

ROUND 7

TOSS-UP

1) PHYSICAL SCIENCE *Short Answer* What is the pH of a neutral aqueous solution?

ANSWER: 7

BONUS

1) PHYSICAL SCIENCE *Short Answer* If a solution has a low pH, what ion predominates in the solution?

ANSWER: HYDRONIUM (ACCEPT: HYDROGEN or H_3O^+ or H^+)

TOSS-UP

2) EARTH SCIENCE *Multiple Choice* When the nickel-iron crystals in iron meteorites cool very slowly it often causes them to:

- W) fall apart
- X) be exceedingly brittle with a flake-like appearance
- Y) have large crystals
- Z) have a soft outer layer and a dense hard inner core

ANSWER: Y) HAVE LARGE CRYSTALS

BONUS

2) EARTH SCIENCE *Multiple Choice* Which of the following is NOT typically true about fossils:

- W) index fossils are not geographically widespread
- X) fossilized marine animals have been found in the Himalayan Mountains
- Y) fossils found in tar pits are very well preserved
- Z) petrified wood is a type of fossil

ANSWER: W) INDEX FOSSILS ARE NOT GEOGRAPHICALLY WIDESPREAD

TOSS-UP

3) MATH *Short Answer* Giving your answer in meters to the first decimal place, if one leg of an isosceles right triangle is 10 meters long, how long is the hypotenuse?

ANSWER: 14.1

(Solution: $c = a\sqrt{2} = 10\sqrt{2} = 14.1\text{m}$)

BONUS

3) MATH *Short Answer* Consider 2 cars that start from the same point along a highway and travel in the same direction. One car travels at a constant rate of 40 miles per hour and the other at a constant rate of 50 miles per hour. How many hours later are the cars 40 miles apart?

ANSWER: 4

TOSS-UP

4) GENERAL SCIENCE *Multiple Choice* If you draw a triangle on a sphere such as a basketball, which of the following is TRUE:

- W) the sum of the 3 angles is greater than 180°
- X) the sum of the 3 angles is equal to 180°
- Y) the sum of the 3 angles is less than 180°
- Z) the triangle has negative curvature and is not considered a triangle

ANSWER: W) THE SUM OF THE 3 ANGLES IS GREATER THAN 180°

BONUS

4) GENERAL SCIENCE *Short Answer* What metallic element is silvery white, takes on a high polish, is extensively used for making stainless steel and other corrosion-resistant alloys, and is used in making rechargeable batteries?

ANSWER: NICKEL (ACCEPT: Ni)

TOSS-UP

5) LIFE SCIENCE *Short Answer* The grasshopper body is grossly divided into what 3 parts?

ANSWER: HEAD; THORAX; ABDOMEN (in any order)

BONUS

5) LIFE SCIENCE *Multiple Choice* Which of the following is the primary excretory organ of the grasshopper:

- W) mandible
- X) gonopore
- Y) malpighian (read as: MAL-pig-ee-an) tube
- Z) siphon

ANSWER: Y) MALPIGHIAN TUBE

TOSS-UP

6) PHYSICAL SCIENCE *Short Answer* If a screwdriver is used to tighten a screw, then the screwdriver is an example of what simple machine?

ANSWER: WHEEL AND AXLE

BONUS

6) PHYSICAL SCIENCE *Short Answer* What is the force, in newtons, with which gravity pulls a 70-kilogram person towards the Earth's surface?

ANSWER: 686 (ACCEPT: 700)

TOSS-UP

7) EARTH SCIENCE *Short Answer* Human-induced global climate change is believed to be caused primarily by the release of what gas into the atmosphere?

ANSWER: CARBON DIOXIDE (ACCEPT: CO₂)

BONUS

7) EARTH SCIENCE *Multiple Choice* Which of the following is a gas that is a pollutant when present in the troposphere but beneficial when present in the stratosphere:

- W) nitrogen
- X) chlorofluorocarbons
- Y) hydrogen
- Z) ozone

ANSWER: Z) OZONE

TOSS-UP

The toss-up and bonus for Question 8 have been omitted.

TOSS-UP

9) GENERAL SCIENCE *Multiple Choice* Which of the following produces red-colored eyes in humans in some photographs taken with a flash:

- W) light that reflects off the retina
- X) light of a certain wavelength that is scattered by the cornea
- Y) light that is illuminating the optic nerve
- Z) certain films react with red light more than others

ANSWER: W) LIGHT THAT REFLECTS OFF THE RETINA

BONUS

9) GENERAL SCIENCE *Short Answer* Giving your answer in meters rounded to the second decimal place, add 2,500 centimeters to 350 millimeters:

ANSWER: 25.35

(Solution: $2500\text{cm} = 25\text{m}$; $350\text{mm} = 0.35\text{m}$; $25\text{m} + 0.35\text{m} = 25.35\text{ meters}$)

TOSS-UP

10) LIFE SCIENCE *Short Answer* How many chromosomes does a mature human sperm typically have?

ANSWER: 23

BONUS

10) LIFE SCIENCE *Short Answer* Of the 4 main blood types, what type has the LEAST amount of reacting antigens and is therefore the most common type for blood transfusions?

ANSWER: O

TOSS-UP

11) PHYSICAL SCIENCE *Multiple Choice* Which of the following is NOT true concerning pure liquid water:

- W) it is a good solvent for simple sugars
- X) it has a high specific heat
- Y) it is a requirement for all known life forms
- Z) the colder it gets the denser it gets from 100°C to 0°C

ANSWER: Z) THE COLDER IT GETS THE DENSER IT GETS FROM 100°C TO 0°C

BONUS

11) PHYSICAL SCIENCE *Multiple Choice* Which of the following is LEAST accurate:

- W) water is a molecule composed of two hydrogen atoms and one oxygen atom
- X) each carbon dioxide molecule has 2 oxygen atoms
- Y) dioxide means something has two oxygen molecules
- Z) carbon dioxide is made of two elements

ANSWER: Y) DIOXIDE MEANS SOMETHING HAS TWO OXYGEN MOLECULES

TOSS-UP

12) EARTH SCIENCE *Multiple Choice* To calculate the distance between an earthquake epicenter and a seismograph, seismologists construct a time-travel curve. What 2 seismic waves are plotted on this curve:

- W) P-waves and S-waves
- X) P-waves and surface waves
- Y) S-waves and surface waves
- Z) P-waves and L-waves

ANSWER: W) P-WAVES AND S-WAVES

BONUS

12) EARTH SCIENCE *Short Answer* Of the following 3 seismic waves, name all that can travel through Earth's liquid outer core: S-wave; surface wave; P-wave

ANSWER: P-WAVE

TOSS-UP

13) MATH *Short Answer* If $a + b = 12$, $b + c = 20$, and $c + d = 6$, find a if $d = 1$:

ANSWER: -3

(Solution: $c + 1 = 6$, $c = 5$; $b + 5 = 20$, $b = 15$; $a + 15 = 12$, $a = -3$)

BONUS

13) MATH *Short Answer* Using $\pi = 3.14$, give the integer value, in square centimeters, for the area of a circle whose diameter is 200 centimeters:

ANSWER: 31,400

(Solution: $A = \pi r^2 = (3.14)(100)^2 = 31,400 \text{ cm}^2$)

TOSS-UP

14) GENERAL SCIENCE *Multiple Choice* Which of the following statements is NOT true:

- W) yeast reproduces asexually
- X) lichens are the mainstay of the caribou diet
- Y) coal is not a native mineral
- Z) a spider's web is made from a specialized carbohydrate

ANSWER: Z) A SPIDER'S WEB IS MADE FROM A SPECIALIZED CARBOHYDRATE

BONUS

14) GENERAL SCIENCE *Multiple Choice* Which of the following celestial objects is the farthest from Earth:

- W) the most distant quasar
- X) the Andromeda galaxy
- Y) the closest binary star
- Z) Vega

ANSWER: W) THE MOST DISTANT QUASAR

TOSS-UP

15) LIFE SCIENCE *Short Answer* What is the scientific term for the male reproductive structure in plants?

ANSWER: STAMEN (ACCEPT: ANTHER)

BONUS

15) LIFE SCIENCE *Short Answer* What is the MOST common term for the root system in most dicots?

ANSWER: TAP ROOT

TOSS-UP

16) PHYSICAL SCIENCE *Multiple Choice* Which of the following occurs as a bottle of milk falls from the edge of a table until just before it strikes a floor:

- W) all the bottle's potential energy is lost to heat and friction
- X) the potential energy of the bottle decreases
- Y) the potential energy of the bottle increases
- Z) the total potential energy of the bottle remains the same

ANSWER: X) THE POTENTIAL ENERGY OF THE BOTTLE DECREASES

BONUS

16) PHYSICAL SCIENCE *Short Answer* What is the total pressure, in atmospheres, at a depth of 40 meters in saltwater?

ANSWER: 5 (ACCEPT 4.87)

TOSS-UP

17) EARTH SCIENCE *Multiple Choice* Where does most of Earth's groundwater come from:

- W) percolation of seawater into underground aquifers where it undergoes natural desalination
- X) precipitation
- Y) aquifers that have been there since Earth's origin
- Z) glacial melting and runoff

ANSWER: X) PRECIPITATION

BONUS

17) EARTH SCIENCE *Multiple Choice* A conglomerate rock belongs to which of the following groups of rocks:

- W) foliated metamorphic
- X) clastic sedimentary
- Y) chemical sedimentary
- Z) organic sedimentary

ANSWER: X) CLASTIC SEDIMENTARY

TOSS-UP

18) MATH *Short Answer* Solve the following equation for x : $|(x - 3)| = -7$ (read as: the absolute value of, parenthesis, $x - 3$, close parenthesis, equals negative 7)

ANSWER: NO SOLUTION (ACCEPT: EMPTY SET)

BONUS

18) MATH *Short Answer* Solve the following equation for x over the real number: $(64)^2 = 16x^2$

ANSWER: 16 and -16

TOSS-UP

19) GENERAL SCIENCE *Multiple Choice* Which of the following is the primary industrial use for diamond dust:

- W) it is melted and made into liquid crystal displays
- X) as an abrasive
- Y) as a bonding agent in high-end ceramics
- Z) as a strengthening agent in high-tech cements

ANSWER: X) AS AN ABRASIVE

BONUS

19) GENERAL SCIENCE *Multiple Choice* Which of the following BEST explains why when a balloon filled with air is moved from a cold room to a warm room, the balloon expands:

- W) the air pressure on the outside of the balloon is now greater
- X) the air molecules inside the balloon get bigger
- Y) the air molecules inside the balloon move faster
- Z) the room's air molecules are repelled from the outside of the balloon by electrostatic forces

ANSWER: Y) THE AIR MOLECULES INSIDE THE BALLOON MOVE FASTER

TOSS-UP

20) LIFE SCIENCE *Multiple Choice* Which of the following trees have simple, pinnate leaves:

- W) red oak and fig
- X) sugar maple and sycamore
- Y) sassafras and palm
- Z) cherry and apple

ANSWER: Z) CHERRY AND APPLE

BONUS

20) LIFE SCIENCE *Short Answer* Of the 4 general types of biological molecules: proteins, carbohydrates, lipids and nucleic acids, under which one would most enzymes be categorized?

ANSWER: PROTEINS

TOSS-UP

21) PHYSICAL SCIENCE *Multiple Choice* The octet rule MOST directly involves which of the following:

- W) only atoms with 8 or more protons
- X) the sharing of valence electrons
- Y) the balance of neutrons to protons
- Z) the loss of protons in radioactive decay

ANSWER: X) THE SHARING OF VALENCE ELECTRONS

BONUS

21) PHYSICAL SCIENCE *Multiple Choice* Which of the following is LEAST accurate:

- W) all atoms have protons in their nuclei
- X) covalent bonding of atoms involves the sharing of electrons
- Y) potassium and bromine normally form covalent bonds
- Z) most of the mass of an atom is in its nucleus and the atom is mostly empty space

ANSWER: Y) POTASSIUM AND BROMINE NORMALLY FORM COVALENT BONDS

TOSS-UP

22) EARTH SCIENCE *Multiple Choice* Oceanic crust being formed at spreading centers is primarily made of:

- W) granite
- X) basalt
- Y) peridotite
- Z) andesite

ANSWER: X) BASALT

BONUS

22) EARTH SCIENCE *Short Answer* What is the name of the process that occurs along a convergent plate boundary whereby one of the plates bends and sinks into the mantle?

ANSWER: SUBDUCTION

TOSS-UP

23) MATH *Short Answer* If Dan can paint a wall in 3 hours but Ryan takes 6 hours, how many hours will it take them to paint the wall if they work together?

ANSWER: 2

(Solution: $1/x = 1/3 + 1/6$; $x = 2$ hrs)

BONUS

23) MATH *Short Answer* Subtract the following, giving your answer in simplest radical form:
 $(\sqrt{20}) - (2\sqrt{45})$

ANSWER: $-4\sqrt{5}$

TOSS-UP

24) GENERAL SCIENCE *Multiple Choice* Pheromones are chemicals produced by various species and function primarily in:

- W) camouflage
- X) digestion
- Y) sweat secretion
- Z) communication

ANSWER: Z) COMMUNICATION

BONUS

24) GENERAL SCIENCE *Multiple Choice* Which of the following U.S. states is LEAST prone to having earthquakes because it does not lie near an existing fault zone:

- W) Florida
- X) Alaska
- Y) Washington
- Z) Missouri

ANSWER: W) FLORIDA

TOSS-UP

25) LIFE SCIENCE *Short Answer* What is the scientific term for the process arthropods go through to shed their exoskeleton to allow them to grow into a new one?

ANSWER: MOLTING

BONUS

25) LIFE SCIENCE *Short Answer* What is the primary protein from which eagles talons are made?

ANSWER: KERATIN