

## ROUND 6

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### TOSS-UP

1) BIOLOGY *Short Answer* What is the common name of the group of marine spiny-finned fish of the order Heterosomata, all of which, when adult, swim along the sea floor on one side of the body, which is highly compressed and has both eyes on the uppermost side?

ANSWER: FLATFISH

### BONUS

1) BIOLOGY *Multiple Choice* Which of the following statements is NOT true about otters?

- W) Newborn otters are taken care of by their fathers only
- X) Their dens are called holts or couches
- Y) They feed on fish, shellfish, amphibians and birds
- Z) A male otter is called a dog

ANSWER: W) NEWBORN OTTERS ARE TAKEN CARE OF BY THEIR FATHERS ONLY

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### TOSS-UP

2) EARTH AND SPACE *Multiple Choice* Which of the following best describes where the salt in ocean water comes from?

- W) Melting of glacial ice
- X) Weathering of continental rocks
- Y) Decomposition of plants and animals
- Z) Precipitation of salty rain

ANSWER: X) WEATHERING OF CONTINENTAL ROCKS

### BONUS

2) EARTH AND SPACE *Multiple Choice* Cayes [**KAYS**] are small sandy islands formed on the surface of coral reefs in tropical areas like the coast of Belize. The sand on these cayes is primarily composed of which of the following?

- W) Silicate
- X) Calcium carbonate
- Y) Sulfide
- Z) Halide

ANSWER: X) CALCIUM CARBONATE

### TOSS-UP

3) PHYSICS *Multiple Choice* Which of the following cells cannot be recharged?

- W) Dry
- X) Wet
- Y) Primary
- Z) Secondary

ANSWER: Y) PRIMARY

### BONUS

3) PHYSICS *Multiple Choice* Changing which of the following will NOT result in a change in the voltage induced in a rotating wire coil?

- W) Rate of rotation
- X) Wire resistance
- Y) Number of coil loops
- Z) Average loop area

ANSWER: X) WIRE RESISTANCE

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### TOSS-UP

4) MATH *Short Answer* What is  $x$  equal to in the following expression:  $\log_x 7 = 1$  [**log base  $x$  of 7 equals 1**]?

ANSWER: 7

### BONUS

4) MATH *Short Answer* If the length, width, and height of a right rectangular prism are in the ratio of 3:4:12 [**3 to 4 to 12**], find the height in meters of the solid if the diagonal of the solid is 26 meters long.

ANSWER: 24

### TOSS-UP

5) CHEMISTRY *Multiple Choice* When assigning electrons to subshells, which of the following subshells will be filled first?

- W) 4f
- X) 5s
- Y) 5d
- Z) 6s

ANSWER: X) 5s

### BONUS

5) CHEMISTRY *Short Answer* Which of the gas laws is demonstrated when an aerosol can is thrown into a fire and explodes?

ANSWER: AMONTON'S (ACCEPT: IDEAL GAS LAW OR GAY-LUSSAC'S LAW)

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### TOSS-UP

6) ENERGY *Short Answer* What is the term for a device used to determine or measure the presence of electrostatic charges?

ANSWER: ELECTROSCOPE

### BONUS

6) ENERGY *Short Answer* What is the efficiency of an appliance whose useful energy output is 5 joules and wasted energy is 20 joules?

ANSWER: 20%

### TOSS-UP

7) MATH *Short Answer* Given that  $g(x) \leq f(x) \leq h(x)$  for all  $x$ , the  $\lim_{x \rightarrow a} g(x) = M$  [**limit as  $x$  approaches  $a$  of  $g$  of  $x$  is  $M$** ], and the  $\lim_{x \rightarrow a} h(x) = M$  [**limit as  $x$  approaches  $a$  of  $h$  of  $x$  is  $M$** ], what is the  $\lim_{x \rightarrow a} f(x)$  [**limit as  $x$  approaches  $a$  of  $f$  of  $x$** ]?

ANSWER: M

### BONUS

7) MATH *Short Answer* What is the largest possible real domain of  $f(x) = \ln(3x - 1)$  [ **$f$  of  $x$  equals the natural log of the quantity  $3x$  minus  $1$** ]?

ANSWER:  $x > 1/3$  (ACCEPT: THE OPEN INTERVAL FROM  $1/3$  TO (POSITIVE) INFINITY)

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### TOSS-UP

8) EARTH AND SPACE *Multiple Choice* Which of the following layers of the atmosphere allows AM radio stations to transmit over great distances at night?

- W) Ionosphere [**eye-ON-uh-sfeer**]
- X) Stratosphere
- Y) Thermosphere
- Z) Troposphere

ANSWER: W) IONOSPHERE

### BONUS

8) EARTH AND SPACE *Multiple Choice* Which of the following steps in atoll formation is the most mature?

- W) Erupting volcanic island
- X) Lagoon
- Y) Volcanic island with barrier reef
- Z) Volcanic island with fringing reef

ANSWER: X) LAGOON

**TOSS-UP**

9) PHYSICS *Short Answer* In 1868, observers of a solar eclipse first noticed a bright yellow spectral line. They theorized that this was due to a new element and gave it what sun-inspired name?

ANSWER: HELIUM

**BONUS**

9) PHYSICS *Multiple Choice* An electroscope is negatively charged, with the leaves at an angle of about  $45^\circ$ . When a negatively charged rod is slowly brought near the plate of the electroscope, the leaves do which of the following?

- W) Repel
- X) Attract
- Y) Repel then attract
- Z) Fall to zero then repel

ANSWER: W) REPEL

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**TOSS-UP**

10) MATH *Short Answer*  $W$  is one of the vertices of a polygon. If there are 8 diagonals of the polygon that contain  $W$ , how many sides does the polygon have?

ANSWER: 11

**BONUS**

10) MATH *Short Answer* A fair standard six-sided die is rolled two times. What is the probability that the sum of the numbers on the two rolls will be greater than 9?

ANSWER:  $1/6$

**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

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**TOSS-UP**

12) ENERGY *Multiple Choice* Which of the following particles has the least penetrating power?

- W) Neutron
- X) Alpha particle
- Y) Beta particle
- Z) Positron

ANSWER: X) ALPHA PARTICLE

**BONUS**

12) ENERGY *Multiple Choice* The power produced by a wind turbine depends primarily on which of the following parameters?

- W) Air volume
- X) Wind pressure
- Y) Blade radius
- Z) Air coefficient

ANSWER: Y) BLADE RADIUS

### TOSS-UP

13) BIOLOGY *Short Answer* Which gas was in short supply in the Earth's atmosphere prior to the evolution of the citric acid cycle?

ANSWER: OXYGEN

### BONUS

13) BIOLOGY *Multiple Choice* Neurons can communicate with each another at synapses via synaptic vesicles. Which of the following does NOT participate in communication at these sites?

- W) Neurotransmitter
- X) Gated channels
- Y) ATP dependent channels
- Z) Acetylcholine [*uh-seet-I-KOH-leen*]

ANSWER: Y) ATP DEPENDENT CHANNELS

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### TOSS-UP

14) EARTH AND SPACE *Multiple Choice* Kilauea [*kee-lou-AY-ah*] and Mauna Loa [*MOU-nuh LOH-uh*], are examples of which of the following types of volcanoes?

- W) Shield
- X) Composite
- Y) Cinder cone
- Z) Transform fault

ANSWER: W) SHIELD

### BONUS

14) EARTH AND SPACE *Short Answer* What is the geologic term for the sinking of large areas of land due to compaction of drained soil and rock layers?

ANSWER: SUBSIDENCE

**TOSS-UP**

15) PHYSICS *Short Answer* A lunar vehicle on Earth moves at 10 kilometers per hour. When it travels at the same speed on the Moon, what is its momentum in comparison to its momentum on Earth, assuming that the Moon's gravitational force is one fifth that of Earth's?

ANSWER: THE SAME (ACCEPT: EQUAL)

**BONUS**

15) PHYSICS *Short Answer* Coulomb's law states that an electric force between two charges is inversely proportional to the square of what quantity?

ANSWER: DISTANCE BETWEEN THEM (ACCEPT: THEIR SEPARATION, RADIAL DISTANCE BETWEEN THEM)

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**TOSS-UP**

16) MATH *Multiple Choice* Which of the following numbers is NOT prime?

- W) 107
- X) 109
- Y) 111
- Z) 113

ANSWER: Y) 111

**BONUS**

16) MATH *Short Answer* Todd the Tortoise is 268 years old, while Sammy the Snail is 32 years old. How many years will it take for Todd's age to be exactly 5 times Sammy's age?

ANSWER: 27

### TOSS-UP

17) CHEMISTRY *Short Answer* What element has the following four characteristics: 1) it occurs naturally only in combination with other elements in minerals; 2) it is used primarily as a hardening agent in alloys; 3) its dust is highly toxic, and 4) it is an alkaline **[AL-kuh-lyn]** earth metal.

ANSWER: BERYLLIUM

### BONUS

17) CHEMISTRY *Short Answer* Identify all of the following four compounds that are ionic: 1) sodium sulfate, 2) methane, 3) ammonium chloride, 4) beryllium iodide.

ANSWER: 1 AND 3 (ACCEPT: SODIUM SULFATE AND AMMONIUM CHLORIDE)

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### TOSS-UP

18) ENERGY *Multiple Choice* Rectifiers are used in computers and other appliances to do which of the following?

- W) Convert direct current to alternating current
- X) Convert alternating current to direct current
- Y) Provide a steady amount of power at all times
- Z) Reduce the energy consumption of an appliance

ANSWER: X) CONVERT ALTERNATING CURRENT TO DIRECT CURRENT

### BONUS

18) ENERGY *Short Answer* When inductors are present in circuits with alternating currents, what type of power do they consume?

ANSWER: REACTIVE

### TOSS-UP

19) BIOLOGY *Multiple Choice* Which of the following best describes why the xylem [**ZY-luhm**] is an important plant tissue?

- W) It transports water and minerals from the roots to the leaves
- X) It transports water and minerals from the leaves to the roots
- Y) It is the best part of the plant to eat
- Z) It gives a plant its strength to stand straight

ANSWER: W) IT TRANSPORTS WATER AND MINERALS FROM THE ROOTS TO THE LEAVES

### BONUS

19) BIOLOGY *Multiple Choice* Your body has approximately one million B cells and ten million different T cells. A gram-negative bacterium enters your body and one of your B cells binds to the bacterium via the BCR recognizing the LPS. Which of the following will happen next?

- W) The B cell will proliferate
- X) The virus will enter the B cell
- Y) Similar T cells will be destroyed
- Z) The B cell will be destroyed

ANSWER: W) THE B CELL WILL PROLIFERATE

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### TOSS-UP

20) EARTH AND SPACE *Multiple Choice* Given the current climatic conditions on Earth, at which of the following locations would a glacier most likely form?

- W) 0° latitude at an elevation of 6,000 meters
- X) 15° N latitude at an elevation of 4,000 meters
- Y) 30° N latitude at an elevation of 3,000 meters
- Z) 45° N latitude at an elevation of 1,000 meters

ANSWER: W) 0° LATITUDE AT AN ELEVATION OF 6,000 METERS

### BONUS

20) EARTH AND SPACE *Multiple Choice* The analysis of which of the following fossil types from ancient vertebrates provides important information about the diet and biota of ancient environments?

- W) Tracks
- X) Coprolite
- Y) Burrows
- Z) Fulgurite [**FUHL-gyuh-ryt**]

ANSWER: X) COPROLITE

**TOSS-UP**

21) PHYSICS *Short Answer* What is the SI unit of inductance?

ANSWER: HENRY

**BONUS**

21) PHYSICS *Multiple Choice* A radioactive element has a half life of 50 seconds. Which of the following is true of a sample of such an element?

- W) Every atom of the element decays after 50 seconds
- X) Every atom of the element decays after 100 seconds
- Y) After 100 seconds, one fourth of the sample has decayed
- Z) After 100 seconds, three fourths of the sample has decayed

ANSWER: Z) AFTER 100 SECONDS, THREE FOURTHS OF THE SAMPLE HAS DECAYED

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**TOSS-UP**

22) MATH *Short Answer* Give the coordinates of the point where the line  $3x + 2y = 18$  intersects the x axis.

ANSWER: (6, 0)

**BONUS**

22) MATH *Multiple Choice* A jar contains 50 marbles. Exactly 10% are green, 20% are blue, 30% are yellow, and the rest are orange. Which of the following is the probability of randomly picking first a blue marble, replacing it, and then picking an orange marble?

- W)  $\frac{1}{25}$
- X)  $\frac{2}{25}$
- Y)  $\frac{3}{25}$
- Z)  $\frac{4}{25}$

ANSWER: X)  $\frac{2}{25}$

### TOSS-UP

23) CHEMISTRY *Multiple Choice* Which of the following is NOT a buffering agent?

- W) Magnesium oxide
- X) Rubidium hydroxide
- Y) Ammonia
- Z) Monopotassium phosphate

ANSWER: X) RUBIDIUM HYDROXIDE

### BONUS

23) CHEMISTRY *Short Answer* What is the name of the reaction, commonly used in lecture demonstrations, in which two colorless solutions are mixed, and the liquid turns to a shade of dark blue after a short time delay?

ANSWER: IODINE CLOCK (ACCEPT: HARCOURT-ESSEN)

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### TOSS-UP

24) BIOLOGY *Short Answer* What is the common name of the unicellular organism that has the following characteristics: 1) it has chloroplasts and can make its own food; 2) it can also ingest food from its environment; 3) it usually lives in ponds or puddles; 4) it moves by a flagellum; 5) it has an eyespot that detects light.

ANSWER: EUGLENA

### BONUS

24) BIOLOGY *Multiple Choice* The gram stain can be used to distinguish between different prokaryotes [*proh-KAR-ee-ohts*] based on which of the following?

- W) Glucose metabolism
- X) Flagella
- Y) Lactose metabolism
- Z) Cell wall morphology

ANSWER: Z) CELL WALL MORPHOLOGY

### TOSS-UP

25) EARTH AND SPACE *Multiple Choice* Which of the following phenomena are responsible for orange and red sunsets?

- W) Dust particles in the atmosphere
- X) Ice crystals in the atmosphere
- Y) Water droplets in the atmosphere
- Z) Water vapor in the atmosphere

ANSWER: W) DUST PARTICLES IN THE ATMOSPHERE

### BONUS

25) EARTH AND SPACE *Short Answer* Uranus was discovered in 1781. Rounding down to the nearest whole number, how many complete revolutions around the Sun has it made since being discovered?

ANSWER: TWO