

## ROUND 14

### TOSS-UP

1) MATH *Multiple Choice* The graph of which of the following equations has a negative slope:

- W)  $y = 2x - 4$
- X)  $y = -2x + 4$
- Y)  $y = -4$
- Z)  $x = -2$

ANSWER: X)  $y = -2x + 4$

### BONUS

1) MATH *Short Answer* Simplify the following completely:  $\frac{-20x^6y^2z^3}{2x^4y^2z^2}$

ANSWER:  $-10x^2z$

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### TOSS-UP

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

- W) all fires burn with a yellow flame
- X) snowflakes and raindrops often contain bacteria
- Y) a general rule for solubility is that 'like dissolves like'
- Z) a super-cooled liquid is a liquid at a temperature below its normal freezing point

ANSWER: W) ALL FIRES BURN WITH A YELLOW FLAME

### BONUS

2) GENERAL SCIENCE *Multiple Choice* Which of the following BEST describes the range of sizes of most animal cells:

- W) 0.2 to 2.0 micrometers
- X) 2.0 to 4.0 micrometers
- Y) 5.0 to 20.0 micrometers
- Z) 12.0 to 40.0 micrometers

ANSWER: Y) 5.0 TO 20.0 MICROMETERS

### TOSS-UP

3) LIFE SCIENCE *Multiple Choice* Which of the following is most advantageous to plants that depend on insects for pollination:

- W) absence of rhizomes
- X) sticky pollen
- Y) small green flowers
- Z) numerous stomata

ANSWER: X) STICKY POLLEN

### BONUS

3) LIFE SCIENCE *Short Answer* Name all of the following biological molecules that are considered polymers: glucose; cellulose; DNA; RNA

ANSWER: CELLULOSE; DNA; RNA (ACCEPT: ALL BUT GLUCOSE)

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### TOSS-UP

4) PHYSICAL SCIENCE *Multiple Choice* Which of the following materials in pure form would register the LOWEST amount of ohms for a given electric current at 20°C if all other variables are constant:

- W) silver
- X) gold
- Y) tin
- Z) lead

ANSWER: W) SILVER

### BONUS

4) PHYSICAL SCIENCE *Multiple Choice* Which of the following optical devices produces a real image:

- W) plane mirror
- X) convex mirror
- Y) concave lens
- Z) convex lens

ANSWER: Z) CONVEX LENS

**TOSS-UP**

5) EARTH SCIENCE *Multiple Choice* A semidiurnal tidal pattern is more typical of which of the following locations:

- W) the East Coast of the U.S.
- X) the West Coast of the U.S.
- Y) the Gulf of Mexico
- Z) the North Pole

ANSWER: W) THE EAST COAST OF THE U.S.

**BONUS**

5) EARTH SCIENCE *Multiple Choice* Which of the following is the most notable product of the hydrolysis of feldspar:

- W) chalk
- X) sandstone
- Y) clay minerals
- Z) halite

ANSWER: Y) CLAY MINERALS

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**TOSS-UP**

6) MATH *Multiple Choice* Which of the following is closest in value to  $\sqrt{51}$  :

- W) 5.1
- X) 5.5
- Y) 6.8
- Z) 7.1

ANSWER: Z) 7.1

**BONUS**

6) MATH *Short Answer* Find the next 3 terms of the arithmetic sequence whose first 3 terms are: 23, 15, 7

ANSWER: -1, -9, -17

**TOSS-UP**

7) GENERAL SCIENCE *Multiple Choice* Which of the following is one of the most likely causes of algal blooms in waterways along the Chesapeake Bay:

- W) fertilizers
- X) natural pesticides
- Y) nitrogen-fixing bacteria
- Z) plastics pollution

ANSWER: W) FERTILIZERS

**BONUS**

7) GENERAL SCIENCE *Short Answer* Giving your answer as winter, spring, summer, or fall, in what season will “dead zones” be most prevalent in the Chesapeake Bay?

ANSWER: SUMMER

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**TOSS-UP**

8) LIFE SCIENCE *Multiple Choice* Pampas, steppes, and savannas are all different types of:

- W) deserts
- X) tropical forests
- Y) tropical shrublands
- Z) grasslands

ANSWER: Z) GRASSLANDS

**BONUS**

8) LIFE SCIENCE *Multiple Choice* Which of the following biomes takes up more square area of the world than any other biome:

- W) rainforest
- X) savanna
- Y) taiga
- Z) tundra

ANSWER: Y) TAIGA

**TOSS-UP**

9) PHYSICAL SCIENCE *Multiple Choice* Hydrogen bonding is NOT important in the physical and chemical properties of:

- W) liquid water
- X) water ice
- Y) DNA
- Z) methane gas

ANSWER: Z) METHANE GAS

**BONUS**

9) PHYSICAL SCIENCE *Short Answer* Arrange the following 3 diatomic molecules in order of INCREASING number of bonds between atoms: oxygen; fluorine; nitrogen

ANSWER: FLUORINE; OXYGEN; NITROGEN

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**TOSS-UP**

10) EARTH SCIENCE *Multiple Choice* Which of the following is NOT a key step in the rock cycle:

- W) cementation
- X) melting
- Y) cooling
- Z) evaporation

ANSWER: Z) EVAPORATION

**BONUS**

10) EARTH SCIENCE *Multiple Choice* Most of Earth's deserts in the northern hemisphere are located near which of the following latitudes:

- W) 0°
- X) 30°
- Y) 70°
- Z) 90°

ANSWER: X) 30°

**TOSS-UP**

11) MATH *Short Answer* Express the following radical in simplified form for all positive values of  $x$  and  $y$ :  $\sqrt{(36x^4y^6)}$

ANSWER:  $6x^2y^3$

**BONUS**

11) MATH *Short Answer* Find the product of  $\sqrt{5x^2}$  times  $\sqrt{5x}$ , giving your answer in its simplest radical form for all positive values of  $x$ :

ANSWER:  $5x\sqrt{x}$

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**TOSS-UP**

12) GENERAL SCIENCE *Multiple Choice* Which of the following is typically used to sterilize laboratory glassware:

- W) hot plate
- X) freeze dryer
- Y) autoclave
- Z) fume hood

ANSWER: Y) AUTOCLAVE

**BONUS**

12) GENERAL SCIENCE *Multiple Choice* Which of the following is NOT true of the Big Dipper:

- W) it is a well known constellation that can be seen from mid-northern latitudes
- X) it appears on the opposite side of the North Star from Cassiopeia
- Y) it is sometimes called the Plough
- Z) assuming clear skies, it can be seen throughout the night every night of the year from mid-northern latitudes

ANSWER: W) IT IS A WELL KNOWN CONSTELLATION THAT CAN BE SEEN FROM MID-NORTHERN LATITUDES

### TOSS-UP

13) LIFE SCIENCE *Multiple Choice* Which of the following is the most likely highest power for an objective lens on a typical student compound light microscope:

- W) 25-times
- X) 100-times
- Y) 500-times
- Z) 1500-times

ANSWER: X) 100-TIMES

### BONUS

13) LIFE SCIENCE *Short Answer* Order the following 4 parts of the human intestine from the FIRST to receive food from the stomach to the LAST: colon; duodenum; ileum; jejunum

ANSWER: DUODENUM; JEJUNUM; ILEUM; COLON

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### TOSS-UP

14) PHYSICAL SCIENCE *Multiple Choice* Which of the following is NOT true of pH:

- W) the terms basic or alkaline describe a solution with pH greater than 7
- X) the highest value on the pH scale is 14
- Y) strong acids dissociate almost completely in water
- Z) a pH meter operates by measuring small differences in the density of different fluids

ANSWER: Z) A PH METER OPERATES BY MEASURING SMALL DIFFERENCES IN THE DENSITY OF DIFFERENT FLUIDS

### BONUS

14) PHYSICAL SCIENCE *Multiple Choice* A decrease of 1 unit on the pH scale represents which of the following:

- W) a 10-fold increase in the hydrogen ion concentration
- X) a 10-fold decrease in the hydrogen ion concentration
- Y) a 100-fold increase in the hydrogen ion concentration
- Z) a 100-fold decrease in the hydrogen ion concentration

ANSWER: W) A 10-FOLD INCREASE IN THE HYDROGEN ION CONCENTRATION

**TOSS-UP**

15) EARTH SCIENCE *Multiple Choice* Earth's atmosphere contains several different layers that are most often defined according to:

- W) pressure
- X) moisture
- Y) wind velocity
- Z) temperature

ANSWER: Z) TEMPERATURE

**BONUS**

15) EARTH SCIENCE *Short Answer* Name all of the following 3 choices that influence wind direction on Earth: Coriolis effect; centripetal force; pressure gradients

ANSWER: ALL

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**TOSS-UP**

16) MATH *Multiple Choice* Which of the following is closest in value to  $79^2$ :

- W) 6084
- X) 6241
- Y) 6399
- Z) 6400

ANSWER: X) 6241

**BONUS**

16) MATH *Short Answer* Solve the following equation for  $x$ :  $9x^2 + 12x = -4$

ANSWER:  $-\frac{2}{3}$

**TOSS-UP**

17) GENERAL SCIENCE *Short Answer* In 2005, into what celestial object did the Deep Impact probe crash into?

ANSWER: COMET (ACCEPT: COMET TEMPLE)

**BONUS**

17) GENERAL SCIENCE *Multiple Choice* Which of the following terms is used most often by astronomers for the total energy emitted per unit time from a star:

- W) apparent magnitude
- X) watts
- Y) luminosity
- Z) stellar unit

ANSWER: Y) LUMINOSITY

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**TOSS-UP**

18) LIFE SCIENCE *Multiple Choice* The presence of which of the following is the most important characteristic that allows xylem to function in plants:

- W) plastids and chloroplasts
- X) strong thick walls
- Y) large fluid-filled vacuoles
- Z) nuclei and endoplasmic reticulum

ANSWER: X) STRONG THICK WALLS

(Solution: xylem cells are dead therefore, W and Z are not possible and Y is unlikely)

**BONUS**

18) LIFE SCIENCE *Short Answer* Name all of the following 4 structures that are composed mostly of keratin: bird's beak; snake teeth; human fingernail; mammalian fur

ANSWER: BIRD'S BEAK; HUMAN FINGERNAIL; MAMMALIAN FUR  
(ACCEPT: ALL BUT SNAKE TEETH)

**TOSS-UP**

19) PHYSICAL SCIENCE *Multiple Choice* Francium has the lowest electronegativity of the elements. This would indicate that francium is in what corner of the periodic chart:

- W) upper left
- X) lower left
- Y) upper right
- Z) lower right

ANSWER: X) LOWER LEFT

**BONUS**

19) PHYSICAL SCIENCE *Multiple Choice* Which of the following compounds is LEAST soluble in water and is frequently used as a radiocontrast agent in imaging of the GI tract:

- W) sodium chloride
- X) potassium chloride
- Y) barium sulfate
- Z) sodium hydroxide

ANSWER: Y) BARIUM SULFATE

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**TOSS-UP**

20) EARTH SCIENCE *Short Answer* At any one time, there are always how many major tidal bulges on Earth?

ANSWER: 2

**BONUS**

20) EARTH SCIENCE *Short Answer* Which 2 of the following 4 choices are primarily responsible for the creation of two major tidal bulges on the Earth: gravity; wind; inertia; sunlight

ANSWER: GRAVITY; INERTIA

**TOSS-UP**

21) MATH *Short Answer* Your English teacher asks that you learn 2 new words every day. If you started with 12 new words, how many total new words will you learn after 30 days?

ANSWER: 72

(Solution:  $w = 12 + 2d = 12 + 2(30) = 72$  words)

**BONUS**

21) MATH *Short Answer* Arrange the following 4 choices in INCREASING order:

$\frac{0.5}{\pi}$ ;  $\sqrt{0.5}$ ;  $0.5^2$ ;  $\sqrt[3]{5}$  (read as: the cube root of 5)

ANSWER:  $\frac{0.5}{\pi}$ ;  $0.5^2$ ;  $\sqrt{0.5}$ ;  $\sqrt[3]{5}$

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**TOSS-UP**

22) GENERAL SCIENCE *Short Answer* What uranium isotope is most common on Earth?

ANSWER: URANIUM-238 (ACCEPT: 238)

**BONUS**

22) GENERAL SCIENCE *Short Answer* What is the common name for the plant from which the prized spice saffron is derived?

ANSWER: CROCUS

**TOSS-UP**

23) LIFE SCIENCE *Short Answer* What natural plant hormone is most directly involved in controlling phototropism?

ANSWER: AUXIN (ACCEPT: INDOLE ACETIC ACID or IAA)

**BONUS**

23) LIFE SCIENCE *Short Answer* Name all of the following 3 types of molecules that are generally soluble in water: simple sugars; mRNA; lipids

ANSWER: SIMPLE SUGARS; mRNA

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**TOSS-UP**

24) PHYSICAL SCIENCE *Short Answer* Knowing that carbon is in group 4 and period 2 on the Periodic Table, give the electron configuration of the carbon atom:

ANSWER:  $1s^2 2s^2 2p^2$  (ACCEPT:  $[\text{He}]2s^2 2p^2$ )

**BONUS**

24) PHYSICAL SCIENCE *Short Answer* Arrange the following 4 materials in DECREASING order of thermal conductivity: granite; rubber; gold; lead

ANSWER: GOLD; LEAD; GRANITE; RUBBER

**TOSS-UP**

25) EARTH SCIENCE *Short Answer* What is the MOST common name for the last stellar stage in the life of our Sun?

ANSWER: WHITE DWARF (ACCEPT: BLACK DWARF)

**BONUS**

25) EARTH SCIENCE *Short Answer* The decay rate of the radioactive isotope potassium-40 into stable argon-40 can be used to radiometrically date rocks. If it takes 1.28 billion years for half the potassium-40 to decay into argon-40, a rock that contains a 50/50 ratio of the two is how many billion years old, to the second decimal place?

ANSWER: 1.28