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

Earth/Space 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) _____

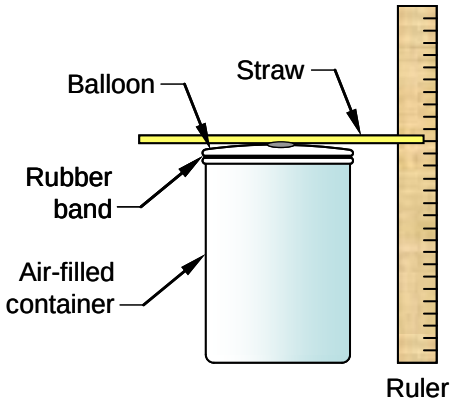
Content area of teaching certificate

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"*)

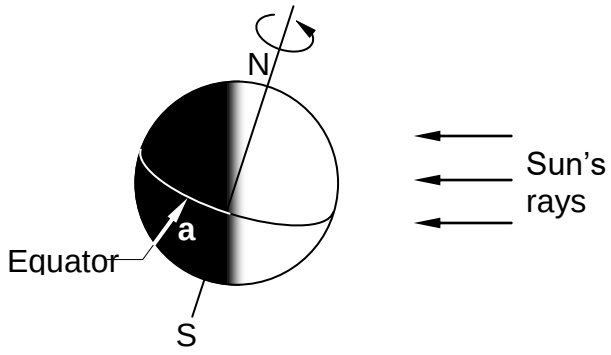
Multiple Choice
Identify the letter of the choice that best completes the statement or answers the question.

____ 1. Soil formation begins with the weathering of
a. litter.
b. humus.
c. rock.
d. glaciers.

____ 2. The geological theory that states pieces of Earth's lithosphere are in constant, slow motion is the theory of
a. plate tectonics.
b. sea-floor spreading.
c. subduction.
d. deep-ocean trenches.



____ 3. A student constructed the apparatus in the diagram. This apparatus enables the student to collect data about
a. humidity.
b. temperature.
c. air pressure.
d. dew point.



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

____ 5. Designing an investigation to explore factors that are related to forecasting weather conditions, students decided to use temperature as their independent variable. Why will this choice prove to be not helpful?
   a. Temperature is hard to accurately measure due to variations such as wind and altitude and thus would not be useful in this investigation.
   b. Students can't control the outside temperature, which is necessary for use as an independent variable.
   c. Temperature often varies widely throughout the day and this lack of consistency results in temperature being poorly controlled for.
   d. Weather conditions arise due to a complex interaction of factors and can not be forecast from just one variable.

____ 6. A rock that contains a metal or other economically useful mineral is called a(n)
   a. ore.
   b. stone.
   c. crystal.
   d. alloy.

____ 7. Seismographs enable geologists to distinguish between S and P seismic waves. The fact that S-waves travel more slowly than P-waves enables geologists to determine
   a. the damage done by an earthquake.
   b. the distance to an earthquake.
   c. the strength of an earthquake.
   d. the cause of an earthquake.

____ 8. Passive solar design includes floor tiles of high thermal mass because they
   a. reflect the heat of the sun in the summer, which keeps the air cool.
   b. absorb the heat of the sun in the winter through south-facing windows.
   c. absorb the heat of the sun, which cools the surrounding air in the summer.
   d. reflect the sunlight, which cools the building in the summer.

____ 9. Surface and open-pit mining are only economically feasible when
a. coal is being mined.
b. mountain-top removal is used.
c. the ore is covered with vegetation.
d. the ore-bearing layer is relatively close to the surface.

____ 10. Which of the following statements is the best evidence that the earth is a sphere and not flat?
a. The shadow that passes over the moon during a lunar eclipse is round.
b. The shadow that passes over the sun during a solar eclipse is round.
c. The sun and moon rise in the east and set in the west.
d. Earthquakes from Asia can be detected in the United States.

____ 11. Balloons are released at a birthday party. As they rise into the sky
a. they increase in size because the temperature increases.
b. they remain the same size because the amount of helium in them does not change.
c. they decrease in size because the pressure exerted upon them increases.
d. they increase in size because the pressure exerted upon them decreases.

____ 12. The ozone layer of the atmosphere serves as a shield absorbing most of the ultraviolet radiation found in the sun's rays. If the ozone layer were reduced, a predicted result would be
a. an increase in human skin cancer.
b. a decrease in violent storms.
c. a decrease in the radiation rate known as the solar constant.
d. an increase in concentration of ozone in the troposphere.

____ 13. A student designs an experiment to measure dew-point. Warm water is placed in a metal container. Ice-cold water is added in increments until condensation appears on the container's surface. In order to determine dew point, the student must measure the temperature of the
a. water in the container.
b. surrounding air in the room.
c. cold water added in each increment.
d. source of the warm water.

____ 14. The Gulf Stream has a moderating effect on England's climate because
a. the movement of the water carries clouds over England.
b. the warm current melts icebergs before they can float that far south.
c. the water stores large amounts of heat and transfers it as it flows by England.
d. the large mass of flowing water disturbs wind patterns over England.

____ 15. A scientist finds fossils of a sea star ("star fish") in an exposed rock on a mountain side. Based on the principle of uniformitarianism, the scientist can assume
a. land-dwelling sea stars are now extinct.
b. the rock containing the fossils formed in a sea or ocean.
c. in the past, sea stars climbed out of the ocean and up the mountains.
d. the same set of circumstances explains all paleontological observations.

____ 16. Which group of planets is in the correct order according to increasing distance from the sun?
a. Venus, Mercury, Saturn, Uranus, Neptune
b. Mercury, Earth Jupiter, Uranus, Neptune
c. Mercury, Mars, Earth, Saturn, Uranus
d. Venus, Earth, Mars, Saturn, Jupiter, Neptune

____ 17. To enhance the reliability of radiometric dating techniques, scientists can
a. use two or more different isotopes that are present in the same sample.
b. average their results with results published in scientific journals.
c. repeat the calculations multiple times using the same data.
d. measure the age of a sample repeatedly over the course of several years.

____ 18. Clouds usually form when
a. relative humidity is decreasing.
b. the condensation rate equals the evaporation rate.
c. air temperature reaches the dew point.
d. evaporation has warmed the surrounding air.

____ 19. How does weathering contribute to the rock cycle?
a. Weathering breaks surface rocks into pieces small enough to be transported deep into the earth's core where they become metamorphic rocks
b. The weathering processes strengthen rocks so they are more likely to become metamorphic over time.
c. Weathering is the process that transforms one type of rock into another over long periods of time.
d. Weathering dislodges small particles from surface rocks that can be transformed into sedimentary rocks.

____ 20. Which set of tools is required to measure the specific gravity of an irregular rock as part of an investigation?
a. A spring-scale and a beaker of water in order to measure the sample's weight when dry and its weight when saturated.
b. A spring-scale to measure the sample's weight and a ruler to measure its dimensions and calculate its volume.
c. A spring scale and a two pan balance in order to compare the difference and calculate the specific effects of gravity.
d. A spring-scale and a graduated cylinder of water in order to measure the sample's weight and volume.

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. Your students conclude that because of the existence of marine fossils on mountain tops, the oceans used to be deep enough to cover the mountains.

(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. During a unit on pollution, your students announce that they don't need to worry about chemical pollution in streams and rivers because their families get water from a well.

    (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 the interior of the earth is the same as its surface, composed mainly of silicate rocks, dirt and water.

(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 explain that high tides occur on the side of the earth facing the moon and low tides occur on the opposite side of the 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 explain that we see only one side of the moon because the moon doesn't rotate like the earth does.

(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.)