

## ROUND 8

---

### TOSS-UP

1) GENERAL SCIENCE *Multiple Choice* Which of the following leaf traits would be most useful in identifying the plants from which the leaves originated?

- W) Presence or absence of veins
- X) Arrangement of leaves on the stem
- Y) Function of the leaves
- Z) Color of the leaves

ANSWER: X) ARRANGEMENT OF LEAVES ON THE STEM

### BONUS

1) GENERAL SCIENCE *Short Answer* What are the three broad categories of galaxy shapes?

ANSWER: SPIRAL, ELLIPTICAL, IRREGULAR

---

### TOSS-UP

2) MATH *Short Answer* Find the value of  $c$  that completes the square of  $r^2 + 32r + c$ .

ANSWER: 256

### BONUS

2) MATH *Short Answer* Given that one liter of water weighs one kilogram, providing your answer in terms of pi and in simplest form, what is the weight in kilograms of the water contained in a full cylindrical container with a radius of 50 centimeters and a height of 1 meter?

ANSWER:  $250\pi$

### TOSS-UP

3) PHYSICAL SCIENCE *Multiple Choice* One gram of which of the following substances will be most dense at standard temperature and pressure?

- W) Water
- X) Gold
- Y) Ethanol
- Z) Lead

ANSWER: X) GOLD

### BONUS

3) PHYSICAL SCIENCE *Short Answer* When an Arrhenius [**ahr-RAY-nee-oos**] acid is added to a base, what are the products?

ANSWER: WATER AND A SALT (ACCEPT: SOLVATED IONS)

---

### TOSS-UP

4) ENERGY *Short Answer* What is the SI unit of measurement for gravitational potential energy?

ANSWER: JOULE

### BONUS

4) ENERGY *Multiple Choice* Which of the following rock types would most likely be the best oil reservoir [**REZ-er-vwohr**]?

- W) Granite
- X) Basalt
- Y) Shale
- Z) Sandstone

ANSWER: Z) SANDSTONE

### TOSS-UP

5) LIFE SCIENCE *Short Answer* Identify all of the following four types of stimuli which can elicit a tropic response in plants: 1) light, 2) gravity, 3) touch, 4) heat.

ANSWER: ALL

### BONUS

5) LIFE SCIENCE *Multiple Choice* Which of the following accurately matches the part of the flower and its description?

- W) Top part of the stamen that produces and bears pollen – sepal
- X) Swollen base of the flower than attaches it to the stem – carpel
- Y) Sticky part of the flower's carpel that traps pollen grains – stigma
- Z) Part of the flower containing the ovules that later develop into seeds – anther

ANSWER: Y) STICKY PART OF THE FLOWER'S CARPEL THAT TRAPS POLLEN GRAINS – STIGMA

---

### TOSS-UP

6) MATH *Short Answer* What is the greatest integer less than or equal to the cube root of 100?

ANSWER: 4

### BONUS

6) MATH *Short Answer* Solve the following system of two equations:  $7x + 2y = -6$  and  $-14x - 4y = -2$ .

ANSWER: NO SOLUTION (ACCEPT: NULL SET, EMPTY SET)

### TOSS-UP

7) GENERAL SCIENCE *Multiple Choice* Patricia is trying to improve her basketball skills. She finds that her shots consistently hit a point to the right of the basket. Which of the following correctly characterizes the precision and accuracy of her shots?

- W) Not accurate or precise
- X) Both accurate and precise
- Y) Accurate but not precise
- Z) Precise but not accurate

ANSWER: Z) PRECISE BUT NOT ACCURATE

### BONUS

7) GENERAL SCIENCE *Short Answer* A scientist testing the effects of a chemical on apple yield sprays an orchard with the chemical. A second similar orchard with the same amount of sunlight, water, and species of apple does not receive the chemical. In the fall, the number of apples harvested from each orchard is counted. What are the independent, dependent, and controlled variables in the experiment?

ANSWER: INDEPENDENT = CHEMICAL; DEPENDENT = NUMBER OF APPLES;  
CONTROLLED = SUNLIGHT, WATER, APPLE SPECIES

---

### TOSS-UP

8) EARTH AND SPACE *Short Answer* Which form of energy can coincide with tectonic plate boundaries?

ANSWER: GEOTHERMAL

### BONUS

8) EARTH AND SPACE *Multiple Choice* Which of the following is the approximate percentage of silica in basaltic lava?

- W) 50%
- X) 60%
- Y) 70%
- Z) 80%

ANSWER: X) 60%

**TOSS-UP**

9) PHYSICAL SCIENCE *Short Answer* When a wave enters a new medium and changes speed, what phenomenon occurs?

ANSWER: REFRACTION

**BONUS**

9) PHYSICAL SCIENCE *Multiple Choice* Which of the following would increase the rate of rusting on a fixed quantity of iron?

- W) Using iron filings instead of iron nails
- X) Putting more water over the iron
- Y) Placing the iron in an ice bath
- Z) It is not possible to change the rate of rusting

ANSWER: W) USING IRON FILINGS INSTEAD OF IRON NAILS

---

**TOSS-UP**

10) ENERGY *Multiple Choice* Which of the following types of friction are you experiencing as you push a book across a table?

- W) Accelerated
- X) Kinetic
- Y) Negative
- Z) Static

ANSWER: X) KINETIC

**BONUS**

10) ENERGY *Short Answer* How much work in joules is done by the force of gravity when a 50 newton object falls a distance of 10 meters?

ANSWER: 500

**TOSS-UP**

11) LIFE SCIENCE *Short Answer* Which cellular organelle contains DNA inherited from the individual's mother but not the father?

ANSWER: MITOCHONDRIA

**BONUS**

11) LIFE SCIENCE *Short Answer* What is the name of the sense organ in fish and some aquatic amphibians [*am-FIB-ee-uhns*] that is sensitive to differences in water pressure due to changes in depth or waves caused by approaching objects?

ANSWER: LATERAL LINE

---

**TOSS-UP**

12) MATH *Short Answer* What is  $-5\sqrt{3} - 3\sqrt{3}$ ?

ANSWER:  $-8\sqrt{3}$

**BONUS**

12) MATH *Short Answer* What number is  $1/2$  of  $1/3$  of  $1/4$  of  $1/5$  of 1,800?

ANSWER: 15

### TOSS-UP

13) EARTH AND SPACE *Multiple Choice* Which of the following types of rock would have the greatest permeability?

- W) Sandstone
- X) Shale
- Y) Claystone
- Z) Limestone

ANSWER: W) SANDSTONE

### BONUS

13) EARTH AND SPACE *Short Answer* The Sun contains the vast majority of the mass in the solar system at 99.9%. What is the location of most of the remaining 0.1% mass in the solar system?

ANSWER: JUPITER

---

### TOSS-UP

14) LIFE SCIENCE *Short Answer* What type of RNA carries copies of the instructions for assembling amino acids from the DNA to the site of translation?

ANSWER: MESSENGER RNA (ACCEPT: mRNA)

### BONUS

14) LIFE SCIENCE *Multiple Choice* The first prokaryotes [*proh-KAR-ee-ohs*], eukaryotes [*yoo-KAR-ee-ohs*], and multicellular organisms all arose during which of the following evolutionary eras?

- W) Precambrian
- X) Mesozoic
- Y) Paleozoic
- Z) Cenozoic

ANSWER: W) PRECAMBRIAN

### TOSS-UP

15) GENERAL SCIENCE *Multiple Choice* Which of the following is a reason why midges of the rainforest are important?

- W) They consume waste on the forest floor
- X) They are harvested for medicinal extracts
- Y) They pollinate the flowers of the cacao plant
- Z) They are used to make perfume

ANSWER: Y) THEY POLLINATE THE FLOWERS OF THE CACAO PLANT

### BONUS

15) GENERAL SCIENCE *Multiple Choice* The term *specific volume* refers to the volume per gram of a substance. Specific volume is an example of which of the following?

- W) A physical extensive property
- X) A physical intensive property
- Y) A chemical extensive property
- Z) A chemical intensive property

ANSWER: X) A PHYSICAL INTENSIVE PROPERTY

---

### TOSS-UP

16) EARTH AND SPACE *Multiple Choice* Which of the following is NOT a process involved in the formation of sedimentary rocks?

- W) Compaction
- X) Cementation
- Y) Melting
- Z) Lithification

ANSWER: Y) MELTING

### BONUS

16) EARTH AND SPACE *Multiple Choice* At a depth of 2,900 kilometers below the Earth's surface, P seismic waves slow down rapidly and S seismic waves disappear. This indicates that 2,900 kilometers is the beginning of which of the following layers?

- W) Solid iron
- X) Solid nickel
- Y) Liquid iron and nickel
- Z) Solid iron and nickel

ANSWER: Y) LIQUID IRON AND NICKEL



**TOSS-UP**

17) PHYSICAL SCIENCE *Short Answer* What form of heat transfer does NOT depend on matter?

ANSWER: RADIATION

**BONUS**

17) PHYSICAL SCIENCE *Short Answer* What is the name for energy which represents the capacity of a system to do non-mechanical work at constant temperature and pressure?

ANSWER: GIBBS FREE ENERGY

---

**TOSS-UP**

18) ENERGY *Multiple Choice* Geothermal heat pumps take advantage of which of the following?

- W) Salinity of the water stored underground
- X) Temperature differences in the underground water layers
- Y) Temperature difference between groundwater and the ground
- Z) Temperature differences between the ground and buildings

ANSWER: Z) TEMPERATURE DIFFERENCES BETWEEN THE GROUND AND BUILDINGS

**BONUS**

18) ENERGY *Multiple Choice* Which of the following is the effect of reactive power on the efficiency of a circuit?

- W) It reduces efficiency
- X) It increases efficiency by about 30%
- Y) The efficiency remains unaffected
- Z) The efficiency is maximized

ANSWER: W) IT REDUCES EFFICIENCY

### TOSS-UP

19) LIFE SCIENCE *Multiple Choice* Cyamids, commonly known as whale lice, are tiny crustaceans that live on the skin of whales. Cyamids obtain nutrition from the whale by feeding on dead skin and algae that grow on the whale's body; it is believed that whales are not helped or harmed by their presence. This type of biological relationship can best be described as which of the following?

- W) Commensalism
- X) Antagonism
- Y) Parasitism
- Z) Mutualism

ANSWER: W) COMMENSALISM

### BONUS

19) LIFE SCIENCE *Short Answer* By number, identify all of the following five characteristics which are true of baleen whales: 1) they travel to cold water for feeding; 2) they travel to warm water to give birth; 3) they have wide, separated lower jaws; 4) they can open their eyes underwater, 5) they have about four times more blood cells than terrestrial mammals.

ANSWER: 1, 2, 3, 4

---

### TOSS-UP

20) MATH *Short Answer* Simplify  $1,000,000^{1/6}$  [**one million to the power of one sixth**].

ANSWER: 10

### BONUS

20) MATH *Short Answer* Evaluate  $f(x) = -x^3 + 6x + 7$  [**f of x equals negative x cubed plus 6 x plus 7**] at  $x = 6$ .

ANSWER: -173

### TOSS-UP

21) GENERAL SCIENCE *Multiple Choice* A population splits and part of the group occupies a different niche [**NICH**] from the parent group and can no longer interbreed with the parent population. Which of the following describes this process?

- W) Genetic drift
- X) Speciation
- Y) Endemism
- Z) Invasion

ANSWER: X) SPECIATION

### BONUS

21) GENERAL SCIENCE *Short Answer* Given the equation  $\text{H}_2 + \text{Cl}_2 \longrightarrow$  [**yields**]  $2\text{HCl} +$  heat, if the reaction were performed with fluorine instead of chlorine, how many moles of  $\text{H}_2$  would be required to yield two moles of HF?

ANSWER: ONE

---

### TOSS-UP

22) EARTH AND SPACE *Multiple Choice* At which of the following latitudes in the Northern Hemisphere will the Sun be directly overhead at solar noon on the summer solstice?

- W) Equator
- X) Tropic of Capricorn
- Y) Tropic of Cancer
- Z) North Pole

ANSWER: Y) TROPIC OF CANCER

### BONUS

22) EARTH AND SPACE *Short Answer* Which process allows water to move from plants to the atmosphere?

ANSWER: TRANSPIRATION

**TOSS-UP**

23) PHYSICAL SCIENCE *Multiple Choice* Which of the following is NOT an example of oxidation?

- W) Electroplating zinc
- X) Rusting iron
- Y) Tarnishing silver
- Z) Burning wood

ANSWER: W) ELECTROPLATING ZINC

**BONUS**

23) PHYSICAL SCIENCE *Short Answer* List the following five colors of the visible spectrum in order of highest to lowest frequency: 1) violet, 2) green, 3) red, 4) blue, and 5) orange.

ANSWER: 1, 4, 2, 5, 3 (ACCEPT: VIOLET, BLUE, GREEN, ORANGE, RED)

---

**TOSS-UP**

24) MATH *Short Answer* What is the  $x$  intercept of the line  $-3x + y = 3$ ?

ANSWER: (-1, 0) (ACCEPT: -1)

**BONUS**

24) MATH *Short Answer* What are the largest possible domain and range, respectively, of  $y = 5 + \sqrt{x - 2}$  [***y equals 5 plus the square root of the quantity x minus 2***]?

ANSWER: DOMAIN  $x \geq 2$ ; RANGE  $y \geq 5$

### TOSS-UP

25) LIFE SCIENCE *Multiple Choice* Which of the following molecules is an important part of membrane structure, is usually NOT soluble in water, and stores about 9 kilocalories of energy in each gram?

- W) Protein
- X) Nucleic acid
- Y) Lipid
- Z) Carbohydrate

ANSWER: Y) LIPID

### BONUS

25) LIFE SCIENCE *Short Answer* Identify all of the following five options which serve as the primary food source for most millipedes: 1) minerals, 2) plants, 3) detritus, 4) blood, 5) slugs.

ANSWER: 2, 3 (ACCEPT: PLANTS, DETRITUS)