

# Study Guide: Unit 4 Test

## HONORS BIOLOGY: DNA and CELL DIVISION

**Directions:** The list below identifies topics, terms, and concepts that will be addressed on your Unit 4 Test. This list should help you focus your review. This is not a homework assignment you will turn into me.

### Identifying DNA as the Genetic Material

- Discoveries and significance
  - Griffith “transforming principle”
  - Avery
  - Hershey and Chase
  - Chargaff
  - Rosalind Franklin and Maurice Wilkins
  - Watson and Crick (how did they use prior work to develop model of DNA?)

### Structure of DNA

- Monomers (ATCG) and structure
- Chargaff’s Rule
- DNA molecule (backbone and rungs)
- Bonding on backbone and rungs (covalent and hydrogen bonding)

### DNA Replication

- Definition (purpose)
- Role of enzymes
- Importance of hydrogen bonds
- Source of new nucleotides for replication
- Result of replication (one old strand and one new strand)
- How can replication occur in just a few hours?

### Chromosomes

- Somatic cells
- Germ cells
  - Gamete production
- Autosomes
  - 22 pair
- Sex chromosomes
  - 1 pair
    - XX or XY
- Homologous chromosomes
- Composition of chromosome
  - Chromatids (sister chromatids)
    - Centromere
  - Histones
  - Chromatin
  - Genes
    - What are genes?
    - How do they store genetic code?
    - What do genes do with code?
    - How many genes do we have?
  - Telomeres
- Diploid and haploid

## Cell Cycle

- Stages of Cell Cycle
  - G<sub>1</sub> phase
  - S phase
  - G<sub>2</sub> phase
  - M phase
  - Cytokinesis
- Rates of cell division
- Limits of cell size (surface area to volume ratio)

## Mitosis

- Cells that undergo mitosis (somatic cells)
- What takes place prior to mitosis
- Genetically identical daughter cells
- 4 main phases of mitosis (PMAT)
  - Prophase
  - Metaphase
  - Anaphase
  - Telophase
- Cytokinesis
- Regulation of cell cycle
  - External and internal factors
- Apoptosis
- Cancer
  - Uncontrolled cell growth
  - Types (benign and malignant)
  - Causes
    - Carcinogens, inherited, radiation
  - Treatments
- Asexual reproduction
  - Binary fission
    - Genetically identical
    - Occurs in prokaryotes
- Advantages and disadvantages of asexual and sexual reproduction

## Meiosis

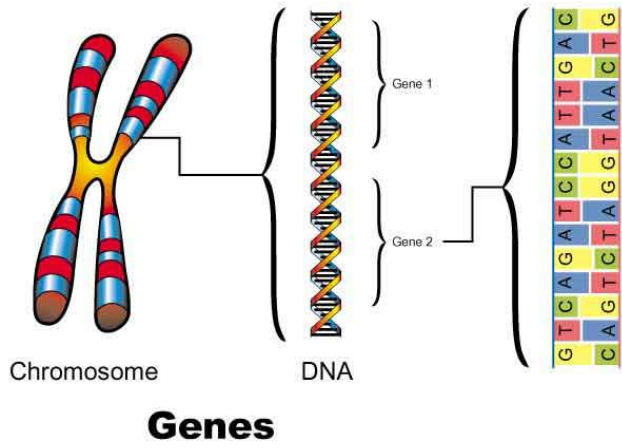
- Takes place in germ cells
- Products of meiosis (haploid cells)
  - Genetically unique
- Stages of Meiosis
  - Meiosis I and Meiosis II
- Gametogenesis
  - Gametes (sperm and egg)

## Multicellular Life

- Levels of organization
- Cell differentiation

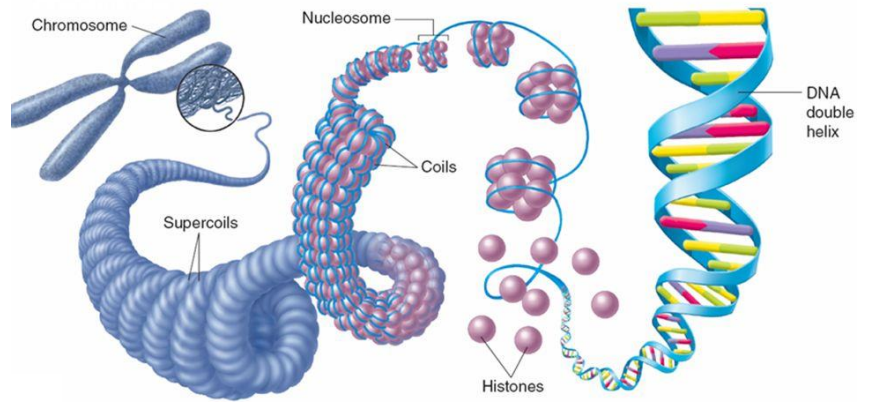
## Stem Cells

- What is a stem cell?
- Types of stem cells
- Importance of stem cells



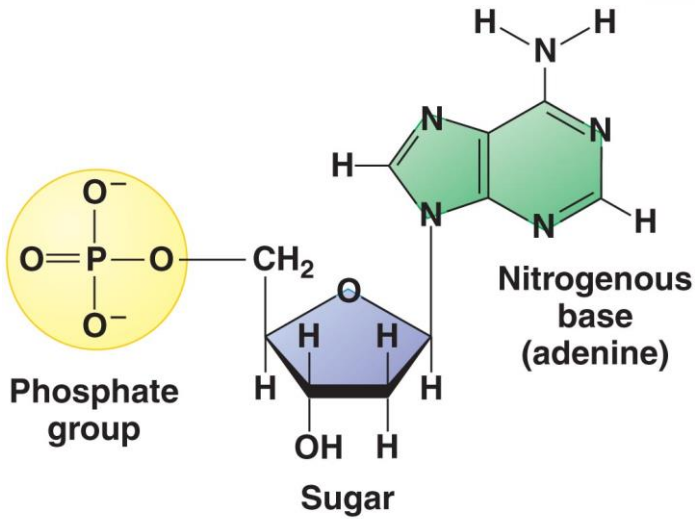
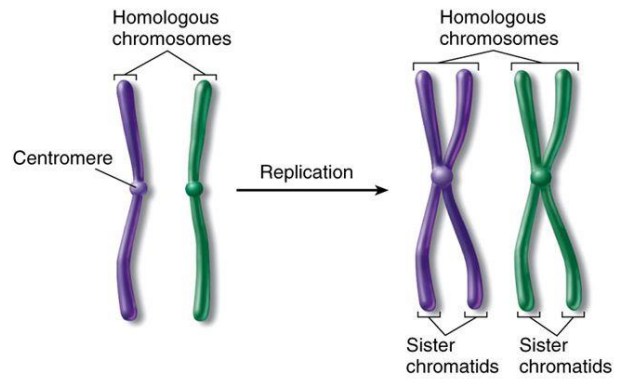
## DNA and Chromosomes

### Eukaryotic Chromosome Structure

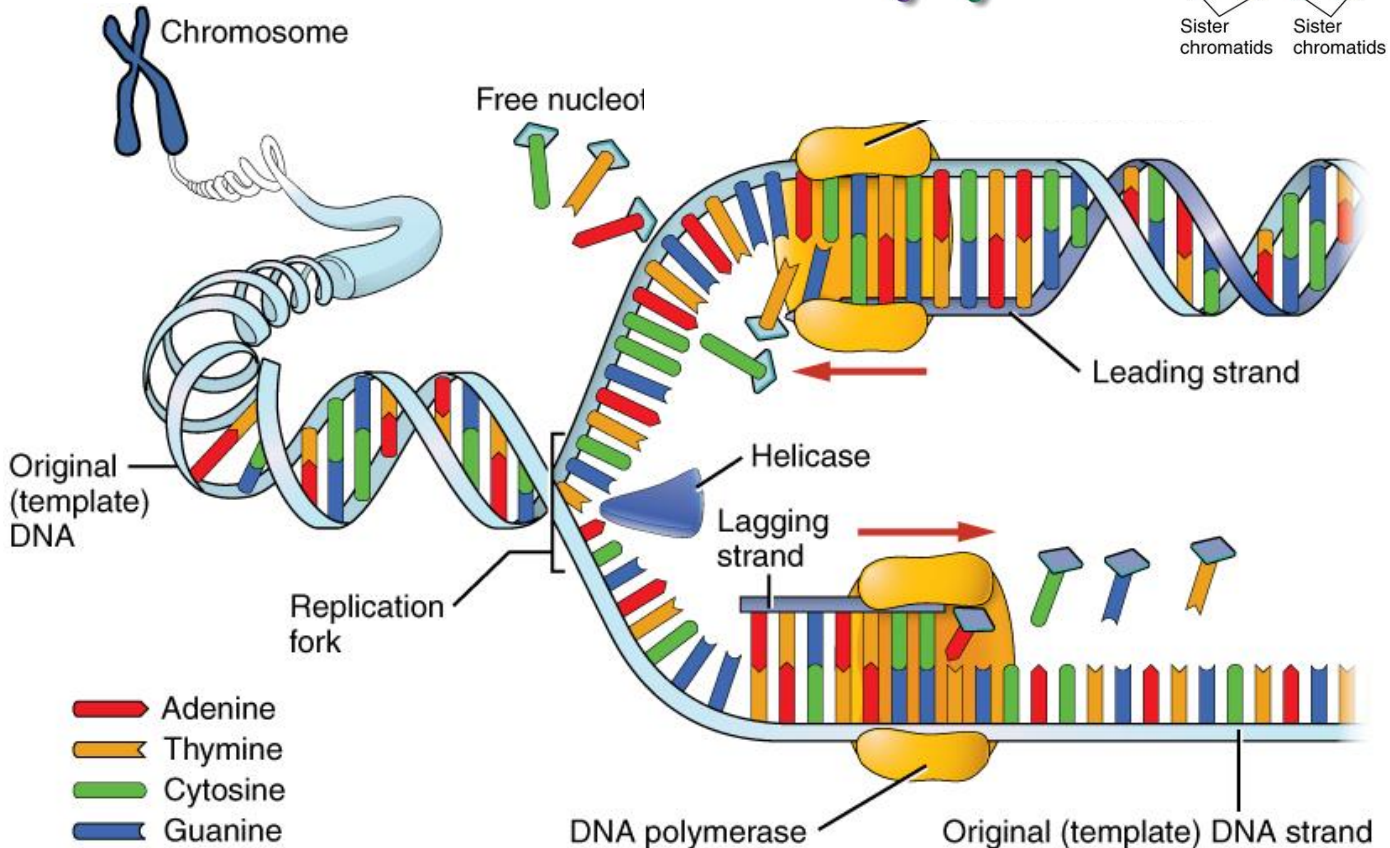


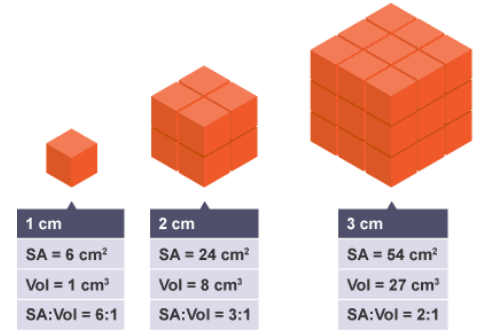
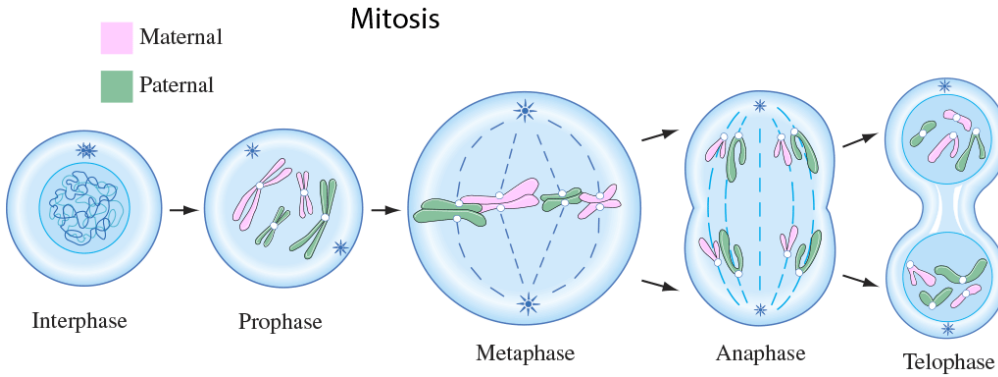
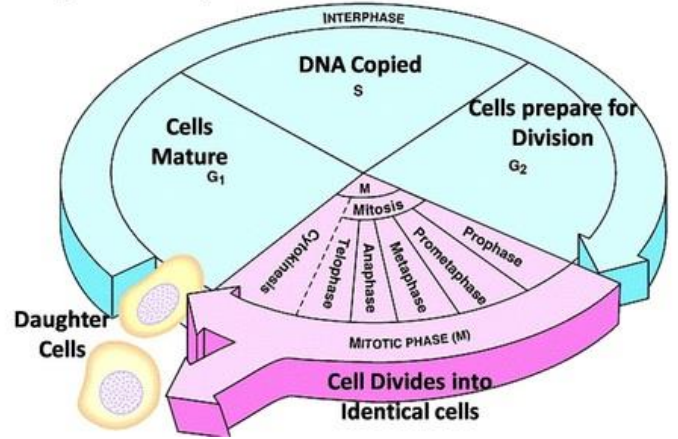
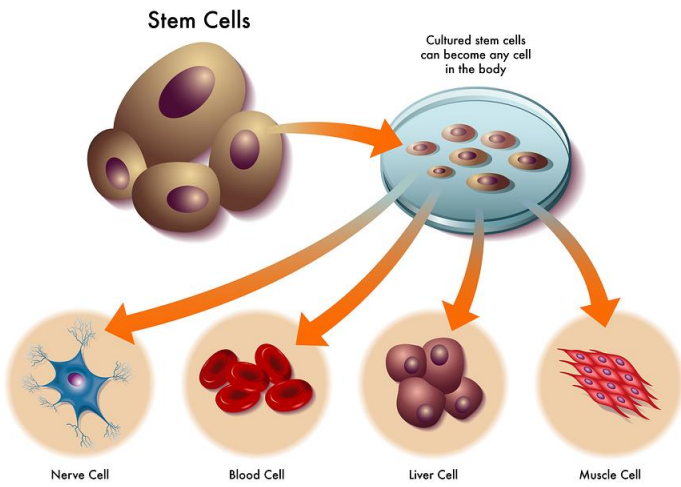
### Basic Terminology

- **Diploid cells** have two copies of each chromosome
- Replicated chromosomes consist of two **sister chromatids**
  - These are held together at the **centromere**



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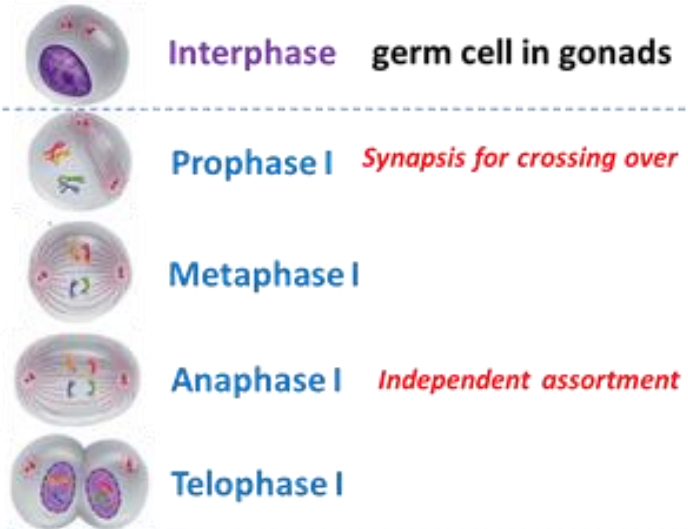


Two stages

## Meiosis I

**Segregation**

Homologous pairs are separated  
reducing chromosome number by half



## Meiosis II

Sister chromatids are separated  
producing four haploid gametes

