Science Tool Time

Middle School Science & High School Biology

Complete the teacher skills checklist and **select three areas you would like to improve upon.**

Benjy Downing – Kestrel Heights High School
Doug Miller – LearnEd Notebooks

Objectives:

- Evaluate your teacher skills using the checklist.
- Discuss notebooking strategies in science.
- Analyze how notebooking strategies can be used for the incorporation of other instructional tools.
- Review and discuss the teacher tool kit and habits of effective teachers.
- Develop a 30 minute lesson plan using one AfL strategy and a sample notebook.
- Q&A

Notebooking in Science:

- Organization
- Sense of ownership
- Student-centered learning
- Differentiation
- Multiple learning styles
- Current and relevant information
- Time management (for both students AND teachers)
- Teaching the way you want to teach!


Parent
Advisor
Coach
Tutor
Teacher
Wait...did the standards change again?
How will my kids do on their EOCT??
My principal found out I'm a good chemistry teacher too...now I have 3 preps!!!
I love science, I love my job, I love my students!
I have 19.5 minutes to eat lunch and I have copies to run for 3rd period!

Assessment for Learning (AfL)

Questioning

Instructional Strategies

Discussion & Expression

Student Evaluation

Assessment & Feedback

What is AfL?

The process of seeking and interpreting to decide where students are in their learning, where they need to go and how best to get there.

Questioning

"Sawing" into the content and collecting student knowledge in an effective way.

Questioning

- Students write questions (demonstrate knowledge, reveal misconceptions)
- Students ask questions (give them opportunities to ask)
- Open vs. closed questions (facilitate the use of abstract thinking)
- Using “might” (allows a greater opportunity to explore answers)

Questioning

- Invert the question (example: "what does it mean for…" instead of simply asking for recall)
- X and Y (why is "x" a good example of "y")
- Use proper question stems
  - How might…
  - Why does…
  - Could you explain…

Instructional Strategies

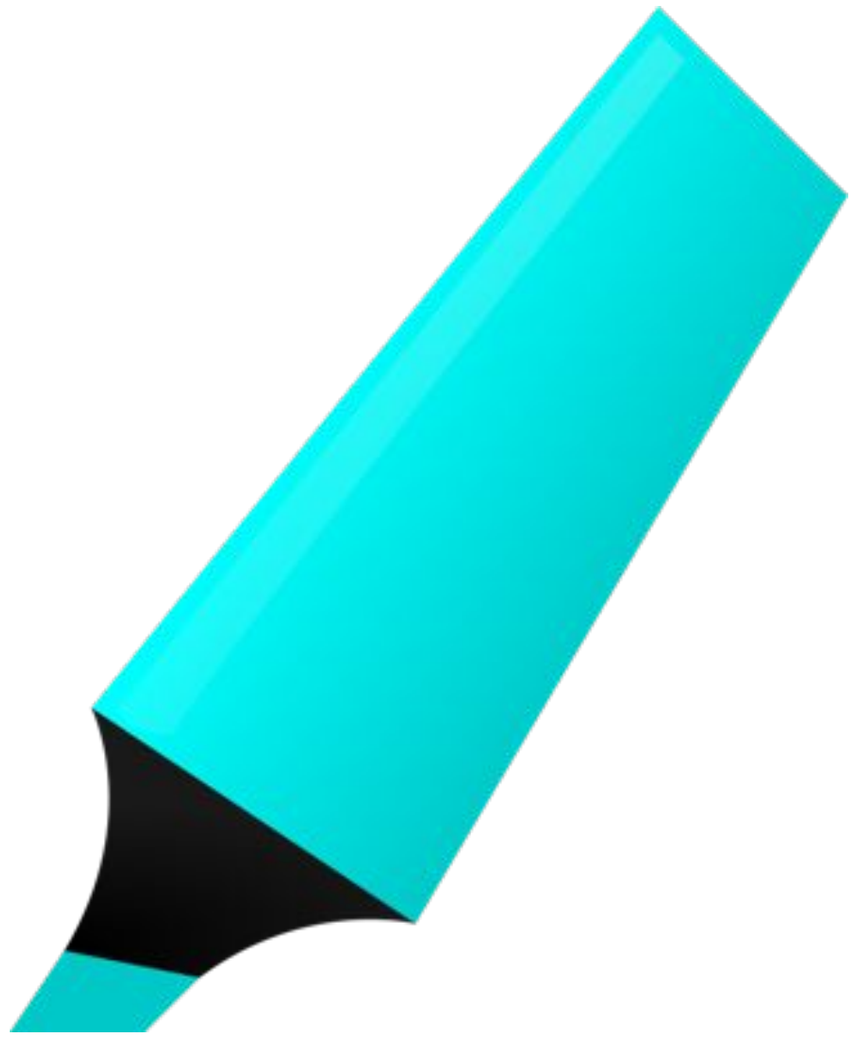
The valuable components that hold a structure together.

Instructional Strategies

- Traffic lights (show understanding, control classroom management or flow of station work)
- Thumbs up (demonstrate student understanding)
- Wait time (teacher response is delayed to evoke greater thinking)

Instructional Strategies

- Making aims clear (be clear about your objectives!)
- Lesson target setting (set targets at the beginning of lessons – celebrate accomplishments)
- Color-coding squares or highlighting (yellow=pre-instruction, blue=midway lesson, green=in between or now understood after review)



Instructional Strategies

- Scene setting (set the scene for the lesson by opening with a broad discussion point)
- Wait and recap (allow students to draw out key words and paraphrase through discussion)
- Graphic organizers (reinforce knowledge using a different output format)

Discussion & Expression

"Hammering" in the key points solidifying a student's base of knowledge.

Discussion & Expression

- Idea thoughts (peer feedback & evaluation)
- Tell your neighbor (think, pair, share)
- Bouncing (“bounce” ideas around the room to gather feedback and ideas)
- Learning Journal (collect and reflect)

Discussion & Expression

- Think through talking (encourage students to **think** about their discussions)
- All you know (students write down all of their existing knowledge about a subject before exploring it)
- Use post its to display knowledge

Discussion & Expression

- White “board meetings”
- KWL (what they know, what they want to know and what they have learned)
- Why is it best? (Have students identify their best example of work and explain why.)
- Active students (activity is the key to AfL)

Discussion & Expression

- Long and short term goals (reevaluate often and make them effective)
- Muddiest point (students write down one or two points on which they are most unclear and explore solutions)
- Discuss key words and reflect!
- Communicate using different techniques or styles

Student Evaluation

Allowing students to be a “driving force” behind their own learning.

Student Evaluation

- Self-assessment targets (learning goals to be revisited and compared to teacher targets)
- Student marking (self or peer marking assignments to take part in their own learning)
- Redrafting (use lesson time to redraft work in a supportive environment)
- Group feedback

Student Evaluation

- What is good? (Students discuss what makes a piece of work or question "good" and explain how they feel about learning targets.
- Self evaluation (students analyze how and why they learn best based on their own feelings and accomplishments)
- Minute paper (students take one minute to summarize what they learned best and still need to improve upon in a single lesson)

Student Evaluation

- Foster collaboration (encourage a friendly and challenging learning environment)
- Generate and answer (students develop their own questions and practice answering them)
- Mark schemes (students develop their own grading system based on what they feel should be assessed)

Assessment & Feedback

Tightening learned skills and finalizing connections.

Assessment & Feedback

- Comment-only marking (teachers only make constructive comments on assignments)
- Incorrect discussion (use incorrect answers to allow students to analyze why it is incorrect and to think outside the box)
- Devise questions that challenge misconceptions, create conflict and explore ambiguity

Assessment & Feedback

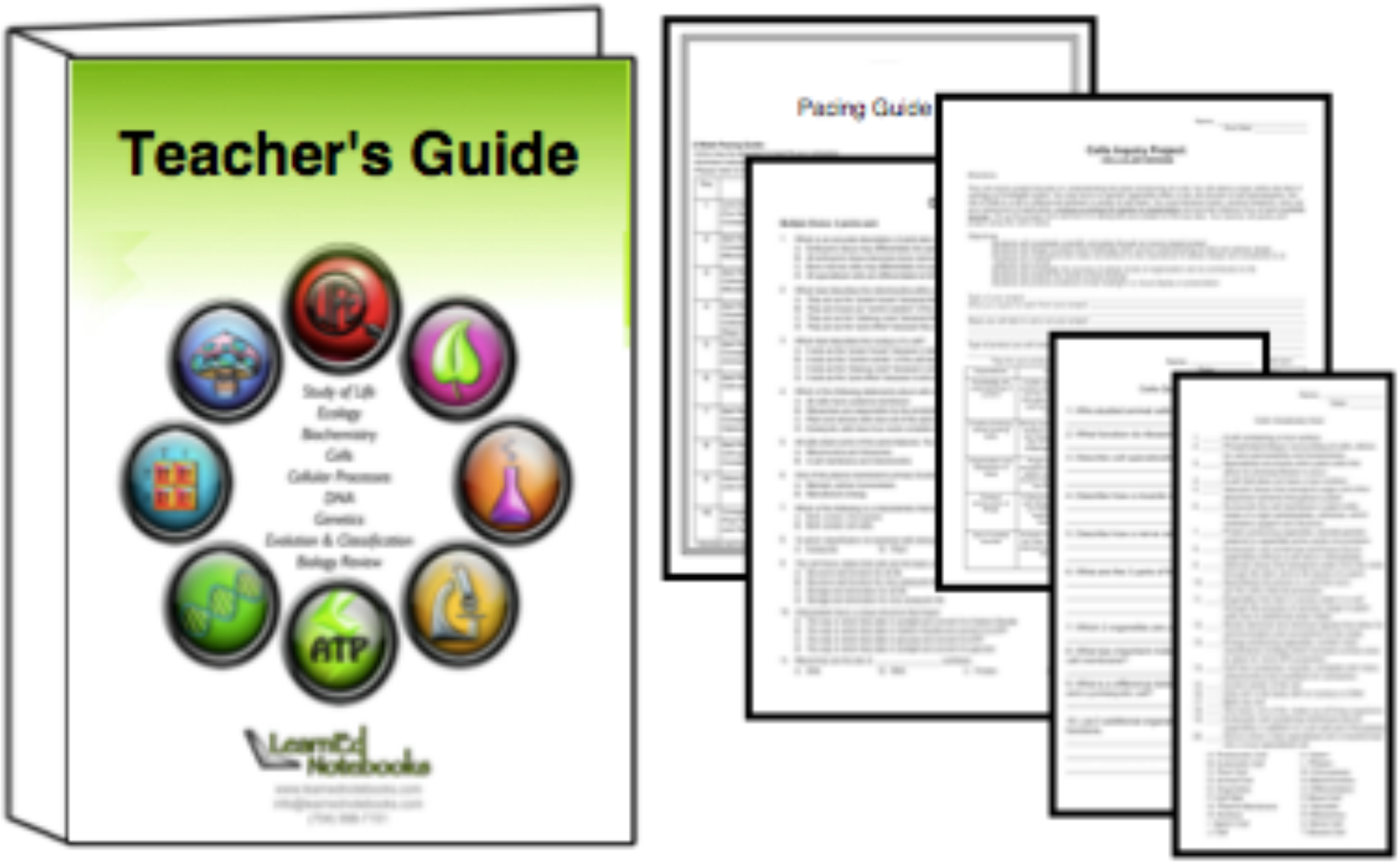
- Mid-unit assessment (mini-benchmarks to assess progress)
- Improvement guidance (provide tips for improvement through written comments on assignments)
- Convey progress (allow students to see that their accomplishments are meaningful)
- Comment follow up (provide opportunities for students to discuss your comments with them for improvement and maintain open dialogue)

Big Picture

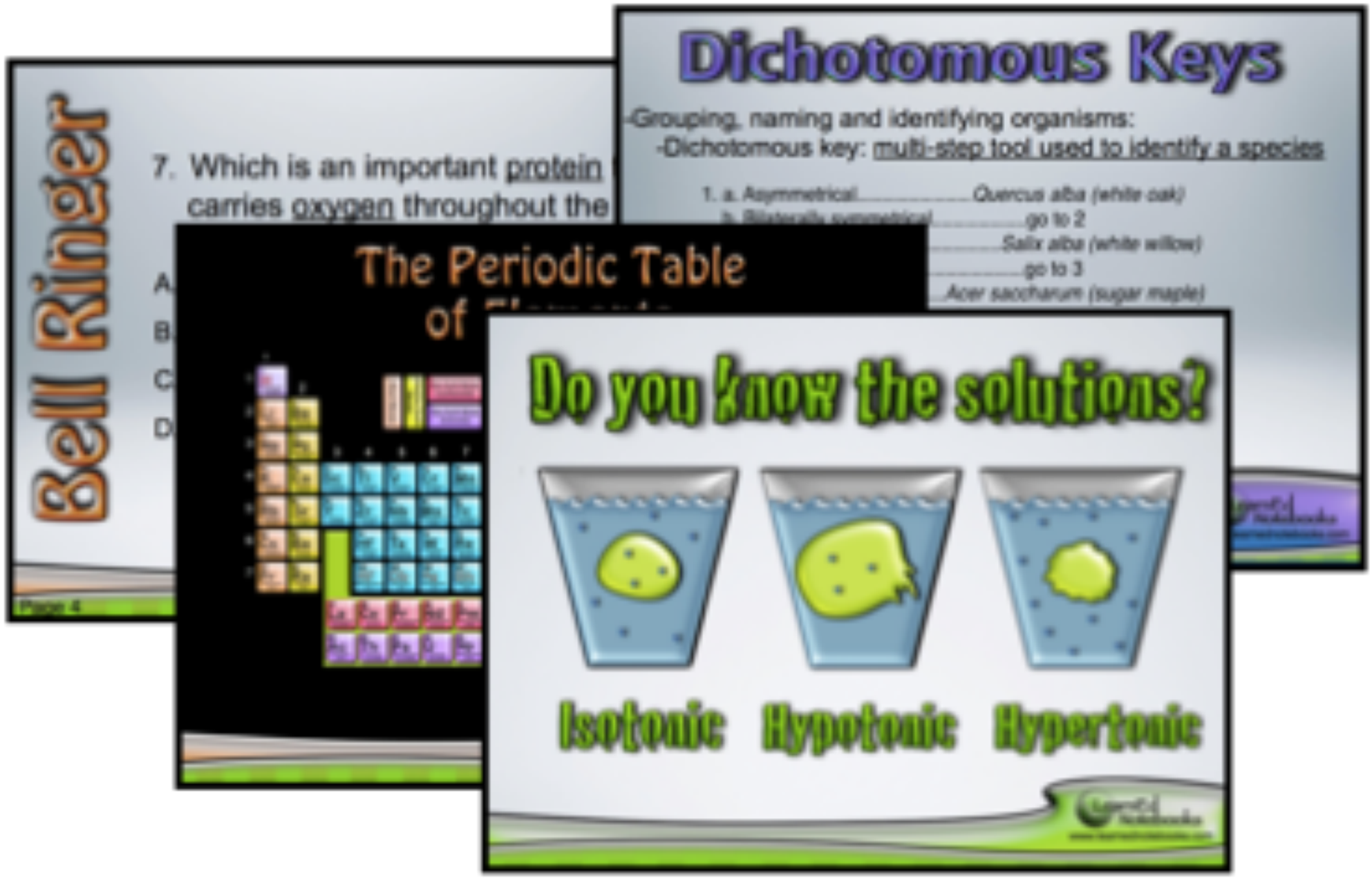
Completing your construction and refining your craft. How can you ensure that all of your tools are being put to use on top of a solid foundation?

Student Notebooks

Teacher Materials



Instructional Presentations



Teacher tool opportunity! – KWL, making predictions

Every notebook follows the same format beginning with a table of contents to streamline instruction.

Vocabulary

Teacher tool opportunity! Incorporating games

Prokar	ave a nucleus
Eukary	true nucleus
Unicel	osed of only one cell
Multic	osed of more than one cell; more
Bacteria	Unicellular prokaryotes that live nearly everywhere; some are helpful and some are harmful
Protists	Unicellular eukaryotes that are
Organelles	The membrane-bo
Cell Wall	Surrounds th
Cell Membrane	Layer surr
Cytoplasm	Gel-like mate
Nucleus	Control center of
Lysosome	Organelle that contains
DNA	Genetic material that codes for traits
Chloroplasts	Found in plant cells (and other photosynthetic organisms) that allow plants to make their own food
Mitochondria	Energy-producing organelles
Vacuole	Organelle that takes in excess water in a cell through the process of osmosis; stores materials
Plant Cell	Eukaryotic cell containing membrane-bound organelles in addition to a cell wall and chloroplasts
Animal Cell	Eukaryotic cell containing membrane-bound organelles without a cell wall or chloroplasts

Unit Organizer

Pre-Check

1. _____ 4. _____ 7. _____ 10. _____
2. _____ 5. _____ 8. _____ 11. _____
3. _____ 6. _____ 9. _____ 12. _____

Post-Check

1. _____ 4. _____ 7. _____ 10. _____
2. _____ 5. _____ 8. _____ 11. _____
3. _____ 6. _____ 9. _____ 12. _____

Teacher tool opportunity! Lesson target setting

Defined vocabulary lists and standards-linked unit organizers are included in each notebook.

All instruction is guided via a series of instructional presentations.

Understanding aspects of organisms that enable them to survive, reproduce and carry out functions

Comparing structures of single-celled organisms	Comparing structures and functions of cells	Summarizing organization of organisms
Euglena, Amoeba, Paramecium, Volvox	Prokaryotic vs. Eukaryotic	Cells, tissues, organs
Movement	Identifying organelles	Organ systems
Nutrition	Plant vs. animal organelles and structures	Functioning of a complete organism

Pre-Check

1. Which organelle contains DNA?

A. cytoplasm B. nucleus C. chloroplast D. vacuole

2. Which does not contain a nucleus?

A. plant cell B. bacterium C. animal cell D. protist cell

3. What do all cells contain?

A. cytoplasm B. nucleus C. chloroplast D. vacuole

4. Which general cell type always contains a cell wall and chloroplasts?

A. plant cell B. bacterium C. animal cell D. protist cell

5. What allows plant cells to take in sunlight and produce food?

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6. Which stores water and materials in a cell?

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BELL RINGERS

1. Which of the following best describes a _____?

   Answer: _____

2. A _____ cell is one that does not _____ a true

   Answer: _____

3. _____ do not contain _____. They are classified as which cell type?

   Answer: _____

4. Which cell part is most likely used for _____?

   Answer: _____

5. A _____ organism uses which of the following _____ to pump out excess _____?

   Answer: _____

6. Which best describes _____?

   Answer: _____

7. Which _____ may use a _____ to move?

   Answer: _____

8. Which _____ uses _____ to move?

   Answer: _____

9. Which of the following _____ is the most _____?

   Answer: _____

10. Which best describes _____?

    Answer: _____

11. The _____ is contained within which _____ in a _____ cell?

    Answer: _____

12. Which best describes the _____ of the _____?

    Answer: _____

13. Which best describes the _____ of the _____?

    Answer: _____

14. Which best describes the _____ of the _____?

    Answer: _____

15. A cell has a _____, _____, and a _____. It is most likely which cell type?

    Answer: _____

16. Which best describes the difference between _____ and _____ cells?

    Answer: _____

17. Cellular _____ is _____ in which of the following _____?

    Answer: _____

18. S

20. W

Every unit also includes 20 bell ringers guided by the instructional presentations

BELL RINGERS

1. Which of the following best describes a cell?

A. The smallest "unit of life" that makes up all living things

B. The smallest "unit of life" that makes up select living things

C. The smallest form of matter

D. The smallest form of an atom

BELL RINGERS

15. A cell has a cell wall, chloroplasts, and a true nucleus. It is most likely which cell type?

A. Bacterium

B. Animal cell

C. Plant cell

D. Fungus cell

Intro to the Cell

What are cells? _____

_____

_____

_____

_____

_____

There are two types of cells that compose all living things:

_____ and _____

Prokaryotic Cell: _____

_____

Eukaryotic Cell: _____

_____

What is a nucleus? _____

Use the diagram below to research and compare these two cell types:

The Cell Theory:

-Consists of _____ parts:

1. The cell is the basic _____ and

_____

2. All _____ he _____

3. Every cell co_____ cell

-Cells go th_____ in

order to _____

-Creates an _____

Teacher tool opportunity! – Highlight for understanding

-All cells contain _____:

-"_____"

-Help the cell complete a variety of _____

-What makes a cell have a certain role?

-All cells contain _____

-_____ (bundled in _____)

In the space below, create a graphic organizer to summarize what you know about cells and their purpose.

Intro to the Cell

- What are cells?
- The basic unit of the structure and function of living organisms
- There are two types of cells that compose all living things:
  - Prokaryotic and Eukaryotic

Intro to the Cell

- Prokaryotic Cell: A cell that does not contain a nucleus (bacteria)

Microbiology

Microbiology involves the study of _____

-Mostly _____

-Some _____ and disease-causing

_____

Important discoveries in microbiology:

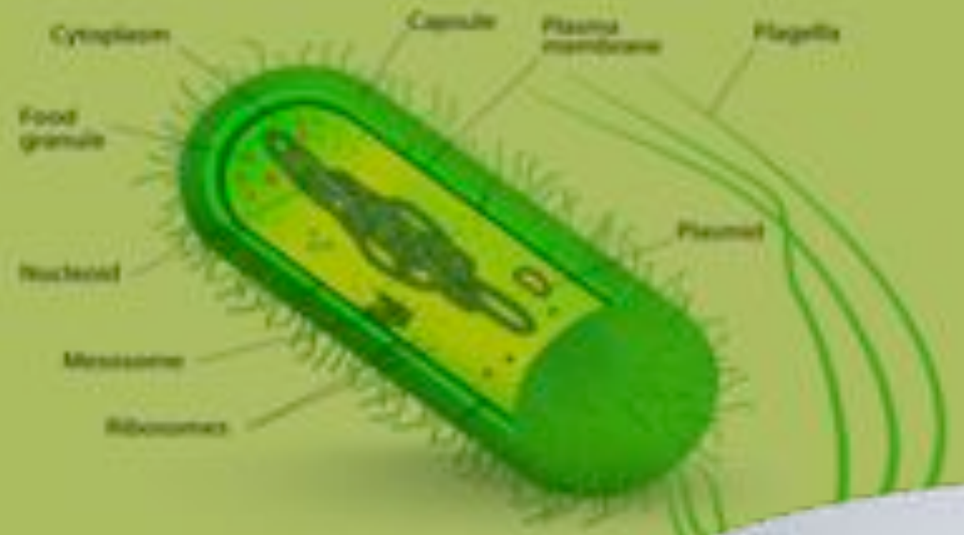
-_____

-_____

-_____

-_____

Bacteria are _____ organisms with specialized structures to help them accomplish life functions



-Cytoplasm: _____

-Ribosome: _____

-Plasmid: _____

-DNA: _____

-Pili: _____

-Flagellum: _____

-Cell Membrane: _____

-Cell Wall: _____

Bacteria

Bacteria have three different shape classifications:

1. _____ (_____)

   -Example: _____

2. _____ (_____)

   -Example: _____

3. _____ (_____)

   -Example: _____

Complete the following chart by researching information about these common strains of bacteria:

Species	Characteristics	Impact
Escherichia coli		

Activities focusing on inquiry and student-centered learning are incorporated throughout each unit.

Examining Unicellular Organisms

Euglena

Description

Structure

Amoeba

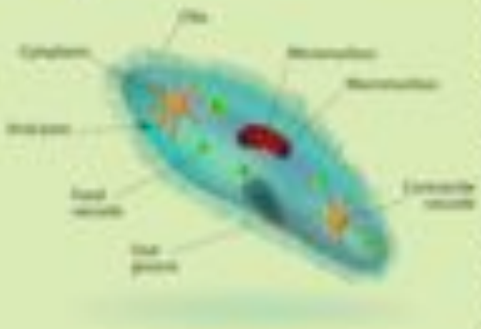
Structure

Description

Paramecium

Description

Structure



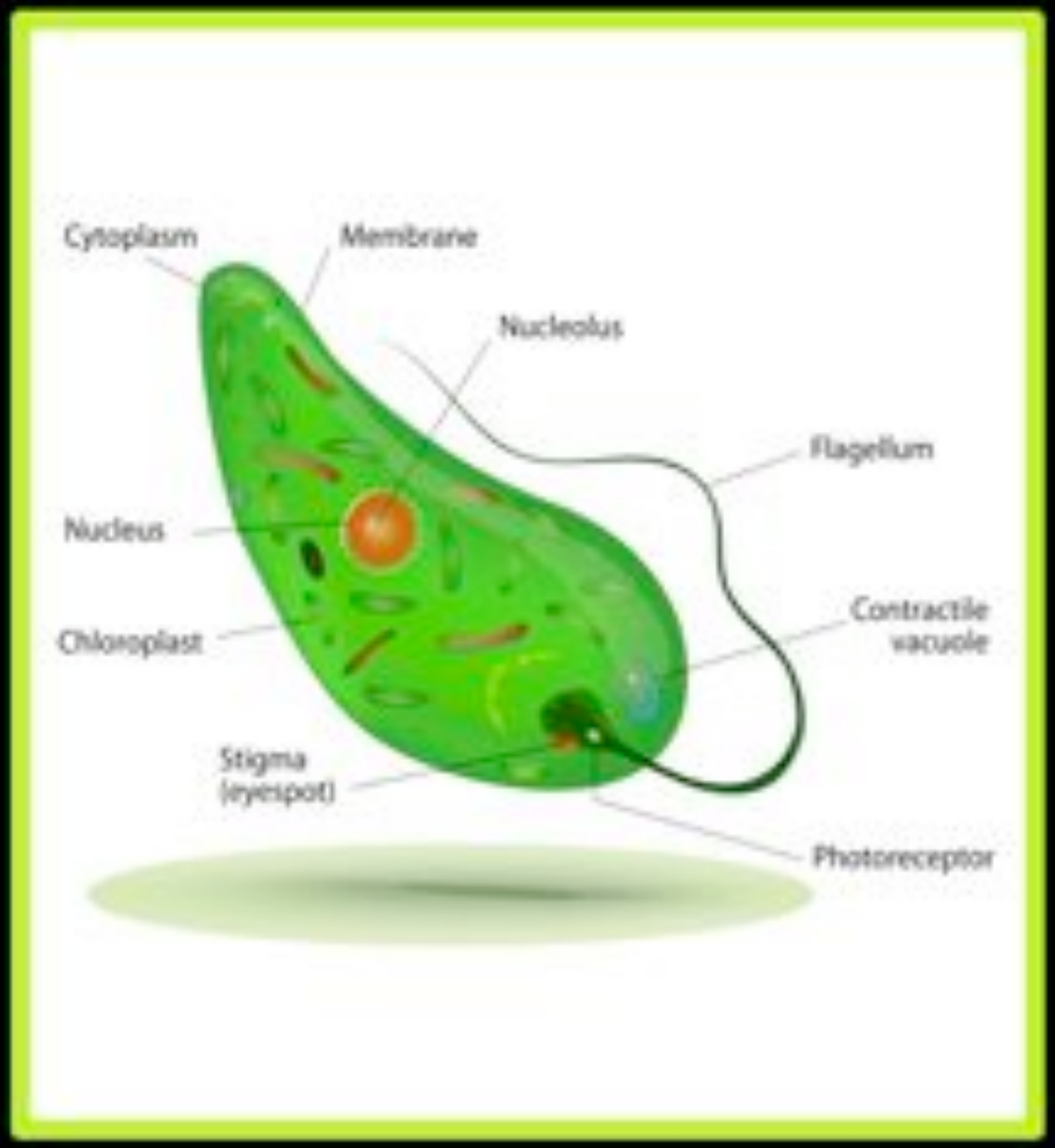
Volvox

Structure

Description

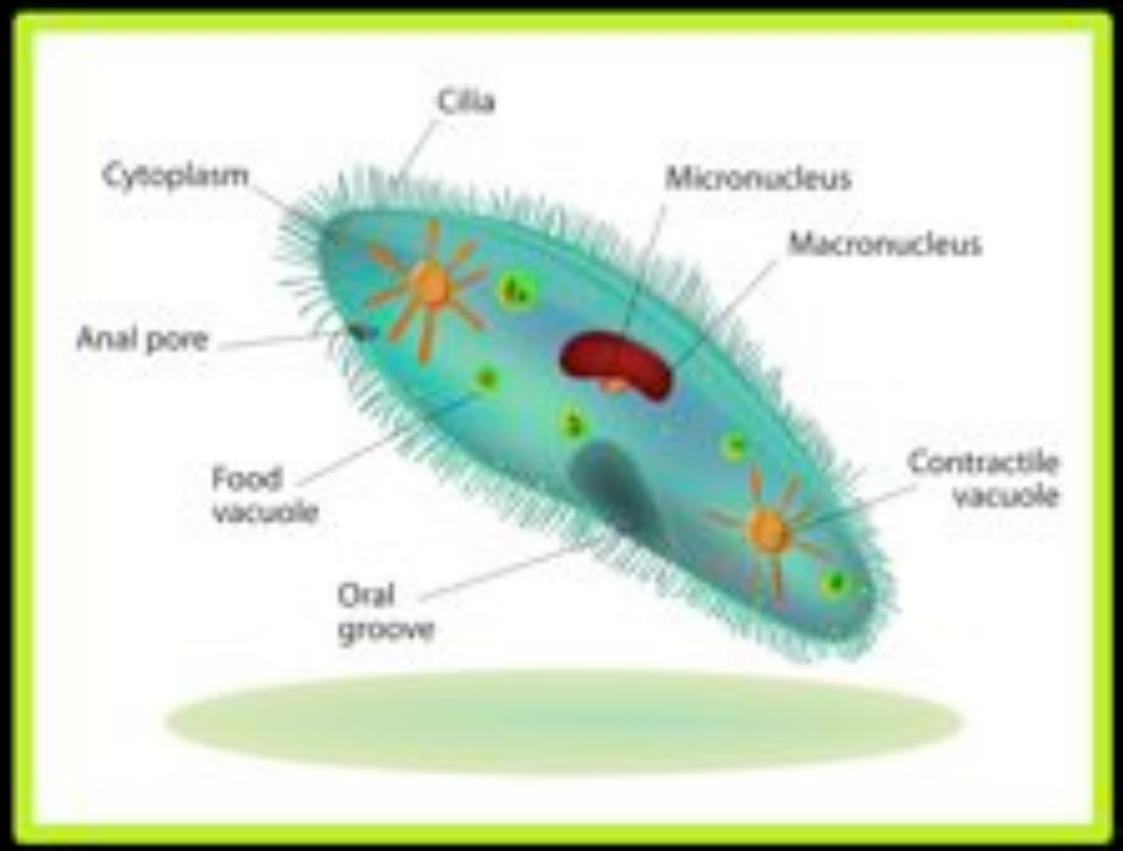
Examining Unicellular Organisms

- Euglena:
  - Freshwater organism that may contain chlorophyll (photosynthesis)
  - Eye spot
  - Moves with a flagellum



Examining Unicellular Organisms

- Paramecium:
  - Water-dwelling protist
  - Most complex
  - Most specialized
  - Moves with cilia



Animal Cells

Complete the chart below describing how the organelle or cell part functions specifically in an animal cell.

Organelle	Function in an Animal Cell	Color-Code
DNA		
Cell Membrane		
Nucleus		
Vacuole		
Centrioles		
Golgi Apparatus		
Mitochondrion		
Ribosome		
Lysosome		

Plant Cells

Complete the chart below describing how the organelle or cell part functions specifically in a plant cell.

Organelle	Function in a Plant Cell	Color-Code
Cell Wall		
Cell Membrane		
Nucleus		
Vacuole		

The entire program is designed to cover instruction for the complete course, allowing teachers to focus on incorporating new ideas and strategies.

Comparing Cells

Cell Type	Primary Function	Organelles Present

Unit Review

1. All living organisms are composed of at least one _____
2. What type of cell does not contain a nucleus? _____
3. What type of cell contains a true nucleus and membrane-bound organelles? _____
4. What is the purpose of DNA? _____
5. Which organelle contains DNA in a eukaryotic cell? _____
6. The vacuole is responsible for storing excess _____
7. Describe the function of the mitochondria: _____
8. [illegible] chloroplasts: _____
9. [illegible] between prokaryotic and eukaryotic cells: _____
10. [illegible]erences between plant and animal cells: _____
11. How does a cell wall benefit a plant cell? _____
12. What membrane encloses the nucleus? _____
13. What are three components that all cells have? _____
14. Give an example of a protist: _____
15. Describe a difference between a protist and bacterium: _____

Every unit ends with a unit review complete with a standards-linked written assignment.

Unit Review

16. What is the difference between cilia and flagella? _____

_____

17. How does a euglena move? _____

18. How does an amoeba move? _____

19. How does a paramecium move? _____

20. What are the three shapes of bacteria? _____

_____

Written assignment: Cells are known as the basic units of structure and function for life. All living organisms are composed of at least one cell, each with different structures that perform different tasks. Discuss the importance of cells to living organisms. Use at least three supporting deta

Teacher tool opportunity! – Discuss key words

Notes

Teacher tool opportunity! – Group learning and games

A set of color-coded flashcards on the back cover provides students with an additional study tool.

Prokaryotic	Eukaryotic	Cell
Protist	Bacterium	Cilia/Flagella
Cellular Reproduction	Unicellular	Multicellular
Lysosome	Tissue	Nucleus
Organ	Vacuole	Cell Wall
Mitochondria	Chloroplasts	Cytoplasm
Plant Cell	Animal Cell	Organelles

Post-Check

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A. vacuole B. nucleus C. chloroplast D. cytoplasm

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A. vacuole B. nucleus C. chloroplast D. cytoplasm

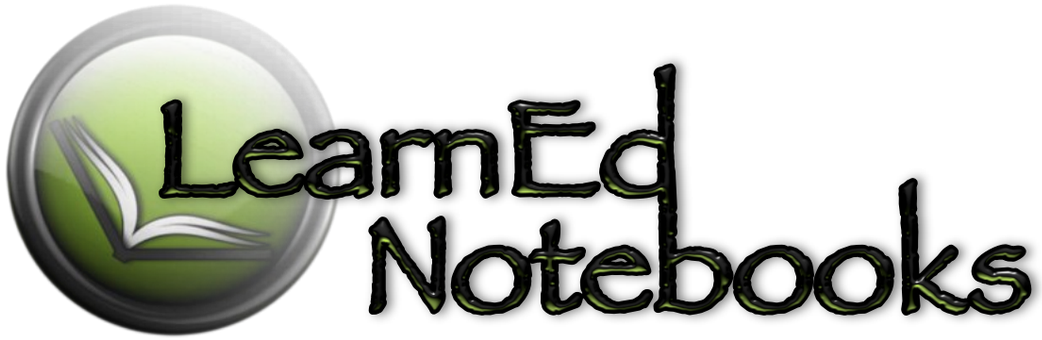
Test Review

What is the smallest unit of life?

A cell
(How might a single cell thrive as a complete organism?)

What is a “little organ” in a cell that carries out specific tasks?

An organelle
(How are cells specialized to carry out different tasks?)



Testing Results & Data

Proficiency	2013-2014
Showed an increase	27 out of 28 schools - 96.43%
Showed at least 10% increase	17 out of 28 schools - 60.71%
Showed at least 15% increase	14 out of 28 schools - 50%
Showed at least 20% increase	7 out of 28 schools - 25%

*District-wide participants met or exceeded growth