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

Life Science DTAMS Assessment – Version 5

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"*)

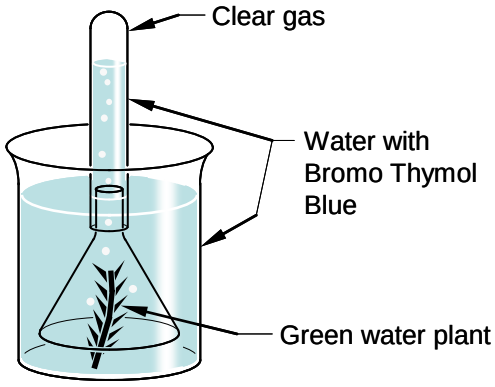
Multiple Choice

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

____ 1. Which process uses oxygen in plants, algae, and animals?
   a. photosynthesis
   b. chemosynthesis
   c. transpiration
   d. respiration

____ 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 and the water has become less acidic.

   From these observations, you infer
   a. chlorophyll has leaked out of the plant leaves.
   b. the plant is removing carbon dioxide from the water.
   c. as oxygen bubbles up from the plant, it changes the color of the water.
   d. oxygen is not needed by the plant.



____ 3. The lower magnifications of a microscope (e.g., 40X) are useful for observing
   a. mitochondria in the cytoplasm.
   b. mice chromosomes in the cell nucleus.
   c. stroma of chloroplasts.
   d. living amoebas in water.

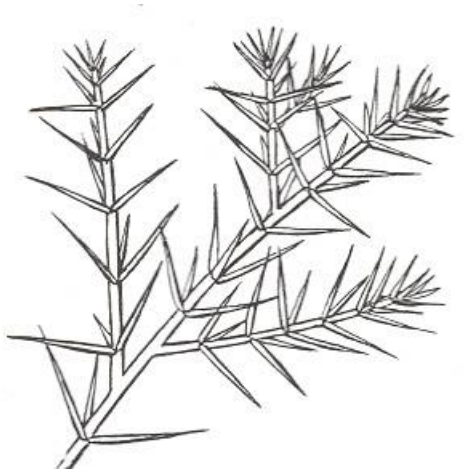
____ 4. You are systemically investigating the trees in a local park. Use the following taxonomic key as a tool to identity the tree represented by the tree branch and leaves below.

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

a. Larch
b. Juniper
c. Green Spruce
d. White Pine

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. Research scientists often use mice for medical investigations. One of the primary reasons that scientist use mice is that they are similar to humans in that they

a. have comparable genetic structure.
b. have the same chromosome number.
c. are in the same taxonomic genus.
d. have A,T,G,C base pairs.

____ 6. The most essential function of tropical rainforests to human economic progress is to
a. regulate climate around the world by recycling carbon dioxide.
b. maintain a protective environment for indigenous peoples.
c. provide increased acreage for agriculture to feed increasing populations.
d. provide freshwater for drinking by collecting rainfall.

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

____ 8. A botanist's plants have stopped producing fruits. She decided to place ants in one of the small greenhouses to see if it will increase fruit production. She also had a greenhouse with the same conditions and number of plants but without the ants. The greenhouse without the ants serves as a(an)
a. independent variable.
b. dependent variable.
c. control.
d. experimental outcome.

____ 9. Farmers have been able to grow herbicide-tolerant soybeans that are otherwise no different from those without herbicide tolerance. Making the soybeans resistant to specific groups of herbicides is a result of which process?
a. chemical induction
b. nitrogen fermentation
c. multiple chemical herbicides
d. genetic modification

____ 10. Which of the following hypotheses can be tested experimentally?
a. Dogs prefer table food over dog food.
b. Cats feel best when they are near a warm item.
c. Earthworms retreat from light sources.
d. Fish exist to clean the oxygen supply to the water.

____ 11. Animal organ systems do not function in isolation but rather interact in complex ways; for example, the skeletal muscle system is dependent on the proper functioning of the digestive system because the digestive system
a. carries protein directly to the muscle tissue.
b. prepares lactic acid for entry into the muscle tissue.
c. carries blood directly to the muscle tissue.
d. provides magnesium ions for muscle contraction.

____ 12. A pure breeding red-flowered plant with smooth seeds, (RRFF) is crossed to white-flowered plant with wrinkled seeds, (rrff). What percentage of the offspring will have red flowers and smooth seeds?
a. 25
b. 50
c. 100
d. 0

____ 13. The organ that plays the major part in absorbing food nutrients is the
a. bladder.
b. small intestine.
c. skin.
d. spleen.

____ 14. Your students expressed a misconception that hepatitis B is no longer possible to catch because of vaccinations. What is the accepted scientific view that corrects this misconception? People still catch hepatitis B because the
a. vaccination is less than 50% effective.
b. virus is transmitted by unhygienic food or water practices.
c. vaccination has not been changed to the current mutated B strand.
d. virus can now permeate the skin directly.

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

____ 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 RNA.
b. Surviving bacteria may become resistant to the medicine.
c. Surviving bacteria will change quickly into different disease forms.
d. Patient will be more likely to tolerate the antibiotic than the first dose.

____ 17. When two species exhibit an ongoing interaction where one species is benefited while the other is harmed, this is an example of
a. mutualism.
b. specialism.
c. parasitism.
d. commensalism.

____ 18. Why are the trees in South Carolina marshes similar to the trees found in the Louisiana bayou?
a. The water found in both marshlands is very acidic, which only supports large live oak trees.
b. The trees exist for only a short period of time and change as the temperature/seasons change.
c. The temperatures found in both marshlands are similar.
d. Both South Carolina and Louisiana are in the same biome.

____ 19. After collecting your yard's excess grass clippings, you started to toss them in the trash when a neighbor said "You should compost those clippings and add them to your garden next year." You were wondering how dead grass would help your garden grow. What is the primary reason your neighbor is correct in suggesting you compost your yard clippings?
a. The composted clippings will provide extra heat to young plants during frosty nights.
b. The composted clippings will provide protection for garden plants from unwanted insects.
c. The composted clippings will provide an odor to keep herbivores from the vegetables.
d. The composted clippings acting as a natural fertilizer will return nutrients to the soil.

____ 20. While outside eating your lunch, you noticed that the ants were present in large numbers on your dropped chips without the salsa as opposed to your dropped chips with salsa. You decide to plan an investigation to determine types of food that ants are attracted. Which scientific technique would you select to yield the best data for this investigation?
a. gene mapping
b. ant taxonomy
c. controlled experiment
d. field plot analysis

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 *Honeysuckle* flower's stamen and pistil are similarly shaped, 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 lilac 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 lilac bush. She said the ice caused the lilac 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 his father was just diagnosed with brain cancer. The class asks this student if he is afraid to share a sofa pillow with his father because they heard you can catch cancer by sharing the same pillow.

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 sitting in class watching it rain, your students say, "This is a good example of the water cycle. The water that was squirted from the sprinkler yesterday has evaporated and now it is here falling as rain. That same water will then flow down into our water supply to be used with our sprinkler system 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 science textbook about the history of the Earth stated that cosmic radiation has been hitting the Earth for many eons. This radiation has caused mutations in organisms. Students discuss the phenomenon and agree that all mutations have been dangerous.

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.