

ROUND 7

TOSS-UP

1) MATH *Short Answer* Paul cut a 50 foot rope into 3 pieces. The longest piece was three times as long as each of the other two pieces. How long was the longest piece of rope, in feet?

ANSWER: 30

BONUS

1) MATH *Short Answer* If a triangle with sides of 5 and 12 is inscribed in a semicircle, what is the length of the radius of the circle?

ANSWER: 6.5 (ACCEPT: $6\frac{1}{2}$, $13/2$)

TOSS-UP

2) PHYSICAL SCIENCE *Multiple Choice* Which of the following is NOT one of the properties of the plasma state of matter?

- W) It is a fluid
- X) It doesn't respond to electromagnetic forces
- Y) It contains charged ions
- Z) It contains free electrons

ANSWER: X) IT DOESN'T RESPOND TO ELECTROMAGNETIC FORCES

BONUS

2) PHYSICAL SCIENCE *Short Answer* Identify all of the following four changes that are irreversible: 1) burning, 2) effervescence, 3) dissolving, 4) melting.

ANSWER: 1, 2 (ACCEPT: BURNING, EFFERVESCENCE)

TOSS-UP

3) GENERAL SCIENCE *Short Answer* How many DNA nucleotide **[NOO-klee-uh-tyd]** bases are required to code for a single amino acid?

ANSWER: THREE

BONUS

3) GENERAL SCIENCE *Short Answer* Order the following four planets from shortest to longest year length: 1) Jupiter, 2) Mercury, 3) Uranus, 4) Earth.

ANSWER: 2, 4, 1, 3 (ACCEPT: MERCURY, EARTH, JUPITER, URANUS)

TOSS-UP

4) EARTH AND SPACE *Multiple Choice* Which of the following gases is NOT considered a greenhouse gas?

- W) Water vapor
- X) Carbon dioxide
- Y) Nitrogen
- Z) Ozone

ANSWER: Y) NITROGEN

BONUS

4) EARTH AND SPACE *Multiple Choice* Diatoms within sea ice are responsible for as much as 10% of the carbon dioxide fixation in the Southern Ocean. During which of the following months would you expect the organic carbon content of the sea ice to be highest?

- W) September
- X) December
- Y) April
- Z) June

ANSWER: X) DECEMBER

TOSS-UP

5) LIFE SCIENCE *Multiple Choice* Mercury and some other toxins have the ability to bioaccumulate in higher trophic levels. This is partially due to the fact that these toxins are soluble in which of the following?

- W) Water
- X) Fat
- Y) Protein
- Z) Salts

ANSWER: X) FAT

BONUS

5) LIFE SCIENCE *Short Answer* Cnidarians [*ny-DAIR-ee-uhns*] are a phylum of animals that include corals, jellyfish, sea anemones [*uh-NEM-uh-nees*], and hydras. Cnidarians display only two basic forms, which occur at different stages of their life cycles. The first form is a polyp, which is a tube-shaped body with a mouth surrounded by tentacles. Name the second form, which has a body shaped like an umbrella with tentacles hanging down.

ANSWER: MEDUSA

TOSS-UP

6) ENERGY *Short Answer* What device allows high voltage power to be “stepped down” for residential use?

ANSWER: TRANSFORMER

BONUS

6) ENERGY *Short Answer* What is the major process that generates heat in the core of the Earth?

ANSWER: RADIOACTIVE DECAY

TOSS-UP

7) MATH *Multiple Choice* Solve for x over the real numbers: $|x - 5| \geq -7$ [*the absolute value of the quantity x minus 5 is greater than or equal to negative 7.*]

- W) $x > -2$
- X) $x \geq -2$ and $x \leq 12$
- Y) Null set
- Z) All real numbers

ANSWER: Z) ALL REAL NUMBERS

BONUS

7) MATH *Short Answer* Dan's truck averages 20 miles per gallon of gasoline, and his car averages 30 miles per gallon. At these rates, how many more gallons of gasoline does his truck need than his car to make a 540-mile trip?

ANSWER: 9

TOSS-UP

8) PHYSICAL SCIENCE *Multiple Choice* Which of the following is central to the Lewis definition of acids and bases?

- W) Acids donate hydrogen ions, while bases accept hydrogen ions
- X) Acids produce hydrogen ions, while bases produce hydroxide ions
- Y) Acids donate protons, while bases accept protons
- Z) Acids accept electron pairs, while bases donate electron pairs

ANSWER: Z) ACIDS ACCEPT ELECTRON PAIRS, WHILE BASES DONATE ELECTRON PAIRS

BONUS

8) PHYSICAL SCIENCE *Multiple Choice* What is the name for the bands of ions from the solar wind and cosmic rays that have become trapped in Earth's magnetic field?

- W) Cassini
- X) Dione
- Y) Magnetosphere
- Z) Van Allen

ANSWER: Z) VAN ALLEN

TOSS-UP

9) GENERAL SCIENCE *Multiple Choice* Which of the following types of reaction is represented by the example: $N_2 + 3H_2 \rightarrow$ **[yields]** $2NH_3$?

- W) Decomposition
- X) Combustion
- Y) Synthesis
- Z) Substitution

ANSWER: Y) SYNTHESIS

BONUS

9) GENERAL SCIENCE *Multiple Choice* Suppose you want to ripen fruit by exposing it to a plant hormone. Which of the following would be most effective?

- W) Auxins **[AWK-sins]**
- X) Gibbberellins **[jib-uh-REL-ins]**
- Y) Cytokinins **[sy-tuh-KY-nins]**
- Z) Ethylene gas

ANSWER: Z) ETHYLENE GAS

TOSS-UP

10) EARTH AND SPACE *Multiple Choice* Which of the following percentages best represents the amount of the Earth's freshwater supply that can be found in lakes and rivers?

- W) 0.03%
- X) 0.3%
- Y) 3%
- Z) 30%

ANSWER: X) 0.3%

BONUS

10) EARTH AND SPACE *Short Answer* What adjective is used to describe the time it takes a star to return to the same place in the sky?

ANSWER: SIDEREAL

TOSS-UP

11) LIFE SCIENCE *Multiple Choice* The extinction of large hooved mammals from Central America has been implicated in the reduction of what types of plants, which relied on them for seed dispersal?

- W) Small seeded plants, like berries
- X) Grasses, such as wheat
- Y) Large pitted plants, like avocados
- Z) Plants with pods, such as peas

ANSWER: Y) LARGE PITTED PLANTS, LIKE AVOCADOS

BONUS

11) LIFE SCIENCE *Multiple Choice* Which of the following scenarios is an example of Brownian motion?

- W) Certain molecules diffusing across a cellular membrane
- X) Unicellular organisms moving through water by the propulsion of flagella
- Y) Fish swimming together in schools
- Z) Active transport of molecules across a cellular membrane

ANSWER: W) CERTAIN MOLECULES DIFFUSING ACROSS A CELLULAR MEMBRANE

TOSS-UP

12) ENERGY *Multiple Choice* Which of the following would be most useful for seeing the lines of force created by the north and south poles of a magnet?

- W) Compass
- X) Copper filings
- Y) Iron filings
- Z) Oscilloscope [*uh-SIL-uh-skohp*]

ANSWER: Y) IRON FILINGS

BONUS

12) ENERGY *Multiple Choice* Which of the following is closest to the percentage of the nuclear power reactors in the U.S. that use nuclear fusion for developing the heat required for generating electricity?

- W) 0%
- X) 7%
- Y) 26%
- Z) 100%

ANSWER: W) 0%

TOSS-UP

13) MATH *Multiple Choice* A side of a square is represented by $(x - 5)$. Which of the following expressions represents the area of the square?

- W) $x^2 - 25$
- X) $x^2 + 25$
- Y) $x^2 - 10x + 25$
- Z) $x^2 + 10x + 25$

ANSWER: Y) $x^2 - 10x + 25$

BONUS

13) MATH *Multiple Choice* If $(x - y)/(x + y) = 2/3$, what is the ratio of x to y ?

- W) 5:1
- X) 5:3
- Y) 3:5
- Z) 1:5

ANSWER: W) 5:1

TOSS-UP

14) PHYSICAL SCIENCE *Multiple Choice* Which of the following components of a reaction is decreased when an organic catalyst is added to speed up the rate of a reaction?

- W) Activation energy
- X) Heat of reaction
- Y) Potential energy of the reactants
- Z) Occupancy time on the enzyme

ANSWER: W) ACTIVATION ENERGY

BONUS

14) PHYSICAL SCIENCE *Short Answer* You are given a triangularly shaped block of copper and asked the volume of the block. Unable to remember any geometric volume formulas, you use a balance and find the block has a mass of 6.742 kilograms. Given that the density of copper is 8.96 grams per milliliter, what is the volume in milliliters of the block you were given, to the nearest 10 milliliters?

ANSWER: 750

TOSS-UP

15) GENERAL SCIENCE *Multiple Choice* Catabolic reactions break down large molecules into smaller ones. These reactions are usually which of the following?

- W) Exothermic
- X) Enzymes
- Y) Endothermic
- Z) Anabolic

ANSWER: W) EXOTHERMIC

BONUS

15) GENERAL SCIENCE *Multiple Choice* Gibbs free energy values determine whether a reaction is spontaneous or nonspontaneous. Which of the following Gibbs free energy values would cause the fastest reaction rate?

- W) 0
- X) -1.5
- Y) -15
- Z) Cannot be determined from the given information

ANSWER: Z) CANNOT BE DETERMINED FROM THE GIVEN INFORMATION

TOSS-UP

16) EARTH AND SPACE *Multiple Choice* Which of the following pairs of ions is responsible for more than 75% of the salt in seawater?

- W) Chloride and calcium
- X) Calcium and potassium
- Y) Sodium and potassium
- Z) Sodium and chloride

ANSWER: Z) SODIUM AND CHLORIDE

BONUS

16) EARTH AND SPACE *Short Answer* In recent years, marine organisms have experienced problems building their shells because oceans are absorbing greater amounts of carbon dioxide. What is this process called?

ANSWER: OCEAN ACIDIFICATION

TOSS-UP

17) LIFE SCIENCE *Multiple Choice* Which of the following is NOT one of the functions of water in photosynthesis?

- W) Donates electrons to replace those removed from chlorophyll in photosystem II
- X) Donates H^+ that will be used to generate a proton gradient to drive the synthesis of ATP from ADP
- Y) Provides H^+ to reduce NADPH to $NADP^+$
- Z) Generates oxygen through hydrolysis

ANSWER: Y) PROVIDES H^+ TO REDUCE NADPH TO $NADP^+$

BONUS

17) LIFE SCIENCE *Multiple Choice* Among adult humans, there is a wide range of individual heights. When the heights of members in a population are plotted, a bell shaped curve is formed. Which of the following types of inheritance patterns would most likely cause this phenotypic [*fee-nuh-TY-pik*] outcome?

- W) Complete dominance
- X) Incomplete dominance
- Y) Co-dominance
- Z) Polygenic inheritance

ANSWER: Z) POLYGENIC INHERITANCE

TOSS-UP

18) GENERAL SCIENCE *Multiple Choice* Which of the following is NOT required for photosynthesis to occur?

- W) CO_2
- X) H_2O
- Y) $C_6H_{12}O_2$
- Z) Photons

ANSWER: Y) $C_6H_{12}O_2$

BONUS

18) GENERAL SCIENCE *Multiple Choice* Suppose a chemical reaction occurs, and a reddish brown gas is released. Which of the following could possibly be this gas?

- W) Chlorine
- X) Bromine
- Y) Iodine
- Z) Argon

ANSWER: X) BROMINE

TOSS-UP

19) MATH *Short Answer* How many different ways can 5 people stand in a single-file line?

ANSWER: 120

BONUS

19) MATH *Short Answer* A square with sides of length $x + 2$ and an equilateral triangle with sides of length $2x$ have equal perimeters. What is the value of x ?

ANSWER: 4

TOSS-UP

20) PHYSICAL SCIENCE *Multiple Choice* Which of the following elements can form a monatomic gas at standard temperature and pressure?

- W) Neon
- X) Oxygen
- Y) Nitrogen
- Z) Fluorine

ANSWER: W) NEON

BONUS

20) PHYSICAL SCIENCE *Short Answer* If 40 grams of water at 0° Celsius is added to 10 grams of water at 100° Celsius, what will be the final temperature of the mixture, in degrees Celsius?

ANSWER: 20°

TOSS-UP

21) LIFE SCIENCE *Multiple Choice* According to the botanical definition, examples of fruits include which of the following?

- W) Tomato, coconut, acorn, celery, and garlic
- X) Orange, cantaloupe, acorn, tomato, bell pepper
- Y) Garlic, onion, tomato, orange, mango
- Z) Eggplant, tomato, apple, potato, onion

ANSWER: X) ORANGE, CANTALOUPE, ACORN, TOMATO, BELL PEPPER

BONUS

21) LIFE SCIENCE *Multiple Choice* Hydrogen peroxide is often used to clean wounds. It reacts with catalase to do which of the following?

- W) Generate pure oxygen
- X) Acidify the immediate area
- Y) Generate toxins that stop bacterial cell wall production
- Z) Generate pure nitrogen

ANSWER: W) GENERATE PURE OXYGEN

TOSS-UP

22) GENERAL SCIENCE *Multiple Choice* Which of the following is a defining characteristic of plankton?

- W) They are photosynthetic
- X) They are multicellular
- Y) They are microscopic
- Z) They float

ANSWER: Z) THEY FLOAT

BONUS

22) GENERAL SCIENCE *Short Answer* A 5 kilogram block is placed at the top of a frictionless 30° ramp. Suppose gravity exerts a downward force of 10 newtons on the block. Assuming the ramp is sufficiently long, how many meters does the block travel in the first 2 seconds?

ANSWER: 2

TOSS-UP

23) LIFE SCIENCE *Multiple Choice* Ferns differ from gymnosperms and angiosperms in which of the following ways?

- W) Ferns do not produce seeds, while gymnosperms and angiosperms do
- X) The dominant life stage of ferns is haploid, while gymnosperms and angiosperms are diploid
- Y) Ferns do not have non-motile sperm, whereas angiosperms and gymnosperms do
- Z) Ferns do not have xylem or phloem [**FLOH-em**], whereas gymnosperms and angiosperms do

ANSWER: W) FERNS DO NOT PRODUCE SEEDS, WHILE GYMNOSPERMS AND ANGIOSPERMS DO

BONUS

23) LIFE SCIENCE *Short Answer* In the laboratory, scientists need tools to cut DNA in specific places. What type of enzyme, first discovered in the 1970s, do scientists primarily use to do controlled cuts of the DNA in specific sequences?

ANSWER: RESTRICTION ENZYME (ACCEPT: RESTRICTION ENDONUCLEASE)

TOSS-UP

24) ENERGY *Short Answer* What is the key ingredient in corn needed to produce ethanol?

ANSWER: SUGAR (ACCEPT: CELLULOSE, GLUCOSE, SUCROSE)

BONUS

24) ENERGY *Multiple Choice* If a car could go 30 miles on one gallon of gasoline, approximately how far in miles would the same car go on one gallon of ethanol?

- W) 10
- X) 20
- Y) 30
- Z) 40

ANSWER: X) 20

TOSS-UP

25) EARTH AND SPACE *Multiple Choice* Dimethylsulfide [**dy-meth-uhl-SUHL-fyd**], or DMS, is a byproduct of biological activity in sea ice and a major source of cloud nuclei [**NOO-kee-eye**] to the atmosphere. Which of the following is true?

- W) DMS levels in ice-free regions of ocean are higher than in ice-laden regions
- X) The Antarctic atmosphere receives the highest amounts of atmospheric DMS during the spring to early summer months (November through December)
- Y) Dissolved DMS concentrations are highest in Southern Ocean waters during the winter (July through August)
- Z) Release of DMS into the Antarctic atmosphere reduces the amount of regional cloud cover during the start of the summer season

ANSWER: X) THE ANTARCTIC ATMOSPHERE RECEIVES THE HIGHEST AMOUNTS OF ATMOSPHERIC DMS DURING THE SPRING TO EARLY SUMMER MONTHS (NOVEMBER THROUGH DECEMBER)

BONUS

25) EARTH AND SPACE *Multiple Choice* High level clouds that are composed of ice crystals and can give the Sun or Moon a "halo" are called which of the following?

- W) Cirrostratus
- X) Stratocumulus
- Y) Cumulonimbus [**kyoo-myuh-loh-NIM-buhs**]
- Z) Nimbostratus

ANSWER: W) CIRROSTRATUS