

Life Science DTAMS Assessment – Version 3
 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") | 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 _____ | 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 | |
| <p>Mark one or more that best describes your situation.</p> <p>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>.</p> <p>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.</p> | <p>not science _____</p> <p>general science _____</p> <p>biology/life science _____</p> <p>chemistry _____</p> <p>physics _____</p> <p>physical science _____</p> <p>earth science _____</p> <p>astronomy _____</p> <p>geology _____</p> <p>other science _____</p> <p>(please describe "other science")</p> |

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 photosynthesis is to
- replenish the atmospheric supply of CO₂.
 - convert light energy to chemical energy.
 - release the energy stored in glucose.
 - produce sugar and starch for animal consumption.
- _____ 2. You would like to demonstrate that salt (NaCl) has an effect on plant growth. You placed 20 marigold seeds in identical potting soil environments under a grow light. Every day, you watered 10 plants with 25 milliliters of water and you watered the remaining 10 plants with 25 milliliters of a 10% salt solution. You measured the growth of each plant's stem from the base of the soil to the top of the plant. Fifteen days later, the plants watered with the 10% salt solution are approximately $\frac{1}{2}$ the size of the plants without any salt. Which of the following would be an accurate observation from your experiment?
- The salt solution causes the plant to lose water.
 - The salt solution is toxic to marigolds' stems.
 - The salt solution adversely affects stem growth.
 - The salt solution affects the stem's turgidity.
- _____ 3. You have a light microscope with four objectives. Which objective would you select first when attempting to focus on a paramecium?
- 1000X
 - 100X
 - 400X
 - 40X

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

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

- a. Juniper
- b. White Cedar
- c. Red Pine
- d. Balsam Fir

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
 - b. Needles in bunches of two, 1-2 inches long
 - 2. Needles many, more than 6, drop in autumn
 - ii. Needles occurring singly;
 - 1. Needles blunt, flat; in flat sprays on twigs
 - 2. Needles sharp; on all sides of twigs
 - a. Needles 4-sided, neither in opposing pairs nor in whorls of 3
 - b. Needles 3-sided, either in opposing pairs or in whorls of 3
- b. Leaves very small and scale-like, hugging twigs:
 - i. Leaves blunt; conifers
 - ii. Leaves sharp; a flowering tree

White Pine
Red Pine
Larch

Balsam Fir

Green Spruce

Juniper

White Cedar
Tamarisk



5. Medical researchers have produced human hormones from bacterial cells. One of the reasons that this is undertaken is
- a. bacterial and human cells are in the same taxonomic genus.
 - b. human hormones from cells in culture would develop new RNA.
 - c. human hormones from cells in culture are very resistant to change.
 - d. bacterial cells can be grown quickly in large quantities.

- _____ 6. The future of humankind and world-wide human conditions are dependent on maintenance of tropical rainforests because tropical rainforests have
- a major part in the water and carbon cycles affecting the climate.
 - a large supply of hardwood forest for logging.
 - refuge space for native peoples.
 - large tracts of soil for future agricultural uses.
- _____ 7. Which of the following best represents the decrease in complexity of living systems?
- organs, cells, tissues, organisms
 - organ systems, tissues, cells, organelles
 - cells, organs, tissues, organisms
 - molecules, tissues, cells, organs
- _____ 8. A breeder's snakes have stopped laying eggs. She decided to put a male snake in one of the female snake'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 snakes but without the male snake. The cage without a male snake serves
- to provide additional variables for the investigation.
 - as a control.
 - as an independent variable.
 - to let the turtles know what will happen if they don't produce.
- _____ 9. Farmers were trying to rid their crop product of an insect-borne virus. Plant breeders scrambled to produce a virus-resistant papaya by using which process?
- fungae fertilization
 - gene splicing
 - multiple chemical insecticides
 - reprocessed alteration
- _____ 10. Which of the following hypotheses can be tested experimentally?
- Carrots feel pain when you boil them.
 - Zinnia stems will grow toward a light source.
 - Roses enjoy classic music over rock music.
 - Plankton exists to feed marine animals.
- _____ 11. Animal organ systems do not function in isolation but rather interact in complex ways; for example, the respiratory system is dependent on the proper functioning of the circulatory system because the circulatory system
- carries the oxygen bound to the T-white blood cells.
 - supplies the carbon dioxide to the mouth.
 - prepares the villi for gas exchange in the lungs.
 - carries the oxygen bound to the hemoglobin of the red blood cells.

- ___ 12. A botanist bred two heterozygous red-flowered plants with smooth seeds (RrFf). What is the chance of getting a white, wrinkled-seeded plant (rrff) in the first generation?
- 1 in 16
 - 1 in 32
 - 1 in 4
 - 1 in 8
- ___ 13. Which of the following is an organ?
- nucleus
 - alveoli
 - hypothalamus
 - pancreas
- ___ 14. Your students expressed a misconception that herpes is no longer contagious because of new medications. What is the accepted scientific view that corrects this misconception? People with herpes take special medication that
- prevents catching other sexually transmitted diseases.
 - alleviates some of the symptoms.
 - prevents the spread of the virus to others during sexual contact.
 - lessens the risk of catching AIDS.
- ___ 15. A herbicide kills 99.99% of a weed population. You would expect future generations of weeds to be
- dormant until the herbicide dissipates.
 - more resistant to the herbicide than the first generation.
 - more susceptible to mutation than the first generation.
 - more susceptible to subsequent exposure to the herbicide.
- ___ 16. Diseases that involve widespread organ infections usually result in a fever because the
- microorganisms trick the body's control center into creating a nutrient enriched environment that favors their growth.
 - rapid multiplication of the invading microorganisms result in extra heat production.
 - disease control center responds by creating a basic environment favorable to all microorganisms.
 - inflammatory and immune responses result in extra heat production.
- ___ 17. Which statement is true of all consumers?
- Consumers produce energy by photosynthesis.
 - Consumers obtain oxygen by eating plants or organisms that have eaten plants.
 - Consumers obtain energy by using inorganic materials.
 - Consumers obtain energy from other organisms.

- _____ 18. Why are the trees in northern Canada similar to the trees on the mountains in Colorado?
- The temperatures found in both areas are similar.
 - The soil found in both areas is very acidic, which only supports evergreen trees.
 - The trees exist for only a short period of time and change as the temperature/seasons change.
 - Both Colorado and Canada are in the taiga biome.
- _____ 19. During a hurricane many tall grasses were uprooted and dropped in a nearby field. A neighbor offered to clear out the plants to help beautify the area. A conservation officer told him that it would be best to leave the dead grass. What is the primary reason for leaving dead grass in the field?
- Dead grass will protect the field from the incursion of snakes.
 - The decomposition of the dead grass provides nutrients for organisms.
 - The grass will eventually dry and contribute additional natural beauty to the area.
 - The dead grass will cause the old grass to die, which prevents future grass fires.
- _____ 20. While outside at a picnic, you notice bees landing on yellow-colored materials. You plan an investigation to determine the colors of flowers that bees most frequently land. Which scientific technique would you select to yield the best data for this investigation?
- bee collection
 - bee species comparison
 - theory interpretation
 - controlled experiment

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 a flower's filament looks similar in shape to its style, 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 azalea 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 azalea bush. She said the ice caused the azalea 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 the class that his father was just diagnosed with colon cancer. The class asks this student if he is frightened to share a bathroom with him, because they heard that you can catch cancer from sitting on a toilet seat.
- 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 snow, your students look at the snow falling and say, “This is a good example of the water cycle. The water on the ground yesterday evaporated to the clouds. While in the clouds, the gas cooled and now is falling as snow. The snow will melt and become the same water that fell on the ground yesterday.”
- 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 newscaster announces that vegetables from genetically engineered plants are being sold in local grocery stores. Students discuss this broadcast in class and believe that eating mutated plants is 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.