

UIL SCIENCE CONCEPTS

BIOLOGY

Written by
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We are a small company that listens! If you have any questions or if there is an area that you would like fully explored, let us hear from you. We hope you enjoy this product and stay in contact with us throughout your academic journey.

~ President Hexco Inc., Linda Tarrant

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Coaching Strategies for UIL Science Success

There are a number of things that you can do as a student or a Science UIL coach to improve your success at any level of the competition. Here are a few of the things that done successfully in the past with students.

1. If you can, **establish a time in the beginning of the year to meet** individually and as a team for practice. This ensures that you get into a good habit early and get your students off to a quick start.
2. If you don't have a feel for the knowledge base of your students, give them a **practice test** from past years. I would recommend an Invitational or District test as you don't want to scare off your freshmen.
3. Nothing can substitute for a student taking physics, chemistry, biology or advanced forms of these. A student can study prep materials, but discussion between student and well-qualified instructor is invaluable.
4. Remember that the UIL science contest is not just for juniors and seniors. Many coaches make the mistake of not **cultivating the younger students**, (freshmen and sophomores), and are faced at the beginning of the year with trying to fill the void left by the graduating seniors. Encourage the underclassmen to try out. Take them to invitationals where they can compete with other 9th and 10th graders in the area. They will see that they can be successful.
5. In the UIL science contest, a student that is a whiz in only biology, chemistry, or physics is a great asset. Remember, you can advance as high individual in each of the three subsections on the test, not just as one of the high individuals or the high team.
6. Break down the materials into **workable sections**, and set a calendar for studying these sections. For example, have them study photosynthesis or solution chemistry one week then go back at the end of the allotted time and discuss this as a group.
7. Be involved. Don't just give students old tests, and let them go. These students have many activities other than your science team, and need guidance. If they see you are dedicated and excited, they will be as well.
8. I always remind my students of the **scoring**: +6 for correct, -2 for incorrect, 0 for blank. Guessing is not encouraged by this grading setup. If they guess and do well, take them to Las Vegas when they are 21 and you can retire, otherwise refrain from flipping a coin in the testing session.
9. Encourage them to go through an entire test. You never know if there will be that one physics question that they remember your discussing, and they can answer it without even turning on their calculator!
10. Many of my students tear off the first page of the test so that they have the **formula sheet** with constants and the periodic table easily accessible. Use units in a problem to help solve problems and remember formulas.
11. Remind them it is cool to be a science nerd and that many of those students that give them a hard time about it will someday call them BOSS!
12. Memorization has its place, but the successful students can **think through problems**. Many of the problems at the Regional and State level involve a combination of several equations in order to solve.
13. Graphing calculators are fine, but we have found a simple scientific calculator does just as well on the test. Make sure your students are comfortable and practice with the same calculator they will use during the competition. We also send our students in with a spare calculator in case of a technical malfunction.

Have fun and good luck in your science endeavors!

Ken Davis

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The Cell

Development of Cellular Biology

- Leeuwenhoek: responsible for microscope; allowed for study of microbial world
- Hooke: named the cell
- Schwann & Schleiden: developers of Cell Theory

The Cell

- Building block of life
- All have plasma membrane or cell membrane made up of **phospholipid bilayer**
- **Prokaryote**: single cell, no nucleus
- **Eukaryote**: larger, contains nucleus
- Cells about 70% water; Protein makes up majority of dry weight of cell

Cell Organelles

- Nucleus: contains all genetic information
- Ribosomes: site of protein synthesis, can be free or attached
- Lysosomes: secrete enzyme lysozyme, breaks down waste products
- Cell wall: structure and support in plants and bacteria
- Vacuoles: membrane-bound storage structures
- Chloroplasts: plastid found in plants where sun's energy is converted to chemical energy
- Golgi Complex: modifies and "packages" proteins
- Endoplasmic reticulum: transports proteins and can chemically modify proteins
- Cilia/Flagella: external structures facilitate movement
- Mitochondria: location of ATP synthesis
 - Mitochondria have their own DNA and can reproduce on their own; you inherit the DNA in the mitochondria from their mother: has inner layer and outer layer; about the size of a bacteria
- Microtubules: make up cytoskeleton of cell; help move organelles within cell
- Centrioles: in animal cells made of microtubules
- Peroxisomes: contain peroxides to degrade recycled organelles

Cell Membranes

- Regulate movement, protect, are selectively permeable
- Consist of **phospholipid bilayer** with integral and transmembrane protein channels
- Membranes are dynamic; referred to as fluid mosaic model
- Protein channels that pass through membrane are known as porins.
- Water moves through porins known as aquaporins.
- Contains glycoproteins and glycolipids that help other cells to recognize it