Your mid-term will be on **Thursday, December 18th from 9:05-10:45**. The test will be multiple choice and expect around 90-100 questions. Please think about forming study groups for your benefit ☺ I will also be available after school if you need any extra help or just need a quiet place to study.

**Chapter 1: Cell Structure**

1. Distinguish between resolution and magnification in reference to a light microscope and electron microscope.
2. Calculate actual sizes of specimens from drawings and photographs.
3. Calculate linear magnification of drawings and photographs.
4. Compare the structure of an animal cell and plant cell.
5. Interpret drawings of plant and animal cells, recognizing the rough endoplasmic reticulum, smooth endoplasmic reticulum, Golgi body, mitochondria, ribosomes, lysosomes, chloroplasts, cell surface membrane, nuclear envelope, centrioles, nucleus, nucleolus, microvilli, cell wall, central vacuole, tonoplast and plasmodesmata.
6. Describe the structure of a prokaryotic cell and contrast the structure of prokaryotic cells with that of eukaryotic cells (Table 1.2 page 22 in new book) particularly the difference in size of the ribosomes in the prokaryote vs. eukaryote cell.
7. Explain how eukaryotic cells may be organized into tissues and organ, with reference to transverse sections of stems, roots, and leaves (pages 20-24 in old book)

**Chapter 2: Biological molecules**

1. Recognize and understand the different tests for macromolecules (including reagents used and analysis of results)
2. Describe the ring forms of α-glucose and β-glucose
3. describe the formation and breakage of a glycosidic bond with reference both to polysaccharides and to disaccharides including sucrose
4. Describe the molecular structure of polysaccharides including starch (amylose and amylopectin), glycogen and cellulose and relate these structures to their functions in living organisms
5. Understand the importance in biology of carbohydrates, lipids and proteins
6. describe the molecular structure of a triglyceride and a phospholipid and relate these structures to their functions in living organisms
7. Distinguish between saturated and unsaturated fatty acids and lipids
8. Describe the structure of an amino acid and the formation and breakage of a peptide bond
9. explain the meaning of the terms *primary structure*, *secondary structure*, *tertiary structure* and *quaternary structure* of proteins and describe the types of bonding (hydrogen, ionic, disulfide and hydrophobic interactions) that hold the molecule in shape
10. Describe the molecular structure of hemoglobin as an example of a globular protein, and of collagen as an example of a fibrous protein and relate these structures to their functions (the importance of iron in the hemoglobin molecule should be emphasized. A hemoglobin molecule is composed of 2 alpha (*α*)chains and 2 beta (*β*) chains, although when describing the chains the terms *α*-globin and *β*-globin may be used. There should be a distinction between collagen molecules and collagen fibers)
11. Describe and explain the roles of water in living organisms and as an environment for organisms

**Chapter 5: Cell and Nuclear Division**

1. Be able to explain the importance of mitosis in growth, repair, asexual reproduction and genetically identical cells.
2. Outline the stages of the cell cycle, including growth, DNA replication, mitosis and cytokinesis.
3. Be able to describe the behavior of the chromosomes during the mitotic cell cycle and describe what happens to the nuclear envelope, cell membrane, centrioles and spindle fibers.
4. Be able to name and identify the main stages of mitosis.
5. Be able to describe how cancer is formed by the formation of tumors and factors that can increase the chances of cancer.
6. Explain the meanings of haploid, diploid and reduction division (meiosis).

**Chapter 6: Genetic Control**

1. Describe the structure of DNA and RNA and explain base pairing and different hydrogen bonding between bases.
2. Reference to adenine and guanine as purines and cystosine, thymine and uracil as pyrimidines.
3. Explain the difference between the purine structure and pyrmidine structure.
4. Describe and explain how DNA replicates semi-conservatively.
5. Be able to state that a polypeptide is coded for by a gene and that a gene is a sequence of nucleotides that forms part of a DNA molecule.
6. Be able explain that a mutation is a change in the sequence that may result in an altered polypeptide.
7. Describe the way in which the nucleotide sequence codes for the amino acid sequence in a polypeptide with reference to the nucleotide sequence for HbA (normal) and HbS (sickle cell) alleles of the gene for the B-globin polypeptide.
8. Describe the process of transcription and translation to construct polypeptides, including the role of mRNA, tRNA and the ribosomes.

**Chapter 14 (Old book): Ecology**

1. Define and provide examples of the terms habitat, niche, population, community and ecosystem.
2. Explain the terms autotrophs, heterotrophs, producer, consumer and trophic level in food chains and food webs.
3. Explain the energy loss along food chains and discuss the efficiency of energy transfer between trophic levels.
4. Describe the nitrogen cycle and how nitrogen is cycled within the ecosystem. Include the roles of nitrogen-fixing bacteria (Rhizobium) and nitrifying bacteria (Nitrosomonas and Nitrobacter).

**Chapter 16: Inherited Change**

1. Describe the behavior of chromosomes, nuclear envelope, cell membrane and centrioles during meiosis.
2. Be able to name and identify the names of the main stages of meiosis.
3. Explain what factors lead to variation (meiosis and fertilization).
4. Explain the terms locus, allele, dominant, recessive, codominant, homozygous, heterozygous, phenotype and genotype.
5. Use genetic diagrams to solve problems involving monohybrid and dihybrid crosses (sex linkage, codominance and multiple alleles).
6. Solve problems using genetic diagrams.
7. Use the chi-squared test to test the significance of differences between observed and expected results.
8. Explain and include examples of how a mutation and environment may affect the phenotype.
9. Explain how a change in the nucleotide sequence in DNA may affect the amino acid sequence in a protein.

**Chapter 17 (New): Selection and Evolution**

1. Explain how natural selection may cause evolution.
2. Explain the importance of variation in selection.
3. Explain how organisms can potentially overproduce.
4. Explain and use examples of how environmental factors can act as stabilizing or evolutionary forces of natural selection.
5. Describe the processes that affect allele frequency in a population with reference to the global distribution of malaria and sickle cell anemia.
6. Explain the role of isolating mechanisms in the evolution of a new species.
7. Describe one example of artificial selection.

**Chapter 21 (old): Biodiversity and Conservation**

1. Outline the five-kingdom classification.
2. Discuss the meaning of biodiversity and the reasons to maintain it.
3. Describe the reasons why one named species has become endangered, and use this information in the context of other endangered species.
4. Discuss the methods of protecting endangered species (zoos, botanic gardens, conserved areas and seed banks).