

**ROUND 9A**

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**TOSS-UP**

1) Physical Science – *Short Answer* What radioactive isotope of carbon is prominently used in radiometric dating?

ANSWER: CARBON-14

**BONUS**

1) Physical Science – *Multiple Choice* Which of the following scientific principles is most directly used in a stationary hand-held radar gun to determine the speed of a car?

- W) Bernoulli's principle
- X) The Doppler effect
- Y) Newton's second law of motion
- Z) The theory of relativity

ANSWER: X) THE DOPPLER EFFECT

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**TOSS-UP**

2) General Science – *Multiple Choice* Which of the following pairs of metric volume units are NOT equal?

- W) Milliliter and cubic centimeter
- X) Centiliter and cubic millimeter
- Y) Liter and cubic decimeter
- Z) Kiloliter and cubic meter

ANSWER: X) CENTILITER AND CUBIC MILLIMETER

**BONUS**

2) General Science – *Short Answer* To the nearest whole number, 100 kilometers per hour is how many meters per second?

ANSWER: 28

**TOSS-UP**

3) Math – *Short Answer* What is the equation of the horizontal line that passes through the point with coordinates (5, 6)?

ANSWER:  $y = 6$

**BONUS**

3) Math – *Multiple Choice* A rectangle is to be constructed using a given segment as one of its diagonals. How many different segments could possibly be the second diagonal of this rectangle?

- W) 1
- X) 2
- Y) 4
- Z) An infinite number

ANSWER: Z) AN INFINITE NUMBER

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**TOSS-UP**

4) Energy – *Multiple Choice* Which of the following alternative energy sources provides the most energy in the US?

- W) Wind
- X) Hydropower
- Y) Biomass
- Z) Solar

ANSWER: X) HYDROPOWER

**BONUS**

4) Energy – *Short Answer* What country has produced the most coal worldwide for the last 10 years?

ANSWER: CHINA

**TOSS-UP**

5) Life Science – *Short Answer* What regions of noncoding RNA are removed from a transcript before translation?

ANSWER: INTRONS

**BONUS**

5) Life Science – *Multiple Choice* Which of the following is the MAJOR difference between Lamarck's and Darwin's theories of evolution?

- W) Lamarck's theory could be applied to giraffes
- X) Lamarck's theory involves changes to a population
- Y) Darwin's theory involves changes to a population
- Z) Darwin's theory involves changes to an individual

ANSWER: Y) DARWIN'S THEORY INVOLVES CHANGES TO A POPULATION

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**TOSS-UP**

6) Earth and Space – *Multiple Choice* Which of the following is a major component of marine snow?

- W) Salt
- X) Frozen water
- Y) Calcium carbonate
- Z) Fecal matter from zooplankton

ANSWER: Z) FECAL MATTER FROM ZOOPLANKTON

**BONUS**

6) Earth and Space – *Short Answer* Edwin Hubble developed a four-type classification for galaxies that is often displayed in a "tuning fork" diagram. What are the four types?

ANSWER: ELLIPTICAL, SPIRAL, BARRED SPIRAL, IRREGULAR (ACCEPT: LENTICULAR FOR BARRED SPIRAL)

**TOSS-UP**

7) Energy – *Multiple Choice* What is the number one tip the Department of Energy has for homeowners to save money on energy bills?

- W) Lower the temperature on your water heater
- X) Use a power strip for your electronic equipment
- Y) Use natural lighting rather than artificial
- Z) Install and set a programmable thermostat

ANSWER: Z) INSTALL AND SET A PROGRAMMABLE THERMOSTAT

**BONUS**

7) Energy – *Short Answer* While E10 fuel is known to reduce carbon monoxide emissions, it is also thought to increase emissions of what triatomic pollutant?

ANSWER: OZONE

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**TOSS-UP**

8) Earth and Space – *Multiple Choice* Which of the following phenomena is NOT related to burning fossil fuels?

- W) Increased atmospheric CO<sub>2</sub> levels
- X) Magnetic reversals
- Y) Acid rain
- Z) Mercury pollution

ANSWER: X) MAGNETIC REVERSALS

**BONUS**

8) Earth and Space – *Multiple Choice* The Intertropical Convergence Zone is the low-pressure zone of rising, warm air found in what atmospheric circulation cell?

- W) Ferrel
- X) Hadley
- Y) Polar
- Z) Wegener [*VEHG-ner*]

ANSWER: X) HADLEY

**TOSS-UP**

9) Math – *Short Answer* The temperature at 9AM was 67 degrees Fahrenheit. If the temperature rose 4 degrees per hour, what was the temperature, in degrees Fahrenheit, at 2PM?

ANSWER: 87

**BONUS**

9) Math – *Multiple Choice* Which of the following translations changes the graph of  $y = x^2$  into that of  $y = (x + 3)^2 + 6$ ?

- W) 6 units down and 3 units to the left
- X) 6 units down and 3 units to the right
- Y) 6 units up and 3 units to the left
- Z) 6 units up and 3 units to the right

ANSWER: Y) 6 UNITS UP AND 3 UNITS TO THE LEFT

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**TOSS-UP**

10) Life Science – *Multiple Choice* What is the name of the bone in the human chin?

- W) Maxilla
- X) Mandible
- Y) Hyoid
- Z) Palatine

ANSWER: X) MANDIBLE

**BONUS**

10) Life Science – *Multiple Choice* What is the largest part of the brain?

- W) Cerebrum
- X) Cerebellum
- Y) Midbrain
- Z) Pons

ANSWER: W) CEREBRUM

### TOSS-UP

11) General Science – *Multiple Choice* If the widest point on a population pyramid is located at the middle-age range then population growth is:

- W) Positive
- X) Negative
- Y) Neutral
- Z) Indeterminate

ANSWER: X) NEGATIVE

### BONUS

11) General Science – *Short Answer* A data set includes a few points that are well out of the range of the rest of the points. What are these points called?

ANSWER: OUTLIERS

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### TOSS-UP

12) Physical Science – *Short Answer* Kinetic energy of an object is determined by what two properties of the object?

ANSWER: SPEED (ACCEPT: VELOCITY) and MASS (DO NOT ACCEPT: WEIGHT)

### BONUS

12) Physical Science – *Short Answer* What is the electric charge of the subatomic particle that carries electromagnetic force?

ANSWER: ZERO (ACCEPT: NEUTRAL)

**TOSS-UP**

13) General Science – *Short Answer* What does a tachometer measure?

ANSWER: ROTATIONAL MOTION (ACCEPT: RPM, ROTATIONAL SPEED, REVOLUTIONS PER MINUTE)

**BONUS**

13) General Science – *Short Answer* What temperature in degrees Fahrenheit is equivalent to 40 degrees Celsius?

ANSWER: 104

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**TOSS-UP**

14) Earth and Space – *Short Answer* Lahars are typically associated with eruptions of what type of volcanoes?

ANSWER: STRATOVOLCANOES (ACCEPT: COMPOSITE VOLCANOES)

**BONUS**

14) Earth and Space – *Short Answer* Identify all of the following three statements that are true of oligotrophic lakes: 1) They are nutrient-poor; 2) They contain abundant algae; 3) They typically have clear blue water.

ANSWER: 1 AND 3

**TOSS-UP**

15) Life Science – *Short Answer* What is the term used to describe the embryonic leaf in a seed?

ANSWER: COTYLEDON

**BONUS**

15) Life Science – *Short Answer* What is the term for the long bone of the upper arm of tetrapods?

ANSWER: HUMERUS

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**TOSS-UP**

16) Energy – *Short Answer* The Ames Laboratory produced approximately 2 million pounds of uranium to contribute to what World War II effort?

ANSWER: THE MANHATTAN PROJECT

**BONUS**

16) Energy – *Multiple Choice* Light water reactors are an example of which of the following?

- W) Fast neutron reactor
- X) Fusion reactor
- Y) Thermal neutron reactor
- Z) Fast breeder reactor

ANSWER: Y) THERMAL NEUTRON REACTOR



### TOSS-UP

17) Math – *Multiple Choice* Two functions that are inverses of each other must be reflections of each other through which of the following?

- W) The line  $y = x$
- X) The  $x$ -axis
- Y) The  $y$ -axis
- Z) The origin

ANSWER: W) THE LINE  $y = x$

### BONUS

17) Math – *Short Answer* Solve the following equation for  $x$  over the negative real numbers:  $x^4 - 3x^2 - 28 = 0$

ANSWER:  $-\sqrt{7}$

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### TOSS-UP

18) Physical Science – *Multiple Choice* Which of the following compounds is covalently bonded?

- W) Calcium oxide
- X) Carbon monoxide
- Y) Lithium bromide
- Z) Sodium chloride

ANSWER: X) CARBON MONOXIDE

### BONUS

18) Physical Science – *Short Answer* What phenomenon, also known as pedesis, was described by Einstein as the result of random collisions of small molecules?

ANSWER: BROWNIAN MOTION

**TOSS-UP**

19) Earth and Space – *Multiple Choice* Where can most deserts be found?

- W) In the horse latitudes and on the lee side of mountains
- X) At the equator and on the lee side of forests
- Y) Near inland seas
- Z) Wherever humans use too much water

ANSWER: W) IN THE HORSE LATITUDES AND ON THE LEE SIDE OF MOUNTAINS

**BONUS**

19) Earth and Space – *Short Answer* Identify all of the following three constellations that would be visible in the night sky over the North Pole on New Year's eve: 1) Mensa; 2) Cassiopeia [**KASS-ee-oh-PEE-ah**]; 3) Ursa Major.

ANSWER: 2 AND 3

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**TOSS-UP**

20) Physical Science – *Multiple Choice* Which of the following causes a drop of liquid to be rounded?

- W) Viscosity
- X) Surface tension
- Y) Nucleation
- Z) Adhesion

ANSWER: X) SURFACE TENSION

**BONUS**

20) Physical Science – *Short Answer* What principle states that it is impossible to know the position and the momentum of a particle simultaneously?

ANSWER: HEISENBERG UNCERTAINTY PRINCIPLE (ACCEPT: UNCERTAINTY PRINCIPLE)

### TOSS-UP

21) Math – *Multiple Choice* What is the minimum number of lines of symmetry for an isosceles trapezoid?

- W) 0
- X) 1
- Y) 2
- Z) 4

ANSWER: X) 1

### BONUS

21) Math – *Short Answer* Jimmy must create a new password for his account using the following criteria: It must begin with 2 English letters, followed by 3 digits. The letters may not be repeated. The digits may be repeated but the password cannot end in zero or one. How many different passwords are possible?

ANSWER: 520,000

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### TOSS-UP

22) Physical Science – *Short Answer* What gas law states that the volume of a gas is directly proportional to its temperature in kelvins if the pressure and number of particles of gas are constant?

ANSWER: CHARLES'S LAW (ACCEPT: IDEAL GAS LAW)

### BONUS

22) Physical Science – *Short Answer* What type of materials will create an induced magnetic field opposite to an externally applied magnetic field?

ANSWER: DIAMAGNETIC

**TOSS-UP**

23) Life Science – *Short Answer* What is the term for the single cell that forms when a sperm cell and an egg cell combine?

ANSWER: ZYGOTE

**BONUS**

23) Life Science – *Short Answer* What is the term for the flexible tissue that holds bones together?

ANSWER: LIGAMENT