

ROUND 5

TOSS-UP

1) PHYSICAL SCIENCE *Multiple Choice* Which of the following lists contains only metals?

- W) Magnesium, phosphorus, lead
- X) Phosphorus, argon, lead
- Y) Magnesium, manganese, lead
- Z) Magnesium, helium, manganese

ANSWER: Y) MAGNESIUM, MANGANESE, LEAD

BONUS

1) PHYSICAL SCIENCE *Short Answer* The speed of sound in air on a given day is 340 meters per second. You are standing 85 meters from a barn when you give a short, loud, yelp. How long in seconds does it take you to hear your own echo?

ANSWER: 0.5 (ACCEPT: ONE-HALF)

TOSS-UP

2) MATH *Short Answer* Express the following product in scientific notation: $(4 \times 10^8)(8 \times 10^{-3})$
[4 times 10 to the 8th times 8 times 10 to the negative 3].

ANSWER: 3.2×10^6

BONUS

2) MATH *Short Answer* Identify all of the following four statements that are always true: 1) if three points are coplanar, they are collinear; 2) if two points are collinear, they are coplanar; 3) three points determine a plane; 4) if two lines are cut by a transversal, the alternate interior angles are equal.

ANSWER: 2 (ACCEPT: IF TWO POINTS ARE COLLINEAR, THEY ARE COPLANAR)

TOSS-UP

3) EARTH AND SPACE *Multiple Choice* Why do hurricanes NOT occur at the equator?

- W) The water is too warm
- X) There is not enough land mass
- Y) The Coriolis effect is too weak
- Z) The days are too long

ANSWER: Y) THE CORIOLIS EFFECT IS TOO WEAK

BONUS

3) EARTH AND SPACE *Short Answer* What kind of rock is found in the dark craters of the Moon?

ANSWER: BASALT

TOSS-UP

4) GENERAL SCIENCE *Multiple Choice* What is the primary source of all weather on Earth?

- W) Clouds
- X) The Sun
- Y) Geographic features
- Z) Human actions

ANSWER: X) THE SUN

BONUS

4) GENERAL SCIENCE *Multiple Choice* The Earth has many types of mountains. Which of the following is the best example of a folded mountain?

- W) Mountains formed when a part of the Earth's crust is broken into large blocks, which are shifted by crust movement
- X) Mountains formed when tectonic movements squeeze rock layers together like an accordion
- Y) Mountains formed when molten rock rises through the crust and pushes up the rock layers above it
- Z) Mountains formed when molten rock erupted onto the Earth's surface

ANSWER: X) MOUNTAINS FORMED WHEN TECTONIC MOVEMENTS SQUEEZE ROCK LAYERS TOGETHER LIKE AN ACCORDION

TOSS-UP

5) ENERGY *Multiple Choice* E-85, also known as “flex-fuel,” gets its name from which of the following?

- W) It is 85% more efficient than gasoline
- X) It is a mixture of 85% gasoline and 15% ethanol
- Y) It is a mixture of 85% ethanol and 15% gasoline
- Z) It has an equivalent octane rating of 85

ANSWER: Y) IT IS A MIXTURE OF 85% ETHANOL AND 15% GASOLINE

BONUS

5) ENERGY *Short Answer* The most common type of fuel cell reacts what two gases to produce electricity?

ANSWER: HYDROGEN AND OXYGEN

TOSS-UP

6) LIFE SCIENCE *Multiple Choice* The crop plants kohlrabi, kale, cabbage, Brussels sprouts, broccoli, and cauliflower are all human cultivars of the wild mustard plant. Which of the following best describes the process by which these modern plants came into existence?

- W) Adaptation to new environments
- X) Genetic drift
- Y) Founder effect
- Z) Artificial selection

ANSWER: Z) ARTIFICIAL SELECTION

BONUS

6) LIFE SCIENCE *Multiple Choice* Which of the following is NOT an example of an angiosperm **[AN-jee-uh-spurm]**?

- W) Daffodils
- X) Mistletoe
- Y) American elm
- Z) Douglas fir

ANSWER: Z) DOUGLAS FIR

TOSS-UP

7) PHYSICAL SCIENCE *Multiple Choice* Which of the following is a transition metal?

- W) Calcium
- X) Potassium
- Y) Iron
- Z) Hydrogen

ANSWER: Y) IRON

BONUS

7) PHYSICAL SCIENCE *Short Answer* Inductance is measured in terms of what SI unit?

ANSWER: HENRY

TOSS-UP

8) MATH *Short Answer* Solve the following equation for x over the real numbers: $x^{-2} = 81$.

ANSWER: $x = \pm 1/9$

BONUS

8) MATH *Short Answer* Find the following sum of fractions: $3/5 + 5/3 + 2/6$.

ANSWER: $13/5$ (ACCEPT: $2\ 3/5$, 2.6)

TOSS-UP

9) EARTH AND SPACE *Multiple Choice* The weather phenomenon that consists of weakened tradewinds that allow surface water from the western Pacific to move eastward, causing a sinking thermocline, is known as El Niño. This process leads to which of the following along coastal South America?

- W) Colder sea surface temperatures and more precipitation
- X) Colder sea surface temperatures and less precipitation
- Y) Warmer sea surface temperatures and more precipitation
- Z) Warmer sea surface temperatures and less precipitation

ANSWER: Y) WARMER SEA SURFACE TEMPERATURES AND MORE PRECIPITATION

BONUS

9) EARTH AND SPACE *Multiple Choice* Which of the following sites is famous for its diversity of Pleistocene [**PLY-stuh-seen**] fossils?

- W) Florissant Formation
- X) Green River Formation
- Y) La Brea Tar Pits
- Z) Columbia River flood basalts

ANSWER: Y) LA BREA TAR PITS

TOSS-UP

10) GENERAL SCIENCE *Multiple Choice* In archery, which of the following represents good accuracy but bad precision?

- W) The arrows all hit the bulls-eye
- X) The arrows are all near the bulls-eye, but are far from each other
- Y) The arrows all hit far from the bulls-eye, but are close to each other
- Z) The arrows all hit far from the bulls-eye and are far from each other

ANSWER: X) THE ARROWS ARE ALL NEAR THE BULLS-EYE, BUT ARE FAR FROM EACH OTHER

BONUS

10) GENERAL SCIENCE *Multiple Choice* Which of the following best explains why oil and water will quickly separate when mixed?

- W) Oil is polar, while water is nonpolar
- X) Oil is nonpolar, while water is polar
- Y) Water is less dense than oil
- Z) Water is more dense than oil

ANSWER: X) OIL IS NONPOLAR, WHILE WATER IS POLAR

TOSS-UP

11) LIFE SCIENCE *Multiple Choice* The cancer that is frequently associated with asbestos exposure is which of the following?

- W) Melanoma
- X) Myeloma [*my-uh-LOH-muh*]
- Y) Mesothelioma
- Z) Multiple sclerosis

ANSWER: Y) MESOTHELIOMA

BONUS

11) LIFE SCIENCE *Short Answer* In pea plants, tall is dominant over short. Suppose you cross a tall pea plant with a short pea plant. The first generations of offspring or the F1 generation are all tall. You then cross two of these F1 generation pea plants to create a new generation of offspring, the F2 generation. What fraction of the F2 generation pea plants will be tall?

ANSWER: 3/4

TOSS-UP

12) PHYSICAL SCIENCE *Multiple Choice* On Earth, Billy weighs 980 newtons. On Planet X, the acceleration due to gravity near the surface is half that of Earth. How much does Billy weigh in newtons on Planet X?

- W) 98
- X) 490
- Y) 980
- Z) 1960

ANSWER: X) 490

BONUS

12) PHYSICAL SCIENCE *Short Answer* What is the term for a change in momentum over a discrete period of time?

ANSWER: IMPULSE

TOSS-UP

13) GENERAL SCIENCE *Short Answer* Which of the four commonly observable states of matter is most common in the universe?

ANSWER: PLASMA

BONUS

13) GENERAL SCIENCE *Multiple Choice* The Hawaiian islands were formed by volcanism due to what?

- W) Convergent plates
- X) Divergent plates
- Y) Transform plates
- Z) A hot spot

ANSWER: Z) A HOT SPOT

TOSS-UP

14) MATH *Short Answer* If a line segment on a number line has endpoints of -24 and 8, what is its midpoint?

ANSWER: -8

BONUS

14) MATH *Short Answer* A wire in the shape of a rectangle with length of 20 inches and width of 10 inches is reshaped into an equilateral triangle. How long is each side of the triangle, in inches?

ANSWER: 20

TOSS-UP

15) EARTH AND SPACE *Short Answer* Name the extinction event during which the non-avian dinosaurs died out.

ANSWER: CRETACEOUS-TERTIARY (ACCEPT: CRETACEOUS-PALEOGENE, K-T, K-PG; BOUNDARY and EXTINCTION are optional)

BONUS

15) EARTH AND SPACE *Multiple Choice* Which of the following does NOT affect the porosity of a material?

- W) Grain sorting
- X) Connection between pores
- Y) Cementation of grains
- Z) Grain shape

ANSWER: X) CONNECTION BETWEEN PORES

TOSS-UP

16) ENERGY *Short Answer* What state leads the U.S. in crude oil production and accounts for about one quarter of total U.S. production?

ANSWER: TEXAS

BONUS

16) ENERGY *Short Answer* The hydrogen gas in synthetic gas can be utilized as an alternative fuel for what energy system?

ANSWER: FUEL CELLS (DO NOT ACCEPT: ELECTROLYSIS)

TOSS-UP

17) GENERAL SCIENCE *Short Answer* In the third century, a Greek mathematician discovered that the buoyant force on an object in a fluid equals the weight of the fluid displaced. What is this concept called?

ANSWER: ARCHIMEDES' PRINCIPLE

BONUS

17) GENERAL SCIENCE *Multiple Choice* If Huntington's disease is determined by a dominant allele and is always fatal, then which of the following explains its continued inheritance?

- W) Huntington's disease only shows up in a fraction of the individuals who carry the allele
- X) There is heterozygote advantage for the alleles that cause the disease in tropical regions
- Y) Huntington's disease shows up later in life, typically after the individual has reproduced
- Z) Huntington's disease has a cure that allows individuals who have it to not show any symptoms and reproduce

ANSWER: Y) HUNTINGTON'S DISEASE SHOWS UP LATER IN LIFE, TYPICALLY AFTER THE INDIVIDUAL HAS REPRODUCED

TOSS-UP

18) LIFE SCIENCE *Short Answer* Which level of protein structure would include the formation of an alpha helix?

ANSWER: SECONDARY

BONUS

18) LIFE SCIENCE *Multiple Choice* Which of the following is an example of anaerobic respiration?

- W) Yeast performing fermentation to release ethyl alcohol and carbon dioxide
- X) A rose using carbon dioxide to produce glucose in the Calvin cycle
- Y) A mouse cell using one molecule of glucose to produce 36 ATPs
- Z) A plant performing photosynthesis to produce energy for storage

ANSWER: W) YEAST PERFORMING FERMENTATION TO RELEASE ETHYL ALCOHOL AND CARBON DIOXIDE

TOSS-UP

19) PHYSICAL SCIENCE *Multiple Choice* An object is placed 10 centimeters from a double convex lens with a focal length of 20 centimeters. Which of the following types of image will be produced?

- W) Real and inverted
- X) Real and upright
- Y) Virtual and inverted
- Z) Virtual and upright

ANSWER: Z) VIRTUAL AND UPRIGHT

BONUS

19) PHYSICAL SCIENCE *Multiple Choice* What law describes the relationship between voltage, current, and impedance in an electric circuit?

- W) Ohm's
- X) Coulomb's
- Y) Lenz's
- Z) Faraday's

ANSWER: W) OHM'S

TOSS-UP

20) MATH *Multiple Choice* If a and b are two rational numbers such that $a < b$, then which of the following is true about $(a+b)/2$?

- W) It is less than both a and b
- X) It is between a and b
- Y) It is greater than both a and b
- Z) Its size relative to a and b can't be determined from the given information

ANSWER: X) IT IS BETWEEN A AND B

BONUS

20) MATH *Short Answer* If the sale price of an item is \$60 after a 25% discount, what was the original price, in dollars?

ANSWER: \$80

TOSS-UP

21) LIFE SCIENCE *Short Answer* *Synechococcus* [**sy-nuh-koh-KOH-kuhs**] is a member of the so-called blue green algae, which are not eukaryotic [**yoo-KAR-ee-oh-tik**] algae at all. What is the phylum [**FY-luhm**] name for this group of bacteria?

ANSWER: CYANOBACTERIA

BONUS

21) LIFE SCIENCE *Multiple Choice* Yenla is studying how a moth population changes over time. Her first sample indicates that 7500 are spotted and 2500 are striped. Ten years later, she samples the same area and finds that 3000 of the moths are spotted and 7000 are striped. What evolutionary process is occurring?

- W) Directional selection
- X) Disruptive selection
- Y) Sexual selection
- Z) Stabilizing selection

ANSWER: W) DIRECTIONAL SELECTION

TOSS-UP

22) EARTH AND SPACE *Short Answer* Black carbon particles are common in Earth's atmosphere. These particles are the result of incomplete combustion, a chemical reaction involving organic matter and what else?

ANSWER: OXYGEN

BONUS

22) EARTH AND SPACE *Multiple Choice* Which of the following is NOT one of the eight most common elements in the Earth's crust?

- W) Oxygen
- X) Sodium
- Y) Carbon
- Z) Calcium

ANSWER: Y) CARBON

TOSS-UP

23) GENERAL SCIENCE *Multiple Choice* Which of the following is the best example of a suspension mixture?

- W) A bowl of mixed fruit
- X) An oil and vinegar salad dressing
- Y) Latex paint
- Z) An ethanol and water mixture

ANSWER: X) AN OIL AND VINEGAR SALAD DRESSING

BONUS

23) GENERAL SCIENCE *Multiple Choice* A volcano erupts, and the lava dries extremely rapidly so that there is essentially no crystal growth. Which of the following rocks may be formed?

- W) Obsidian
- X) Basalt
- Y) Granite
- Z) Rhyolite [*RY-uh-lyt*]

ANSWER: W) OBSIDIAN

TOSS-UP

24) ENERGY *Multiple Choice* What is the primary element in today's commercially available solar cells?

- W) Silicon
- X) Gold
- Y) Selenium
- Z) Germanium

ANSWER: W) SILICON

BONUS

24) ENERGY *Multiple Choice* The efficiency of a solar water heater collector depends directly on solar irradiance and which of the following?

- W) Collector temperature and ambient temperature
- X) Collector temperature and efficiency of the heat exchanger
- Y) Efficiency of the heat exchanger and temperature of the water
- Z) Tilt angle of the collector and collector temperature

ANSWER: W) COLLECTOR TEMPERATURE AND AMBIENT TEMPERATURE

TOSS-UP

25) LIFE SCIENCE *Multiple Choice* In which of the following types of interspecific interaction is there no negative effect on either species involved?

- W) Competition
- X) Commensalism
- Y) Herbivory
- Z) Predation

ANSWER: X) COMMENSALISM

BONUS

25) LIFE SCIENCE *Short Answer* A cross between a male donkey ($2n = 62$) and female horse ($2n = 64$) results in a mule that is generally infertile. What is the diploid chromosome number for a mule?

ANSWER: 63