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

Life Science DTAMS Assessment – Version 1

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 beginning reactants of photosynthesis are light and
   a. oxygen and carbon dioxide.
   b. carbon dioxide and water.
   c. glucose and water.
   d. glucose and carbon dioxide.

____ 2. You would like to demonstrate that light has an effect on leaves of plants. On 10 leaves of three geranium plants, you affixed 1-inch square pieces of aluminum foil. You had three similar-sized geraniums to which you did not affix aluminum foil. You placed all six plants in similar sunlight and watered them the same amount each day. A month later, you removed the aluminum foil patches from the leaves on the three plants to discover the covered, patched areas were almost white. Those geraniums without aluminum foil patches did not have white spots. Which of the following would be an accurate observation from your experiment?
   a. Leaves will turn white in the absence of light.
   b. Photosynthesis occurs in the leaves.
   c. Chlorophyll is necessary for photosynthesis.
   d. White areas of leaves have no chlorophyll.

____ 3. You have a light microscope with four objectives. Which objective would you select first when attempting to focus on the arrangement of cells in a leaf?
   a. 1000X
   b. 400X
   c. 40X
   d. 100X

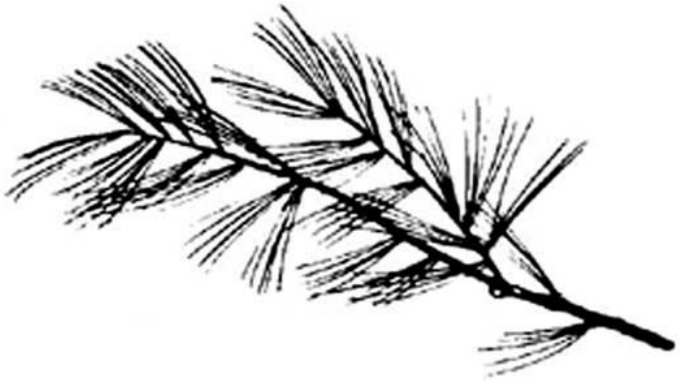
____ 4. You are systemically investigating the trees in a local park. Use the following taxonomic key as a tool to identity the tree represented by the tree branch and leaves below.

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

a. White Cedar
b. Balsam Fir
c. White Pine
d. Junipers

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. Pharmaceutical companies often produce human proteins in bacterial cells. One of the reasons that this is undertaken is

a. proteins from human cells in culture would develop into tissues.
b. bacterial cells can be grown quickly in large quantities.
c. proteins from human cells in culture are always cancerous.
d. bacterial and human cells are in the same taxonomic family.

___ 6. For long-term sustainability, tropical rainforests can best contribute to the human condition in which of the following ways?
   a. They provide cleared, virgin land for the development of increased agriculture to feed more people.
   b. They supply all of the world's needs in lumber by deforestation.
   c. They provide additional fields for cattle and llama grazing.
   d. They regulate world temperatures and weather patterns by recycling carbon dioxide into oxygen.

____ 7. Which of the following best represents the increase in complexity of living systems?
   a. cells, organs, tissues, organisms
   b. molecules, cells, tissues, organisms
   c. molecules, tissues, cells, organs
   d. organs, cells, tissues, organisms

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

____ 9. A genetically modified "super tomato" can resist heat, cold, and insects. What is the technology used to modify organisms genetically?
   a. Plants are exposed to radiation to create desired mutations.
   b. Cell nuclei are removed from one organism and placed into another.
   c. Genes are taken from one species and placed into another.
   d. Plants are provided super-attenuated minerals.

____ 10. Which of the following hypotheses can be tested experimentally?
   a. Condoms are not effective in preventing pregnancy.
   b. It is against Mother Nature to prevent pregnancy by artificial means.
   c. People are not meant to interfere with fertilization of human eggs.
   d. Sexual abstinence is the only morally acceptable way to prevent pregnancy.

____ 11. Animal organ systems do not function in isolation but rather interact in complex ways; for example, the excretory system is dependent on the proper functioning of the circulatory system because the circulatory system
   a. carries the urine from the kidney to the bladder.
   b. supplies fecal material to the colon.
   c. prepares the urine for entry into the lymph system.
   d. delivers waste from the entire body to the kidney.

____ 12. A pure breeding red-flowered plant with smooth seeds, (RRFF) is crossed to a white-flowered plant with wrinkled seeds, (rrff). What genotype is the offspring?
a. RrFf
b. RRff
c. RfRf
d. rrFF

____ 13. Which of the following is an organ?
a. skin
b. capillary bed
c. cell organelle
d. cytoplasm

____ 14. Your students expressed a misconception that polio is no longer contagious because nobody gets it anymore. What is the accepted scientific view that corrects this misconception? Polio is contagious but
a. the vector that transmits the disease is no longer widespread.
b. most people are vaccinated and thus are protected.
c. nobody gets it because the viral strain has been altered.
d. nobody gets it because modern nutrition provides most vitamins.

____ 15. An antibiotic, erythromycin, kills 99.99% of a bacterial population. You would expect future generations of bacteria to be
a. more likely to be susceptible to erythromycin than the first generation.
b. more resistant to erythromycin than the first generation.
c. dormant until the antibiotic dissipates.
d. more susceptible to other antibiotics than the first generation.

____ 16. Diseases that involve widespread tissue infections usually result in a fever because
a. microorganisms trick the brain's temperature control center into creating a hot environment that favors their growth.
b. rapid multiplication of the invading microorganisms result in extra heat production.
c. inflammatory and immune responses result in extra heat production.
d. muscle's temperature control center responds to systemic infection by creating a hot fiber environment favorable to microorganisms.

____ 17. In the food chain, larvae → mackerel → shark, the mackerel is a(an)
a. herbivore.
b. autotroph.
c. producer.
d. carnivore.

____ 18. A new population of primary consumers has moved into an existing ecosystem. As a scientist studying the ecosystem, predict the most likely effect this new population might have on the ecosystem.
a. Competition for available resources will cause a decline in existing populations.
b. Resources will increase causing an increase in populations.
c. The new population will have a stabilizing effect on the ecosystem.
d. The producers will increase proportionately.

____ 19. During a recent storm many trees were uprooted and fell over in a nearby forest. A Scout troop offered to clear out the dead trees to help beautify the forest. A conservation officer told them that it would be best to leave the dead trees. What is the primary reason for leaving dead trees in the forest?
a. Since there is no benefit for either removing them or leaving them, the cost for removal is an unnecessary expense.
b. The fallen trees will eventually fossilize and contribute additional natural beauty to the area.
c. The decomposition of the dead trees provides nutrients for organisms.
d. Dead trees will protect the forest from the incursion of all-terrain vehicles.

____ 20. You plan an investigation to determine the home range of the beavers that have built a dam in a nearby river. Which scientific technique would you select to yield the best data for this investigation?
a. gene mapping of beaver species
b. controlled experiment
c. modeling of beaver dams
d. observation of beaver behavior

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 Eastern Greenviolet's green flowers are similar in color to the plant's leaves, 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 rose 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 rose bush. She said the ice caused the rose 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 grandmother was just diagnosed with skin cancer. He said she has some type of tumor cells that are invading her normal cells. The class asks this student if he is frightened to touch her because they heard that skin cancer cells could quickly invade his cells by touching the affected area.

    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 a waterfall 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 recent movie portrays people who have mutations. Students discuss the movie in class and agree that mutations are 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.