

# Study Guide Questions

## 1. Biological Molecules - Study Guide Questions

What color changes did you observe when you added Benedict's solution to water and heated it?

What is indicated by Benedict's solution changing from blue to orange when heated?

What color changes occur when Benedict's solution is added to the 5% Glucose solution and heated?

What is indicated by Iodine solution when it changes from light brown to purple?

What color changes are observed when Sudan solution is added to water?

What color changes occur when Sudan solution is added to corn oil?

Iodine solution was added to chocolate chip cookie solution and the color changed to purple: based on this result what biological molecules are present in the chocolate chip cookie solution?

Is the Benedict's test a qualitative test or quantitative test? Explain.

Is the Iodine's test a qualitative test or quantitative test? Explain.

## 2. Microscopy - Study Guide Questions

What are the three ideas that make up the Cell Theory?

Who came up with the name "cell"?

Which type of cell would be easier to see under a microscope, a eukaryotic cell or a prokaryotic cell?

Three molecules of A are on the inside of a cell and 100 molecules of A are on the outside. If an A molecule moves from the inside to the outside, would it be moving along or against the concentration gradient?

Is energy required to move a substance along its concentration gradient?

Do all cells contain cytoplasm?

Which type of cell is usually organized in multicellular groups?

What structures do all cells contain?

If insulin is a secreted protein, which organelle(s) is/are essential for it to be secreted?

What is the property of a cell membrane that describes how some chemicals can pass through it and others cannot?

What cellular structures are common to all Eukaryotes and Prokaryotes?

What is the function of the cytoplasm?

Which cellular structure separates and protects the cell from the environment?

What organelle store fluids, nutrients and waste?

### **3. Diffusion and Osmosis - Study Guide Questions**

Describe how you know if equilibrium has been reached when looking at the distribution of molecules.

What is active transport? Does it require energy?

You fill a dialysis bag with a starch solution and place it in a beaker with dilute iodine. The color of the dilute iodine stays yellow(ish). What can you conclude about the pore size of the membrane relative to the size of the starch molecules?

Describe what elodea cells would look like if they were placed in a hypertonic solution. How would this change if they were put in a hypotonic solution?

### **4. Enzymes - Study Guide Questions**

Why does the enzyme only function in a limited range of temperatures?

Why does the enzyme only function in a limited range of pH values?

What was the enzyme, substrate, and product in this experiment?

### **5. Cellular Respiration - Study Guide Questions**

How is anaerobic respiration different that aerobic respiration?

What is the purpose of respiration?

Why do disaccharides produce more CO<sub>2</sub> than monosaccharides?

### **6. Photosynthesis - Study Guide Questions**

Why is photosynthesis so crucial to life on earth?

Photosynthesis takes carbon dioxide, water and sunshine and turns them into"?

Photosynthesis produces oxygen and glucose from...?

How do plants metabolize the sugars they produce by photosynthesis?

If plant cells make their own glucose, why do they need mitochondria?

### **7. Mitosis and Meiosis - Study Guide Questions**

What are the four phases of mitosis and what occurs during each phase?

What is the order of progression of the mitotic phases? (e.g., which is first and which phases follows)

What additional consideration needs to be taken into account in mitosis of plant and fungal cells?

What is the relationship between mitosis and somatic cells?

What are the two processes that lead to nuclear division?

What is the relationship between meiosis and gametes?

Is a gamete destined to divide? If not, what is it destined to do?

Do gametes have pairs of chromosome? Do somatic cells?

How many pairs of chromosomes in human somatic cells? How many total chromosomes?

What does it mean when we say that somatic cells are diploid and gametes are haploid?

How many copies of a chromosome are present in a cell that is tetraploid? How about in an octoploid?

Is DNA replicated the same number of times in mitosis and meiosis? Does a cell divide the same number of times in mitosis and meiosis?

Does crossing over happen in prophase during mitosis as it does in prophase I of meiosis?

Are sister chromatids still attached in anaphase during mitosis as they are in anaphase I of meiosis?

## **8. Basic Genetics - Study Guide Questions**

Who is the Austrian monk that discovered two fundamental laws of genetics? What organism did he work with?

What is a phenotype? What is a genotype? Give an example of each.

What is a "true breeding" plant?

What is the difference between a dominant trait and a recessive trait?

An diploid individual has Rr as a genotype for the tongue rolling trait in humans. Some of his gametes will contain R while others will contain r. Does this example illustrate the Law of Independent Assortment or the Law of Segregation? Why?

Draw a punnett square where you cross two heterozygous individuals, each having an Aa genotype (assume A is dominant to a). What fraction (or %) of the offspring will display the dominant phenotype? What fraction (or %) will display a recessive phenotype?

If you have another individual with a genotype of BbCcDd, what are all the different possible gametes that she will produce?

## **9. DNA - Study Guide Questions**

What are the three components of a nucleotide?

What are the names of the four nucleotides found in DNA?

If the % of Adenine in a double-stranded piece of DNA is 15%, what is the amount of Cytosine? what is the amount of Thymine?

If the % of Cytosine is the same as the % of Thymine in a double-stranded piece of DNA, what are the percentages for each of the nucleotides?

If you have a strand of DNA with the following sequence: AATGCTGCA, what is the sequence of the complementary strand? Since two hydrogen bonds hold Adenine and Thymine together, while three hydrogen bonds hold Guanine and Cytosine together, which of the following strands of DNA would be harder to pull apart?

Option 1: AATTATA      Option 2: GGTGCCA  
          TTAATAT            CCACGGT

You are studying DNA replication in a Martian cell. You observe that after replication one DNA molecule contains the two old strands while the other DNA molecule contains two new strands. Is this sort of replication semi-conservative?

What is the name of the structure where two chromatids are joined?

## 10. RNA to Protein - Study Guide Questions

What is transcription?

What is the name of the enzyme that carries out transcription?

What is the difference between RNA and DNA in terms of the type of sugar present in each?

What are the four nucleotides present in RNA? How do they pair?

What is the difference between RNA and DNA in terms of the number of strands?

What is the function of ribosomal RNA, transfer RNA and messenger RNA?

What are three types of RNA? Which are translated into proteins and which are not?

If you have the following messenger RNA sequence:

AUGCCCGUAAGAUAA

- 1) Draw the sequence of the double-strand DNA used to make this messenger RNA.
- 2) What is the sequence of the protein that is made?

## 11. Biotechnology - Study Guide Questions

What are restriction enzymes and what is their function?

You cut a piece of DNA with restriction enzyme A and restriction enzyme B. Enzyme A leaves a sticky end of CTTAAG while Enzyme B leaves a sticky end of TAAGGC. Could segments cut with Enzyme A be joined to segments cut with Enzyme B?

What is a plasmid?

If you were given the results of gel electrophoresis for DNA from the victim, defendant and crime scene, how would you determine whether the defendant was present at the crime scene?

Describe the technique that is used to increase the quantity of DNA. What is the technique called?

## 12. Evolution - Study Guide Questions

Which of the following evolves: individuals, populations, entire species?

What is the source of new alleles in a population?

What is the difference between allopatric and sympatric speciation?

Is the evolving of a new species an example of microevolution or macroevolution?

Does the Hardy-Weinberg rule allow us to demonstrate macroevolution or microevolution?

### **13. Systematics - Study Guide Questions**

Describe the biological-species concept.

What is systematics and what are its two branches?

What is the difference between phylogeny and taxonomy?

Does the biological-species concept hold for Archaea? Why or why not?

Describe how life was classified before and after the 1960s.

Give an example of the binomial system of nomenclature applied to your favorite organism.

Why is the binomial system of nomenclature still used today?

Be able to arrange the 7 taxa from most inclusive to least inclusive and vice versa.

Given a group of organisms, create a classification system.

Using a classification key, identify the organism.

### **14. Plants - Study Guide Questions**

Plants can be labelled as tracheophytes, gymnosperms, seedless vascular, monocots, bryophytes, angiosperms and dicots. Describe how these terms are used to categorize plants and the basic characteristics of each group.

You found a flowering plant that has leaves with parallel veins. Is this a monocot or dicot?

Given a picture of a plant's roots, leaves or vascular stem tissue, be able to identify whether it is a monocot or dicot.

Describe the functions of the following angiosperm organs: roots, leaves, stems and flowers.

What is a seed?

### **15. Animal Tissues - Study Guide Questions**

Describe the structure and function of the four types of animal tissues.

If you look under the microscope, how can you tell the difference among smooth muscle, cardiac muscle and skeletal muscle?

## **16. Earthworm - Study Guide Questions**

The dorsal side of the earthworm is a muddy brown and darker than the ventral side. How might such coloring benefit the organism in its natural habitat?

What is the function of the clitellum the only organ visible externally on the earthworm?

Which of the earthworm's organs pump blood?

On what side of the earthworm are the setae located and how does that connect to their function?

How does an earthworm breathe (with what organ)?

## **17. Ecology - Study Guide Questions**

What is a niche?

Describe the concept of competitive exclusion.

What does symbiosis mean?

Describe the three types of symbiotic relationships and give an example of each.