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

Earth/Space Science DTAMS Assessments – Version 6

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) _____

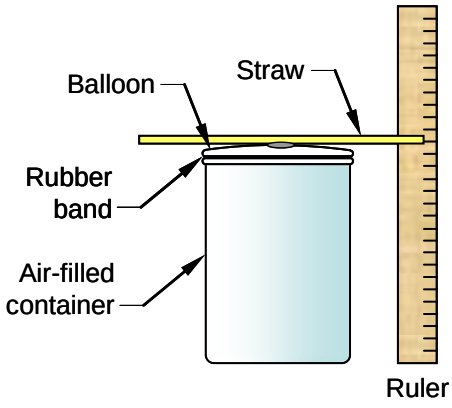
Content area of teaching certificate

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"*)

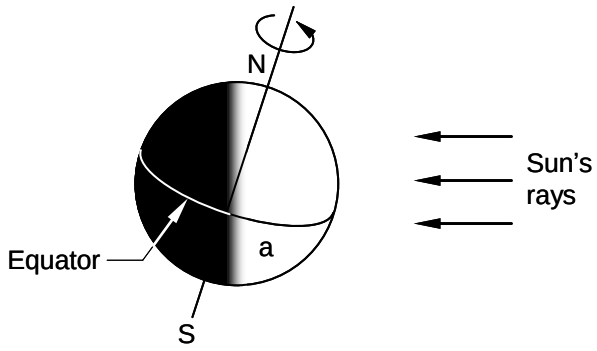
Multiple Choice
Identify the letter of the choice that best completes the statement or answers the question.

____ 1. The agent of mechanical weathering in which rock is worn away by the grinding action of other rock particles is called
a. ice wedging.
b. erosion.
c. abrasion.
d. exfoliation.

____ 2. Plate tectonics is a theory that explains
a. earthquakes and continental drift.
b. how erosion contributes to Earth's landscapes.
c. the movement of land over water.
d. the weathering processes on various landscapes.



____ 3. The balloon on the top of the device pictured above will bulge upward when the
a. device is placed upon a block of ice.
b. device is placed in a humid bathroom.
c. dew point outside the device falls.
d. air pressure outside the device falls.



____ 4. The season of the year at point "a" on the diagram of the Earth above is
   a. fall.
   b. spring.
   c. summer.
   d. winter.

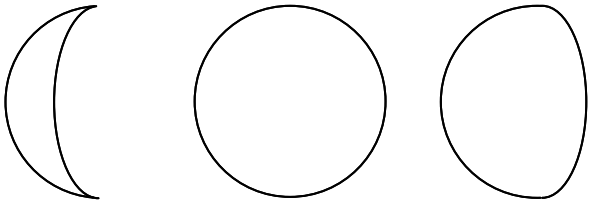
____ 5. During an investigation of factors that may be used to forecast weather conditions, students collect data on four factors (air pressure, temperature, rainfall, and cloud cover) over a period of a month. The best use of these data would be to
   a. overlay graphs of the data to look for consistent patterns among the factors.
   b. create separate graphs for each factor to better sort out the independent contribution of each factor to the weather.
   c. average the measurements for each factor to get a representative data set for the month.
   d. only use those data that support their hypothesis since contradictions are possible due to measurement error.

____ 6. To describe a rock's texture, geologists determine
   a. how the rock was formed.
   b. the size, shape, and pattern of the rock's grains.
   c. how many minerals the rock contains.
   d. the color and density of the rock.

____ 7. What seismographic data would you need to calculate the distance from an earthquake to your location?
   a. times of arrival of S and P waves
   b. readings on a Richter Scale
   c. intensity of the seismic waves
   d. size of the earthquake waves

____ 8. Passive solar home design provides the greatest benefits to homes
   a. at high latitudes because the design eliminates the need for furnaces to provide warming in the winter.
   b. at moderate latitudes because the design maximizes warming in the winter and minimizes warming in the summer.
   c. near the equator because the sun's higher intensity maximizes the benefits of passive design.
   d. south of the equator because winter occurs when the earth is closest to the sun in the southern hemisphere.

____ 9. When dirt and rock removed in the process of surface mining are replaced in a form that returns the land to its previous use or to new uses, the land is said to be
   a. ruined.
   b. conserved.
   c. reclaimed.
   d. returned.



____ 10. Repeated observations show that Mars can be seen only in gibbous and full phases from Earth. These observations provide evidence that Mars
   a. is closer to the Earth than it is to Jupiter.
   b. is farther from the sun than Earth is from the sun.
   c. has a surface similar to Earth's moon.
   d. is more reflective than other planets.

____ 11. The density of Earth's atmosphere decreases with altitude. This is because
   a. cosmic radiation from the sun blows the upper atmosphere away.
   b. the weight of the air above any point compresses the air, causing the density to be greater at low altitudes.
   c. humidity is higher at Earth's surface.
   d. winds at the surface blow more slowly than at high altitudes allowing the air to become more concentrated.

____ 12. The ozone layer of the atmosphere serves as a shield absorbing most of the
   a. heat from the sun, protecting against global-warming.
   b. infrared radiation from the sun, causing global-warming.
   c. ultraviolet radiation from the sun, protecting against skin cancer.
   d. cosmic rays, protecting against interference with radio transmissions.

____ 13. A student would like to make a model to demonstrate the greenhouse effect. She puts a thermometer inside an upside-down glass jar on a sunny window to measure the temperature. What additional measurement(s) would be necessary to show the greenhouse effect?
a. The air pressure in the jar and in the room.
b. The humidity of the air in the upside-down jar.
c. The temperature of the air surrounding the jar.
d. The volume of the air in the upside-down jar.

____ 14. A prevailing wind blows from an ocean across a mountain from west to east. In most cases, the land on the east side of the mountain will be
a. drier than the land on the west side.
b. dry in winter and wet in summer.
c. more green and lush than the land on the west side.
d. equally as humid or dry as the west side.

____ 15. Based on the principle of uniformitarianism, the explanation for both the current accumulation of basalt (an igneous rock) on active volcanic sites and the presence of columns of basalt in sedimentary rock would assume that
a. volcanoes are the birthplace of every kind of rock.
b. volcanoes only form in places that have lots of basalt available for creating magma.
c. the same kind of processes that produces volcanoes produced basalt columns.
d. volcanoes are formed from melted basalt columns.

____ 16. Which of the following planets is relatively small, rocky, and close to the earth?
a. Venus
b. Pluto
c. Jupiter
d. Saturn

____ 17. Which assumption allows scientists to justify use of radiometric dating when the original proportions of isotopes are not known.?
a. Uniformity exists between the rates of sedimentation at all points in geologic history.
b. The proportions of isotopes do not change over long periods of time.
c. The half-lives of isotopes don’t change over long periods of time.
d. Different elements were present in the past than today.

____ 18. Which type of clouds would most likely lead you to predict a thunderstorm?
a. Cumulonimbus
b. Stratus
c. Cirrus
d. Cumulus

____ 19. How does erosion contribute to the rock cycle?

a. Erosion allows surface rock particles to sink deep into the earth's interior where temperature and pressure change them into metamorphic rocks.
b. Erosion transports small rock particles that are eventually deposited and can be transformed into sedimentary rocks.
c. Erosion pushes mountains under the earth's surface by the collision of tectonic plates.
d. Erosion transforms one type of rock into another over long periods of time.

____ 20. A scientist needs to identify a rock sample as part of a geological investigation. The sample's specific gravity is determined to be 2.9. After consultation with a resource table, the scientist determines that the sample is basalt. The conclusion that the sample was basalt was possibly incorrect for what reason?

a. The measurement was not repeated and values averaged.
b. Several different types of rock can have similar specific gravities.
c. There is a range of values for the specific gravity of basalt.
d. Specific gravity is not used to identify rocks.

Open Response Directions

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 lesson, textbook, activity, piece of equipment, or media, assume the reader is not familiar with it and explain how it is used to support student learning. Assume you have access to any equipment that would be available in a reasonably well-funded K-12 school setting so that your proposed instruction is feasible to implement.

21. Pointing out that erosion and weathering are constantly wearing down mountains, your students explain that all mountains on Earth are gradually becoming shorter and that eventually there will be no more tall mountains on Earth.

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

22. Your students explain that deserts occur in places where there are no mountains that cause the moist ocean air to rise, cool, and cause precipitation.

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

23. Your students believe, from scenes they have witnessed in movies, that the center of the earth below the crust is composed of vast underground caverns.

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

24. Your students claim that tides occur because the moon has a greater gravitational attraction for water than for solid earth.

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

25. Your students assert that there is an eclipse every month when the moon passes between the earth and the sun.

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