

Study Guide for Cell Biology Unit Test on November 17, 2017

The test will be a mix of multiple-choice, short-answer, and alternative-format questions. Examples of types of questions that might be asked can be seen in the quizzes on this material:

- Sept. 25: quiz on cell parts
- Oct. 9: quiz on diffusion, photosynthesis, and respiration
- Oct. 16: quiz on cell division
- Oct. 20: quiz on heredity
- Nov. 3: quiz on Central Dogma
- Nov. 9: quiz on translation and mutation

The test will cover all of the biology content since your Sept. 18 science processes unit test. This includes the subunits below, with study questions listed by part:

- 1. Cell parts
 - 1.1: What are the 3 parts of the “cell theory”?
 - 1.2: Describe the functions of the major organelles of eukaryotic cells.
 - 1.3: How is a plant cell different from an animal cell?
- 2. Crossing Cell Membranes (Diffusion)
 - 2.1: What is the difference between diffusion and osmosis?
 - 2.2: List 2 distinct ways that substances like nutrients and wastes can get through cell membranes.
 - 2.3: How does the bag-of-starch experiment illustrate the idea that cell membranes are semi-permeable?
- 3. Photosynthesis & Respiration
 - 3.1: List the chemical equations for photosynthesis and respiration.
 - 3.2: Explain these chemical equations in words.
 - 3.3: Why does your breathing rate go up when your heart rate goes up, and down when your heart rate goes down?
- 4. Cell Division (Mitosis and Meiosis)
 - 4.1: List and briefly describe the 6 stages of the cell cycle.
 - 4.2: Which cells are produced by mitosis? Which cells are produced by meiosis? In each case, how many chromosomes to the daughter cells have relative to the parental cells?
 - 4.3: When given a normal chromosome count and shown a picture of metaphase or anaphase, be able to tell whether the cell is in mitosis, meiosis I, or meiosis II.
- 5. Heredity (Mendel)
 - 5.1: Describe the difference between a gene and an allele.
 - 5.2: Describe the difference between a genotype and a phenotype.
 - 5.3: Explain how Mendel’s experiments with pea plants contradicted the “black squirrel/white squirrel” (or “blending”) model of inheritance and gave rise to the concept of dominant and recessive alleles and traits.

- 5.4: When given parents' genotypes, draw Punnett Squares to predict the genotypes and phenotypes of offspring.
- 6. Genes to Proteins (Central Dogma)
 - 6.1: List several differences between DNA and RNA.
 - 6.2: What are the locations and starting materials and end products of transcription and translation?
 - 6.3: How did experiments like Marshall Nirenberg's allow us to tell that the genetic code was likely a TRIPLET code (i.e., each amino acid is specified by a set of 3 bases)?
 - 6.4: If given a table of the genetic code, determine the amino acid sequence that would result from a given sequence of DNA.
 - 6.5: How does messenger RNA (mRNA) differ from transfer RNA (tRNA)?
 - 6.6: Identify a given genetic mutation as an insertion (addition), deletion, or substitution (missense) and explain how it would affect the sequence of the corresponding protein.
- 7. Separating DNA by Gel Electrophoresis
 - 7.1: What determines the direction (toward the positive or negative electrode) and speed at which DNA migrates on a gel?
 - 7.2: List two distinct reasons why a scientist might perform DNA electrophoresis.
 - 7.3: Estimate the size of an unknown DNA molecule from a picture of a gel.