in 2 daughter cells with replicated chromosomes.
Equational division is: Meiosis 2 sister chromatids separate, results in 4 haploid cells with unreplicated chromosomes.

Ch 12:
Law of Segregation: Monohybrid cross. The 2 alleles for a heritable character segregate during gamete formation and end up in different gametes. An egg or sperm receive only one of the two alleles.
Law of Independent Assortment: Dihybrid cross. Each pair of alleles segregates independently of each other during gamete formation. Applies to genes on different, non-homologous chromosomes.
True dominance: occurs when phenotypes of the heterozygote and dominant homozygote are identical
Codominance: two dominant alleles affect the phenotype in separate, distinguishable ways
Incomplete dominance: the phenotype of F1 hybrids is somewhere between the phenotypes of the two parental varieties
Multiple alleles: The enzyme encoded by I A adds the A carbohydrate, and the enzyme encoded by I B adds the B carbohydrate; the enzyme encoded by the i allele adds neither
Pleiotropy: One gene shows its influence on multiple phenotypic traits.
Polygenic inheritance: an additive effect of two or more genes on a single phenotype

Ch 13:
Female: needs two copies of the allele (homozygous)
Male: needs only one copy of the allele (hemizygous)
The SRY gene on the Y chromosome: required for the developments of testes, determines male sexual characteristics
Sex-linked diseases are more common in human males because: X-linked recessive disorders are much more common in males than in females because males are hemizygous so they express the trait when they inherit one mutant allele.
Linked genes: tend to be inherited together because they are located near each other on the same chromosome
Unlinked genes: any two genes on different chromosomes (50% frequency)
Sex-linked gene: a gene that is located on either sex chromosome

Why do linked genes do not assort independently: Linked genes segregate, so they don't usually result in recombinant types.
How does crossing over unlink genes: if they cross over during Prophase I of meiosis I, they will result in some recombinant phenotypes
Aneuploidy: results from the fertilization of gametes in which nondisjunction occurred. Offspring with this condition have an abnormal number of a particular chromosome.
Polyploidy: a condition in which an organism has more than two complete sets of chromosomes, it's common in plants.
Nondisjunction: pairs of homologous chromosomes do not separate normally during meiosis, so one gamete receives 2 of the same type of chromosome while another recieves none.
Down syndrome: aneuploid condition that results from 3 copies of chromosome 21
Klinefelter syndrome: the result of an extra chromosome in a male, producing XXY individuals
Females with trisomy X: slightly taller than average
Monosomy X (Turner syndrome): produces X0 females, who are sterile. Only viable monosomy in humans.

Ch 14:
Describe the structure of DNA and evidence that it is the genetic material: Double helical structure. Since the two strands of DNA are complementary, each strand acts as a template for building a new strand in replication. Watson and Crick noted that the specific base pairing suggested a possible copying mechanism for genetic material.
Summarize the major experiments that conclusively demonstrated DNA was the molecule of inheritance: In 1953, James Watson and Francis Crick introduced an elegant double-helical model for the structure of deoxyribonucleic acid, or DNA. Hereditary information is encoded in DNA and reproduced in all cells of the body (DNA replication).
Describe the features of the DNA molecule: Carbohydrate, sugar-phosphate backbone and 4 nitrogenous bases
Semi-conservative replication: Proposed by Watson and Crick, each strand of the double helix serves as a template of a new strand, but there is no way of knowing how the new strands and parent strands combine to form 2 double helical molecules (parent and template combo)
Conservative replication: Parent strands remain together and produce a copy composed of 2 new strands that contain all of the new DNA base pairs
Dispersive replication: A combination of both semi-conservative and conservative, where two copies of DNA are produced that are composed of either both original strands or both new strands (proven to be incorrect)
Identify the features of the leading and lagging strands of DNA replication: Along one template strand of DNA, the DNA polymerase synthesizes a leading strand continuously, moving toward the replication fork. To elongate the other new strand, called the lagging strand, DNA polymerase must work in the direction away from the replication fork (5' to 3').
Identify the key proteins used in DNA replication: Helicase, topoisomerase, primase, DNA polymerase, DNA ligase.
Identify the bonds formed between the nucleotide monomers to make the DNA polymer: Hydrogen Bonds

Identify the bonds formed between the nitrogenous base pairs: Also hydrogen bonds
Replication fork: a y-shaped region located at the end of each bubble where the parental DNA are being unwound
Protein that untwists the double helix at replication forks: Helicase. Breaks the H-bonds between complementary nucleotides
Topoisomerase: relieves strain caused by tight twisting by breaking, swiveling, and rejoining strands
DNA polymerase: Can't initiate synthesis of a polynucleotide; they can only add nucleotides to an already existing chain base-paired with the template
Initial nucleotide strand: a short RNA primer added by DNA primase
Primase: an enzyme that starts an RNA chain using parental DNA as a template
DNA polymerase III: catalyzes elongation of a new DNA strand at replication fork
DNA synthesis direction: from 5' to 3'
Leading strand: synthesized continuously by DNA polymerase, moving towards replication fork
Lagging strand: synthesized by DNA polymerase away from the replication fork
Okazaki fragments: the series of lagging strand segments
DNA polymerase I: replaces primers with nucleotides
DNA ligase: joins gaps
Telomeres: special nucleotide sequences at the end of eukaryotic chromosomal DNA molecules (shortening of telomeres connected to aging?)
Repeated rounds of replication: produce shorter DNA molecules
Telomerase: catalyzes lengthening of telomeres in germs, not active in most human somatic cells beside cancer
DNA methylation: acts to repress gene transcription by making it harder for the DNA to unwrap from the histones

Ch 15:
What is the direction of the codon and anticodon? Codon is 5' to 3', anti-codon is 3' to 5'.
Name the sections of large subunit: Exit, Peptidyl, Amino
Gene region begins and ends with: Begins with a promoter and ends with an indicator
How many proteins are included: 60k-100k
Trp: UGG
Phe: UUU
Gly: GGC
Ser: UCA
Triplet code: A series of non-overlapping, three-nucleotide words
Start Codon: AUG
Stop Codon 1: UAA
Stop Codon 2: UAG
Stop Codon 3: UGA
Total number of codons: 64
Number of codons that code for amino acids: 61
First stage of gene expression: Transcription

RNA polymerases: assemble polynucleotides in the 5’ to 3’ direction, can start a chain without a primer
DNA sequence where polymerase attaches: promoter
Sequence signaling the end of transcription: terminator
3 stages of transcription: Initiation, elongation, termination
TATA Box: Promoter
Termination occurs when: a stop codon in the mRNA reaches the A site of the ribosome
Bacterial termination: Polymerase stops transcription and mRNA can continue being translated
Eukaryotic termination: RNA polymerase II transcribes polyadenylation signal sequence
Poly-A tail: 3’ end modified to receive
RNA splicing: removes introns and joins exons
Spliceosomes: carry out RNA splicing
Wobble: Created when an amino acid is attached to the 3’ end
E-site: exit site, where discharged tRNAs leave the ribosome
P-site: Peptidyl-tRNA binding site that holds the tRNA that carries the growing polypeptide chain
A-site: Aminoacyl-tRNA binding site that holds the tRNA that carries the next amino acid to be added to the chain