Honors Biology
Review Fall Mid-Term Exam
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Chapter 1: Biology in the 21st century

Be able to define and use the following terms:

Asexual reproduction	Biology	Cell
Sexual reproduction	Hypothesis	Unicellular organism
Autotroph	Theory	Multicellular organism
Heterotroph	Independent variable	Model
Homeostasis	Dependent variable	Inference
Biotechnology	Resolution	Genomics

Key concepts:

1. List the themes that unify the study of biology.
2. Explain the characteristics that are considered distinct properties of living things.
3. Identify the control and experimental groups, independent and dependent variables, and constants in an experimental design.
4. Know the steps in the scientific method.
5. Identify base units of measurements and convert units in the metric system.
6. Identify and label parts of the microscope, know how to determine magnification and limitations of various microscopes.
7. Explain how the study of biology relates to your personal experience.
8. Understand standard safety practices.

Chapter 2 : Chemistry of Life

Be able to define and use the following terms:

atom	compound	endergonic	acid	solution
molecule	chemical reaction	exergonic	base	solvent
atomic number	mass	product	alkaline	solute
covalent bond	matter	reactant	dissociation	
ionic bond	catalyst	activation energy	pH	
hydroxide ion	saturated solution	element	concentration	
hydronium ion	adhesion	cohesion	hydrogen bond	
polar	organic compound	amino acid	lipid	
carbohydrate	disaccharide	monosaccharide	nucleic acid	
phospholipid	polysaccharide	protein	steroid	
triglyceride	ATP	functional group	non-polar	

Chapter 2 continued:

Key Concepts:

1. Review element symbols.
2. Be able to determine the number of protons, electrons, and neutrons in an atom from the periodic table.
3. Describe the location of subatomic particles.
4. Explain how electrons fill energy levels.
5. Describe the process of elements combining covalently and ionically.
6. Explain the values indicated on a pH scale and understand how to read pH paper.
7. Tell why water is a very good solvent.
8. Identify what monomers and polymers are and how polymers are synthesized and broken down.
9. Provide examples of lipids, monosaccharides, polysaccharides, disaccharides, proteins, and nucleic acids.
10. Identify the properties, structures, and functions of organic macromolecules.
11. Summarize the role of enzymes in living things.
12. Describe the lock-and-key structure of enzymes and their substrates.

Chapter 3 :Cell Structure and Function

Be able to define and use the following terms:

prokaryote	cell	fluid mosaic model
eukaryote	passive transport	hypotonic
carrier protein	diffusion	hypertonic
concentration gradient	osmosis	selective permeability
isotonic	plasmolysis	facilitated diffusion
contractile vacuole	turgor pressure	active transport
cytolysis	ion channel	vesicle
equilibrium	endocytosis	exocytosis
pinocytosis	phagocytosis	
sodium-potassium pump		

Key Concepts:

1. Be familiar with the scientists who first looked at cells and the theories of each.
2. List the parts of the cell theory.
3. Compare and contrast prokaryotic and eukaryotic cells; give examples of each.
4. Compare and contrast plant and animal cells.
5. Describe the relationship between cell size/shape and function (form fits function)
6. Identify the organelles of the cell and describe their functions.
7. Be able to label cell structures.
8. Compare and contrast passive and active transport.
9. Explain mechanisms of passive and active transport.
10. Describe the components of the plasma membrane and the function of each.
11. Relate the structure of the cell membrane to the maintenance of homeostasis.

Chapter 3 continued

12. Understand what occurs when cells are placed in hypotonic, hypertonic, and isotonic solutions.

Chapter 4: Cells and Energy

Be able to define and use the following terms:

Biochemical pathway	chemiosmosis	chlorophyll	photosynthesis
Electron transport chain	photosystem	stroma	granum
Light reactions	pigment	C_3 plant	C_4 plant
Calvin Cycle	carbon fixation	stomata	ATP
cellular respiration	fermentation	aerobic	anaerobic
glycolysis	kilocalorie	mitochondria	

Key Concepts

1. Know starting materials and end products for photosynthesis.
2. Understand the role of the chloroplast in the processes of photosynthesis.
3. Explain why it is critical that autotrophs carry out the process of photosynthesis.
4. Know the basic steps in the process of photosynthesis.
5. Understand the role of cellular respiration in the production of ATP.
6. Diagram the structure of ATP, explain the ATP/ADP cycle, and describe how the ATP stores energy.
7. Describe the starting materials and the end products of cellular respiration.
8. Differentiate between aerobic and anaerobic pathways.
9. Explain the basic steps of cellular respiration. Know where each occurs.
10. Contrast aerobic and anaerobic processes. Explain why fermentation is necessary in some cells.
11. Relate the folded membranes of cellular structures to the production of ATP.
12. Differentiate between the various processes of matter and energy conversion within an organism such as photosynthesis, respiration, and fermentation.

Chapter 5: Cell Growth and Division

Be able to define and use the following terms:

autosome	centromere	chromatin	chromatid
gene	diploid	haploid	histone
homologous	chromosomes	anaphase	mitosis
somatic cell	binary fission	cell cycle	S phase
interphase	prophase	metaphase	G_0 phase
telophase	cytokinesis	kinetochore	G_1 phase
cell plate	cleavage furrow	centrosome	G_2 phase
centriole	mitotic spindle	asexual reproduction	sexual reproduction
stem cell	tissue	organ	organ system

Chapter 5 continued:

Key Concepts

1. Analyze the organizational hierarchy of cells, tissues, organs, organ systems, organisms.
2. Know the phases of the cell cycle.
3. Compare and contrast mitosis and meiosis. Know the reason for each type of cell division. How do the cells that result from each process compare to the original cell?
4. Describe the structure of the genetic material (DNA) during each phase of the cell cycle.
5. Know the details of each of the phases of mitosis.
6. Explain how the cell cycle is controlled.
7. Know how mutations in proto-oncogenes or tumor suppressor genes can cause cancer.
8. Explain the use of stem cells.

Chapter 6: Meiosis and Mendel

Be able to define and use the following terms:

allele	dominant	F_1 generation	F_2 generation
P generation	genetics	heredity	Gregor Mendel
probability	recessive	dominant	
law of segregation	pollination	cross-pollination	genotypic ratio
codominance	trait	self-pollination	incomplete
strain	dihybrid cross	genotype	phenotype
homozygous	heterozygous	probability	test cross
Punnett square	monohybrid cross	gamete	gametogenesis
sperm	egg	zygote	gene
probability	crossing over	genetic linkage	dominance
law of independent assortment			

Key Concepts

1. Describe the purpose of meiosis and the phases of the meiotic process.
2. Distinguish between dominant and recessive traits.
3. Paraphrase how Mendel's experiments led to the discovery of genes and chromosomes.
4. Explain the laws of segregation and the law of independent assortment.
5. Know how probability is used to predict the results of genetic crosses.
6. Be able to use both monohybrid and dihybird crosses to predict probability.
7. Explain the purpose of a test cross.

Chapter 7: Extending Mendelian Genetics

Be able to define and use the following terms:

sex linked gene	x-linked gene	y-linked gene	linkage group
somatic mutation	map unit	chromosome map	lethal mutation
deletion	substitution	inversion	point mutation
translocation	nondisjunction	germ-cell mutation	frame shift mutation
pedigree	carrier	pattern of inheritance	sex-influenced trait
single allele trait	multiple allele trait	genetic disorder	polygenic traits
genetic marker	monosomy	trisomy	linkage map
color blindness	Down Syndrome	Huntington's disease	
Duchenne muscular dystrophy		X Chromosome inactivation	
incomplete dominance		codominance	
autosome	epistasis	phenylketonuria (PKU)	

Key Concepts:

1. Explain how sex chromosomes determine the sex of an organism.
2. Know how sex linkage affects the inheritance of traits.
3. Construct a chromosome map.
4. Know the differences between chromosome mutations and gene mutations.
5. Analyze how a pedigree illustrates inheritance of traits.
6. Know the inheritance patterns of Huntington's disease, cystic fibrosis, blood types, polygenetic traits, color blindness, hemophilia and Duchenne muscular dystrophy.
7. Describe how nondisjunction causes Down syndrome.
8. Describe the process of amniocentesis.
9. Construct and analyze a karyotype.

Chapter 8: From DNA to Protein

Be able to define and use the following terms:

Nucleic Acid	deoxyribose	adenine	thymine
guanine	cytosine	nitrogen-containing base	
pyrimidine	purine	helicase	DNA polymerase
base-pairing rule	replication fork	mutation	double helix
replication	ribose	uracil	mRNA
rRNA	tRNA	transcription	translation
RNA polymerase	codon	anticodon	genetic code
translation	start codon	stop codon	protein synthesis

Chapter 8: continued

Key Concepts

1. Describe the structure of DNA.
2. Define complementary base pairing. Articulate Chargaff's rule.
3. Summarize steps in DNA replication, explain the purpose of DNA replication, and describe when in the cell cycle it occurs.
4. Compare and contrast the structure, location, and function of DNA and RNA.
5. Define and summarize the central dogma of molecular biology as described by Francis Crick.
6. Summarize the process of transcription.
7. Describe the function of each type of RNA.
8. Explain the roles of the start and stop codons.
9. Describe the genetic code.
10. Summarize the process of translation.
11. Know the differences between chromosome mutations and gene mutations.
12. Define gene expression.
13. Describe the regulation of the lac operon in prokaryotes.
14. Distinguish between introns and exons.
15. Explain how gene expression is controlled in eukaryotes.
16. Know how morphogenesis is affected by the control of gene expression.

Chapter 9:

Be able to define and use the following terms:

restriction enzyme	clone	transgenic
gel electrophoresis	genetic engineering	gene knockout
restriction map	recombinant DNA	plasmid
polymerase chain reaction (PCR)	genomics	gene sequencing
primer	bioinformatics	DNA microarray
DNA fingerprint	proteomics	Human Genome Project
Genetic screening	gene therapy	palindrome

Key Concepts:

1. Summarize how restriction enzymes cut DNA.
2. Explain how restriction maps show the lengths of DNA fragments.
3. Describe the role of polymerases in copying DNA segments.
4. Outline the PCR process and explain why it is used.
5. Describe what a DNA fingerprint represents.
6. Summarize how DNA fingerprints are used for identification.
7. Describe how organisms are cloned.
8. Explain how new genes can be added to an organism's DNA.
9. Define and explain the importance of genomics.

Chapter 9 continued:

10. Identify how technology helps compare and study genes and proteins.
11. Explain how genetic screening can detect genetic disorders.
12. Describe how gene therapy research seeks to replace faulty genes.
13. Explain the use of DNA microarray technology.