

ROUND 10A

TOSS-UP

1) MATH *Multiple Choice* If θ_1 [**theta sub 1**] and θ_2 [**theta sub 2**] are complementary angles then which of the following is always correct?

W) $\tan\theta_1 = -\tan\theta_2$ [**tangent of theta sub 1 equals negative tangent of theta sub 2**]

X) $\sin\theta_1 = \sin\theta_2$ [**sine of theta sub 1 equals sine of theta sub 2**]

Y) $\sin\theta_1 = \cos\theta_2$ [**sine of theta sub 1 equals cosine of theta sub 2**]

Z) $\cos\theta_1 = \cos\theta_2$ [**cosine of theta sub 1 equals cosine of theta sub 2**]

ANSWER: Y) $\sin\theta_1 = \cos\theta_2$

BONUS

1) MATH *Short Answer* Evaluate the expression $x^2 - 6x + 9$ when $x = 3 - 2\sqrt{7}$:

ANSWER: 28

TOSS-UP

2) LIFE SCIENCE *Multiple Choice* Which of the following organisms has a carapace [**KAR-uh-pays**]?

W) Crayfish

X) Jellyfish

Y) Limpet

Z) Starfish

ANSWER: W) CRAYFISH

BONUS

2) LIFE SCIENCE *Multiple Choice* Which of the following is NOT a main class of connective tissue in humans?

W) Cellular

X) Connective tissue proper

Y) Cartilage

Z) Osseous [**OS-ee-uhs**]

ANSWER: W) CELLULAR

TOSS-UP

3) EARTH AND SPACE *Short Answer* What is the term for an earthquake's initial rupture point?

ANSWER: FOCUS (ACCEPT: HYPOCENTER)

BONUS

3) EARTH AND SPACE *Multiple Choice* Which of the following is NOT a consequence of a drought?

- W) Increased electricity due to wind generation
- X) Snake migration and increases in snake bites
- Y) Diminished crop yields
- Z) Dust storms

ANSWER: W) INCREASED ELECTRICITY DUE TO WIND GENERATION

TOSS-UP

4) GENERAL SCIENCE *Multiple Choice* Which of the following colors has the highest energy photons?

- W) Yellow
- X) Green
- Y) Blue
- Z) Red

ANSWER: Y) BLUE

BONUS

4) GENERAL SCIENCE *Short Answer* Performing electrolysis on water results in the production of which two diatomic gasses?

ANSWER: HYDROGEN AND OXYGEN

TOSS-UP

5) PHYSICAL SCIENCE *Multiple Choice* What happens to the wavelength and frequency of a wave when the amplitude of a wave increases?

- W) It stays the same
- X) It decreases then increases
- Y) It decreases
- Z) It increases

ANSWER: W) IT STAYS THE SAME

BONUS

5) PHYSICAL SCIENCE *Short Answer* What temperature in degrees Fahrenheit is equivalent to 10 degrees Celsius?

ANSWER: 50°

TOSS-UP

6) MATH *Multiple Choice* Jared has two standard 6-sided dice, one white and one red. If Jared tosses the dice, what is the probability he will get 4 on the white die and an odd number on the red die?

- W) 1/18
- X) 1/12
- Y) 1/6
- Z) 5/18

ANSWER: X) 1/12

BONUS

6) MATH *Short Answer* What fraction of the non-negative integers less than 30 are prime?

ANSWER: 1/3

TOSS-UP

7) ENERGY *Multiple Choice* What is the amperage in the following circuit: 14 volt power source and four 7-ohm light bulbs in series?

- W) 14 amps
- X) 2 amps
- Y) 1/2 amp
- Z) None of these

ANSWER: Y) 1/2 AMP

BONUS

7) ENERGY *Short Answer* What is the name of the process by which humans extract energy from the chemical bonds in food?

ANSWER: RESPIRATION (ACCEPT: DIGESTION)

TOSS-UP

8) LIFE SCIENCE *Multiple Choice* Which of the following types of interactions will NOT occur between enzymes and their substrates?

- W) Covalent bonding
- X) Ionic bonding
- Y) Hydrophobic interactions
- Z) Van der Waals interactions

ANSWER: W) COVALENT BONDING

BONUS

8) LIFE SCIENCE *Short Answer* Until recently, it was thought that the ecologically significant process of nitrogen fixation could only happen in the absence of what oxidant?

ANSWER: OXYGEN

TOSS-UP

9) EARTH AND SPACE *Multiple Choice* Which of the following is a stratovolcano?

- W) Galapagos Islands
- X) Olympus Mons
- Y) Mount St. Helens
- Z) The Hawaiian Island chain

ANSWER: Y) MOUNT ST. HELENS

BONUS

9) EARTH AND SPACE *Short Answer* The United States hosts a geologic sword of Damocles [**DAM-uh-kleez**]: the supervolcano. Under what national park is this supervolcano located?

ANSWER: YELLOWSTONE NATIONAL PARK

TOSS-UP

10) GENERAL SCIENCE *Short Answer* Which organelle is one of the defining characteristics of eukaryotic [**yoo-KAR-ee-oh-tik**] cells and is not present at all in prokaryotic cells [**proh-KAR-ee-oh-tik**]?

ANSWER: NUCLEUS

BONUS

10) GENERAL SCIENCE *Multiple Choice* Which of the following is NOT a trait of RNA which has been used to explain why it may have preceded DNA as the first information molecule?

- W) RNA can be replicated
- X) RNA can be catalytic
- Y) RNA is less stable than DNA
- Z) RNA is more stable than DNA

ANSWER: Z) RNA IS MORE STABLE THAN DNA

TOSS-UP

11) PHYSICAL SCIENCE *Multiple Choice* Stars are composed of a number of elements at their birth. Which of the following elements has the HIGHEST percent composition when a star is born?

- W) Hydrogen
- X) Neon
- Y) Oxygen
- Z) Helium

ANSWER: W) HYDROGEN

BONUS

11) PHYSICAL SCIENCE *Multiple Choice* Which of the following best describes chlorine at room temperature?

- W) A colorless gas
- X) Greenish-yellow gas
- Y) Reddish-brown liquid
- Z) Steel-gray solid

ANSWER: X) GREENISH-YELLOW GAS

TOSS-UP

12) MATH *Multiple Choice* Which of the following CANNOT be the lengths of the sides of a triangle?

- W) 1, 1, 1
- X) 1, 2, 4
- Y) 1, 75, 75
- Z) 2, 3, 4

ANSWER: X) 1, 2, 4

BONUS

12) MATH *Short Answer* The average of a set of 6 numbers is 9. When one more number is added, the average increases by 2. What number was added?

ANSWER: 23

TOSS-UP

13) LIFE SCIENCE *Multiple Choice* Which animal might live in a kelp forest?

- W) Beaver
- X) Otter
- Y) Seal
- Z) Oyster

ANSWER: X) OTTER

BONUS

13) LIFE SCIENCE *Multiple Choice* The seed coat of angiosperm seeds typically develops from which of the following?

- W) Integuments
- X) Polar nuclei [**NOO-klee-eye**]
- Y) Nucleus [**NOO-klee-uhs**]
- Z) Cotyledons [**kat-uhl-EED-uhns**]

ANSWER: W) INTEGUMENTS

TOSS-UP

14) EARTH AND SPACE *Multiple Choice* Which of the following is NOT an important component of the hydrologic cycle?

- W) Transpiration
- X) Condensation
- Y) Runoff
- Z) Respiration

ANSWER: Z) RESPIRATION

BONUS

14) EARTH AND SPACE *Short Answer* What kind of tide should be expected on June 10 if the last full moon was May 21?

ANSWER: SPRING TIDE

TOSS-UP

15) GENERAL SCIENCE *Short Answer* Endoplasmic reticulum [**EN-duh-plaz-mik ri-TIK-yuh-luhm**] is the site inside the cell where proteins and membranes are formed. There are two types: smooth and rough. What is the name of the structures present only on rough but absent on smooth endoplasmic reticulum?

ANSWER: RIBOSOMES

BONUS

15) GENERAL SCIENCE *Short Answer* What is another name for hurricanes or tropical cyclones in the western Pacific area and China seas?

ANSWER: TYPHOON

TOSS-UP

16) ENERGY *Multiple Choice* Which of the following represents a typical rechargeable battery?

- W) Carbon zinc
- X) Alkaline
- Y) Magnesium aluminum
- Z) Nickel cadmium

ANSWER: Z) NICKEL CADMIUM

BONUS

16) ENERGY *Multiple Choice* Some devices use electricity even after they are turned off. What is the term for this phenomenon?

- W) Efficiency load
- X) Phantom load
- Y) Voltage drop
- Z) Wattage reduction

ANSWER: X) PHANTOM LOAD

TOSS-UP

17) PHYSICAL SCIENCE *Multiple Choice* Which of the following loses its valence electrons the most readily?

- W) Active nonmetal
- X) Active metal
- Y) Inactive nonmetal
- Z) Inactive metal

ANSWER: X) ACTIVE METAL

BONUS

17) PHYSICAL SCIENCE *Short Answer* What is happening when an atom gives up an electron to another atom, thus forming two ions of opposite charge and greater stability?

ANSWER: FORMATION OF AN IONIC BOND (ACCEPT: IONIZATION, OXIDATION, REDOX)

TOSS-UP

18) MATH *Multiple Choice* At what point do the lines $x = 4$ and $y = x - 4$ intersect when graphed in the coordinate plane?

- W) (0, 4)
- X) (4, 0)
- Y) (0,-4)
- Z) (-4,0)

ANSWER: X) (4, 0)

BONUS

18) MATH *Short Answer* What is the 21st term of the arithmetic sequence with first three terms -18, -12, -6?

ANSWER: 102

TOSS-UP

19) LIFE SCIENCE *Multiple Choice* Which of the following is a major reason for “dead zones” in the ocean?

- W) Too many predators
- X) Use of fertilizers
- Y) Lack of upwelling
- Z) Recreational ocean use

ANSWER: X) USE OF FERTILIZERS

BONUS

19) LIFE SCIENCE *Short Answer* In an experiment, you expect a plant to photosynthesize optimally with 440 nm of light. Instead you observe optimal photosynthesis at 460 nm. This is most likely due to the presence of what pigment?

ANSWER: CHLOROPHYLL B (DO NOT ACCEPT: CHLOROPHYLL ALONE)

TOSS-UP

20) ENERGY *Short Answer* What type of highly efficient battery is used for electric vehicles?

ANSWER: LITHIUM-ION BATTERY

BONUS

20) ENERGY *Multiple Choice* In watts, how much power is consumed by a circuit that has a resistance of 10 ohms at a current of 3 amperes?

- W) 30
- X) 45
- Y) 90
- Z) 180

ANSWER: Y) 90

TOSS-UP

21) EARTH AND SPACE *Multiple Choice* Which of the following is NOT associated with active margins?

- W) Earthquakes
- X) Subduction zones
- Y) Transform faults
- Z) Hot spot volcanism

ANSWER: Z) HOT SPOT VOLCANISM

BONUS

21) EARTH AND SPACE *Multiple Choice* A long straight shoreline faces northeast. Waves approach the beach from the north and wave refraction bends the waves to the shore. In what direction will the resulting long shore current flow?

- W) Southeast
- X) Southwest
- Y) Northeast
- Z) Northwest

ANSWER: W) SOUTHEAST

TOSS-UP

22) GENERAL SCIENCE *Short Answer* What is a common example of a seasonal immune system response?

ANSWER: ALLERGIES

BONUS

22) GENERAL SCIENCE *Multiple Choice* How many phases does the Moon have?

- W) 4
- X) 6
- Y) 8
- Z) 10

ANSWER: Y) 8

TOSS-UP

23) PHYSICAL SCIENCE *Multiple Choice* Thermal energy spontaneously flows from which of the following?

- W) Gas to a liquid
- X) A liquid to a solid
- Y) A warmer region to a cooler region
- Z) A freezing material to a boiling material

ANSWER: Y) A WARMER REGION TO A COOLER REGION

BONUS

23) PHYSICAL SCIENCE *Multiple Choice* The penultimate fate of most low mass stars is which of the following?

- W) Blue dwarf
- X) Neutrino
- Y) Black hole
- Z) White dwarf

ANSWER: Z) WHITE DWARF