

ROUND 9

TOSS-UP

1) GENERAL SCIENCE *Multiple Choice* The giant Arecibo telescope depicted in the movie *Contact* is:

- W) a gamma ray telescope
- X) an x-ray telescope
- Y) an adaptive optical infrared telescope
- Z) a radio telescope

ANSWER: Z) A RADIO TELESCOPE

BONUS

1) GENERAL SCIENCE *Multiple Choice* Which of the following is NOT true about solutions:

- W) ethylene glycol, or antifreeze, lowers the freezing point of water in a car radiator
- X) reverse osmosis is used to convert salt water into fresh water
- Y) the presence of colloidal particles in solution is easily detected by a beam of light
- Z) a solution of hydrochloric acid acts as an ideal proton acceptor

ANSWER: Z) A SOLUTION OF HYDROCHLORIC ACID ACTS AS AN IDEAL PROTON ACCEPTOR

TOSS-UP

2) LIFE SCIENCE *Multiple Choice* Which of the following is the BEST explanation for what would happen to a red blood cell if it were placed in a 25% sugar solution:

- W) it would lose salt to the sugar solution and gain sugar and remain the same size
- X) it would gain salt and swell
- Y) it would lose water to the sugar solution and gain salt and remain the same size
- Z) it would lose water to the sugar solution and shrink

ANSWER: Z) IT WOULD LOSE WATER TO THE SUGAR SOLUTION AND SHRINK

BONUS

2) LIFE SCIENCE *Short Answer* When blood returns to the human heart from the lower part of the body, to what specific chamber will the blood first enter?

ANSWER: RIGHT ATRIUM (DO NOT ACCEPT: ATRIUM)

TOSS-UP

3) PHYSICAL SCIENCE *Short Answer* Butane is made up of what 2 elements?

ANSWER: CARBON AND HYDROGEN (ACCEPT: C AND H)

BONUS

3) PHYSICAL SCIENCE *Short Answer* If a block of wood floats with 22% of its volume not submerged, what is its density, to the second decimal place in grams per cubic centimeter?

ANSWER: 0.78

TOSS-UP

4) EARTH SCIENCE *Multiple Choice* Sinuous ridges of sand and gravel that form beneath the lower end of a glacier in the ablation zone are called:

- W) sandbars
- X) fjords
- Y) eskers
- Z) dikes

ANSWER: Y) ESKERS

BONUS

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

- W) a complete tidal day is more than 24 hours long
- X) tides are influenced by gravitational attractions
- Y) the Sun's influence on Earth's tides is about 2-times greater than the Moon's influence
- Z) each lunar day, some coastlines have 2 high tides and 2 low tides whereas some have only have 1 high tide and 1 low tide

ANSWER: Y) THE SUN'S INFLUENCE ON EARTH'S TIDES IS ABOUT 2-TIMES GREATER THAN THE MOON'S INFLUENCE

TOSS-UP

5) MATH *Multiple Choice* Which of the following is NOT true about slopes:

- W) the slope of a line is defined as the ratio of vertical change to horizontal change
- X) if 2 non-vertical lines are perpendicular, their slopes are negative reciprocals
- Y) parallel lines have the same slope
- Z) if a line is parallel to the x -axis, its slope is 1

ANSWER: Z) IF A LINE IS PARALLEL TO THE X -AXIS, ITS SLOPE IS 1

BONUS

5) MATH *Short Answer* Give the numerical value of 5 factorial minus 4 factorial:

ANSWER: 96

TOSS-UP

6) GENERAL SCIENCE *Multiple Choice* Which of the following is NOT true in nutrition:

- W) poor diet and exercise in youths and adolescents are risk factors for osteoporosis in later life
- X) selenium is considered a trace element
- Y) calcium plays a central role in blood clotting and muscle function
- Z) vitamin E is a water-soluble vitamin

ANSWER: Z) VITAMIN E IS A WATER-SOLUBLE VITAMIN

BONUS

6) GENERAL SCIENCE *Multiple Choice* Although bioflavonoids and phytochemicals are not true vitamins, they are commonly sold as a vitamin supplement and are most commonly known for their antioxidant activity. Which of the following is the BEST dietary source for these compounds:

- W) fish
- X) fruit
- Y) meat
- Z) dairy

ANSWER: X) FRUIT

TOSS-UP

7) LIFE SCIENCE *Short Answer* Stomata are each made of how many guard cells?

ANSWER: 2

BONUS

7) LIFE SCIENCE *Short Answer* Name all of the following 4 cell types that function as dead cells for water transport in higher plants: tracheids (read as: TRAY-key-ids); sieve tubes; parenchyma (read as: par-en-key-mah); vessel elements

ANSWER: TRACHEIDS; VESSEL ELEMENTS

TOSS-UP

8) PHYSICAL SCIENCE *Multiple Choice* Acids are often defined as proton donors. Which of the following is the common form of this proton:

- W) salts
- X) positive hydrogen ion
- Y) positron
- Z) buffer

ANSWER: X) POSITIVE HYDROGEN ION

BONUS

8) PHYSICAL SCIENCE *Multiple Choice* Which of the following BEST explains where the bubbles in a boiling pot of water come from:

- W) the water is condensing
- X) hydrogen gas is produced and it rises quickly through the water
- Y) the water is vaporizing
- Z) oxygen from the atmosphere enters the water

ANSWER: Y) THE WATER IS VAPORIZING

TOSS-UP

9) EARTH SCIENCE *Multiple Choice* Which of the following is a landform typically formed by glaciers and can be used to determine which way an ancient glacier moved:

- W) dike
- X) pluton
- Y) U-shaped valley
- Z) drumlin

ANSWER: Z) DRUMLIN

BONUS

9) EARTH SCIENCE *Multiple Choice* Which of the following is the global wind system that most influences weather between 60° and 90° north and south latitudes:

- W) tropical easterlies
- X) prevailing westerlies
- Y) trade winds
- Z) polar easterlies

ANSWER: Z) POLAR EASTERLIES

TOSS-UP

10) MATH *Short Answer* Giving your answer in the simplest form, what is the slope-intercept equation of the line with a slope of 4 and passing through the point (0, 15)?

ANSWER: $y = 4x + 15$

BONUS

10) MATH *Short Answer* Find the solution set for the following inequality: $15 - x \geq 3x + 6$

ANSWER: $X \leq \frac{9}{4}$

(ACCEPT THE STATEMENT: ALL NUMBERS LESS THAN OR EQUAL TO $\frac{9}{4}$ or $2\frac{1}{4}$)

TOSS-UP

11) GENERAL SCIENCE *Multiple Choice* Coal-burning factory smokestacks in Chicago that release large quantities of pollutants that contribute to acid rain primarily affect which of the following areas:

- W) a regional area within the immediate vicinity of the factory
- X) within about a 1,000 kilometer radius of the factory
- Y) long-range downwind as far away as New England
- Z) most of the U.S. and Canada

ANSWER: Y) LONG-RANGE DOWNWIND AS FAR AWAY AS NEW ENGLAND

BONUS

11) GENERAL SCIENCE *Multiple Choice* Almost all synthetic adhesives are:

- W) polymers
- X) protein based
- Y) ionic bonded non-metals
- Z) covalent-bonded metals

ANSWER: W) POLYMERS

TOSS-UP

12) LIFE SCIENCE *Multiple Choice* Which of the following is the BEST description of the primary function of a protein enzyme:

- W) a catalyst made of amino acids
- X) a string of amino acids added to a sugar to make the sugar stronger
- Y) to store genetic information
- Z) as a short term form of energy storage

ANSWER: W) A CATALYST MADE OF AMINO ACIDS

BONUS

12) LIFE SCIENCE *Multiple Choice* Which of the following is NOT true about the human eye:

- W) the cornea acts as a lens with a fixed shape
- X) images that are formed on the retina are inverted
- Y) most of the eye is filled with a liquid called the aqueous humor
- Z) vitamin A is important for light absorbing molecules critical in vision

ANSWER: Y) MOST OF THE EYE IS FILLED WITH A LIQUID CALLED THE AQUEOUS HUMOR

TOSS-UP

13) PHYSICAL SCIENCE *Short Answer* What atomic particle is most directly responsible for fissioning each nucleus in an atomic chain reaction?

ANSWER: NEUTRON

BONUS

13) PHYSICAL SCIENCE *Multiple Choice* Which of the following must increase for the particles in a closed container of a constant volume if the temperature in the container increases:

- W) kinetic energy
- X) heat of fusion
- Y) total mass
- Z) mechanical energy

ANSWER: W) KINETIC ENERGY

TOSS-UP

14) EARTH SCIENCE *Multiple Choice* Which of the following is a simple device that can be used to show that the Earth rotates on its axis:

- W) the astrolabe
- X) Foucault Pendulum
- Y) gnomon
- Z) an interferometer

ANSWER: X) FOUCAULT PENDULUM

BONUS

14) EARTH SCIENCE *Multiple Choice* Which of the following is NOT true about magma:

- W) volcanic glass results when magma cools very slowly
- X) fluid basaltic magma typically produces the least pyroclastic material
- Y) granitic magma contains more silica and water than basaltic magma
- Z) andesitic magma is dominant in volcanoes around the Pacific Ocean Basin

ANSWER: W) VOLCANIC GLASS RESULTS WHEN MAGMA COOLS VERY SLOWLY

TOSS-UP

15) MATH *Short Answer* Find the midpoint of the line segment joining the following pair of points: (4, 1) and (12, 7)

ANSWER: (8, 4)

(Solution: midpoint $x = (x_1 + x_2)/2 = (4 + 12)/2 = 8$; midpoint $y = (y_1 + y_2)/2 = (1 + 7)/2 = 4$)

BONUS

15) MATH *Short Answer* If one endpoint of a given line segment is at point (-2, 1) and the midpoint is at (8, 1), find the other endpoint:

ANSWER: (18, 1)

TOSS-UP

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

- W) when diluting strong acids, it is safer to pour the acid into the water
- X) carbon monoxide is a poisonous gas
- Y) iron plays a central role in the chlorophyll molecule
- Z) the pH of soapy water is basic

ANSWER: Y) IRON PLAYS A CENTRAL ROLE IN THE CHLOROPHYLL MOLECULE

(Solution: magnesium in chlorophyll, iron in hemoglobin)

BONUS

16) GENERAL SCIENCE *Multiple Choice* Which of the following diseases is LEAST likely to respond to antibiotics:

- W) pertussis or whooping cough
- X) tetanus
- Y) hepatitis C
- Z) strep throat

ANSWER: Y) HEPATITIS C

TOSS-UP

17) LIFE SCIENCE *Short Answer* Many raptors suffered great declines in their populations in the mid-20th century by exposure to what outlawed insecticide?

ANSWER: DDT (ACCEPT: DICHLORO-DIPHENYL-TRICHLOROETHANE)

BONUS

17) LIFE SCIENCE *Multiple Choice* Which of the following is the BEST explanation of why DDT was such a problem for raptors:

- W) it is stable and accumulates in animals as it moves up the food chain
- X) it causes extreme light sensitivity and since raptors have no eye lids it causes them to go blind quickly
- Y) it is highly concentrated in the kidneys of mice which are a main food source of most raptors
- Z) raptors are extremely sensitive to very low doses of DDT and it causes immediate death on exposure

ANSWER: W) IT IS STABLE AND ACCUMULATES IN ANIMALS AS IT MOVES UP THE FOOD CHAIN

TOSS-UP

18) PHYSICAL SCIENCE *Short Answer* How many atoms of each element are in the following chemical compound: $\text{Al}(\text{NO}_3)_3$

ANSWER: Al (Aluminum) = 1; N (Nitrogen) = 3; O (Oxygen) = 9

BONUS

18) PHYSICAL SCIENCE *Short Answer* Name all of the following 4 choices that are natural polymers: starch; ethanol; DNA; dextrose

ANSWER: STARCH AND DNA

TOSS-UP

19) EARTH SCIENCE *Multiple Choice* Meandering streams are most commonly noted to form which of the following specific bodies of water:

- W) high mountain stagnant pond
- X) fen
- Y) bog
- Z) oxbow lake

ANSWER: Z) OXBOW LAKE

BONUS

19) EARTH SCIENCE *Multiple Choice* Which of the following is believed to create Earth's magnetic field:

- W) the tilt in Earth's axis rocking Earth's inner core
- X) the spinning of Earth's outer core
- Y) the Coriolis effect
- Z) how fast the Earth revolves around the Sun

ANSWER: X) THE SPINNING OF EARTH'S OUTER CORE

TOSS-UP

20) MATH *Short Answer* What is the greatest common factor and the least common multiple of the following 3 numbers, respectively: 3, 6, and 8

ANSWER: GCF = 1; LCM = 24

BONUS

20) MATH *Short Answer* Find the product of the following 2 binomials, giving your answer in standard form: $(-x - 3y)(-x + 3y)$

ANSWER: $x^2 - 9y^2$

TOSS-UP

21) GENERAL SCIENCE *Multiple Choice* Buffers in biological fluids primarily work to resist changes in:

- W) temperature
- X) pH
- Y) toxins
- Z) osmotic pressure

ANSWER: X) pH

BONUS

21) GENERAL SCIENCE *Short Answer* Order the following 4 metric units from the SMALLEST to the LARGEST: microgram; nanogram; picogram; milligram

ANSWER: PICOGRAM; NANOGRAM; MICROGRAM; MILLIGRAM

TOSS-UP

22) LIFE SCIENCE *Short Answer* Which one of the following 5 trees would be LEAST characteristic in a temperate deciduous forest: maple; aspen; red oak; birch; palm

ANSWER: PALM

BONUS

22) LIFE SCIENCE *Short Answer* What is the specific scientific term for organisms that can grow in high temperature environments, such as in undersea thermal vents?

ANSWER: THERMOPHILES (ACCEPT: THERMOPHILIC ORGANISMS/BACTERIA)

TOSS-UP

23) PHYSICAL SCIENCE *Short Answer* What is the ideal mechanical advantage of a ramp 16 meters long and 2 meters high that has a frictional coefficient of 2?

ANSWER: 8

BONUS

23) PHYSICAL SCIENCE *Short Answer* How many amperes of current are running through a 3,600 watt space heater on a 120 volt electric line?

ANSWER: 30

(Solution: current = watts/volts; $3600/120 = 30$ amperes)

TOSS-UP

24) EARTH SCIENCE *Multiple Choice* Which of the following types of sea floor is the youngest:

- W) abyssal plain
- X) abyssal hill
- Y) mid-ocean ridge
- Z) continental shelf

ANSWER: Y) MID-OCEAN RIDGE

BONUS

24) EARTH SCIENCE *Short Answer* If the Earth were a perfect sphere without large continents and land masses, how many low and high equally proportioned tides would occur each lunar day?

ANSWER: 2 HIGH AND 2 LOW

TOSS-UP

25) MATH *Short Answer* Simplify the following, giving your answer in standard form: $\frac{(x + x^2)}{x}$

ANSWER: $1 + x$ (ACCEPT: $x + 1$)

BONUS

25) MATH *Short Answer* Divide the polynomial, $x^2 + 12x + 32$, by the quantity $x + 4$:

ANSWER: $x + 8$