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

Earth/Space Science DTAMS Assessments – 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) _____

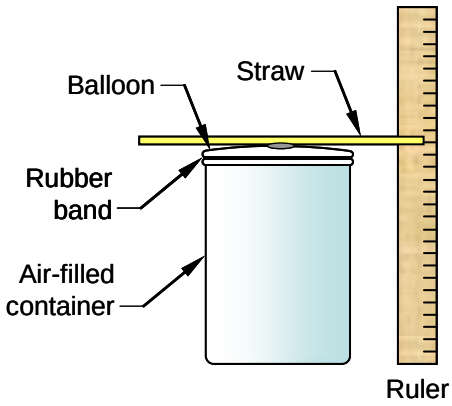
Content area of teaching certificate

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

____ 1. The process by which natural forces detach weathered rock and soil from a surface is called
a. erosion.
b. soil conservation.
c. abrasion.
d. deposition.

____ 2. A collision between two pieces of continental lithosphere at a converging boundary produces a
a. mid-ocean ridge.
b. deep ocean trench.
c. rift valley.
d. mountain range.



____ 3. The straw on the top of the device pictured above will rise when the air

a. temperature increases.
b. temperature decreases.
c. pressure in the room increases.
d. pressure in the room decreases.

____ 4. Seasons occur on Earth because
a. Earth's orbit is elliptical, so it is closer to the Sun in summer.
b. gravitational effects of the Sun and the Moon cause Earth to move closer and farther from the sun at different seasons.
c. Earth rotates on its axis exposing different areas to the sun at different seasons.
d. Earth is tilted on its axis so different hemispheres receive more direct sun rays at different times as Earth revolves around the sun.

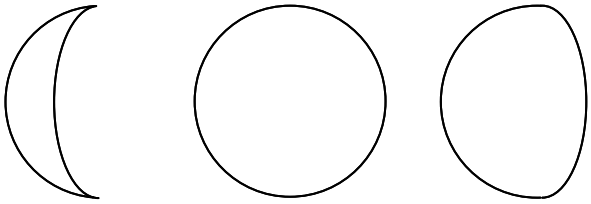
____ 5. A scientist wants to investigate factors that are related to prediction of the local weather. Barometric pressure is measured once a day and recorded. Cloud cover is observed and recorded next to the pressure on the chart. No noticeable patterns are found. What change in the procedure might produce more useful data?
   a. Average the pressures measured during similar weather patterns.
   b. Measure pressure more frequently.
   c. Change the time of day at which the measurement is made.
   d. Compare results with measurements taken at the same time at different latitudes.

____ 6. The softest mineral on the Moh's hardness scale is
   a. gypsum.
   b. apatite.
   c. quartz.
   d. talc.

____ 7. If you would like to determine the distance to an earthquake from your location, you would compare the
   a. difference in the time it takes the P and S waves to arrive at a seismograph.
   b. speeds of the S and P waves as they travel through different substances.
   c. difference between the sizes of the S and P-wave traces on the seismograph.
   d. amplitudes of the S and P-wave traces on the seismograph.

____ 8. In North America, south-facing windows are installed to maximize warming in winter and minimize warming in summer because
   a. the sun is low in the southern sky.
   b. the sun shines on the north side of a house in summer.
   c. cool winds blow through the south-facing windows in summer.
   d. the cold winds blow from the north in winter.

____ 9. Coal that is relatively close to the surface of the earth may be exposed by
   a. smelting.
   b. reclamation.
   c. conservation.
   d. open pit mining.



____ 10. Repeated observations show that Jupiter can be seen only in gibbous and full phases from Earth. These observations provide evidence that Jupiter
a. has an elliptical orbit around the sun.
b. is farther from the sun than Earth is from the sun.
c. is a large, gaseous planet.
d. has multiple moons similar to Earth's one moon.

____ 11. Atmospheric pressure decreases with altitude. This is because
a. air molecules decompose as they rise in the atmosphere.
b. atmospheric composition changes with altitude.
c. at higher altitudes the gravity of the sun dissipates the air and reduces pressure.
d. there are more molecules in any given volume at low altitudes.

____ 12. Carbon dioxide in the atmosphere has been increasing during the last two centuries. A widely accepted conclusion is that this
a. has contributed to higher temperatures on earth.
b. allows for more heat to escape into space.
c. has caused the beginning of another ice age.
d. is causing ocean levels to drop.

____ 13. A student puts one thermometer on a sunny windowsill. She puts another thermometer on the same windowsill, but inside an upside-down glass jar. She records the temperature of both thermometers every minute for ten minutes. She is making a model to show the principle of
a. conservation of energy.
b. greenhouse effect.
c. light as waves.
d. air convection.

____ 14. Oceans play a moderating role in limiting climate extremes on Earth because
a. ocean water warms and cools more slowly than land.
b. icebergs form in polar regions and float toward warmer regions.
c. oceans have a large surface area, which reflects away sunlight and heat.
d. the flat ocean surface allows cooling winds to circulate.

____ 15. A scientist finds fish fossils throughout several rock layers on a high plateau. Based on the principle of uniformitarianism, the scientist can assume
a. this species of fish is now extinct.
b. the rock containing these fossils formed under water.
c. today's fish must be very different from those that lived millions of years ago.
d. the plateau is periodically inundated by massive floods.

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

____ 17. A common criticism of radiometric dating of fossils is that the original amount of radioactive isotope is not known. What experimental approach bests answers this criticism?
a. Sampling of the fossil DNA from several organisms of the same species.
b. Assuming the historic proportion of isotope was the same as current levels.
c. Comparing dating results of several isotopes having different half-lives.
d. Examination of the crystal structure of the sample being tested.

____ 18. What type of weather is expected when the sky is filled with cumulonimbus clouds?
a. light rain in about 24 hours
b. warm and dry
c. thunderstorms
d. gradually clearing and fair

____ 19. The rock cycle is a model that shows how one type of rock can be transformed into another. Which of the processes below is the first step for transforming metamorphic rock into igneous rock?
a. melting
b. erosion
c. weathering
d. extrusion

____ 20. Which equipment can be used to measure the specific gravity of an irregular rock?
a. A spring-scale and a water source 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 measuring tape to measure its circumference and calculate its volume.
c. A two pan balance in order to calculate the specific effects of gravity when the sample is dry or wet.
d. A spring-scale and a beaker of water in order to measure the sample's weight and the buoyant force exerted by the water.

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 cite the fact that the Rocky Mountains in the western United States are much taller than the Appalachian mountains in the east as evidence that the Rocky Mountains were formed and started growing much earlier than the Appalachian.

    (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 assert that the water cycle must only include lakes and rivers--not the ocean--because rainwater is fresh, not salty.

(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 conclude that the layers of Earth below the crust are liquid because volcanic eruptions are liquid (lava).

(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 predict that because the earth rotates on its axis once a day there should be one high tide and one low tide per day.

(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 the full moon is closer to the Earth when it rises and sets because it is much larger on the horizon than it is when it is overhead.

    (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.)