

## ROUND 2

### TOSS-UP

21) CHEMISTRY Short Answer Give the name of the periodic table group that contains elements that are silver in color, soft, and react explosively with water.

ANSWER: ALKALI METALS (ACCEPT: GROUP 1 OR GROUP 1A)

### BONUS

21) CHEMISTRY Short Answer A particle has a de Broglie [duh broh-GLEE] wavelength of  $3 \times 10^{-10}$  meters when it is traveling at  $1.1 \times 10^7$  meters per second. Expressing your answer in kilograms and in scientific notation to one significant figure, what is its approximate mass?

ANSWER:  $2 \times 10^{-31}$

### TOSS-UP

24) BIOLOGY Short Answer What class of hormone, often produced in a plant's roots, induces cell division in plant roots and shoots?

ANSWER: CYTOKININ

### BONUS

24) BIOLOGY Multiple Choice Which of the following is NOT true regarding human myoglobin [my-uh-GLOH-bin]?

W) It is a monomer

X) It exhibits higher affinity for oxygen than hemoglobin

Y) It exhibits a sigmoidal [SIG-moid-uhl] saturation curve

Z) It is primarily an oxygen storage protein

ANSWER: Y) IT EXHIBITS A SIGMOIDAL SATURATION CURVE

### TOSS-UP

11) CHEMISTRY Short Answer What is the name of the bond linking each fatty acid to glycerol [GLIS-uh-rol] in a triglyceride?

ANSWER: ESTER

### BONUS

11) CHEMISTRY Short Answer Several candidates have been proposed as the discoverer of oxygen. Who, however, is the scientist who most carefully documented his work and thus has been credited with its discovery?

ANSWER: PRIESTLY

### TOSS-UP

4) EARTH AND SPACE Multiple Choice Which of the following is generated from temperature changes in the atmosphere?

W) Latent heat

X) Sensible heat

Y) Potential temperature

Z) Irradiate heat

ANSWER: X) SENSIBLE HEAT

### BONUS

4) EARTH AND SPACE Short Answer What kind of black hole can be described entirely by its mass?

ANSWER: SCHWARZSCHILD

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TOSS-UP

1) MATH Short Answer Expressing your answer in simplest form, if  $y = (x^6) \ln(x)$  [y equals x to the sixth power times the natural log of x], what is the derivative of y with respect to x?

ANSWER:  $6x^5 \ln(x) + x^5$

BONUS

1) MATH Short Answer A national achievement test is administered. The test has a mean score of 100 and a standard deviation of 15. If Vince's z-score is 1.20, what is his score on the test?

ANSWER: 118

TOSS-UP

20) ENERGY Short Answer Cadmium and boron are used in a nuclear reactor to absorb which subatomic particle?

ANSWER: NEUTRON

BONUS

20) ENERGY Multiple Choice Which of the elements, used as a nuclear fuel, is most abundant in the Earth's crust?

W) Uranium

X) Plutonium

- Y) Thorium
- Z) Americium

ANSWER: Y) THORIUM

TOSS-UP

17) PHYSICS Multiple Choice When a tennis racket hits a tennis ball, how do the forces on each object compare?

- W) The force on the tennis ball has a greater magnitude than the force on the racket
- X) The force on the racket has a greater magnitude than the force on the ball
- Y) The magnitude of the force on each object is the same
- Z) The forces depend on the level of impact

ANSWER: Y) THE MAGNITUDE OF THE FORCE ON EACH OBJECT IS THE SAME

BONUS

17) PHYSICS Short Answer A wave with a frequency of 40 hertz has a wavelength of 2.5 meters. What is the phase velocity in meters per second?

ANSWER: 100

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TOSS-UP

13) BIOLOGY Short Answer Motion of the basilar membrane stimulates what cell type that initiates the transmission of a signal to the brain?

ANSWER: INNER HAIR (ALSO ACCEPT STEREOCILIA OR HAIR CELLS)

BONUS

13) BIOLOGY Multiple Choice The basilar membrane in the cochlea [KOK-lee-uh] is differentially sensitive to which of the following aspects of sound?

- W) Amplitude
- X) Direction
- Y) Frequency
- Z) Bandwidth

ANSWER: Y) FREQUENCY

TOSS-UP

24) BIOLOGY Short Answer Name the genus of mosquito that most frequently serves as the

vector for the debilitating dengue [DENG-gay] fever.

ANSWER: AEDES

BONUS

24) BIOLOGY Short Answer Indicate, respectively, the term to describe the stage in which two genetically different nuclei occur in the same cell, and the principal kingdom in which the stage occurs as a normal part of the organism's life cycle.

ANSWER: STAGE = HETEROKARYOTIC; KINGDOM = FUNGI

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TOSS-UP

13) EARTH AND SPACE Multiple Choice In general, the probability of flooding decreases when there is an increase in the amount of which of the following?

W) Precipitation

X) Infiltration

Y) Runoff

Z) Snow melt

ANSWER: X) INFILTRATION

BONUS

13) EARTH AND SPACE Multiple Choice Which of the following is the age of the most abundant surface bedrock in the Finger Lakes region of New York State?

W) Cambrian

X) Devonian

Y) Pennsylvanian

Z) Permian

ANSWER: X) DEVONIAN

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22) EARTH AND SPACE Multiple Choice Which of the following is NOT evidence that liquid water was once present on Mars?

W) Large flood channels

X) Sedimentary layering

Y) Sand dunes

Z) Eroded craters

ANSWER: Y) SAND DUNES

BONUS

22) EARTH AND SPACE Short Answer What is the typical adjective used to describe a volcano that is not currently erupting but is considered likely to do so in the future?

ANSWER: DORMANT

TOSS-UP

17) PHYSICS Short Answer A person standing on a scaffold lowers an object with a weight of 250 newtons by means of a rope, at constant speed. If the weight of the rope is negligible, what is the force in newtons that the person exerts on the rope?

ANSWER: 250

BONUS

17) PHYSICS Short Answer Relative to the ground, how many joules of potential energy does a 1000 newton boulder have at the top of a 5 meter ledge, relative to the bottom of the ledge and given  $g$  as 10 meters per second squared?

ANSWER: 5000

TOSS-UP

4) EARTH AND SPACE Multiple Choice Which of the following is the rate at which atmospheric gases and particles are moved across a surface?

W) Vertical dispersion

X) Turbulence

Y) Flux

Z) Stratospheric transport

ANSWER: Y) FLUX

BONUS

4) EARTH AND SPACE Multiple Choice Which of the following is true of sandstone formed from a long-term paleodesert?

W) It would exhibit clearly graded bedding

X) It would have preserved ripples but not dunes

Y) It would appear black due to the dark iron-rich minerals present

Z) It would contain well rounded grains and have high quartz content

CONTENT

TOSS-UP

9) CHEMISTRY Short Answer In a flame test on an unknown compound, the flame is violet. What element is likely to be in the compound?

ANSWER: POTASSIUM (ACCEPT: RUBIDIUM, CESIUM)

BONUS

9) CHEMISTRY Multiple Choice Which of the following anhydrous compounds has the lowest melting point?

W) Aluminum chloride

X) Calcium chloride

Y) Copper (II) chloride

Z) Lead (III) chloride

ANSWER: W) ALUMINUM CHLORIDE

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