Biology Review Guide
DNA Structure & Replication, Cell Cycle & Mitosis, and Cancer

Nucleic Acids - DNA

- Identify the three types of nucleic acids
- List the 5 elements present in nucleic acids
- Identify the building blocks of nucleic acids
- Explain important characteristics about DNA
  - What does DNA stand for?
  - What is DNA's main job?
  - How is DNA related to chromosomes and genes?
- Identify the parts of a nucleotide
- Explain the structure of DNA
  - What is the type of sugar in a DNA nucleotide?
  - What are the four bases within DNA?
  - What is the difference between a purine and a pyrimidine?
  - Which bases are purines, which are pyrimidines?
  - Where is the sugar-phosphate backbone compared to the bases?
  - What bonds hold the bases together?
  - What are the base-pairing rules?
  - What is the name of the shape that DNA holds?

DNA Replication

- Define DNA replication
- Describe the steps of DNA replication **(as defined in our notes)**
  - What enzyme assists with the first step? What does it do?
  - What is a replication fork?
  - What does DNA polymerase do?
  - What bonds hold the two strands together at the bases?
- Explain how original DNA strands are used as a template for DNA replication
  - If the original strand reads ATT-GCT-ACG, what would the complementary DNA strand read?
  - Why is the model of DNA replication referred to as "semi-conservative"? What is being "conserved"?
  - How do the sequences of the two DNA molecules compare after replication takes place?

Cell Reproduction: Binary Fission & The Cell Cycle

- Identify the difference between prokaryotic DNA and eukaryotic DNA
  - Where are the two located? What is different about their shapes?

- Describe the steps of binary fission
  - How do the offspring ("children") compare to the original cell?
  - What types of organisms use binary fission?

- List reasons for why new cells need to be made for eukaryotes

- Define "The Cell Cycle" for eukaryotes

- Compare and contrast chromatin, chromosomes, and chromatids
  - During what part of the Cell Cycle are these forms of DNA present?

- List the phases of the cell cycle and give a brief description of the occurrences in each phase
  - What three parts make up Interphase?
  - What is the difference between mitosis and cytokinesis?

Mitosis Circles Notes

- Identify and describe the four phases of mitosis
  - What structures are involved during each step?
  - What shape/form is the DNA in during each stage?

- Differentiate between animal and plant cells during telophase
  - What structure makes the last phase of mitosis different for animal and plant cells?
  - What is it called in animal cells where the cell membrane is being pinched to form two separate cells?
  - What structure in plant cells eventually becomes the cell wall between two newly separated cells?

Understanding Cancer – NIH Videos

- Describe the roles of tumor suppressor genes and proto onco genes

Cancer (The Cancer/Mitosis Connection)

- Describe how the rate of cell division is related to cancer

- Identify examples of different rates of division for different cells
  - How are these rates "appropriate" for that particular cell type?
  - What stage of the cell cycle do cells spend most of their time in?

- Identify how the rate of cell division (or cell growth) is regulated
  - What happens when this process is disrupted?

- Describe the consequences of increased rates of mitosis

- Identify different causes of cancer (be prepared to identify specific examples)
  - Extra – does all types of radiation cause cancer? Which types do – high energy radiation or low energy radiation?

- Define carcinogen
  - What does it mean that exposure to carcinogens is cumulative?
  - What do carcinogens do?

- Identify the two types of tumors
  - Which is the dangerous type? Why is it considered dangerous?

- Describe how cancer cells affect neighboring cells

- Identify and describe the different options for cancer treatment