UNIVERSITY OF LOUISVILLE
CENTER FOR RESEARCH IN MATHEMATICS & SCIENCE TEACHER DEVELOPMENT
(CRIMSTED)

Life Science DTAMS Assessment – Version 4

Diagnostic Teacher Assessments in Mathematics and Science—Middle School

Date _____ **Start time**_____ **Finish time** _____

Please provide the following information about yourself:

Years teaching experience (0 if preservice) _____	Last 4 digits of Social Security number (*or any 4-digit number you'll remember*) _____ (used as identifier on score report)
Check grade level(s) **currently teaching** (or will be teaching if preservice). Mark one or more that best describes your situation. (*please describe below if "other"*) Pre-K_____ K-3_____ 4-5_____ 6-8_____ 9-12_____ other_____	Check current (or future if preservice) **teaching certificate grade level(s)**. Mark one or more that best describes your situation. (*please describe below if "other"*) Pre-K_____ K-3_____ 4-5_____ 6-8_____ 9-12_____ other_____
Number of college & graduate **earth science courses** _____	Number of college & graduate **life science courses** _____
Number of college & graduate **physical science courses** _____	Sex (M/F) _____

Content area of teaching certificate

Mark one or more that best describes your situation. If your certificate is a <u>general education certificate</u> that covers all subjects (e.g. as many elementary certificates do) but doesn't specifically include a separate science certification, please <u>mark "not science"</u>. If your certificate includes content areas in addition to science, please choose from the list on the right based on the science content portion only and <u>do not mark</u> the "not science" category.	not science_____ general science_____ biology/life science_____ chemistry_____ physics_____ physical science_____ earth science_____ astronomy_____ geology_____ other science_____ (*please describe "other science"*)

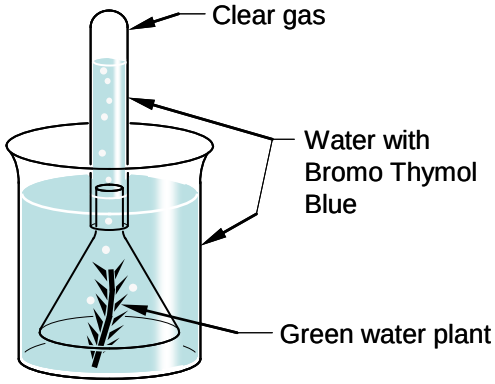
Multiple Choice

Identify and write in the space the letter of the choice that best completes the statement or answers the question.

____ 1. The primary function of respiration is to
a. convert light energy to chemical energy.
b. produce sugar and starch for animal consumption.
c. release the energy stored in glucose.
d. replenish the atmospheric supply of CO_2.

____ 2. Each of your students has placed a green water plant under a funnel in a beaker of water to which Bromo Thymol Blue (BTB) has been added. The solution was originally blue; however, the indicator BTB will turn green or yellow in the presence of a weak acid. Each student gently blows through a straw into the beaker of water until it turns yellow. The setup is then allowed to sit in the sunlight. After several hours, the water in the beaker has turned green and bubbles are observed rising from the plant, through the water, into the inverted test tube. A clear gas has gathered at the top of the test tube.

Which of the following could be used to help identify the gas in the test tube?
a. measurement of the pH of the solution
b. a taxonomic table
c. electrolysis of the water
d. a smoldering wood splint



____ 3. The lower magnifications of a microscope (e.g., 40X) are useful for observing
a. ribosomes in the cytoplasm.
b. internal structure of mitochondria.
c. fruit fly chromosomes in the cell nucleus.
d. living protozoans in water.

____ 4. You are systemically investigating the trees in a local park. Use the following taxonomic key as a tool to identity the tree represented by the tree branch and leaves below.

Identify the tree or tree type in the picture using the key above.

a. White Pine
b. Balsam Fir
c. Juniper
d. Larch

KEY: for Trees with Needlelike or Scale-like Leaves:

a. Leaves long, needlelike;	
i. Needles in bundles or groups along twigs;	
1. Needles 2-5 in bunches on the branch, evergreen	
a. Needles in bunches of five, 2-4 inches long	**White Pine**
b. Needles in bunches of two, 1-2 inches long	**Red Pine**
2. Needles many, more than 6, drop in autumn	**Larch**
ii. Needles occurring singly;	
1. Needles blunt, flat; in flat sprays on twigs	**Balsam Fir**
2. Needles sharp; on all sides of twigs	
a. Needles 4-sided, neither in opposing pairs nor in whorls of 3	**Green Spruce**
b. Needles 3-sided, either in opposing pairs or in whorls of 3	**Juniper**
b. Leaves very small and scale-like, hugging twigs:	
i. Leaves blunt; conifers	**White Cedar**
ii. Leaves sharp; a flowering tree	**Tamarisk**

____ 5. Science researchers often use bacterial cells in their research. One of the primary reasons they use bacterial cells is that those cells

a. can be easily incorporated into human tissue.
b. are rarely rejected by human organs.
c. can develop quickly into human cells.
d. can be grown rapidly in large quantities.

____ 6. Tropical rainforests are most essential to the future development of human society because tropical rainforests
   a. have a major role in converting carbon dioxide to oxygen.
   b. provide much of the food to feed a growing population.
   c. absorb most of the world's rainwater and supply the majority of trees.
   d. supply exotic hardwood trees that are valuable lumber.

____ 7. Which of the following best represents increasing levels of organization?
   a. tissue, cell, organ, organ system
   b. cell, organ, tissue, organism
   c. cell, tissue, organ system, organ
   d. cell, tissue, organ, organ system

____ 8. A breeder's lizards have stopped laying eggs. She decided to put a male lizard in one of the female lizard's glass cage to see if it will increase the egg-laying rate. She also had a cage with the same conditions and number of lizards but without the male lizard. The cage without a male lizard serves
   a. to provide additional variables for the investigation.
   b. as an independent variable.
   c. as a control.
   d. to let the turtles know what will happen if they don't produce.

___ 9. Farmers have been able to avoid the damaging effects of insects to their corn crops as corn plants now produce their own *Bacillus thuringiensis* toxins. Making the corn resistant to specific groups of insects is a result of which process?
   a. nitrogen fertilization
   b. recombinant DNA
   c. reprocessed fixation
   d. multiple chemical insecticides

____ 10. Which of the following hypotheses can be tested experimentally?
   a. The roots from a seed will grow toward the center of the Earth.
   b. Palm trees feel best when they are planted near a mild breeze.
   c. Apple trees like certain nutrients over others.
   d. Carrots exist to provide vitamin A for humans.

____ 11. Animal organ systems do not function in isolation but rather interact in complex ways; for example; the central nervous system is dependent on the proper functioning of the digestive system because the digestive system
   a. carries proteins to the spinal chord for absorption.
   b. supplies potassium and sodium for nervous impulse conduction.
   c. prepares calcium for the brain tissue.
   d. provides sugars to the spinal column.

____ 12. A botanist bred two heterozygous red-flowered plants with smooth seeds (RrFf). What is the chance of getting red, smooth-seeded plant in the first generation?
a. 1 in 16
b. 3 in 16
c. 9 in 16
d. 4 in 16

____ 13. The organ that plays the major part in ridding the human body of excess heat is the
a. bladder.
b. spleen.
c. skin.
d. duodenum.

____ 14. Your students expressed a misconception that rabies is no longer possible to catch because animals are routinely vaccinated during visits to the veterinarian's office. What is the accepted scientific view that corrects this misconception? People still catch rabies because
a. domestic animals are not the only carriers of the rabies virus.
b. some animal bites are more severe than others.
c. the vaccinations are only moderately effective.
d. the vaccination has not been altered to the new rabies viral strands.

____ 15. A farmer noted that over a period of ten years, a beetle species, which feeds on rice plants, became resistant to the pesticide that was being used to control it. Which of the following best explains this observation?
a. Those beetles with genetically determined tolerance survived and reproduced.
b. The beetles learned to avoid the spray and modeled the behavior for their offspring.
c. With time and asexual reproduction, the beetles developed resistance to pesticides.
d. Some beetles developed tolerance to the spray, and their offspring inherited that adaptation.

____ 16. Why is it important to take the entire antibiotic amount that is prescribed by the doctor when one is sick?
a. surviving bacteria will incorporate the antibiotic into its DNA plasmid ring.
b. patient will be more likely to be allergic to the antibiotic than the first dose.
c. surviving bacteria will mutate into a different disease form.
d. surviving bacteria may become resistant to the medicine.

____ 17. Which statement is true of <u>all</u> consumers?
a. Consumers obtain energy by using nonliving materials.
b. Consumers may be carnivores, omnivores, or herbivores.
c. Consumers obtain the oxygen they need by eating plants or organisms that have eaten plants.
d. Consumers obtain energy by using abiotic material.

____ 18. Why are the trees on Florida's coastline similar to the trees found on Hawaii's coastline?
a. The water found on both coasts is very acidic, which only supports palm trees.
b. Both Florida and Hawaii are in the same biome.
c. The trees exist for only a short period of time and change as the temperature/seasons change.
d. The temperatures found in both areas are similar.

____ 19. During a recent thunderstorm many trees were broken with their limbs falling on the forest floor. A mulching company offered to clear out the dead limbs to help beautify the forest. A conservation officer told them that it would be best to leave the dead limbs. What is the primary reason for leaving dead tree limbs on the forest floor?
a. The fallen tree limbs will eventually fossilize and contribute additional natural beauty to the area.
b. Dead tree limbs will protect the forest from the incursion of mountain bikes.
c. The decomposition of the dead trees limbs provides nutrients for organisms.
d. The dead trees limbs will provide new nesting sites for birds.

____ 20. While walking across the school grounds, you notice squirrels gathering nuts from the ground. You decide to plan an investigation to determine the types of nuts squirrels gather. Which scientific technique would you select to yield the best data for this investigation?
a. modeling of squirrel habitat
b. observation of squirrel behavior
c. gene mapping of squirrel species
d. chemical analysis of nut proteins

Open Response

Write responses to parts **a** *and* **b** *in the space provided. If more space is needed, please use the back of the paper and indicate that your response continues on the back.*

Directions for part (a):

In each question, students expressed a misconception. Please describe the currently accepted scientific explanation of the phenomenon that the students are not understanding. Explain the science in as much depth as possible, even if that level of depth would be inappropriate to expect middle school students to know. Your explanation should demonstrate a thorough knowledge of the underlying science – simply stating the opposite of the students' misconception without further explanation is not sufficient.

Directions for part (b):

Explain how you would address this misconception using best instructional practices. Please describe the classroom instruction, including what the students and teacher are doing, in enough detail so that the reader can envision what is happening. For example, if you refer to a specific activity or lesson, to the use of a piece of equipment, or to the use of specific media, assume the reader is not familiar with it and explain how it is used to support student learning. Assume you have or can get any equipment that would reasonably be available in a well-funded K-12 school setting so that your proposed instruction is feasible to implement.

21. Several students state that since the plant's white flowers are similar in color to the plant's roots, they must have the same function.

a) Please describe the currently accepted scientific explanation of the phenomenon that the students are not understanding. See directions at the beginning of the open response section for more detailed directions.

b) Explain how you would address this misconception using best instructional practices. See directions at the beginning of the open response section for more detailed directions.

22. A student lamented that she accidentally killed her mom's prize rhododendron bush. She was making homemade ice cream in a churn containing salted ice. She decided to give the plant a drink on the hot summer day and dumped the salt-ice mixture from the churn near the base of the rhododendron bush. She said the ice caused the rhododendron bush to wilt and die.

a) Please describe the currently accepted scientific explanation of the phenomenon that the students are not understanding. See directions at the beginning of the open response section for more detailed directions.

b) Explain how you would address this misconception using best instructional practices. See directions at the beginning of the open response section for more detailed directions.

23. A student tells you that her mother was just diagnosed with breast cancer. The class asks the student if she still hugs her mom, because they heard that breast cancer can be caught by hugging too closely.

a) Please describe the currently accepted scientific explanation of the phenomenon that the students are not understanding. See directions at the beginning of the open response section for more detailed directions.

b) Explain how you would address this misconception using best instructional practices. See directions at the beginning of the open response section for more detailed directions.

24. While on a field trip with your class, your students look at Yosemite Falls and say, "This is a good example of the water cycle. The water that falls into the pool evaporates and becomes rain that falls on top of the waterfall. That same water then flows down the waterfall again."

a) Please describe the currently accepted scientific explanation of the phenomenon that the students are not understanding. See directions at the beginning of the open response section for more detailed directions.

b) Explain how you would address this misconception using best instructional practices. See directions at the beginning of the open response section for more detailed directions.

25. A newspaper article reported that genetically engineered stem cells could produce skin cells. Students debated about this in class and agreed that using genetically designed skin would be dangerous and scientists should never perform genetic engineering.

a) Please describe the currently accepted scientific explanation of the phenomenon that the students are not understanding. See directions at the beginning of the open response section for more detailed directions.

b) Explain how you would address this misconception using best instructional practices. See directions at the beginning of the open response section for more detailed directions.