Earth Science Puzzles

Thomas McGuire*, Educator & Author, Cave Creek, AZ

(Listed by Earth Science Topics)

These puzzles have been chosen for their interest level and required insights into science, mathematics and/or Earth processes. A few are actually tricks of language. While they are likely to challenge creative thinkers, most will be too difficult for many students. They may be best used for extra credit on tests or to initiate class discussions. In some cases it is best to present them verbally to the class, but they can also be presented in text form. Most of these puzzles are of unknown origin and widely used in classic printed sources.

MAPS/GEOG.

1. A man liked sunshine so much that he built a rectangular house with windows facing south on all four sides. He was so pleased with his new house that he went hunting and shot a bear. What color was the bear?

2 Which two extremes of Earth were reached by humans in the same decade? (There might be two answers, but one pair is in debate.)

3. We may be taught the the North Pole has 6 months of daylight and 6 months of darkness each year. But, the fact is that the poles both receive more than 6 months of direct sunlight. Why? (There may be several reasons.) (Similar to #16 below.)

4. If opposite magnetic poles attract, why does the north end of a bar magnet tend to turn toward Earth's North Pole?

5. If Earth were completely covered by calm oceans, why wouldn't our planet be a perfect sphere?

MINERALS/ROX

6. What rock contains no minerals, and what mineral is found in no rocks?

7. Name at least two non-metallic minerals that we might intentionally come into contact with in our indoor daily lives.

SEISMOLOGY

8. Note that the travel time lines for P and S-waves in the New York Earth Science Reference Tables are curved lines. Why do they curve downward? (There are at least two reasons.)

9. What is the difference among seismographs, seismograms and seismometers?

PLATE TECT..

10. Why doesn't centrifugal force cause the drifting continents to move toward Earth's equator?

EARTH HIST.

11. Two of the ideas now finding their way into Earth science are chaos theory and the gaia concept. To the people of ancient Greece, who were Chaos and Gaia?

12. What marine animal ceased to be a fossil species about 1950?

continued...

WEATHER/CLI. 13. This experiment is in "hot" debate. Some people say that an ice cube tray of hot water will freeze faster than an identical tray of an equal amount of cold water. Give an explanation of why this would be true, or why it would ***not*** be true.

14. Most thermometers use liquid mercury or alcohol to show temperatuyre changes. What strange behavior would we observe in a thermometer filled with colored water within the temperature range of 1°C and 99°C?

15. Construct a simple diagram to show the wind direction as a strong cyclone slowly approaches from the south. (Northern Hemisphere only.)

16. Why is the sun actually visible more than 50% of the time at any given location on Earth? (There are several reasons.) (Similar to # 3 above.)

17. Why are temperatures on the lee (downwind) side of a mountain range usually warmer than at the same elevation on the windward side?

18. What causes the monsoons of India and the American Southwest?

ASTRONOMY 19. The moon is the principal cause of ocean tides. But the moon is overhead approximately once a day. So why do most coastal locations have two high tides each day?

20. What forms of terrestrial energy ***cannot*** be traced back to the sun?

21. The two solstices occur late in June and December. But if you check sunrise and sunset times in the newspapers, the dates when sunrise and sunset are earliest or latest do not occur on these exact dates. Why?

22. The moon takes about 27 days to orbit Earth, but the period of moon phases is about 29 days. Why are they different?

23. Distinguish among meteors, meteorites, meteoroids and meteorologists?

24. Astronomers have been able to observe the whole surfaces of the planets of our solar system, although some are too distant to see clearly. But until about 1960 astronomers were only able to observe about half of the moon's surface. Why was the moon different and why did scientific observations of the moon's surface increase dramatically about 1960?

25. Its the beginning of eternity; the end of space and time, the start of every end and the end of every rhyme. What is it?

REVIEW 26. Give two Earth science definitions of the word "focus"and two of "phase."

* The author is interested in learning of other similar puzzles; cavecreekdigital@msn.com

Key to Earth Science Puzzles

(Thomas McGuire)

1 White. (Only at the North Pole are all directions south and only polar bears inhabit that region.)

2. Mt. Everest & the Challenger Deep,
possibly also the North & South Poles. (See next paragrph.)

   In September of 1909 Frederick A. Cook, astonished the world with the news that he and two Eskimo companions had reached the North Geographic Pole on April 21, 1908. Five days later, another veteran arctic traveler and a Navy civil engineer, Robert E. Peary, announced that he and five companions had reached the North Pole on April 6-7, 1909 and labeled Cook a fake.

   In fact, it is nearly impossible to prove either claim and some have discredited both explorers.

3. The sun has a measurable diameter so part of it is visible more than half the time. Also, light is refracted downward within the atmosphere making the sun visible even after it has actually set.

4. The end labeled “N” on a bar magnet is actually the “north seeking” end of the magnet. It is the magnetic equivalent of Earth’s Magnetic South Pole.

5. Earth bulges about 40 kilometers (25 miles) at the equator due to its rotation and centrifugal force. There are also several other less important causes of Earth’s “imperfect” shape including the bulk of land in the Northern Hemisphere.

6, Limestone and coal contain no minerals. By definition, minerals must be of inorganic origin. Ice is a component of no rocks, but technically it fits the definition of a mineral.

7. Salt, Gypsum (plaster board) and possibly diamond.

8. Seismic (internal, body) waves take a shortcut through Earth and they also travel faster as they go deeper. Both factors contribute to make the waves seem to travel faster with distance. So the travel time does not increase at the same rate as the surface distance from the epicenter.

9.. Seismograph instruments record earthquake waves on a seismogram. So the seismogram is the piece of paper. Seismometer instruments may have no recording mechanism.

10.. The centrifugal force is countered by the fact that Earth is a spheroid. So the continents would be moving, in a sense, uphill. The centrifugal force is in exact balance with this “uphill” path toward the equator. They cancel each other exactly.

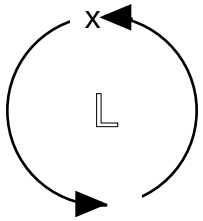
11. Chaos was the god of destruction and disorder while Gaia was the Mother Earth, sometimes considered a goddess of harmony.

12. The coelacanth. (A species through to be extinct until discovered by people fishing the deep oceans.)

13. There seems to be endless debate about this famous experiment. It all depends upon how it's done. The hot water could freeze faster because it makes the cooling unit work harder than if a tray of cold water had been inserted instead. In addition, evaporation form the hot water might also accelerate the cooling rate. These factors might make the hot water freeze first. On the other hand, if both trays are inserted at the same time and covered to prevent evaporation, it will take the hot water some time to get to the initial condition of the cold water. This gives the cold water a head start from which the initially hot tray cannot recover. In this case, the cold water would solidify first. This contest could go either way.

14. The liquid level would go down in the tube as the thermometer is heated from 0° to 4°C. (Water reaches a maximum density/minimum volume at 3.98°C.) It would be difficult to properly read temperatures between about freezing and 10°C. (Freezing would not be a problem as the question specifies temperatures at which water is a liquid.)

15. See the diagram to the right: (This would be an east wind due to counter-clockwise circulation around the low.)



16. See #3. If you count the daylight period from when the top of the sun's disk appears until the top disappears, that's more than half of the 360° sun path. (More than 12 hours.) Also, Earth's atmosphere makes the sun's rays curve (diffract) so the sun is visible when it's actually below the horizon. The angle at which the sun crosses the horizon also has an effect. Th elower the angle of incidence from 90°, the more that daylight is extended.

17. Rising air on the windward side of a mountain range is often relatively moist so it cools slowly due to condensation and cloud formation. But the descending air and the leeward land surface are often relatively dry. There is no change in state of water to slow the warming. So the rate of temperature change is faster for descending air.

18. Warm summer temperatures over a large land mass cause a stationary low pressure which draws in air and moisture from ocean areas. Cold winter temperatures cause a stationary high pressure area which tends to cause dry, continental winds in the opposite direction.

19. When the moon is overhead, it's gravity draws the nearby ocean water upward. But about12 hours later the moon pulls the solid Earth away from the distant water and causes another high tide when the moon is on the opposite side of Earth.

20. Starlight, Earth's radioactive materials, Earth's original heat, and heat from the Big Bang did not originate in the sun. The vast majority of the energy on Earth's surface can somehow be traced back to sunlight. For example, if you consider electricity, most electricity is generated from fossil fuels which originated as plants growing in sunlight.

21. Earth's orbit is not a perfect circle, so Earth's speed in its orbit changes.Therefore solar noon is usually earlier or later according to our regulated and averaged out clock time. This causes the whole day to run a few minutes earlier or later in an annual cycle.

22. As the moon orbits Earth, they both move around the sun. So the moon has to orbit Earth more than 360° to return to its position between the sun and Earth. (new moon) It needs to orbit about 390° to get back to the new moon phase.

23. Meteroids are objects in space that can fall to Earth as visible meteors and strike the ground to become meteorites. They're labeled diffffferently before, during and after falling through the atmosphere. Meteorology is the study of weather.

24. The periods of rotation and revolution of Earth's moon are coupled. That is, the same side of the moon always faces Earth. We can never see the other part of it's surface that always faces away from Earth. The first human observations of the far side of the moon were made by the Soviet satellite Luna 3 in October, 1959.

25. The letter "e." (Well, it sounds like an astronomy puzzle.)

26. Focus: (1) The origin point of an earthquake generally below the epicenter.
(2) One of two points that determine the shape of an ellipse.

Phase: (1) A state of matter such as solid, liquid or gas.
(2) The apparent shape of the moon caused by light and shadow.