

MIDDLE SCHOOL - ROUND 5A

TOSS-UP

1) Physical Science – *Short Answer* What is the term for the tendency of an object to resist changes in its motion?

ANSWER: INERTIA

BONUS

1) Physical Science – *Short Answer* Identify all of the following three properties that correctly describe a solid: 1) Definite shape; 2) Definite volume; 3) Ability to change shape to match its container.

ANSWER: 1 AND 2

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### TOSS-UP

2) Earth and Space – *Short Answer* What is the Earth's largest coral reef?

ANSWER: GREAT BARRIER REEF

### BONUS

2) Earth and Space – *Multiple Choice* Extensional boundaries are typically associated with what type of faulting?

- W) Reverse
- X) Thrust
- Y) Normal
- Z) Recumbent

ANSWER: Y) NORMAL

**TOSS-UP**

3) Math – *Short Answer* Solve the following equation for y:  $y - 16 = 16 - y$ .

ANSWER: 16

**BONUS**

3) Math – *Short Answer* A circle with radius 7 is inscribed in a square. To the nearest 10, what is the area of the region inside the square but outside the circle?

ANSWER: 40



**TOSS-UP**

4) Energy – *Multiple Choice* Scientists working at Ames Laboratory have devised a way to increase the catalytic activity of nanoparticles in fuel cell applications. What quantity related to the particles did scientists focus on increasing?

- W) Number
- X) Length
- Y) Surface area
- Z) Volume

ANSWER: Y) SURFACE AREA

**BONUS**

4) Energy – *Short Answer* What reaction, in which the starting material is decomposed in the presence of high temperatures without oxygen, is used to make biochar?

ANSWER: PYROLYSIS

**TOSS-UP**

5) Earth and Space – *Short Answer* To what constellation does the star Sirius belong?

ANSWER: CANIS MAJOR

**BONUS**

5) Earth and Space – *Short Answer* What astronomical term comes from the Greek meaning “yoked together” and is used to describe the alignment of three celestial bodies?

ANSWER: SYZYG



**TOSS-UP**

6) Life Science – *Short Answer* What is the term for alternative versions of the same gene?

ANSWER: ALLELE

**BONUS**

6) Life Science – *Short Answer* What is the name for the phase of mitosis in which chromosomes condense and the nuclear membrane breaks down?

ANSWER: PROPHASE

**TOSS-UP**

7) Energy – *Short Answer* Scientists at Princeton Plasma Physics Lab are hunting for a signature of the Big Bang in what light neutral class of leptons [*LEP-tawns*]?

ANSWER: NEUTRINO

**BONUS**

7) Energy – *Short Answer* What is the coolant used in most nuclear reactors in the United States?

ANSWER: WATER (ACCEPT: LIGHT WATER, H<sub>2</sub>O)



**TOSS-UP**

8) Earth and Space – *Short Answer* What is the defining mineral for a Mohs hardness of 1?

ANSWER: TALC

**BONUS**

8) Earth and Space – *Multiple Choice* Where does peridotite [*peh-RID-oh-tite*] form?

- W) Bottom of the ocean
- X) Upper mantle
- Y) Convergent plate boundaries
- Z) Evaporite deposits

ANSWER: X) UPPER MANTLE

**TOSS-UP**

9) Math – *Short Answer* If the perimeter of a triangle is 42, and the lengths of two of its sides are 18 and 11, what is the length of its third side?

ANSWER: 13

**BONUS**

9) Math – *Short Answer* The mean number of weekly work hours for 13 part-time employees at a store is 18. The mean number of hours for 5 of the employees is 13. To the nearest whole number, what is the mean number of hours for the rest of the store's employees?

ANSWER: 21

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TOSS-UP

10) Life Science – *Short Answer* What term describes an observable trait or traits of an organism?

ANSWER: PHENOTYPE

BONUS

10) Life Science – *Short Answer* Fermentation occurring in humans produces what molecule?

ANSWER: LACTIC ACID (ACCEPT: LACTATE)

TOSS-UP

11) Physical Science – *Short Answer* What is the general term for the substances that are used up in a chemical reaction?

ANSWER: REACTANTS

BONUS

11) Physical Science – *Short Answer* Identify all of the following three statements that are true of energy: 1) Energy from the Sun reaches the Earth via conduction; 2) Car engines convert chemical energy to both thermal and mechanical energy; 3) Absolute zero is the value zero on the Celsius scale.

ANSWER: 2

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**TOSS-UP**

12) Energy – *Short Answer* Most megacities are surrounded by a brown haze. Researchers working with the Pacific Northwest National Laboratory investigated chemicals found in pollution that could be causing the brown haze. What chemicals found in most pollution caused by cars is responsible for the brown haze?

ANSWER: NITROGEN OXIDES (ACCEPT: NO<sub>x</sub>, NO and NO<sub>2</sub>)

**BONUS**

12) Energy – *Short Answer* Researchers at Brookhaven National Lab are studying quark-gluon plasma. What user facility at BNL are they using to produce this type of matter?

ANSWER: RELATIVISTIC HEAVY-ION COLLIDER (ACCEPT: RHIC)

**TOSS-UP**

13) Life Science – *Short Answer* What is the general term for a polymer composed of sugars?

ANSWER: POLYSACCHARIDE (ACCEPT: STARCH)

**BONUS**

13) Life Science – *Short Answer* During what phase of interphase is DNA actively being synthesized?

ANSWER: S PHASE

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TOSS-UP

14) Math – *Short Answer* What is 60% of 30 plus 60% of 40?

ANSWER: 42

BONUS

14) Math – *Short Answer* A cyclist travels 0.48 kilometers in one minute. What is the average speed of this cyclist in meters per second?

ANSWER: 8

TOSS-UP

15) Physical Science – *Multiple Choice* Which of the following types of energy transformation occurs in a lightbulb?

- W) Kinetic to electrical
- X) Electrical to kinetic
- Y) Electrical to radiant
- Z) Electrical to chemical

ANSWER: Y) ELECTRICAL TO RADIANT

BONUS

15) Physical Science – *Short Answer* A vessel is pressurized to 500 Pascals and is applying force over an area of 20 meters squared. What is the force, in newtons, applied by this vessel?

ANSWER: 10,000

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**TOSS-UP**

16) Life Science – *Short Answer* What group of lipids that are composed of two fatty acid tails and a phosphate group can be found in the lipid bilayer of the cell membrane?

ANSWER: PHOSPHOLIPID

**BONUS**

16) Life Science – *Short Answer* Hexokinase [*hex-oh-KYE-nase*] is an enzyme that catalyzes the first step of glycolysis [*glye-KAWL-eh-sis*]. What functional group does it add to the glucose molecule?

ANSWER: PHOSPHATE

**TOSS-UP**

17) Math – *Short Answer* Solve the following equation for  $x$ : open parenthesis  $x - 4$  close parenthesis cubed = 27.

ANSWER: 7

**BONUS**

17) Math – *Short Answer* A hula hoop with a radius of 15 inches is cut into 5 congruent pieces. To the nearest whole number of inches, what is the length of each piece?

ANSWER: 19

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TOSS-UP

18) Earth and Space – *Multiple Choice* What property of protostars or protoplanets leads to accretion [*ah-KREE-shun*]?

- W) Composition
- X) Mass
- Y) Temperature
- Z) Velocity

ANSWER: X) MASS

BONUS

18) Earth and Space – *Short Answer* What spectral class is the star Sirius, which has a temperature of approximately 10,000 kelvins?

ANSWER: A (ACCEPT: A1)

TOSS-UP

19) Physical Science – *Short Answer* What is the molecular formula of carbon tetrachloride?

ANSWER: CCl₄

BONUS

19) Physical Science – *Short Answer* Identify all of the following three statements that are true for heating or cooling a substance in a closed system: 1) The freezing point of a liquid is the same temperature as the melting point of the corresponding solid; 2) At the boiling point, a heated liquid will continue to rise in temperature until completely converted into a gas; 3) Condensation only occurs at the boiling point temperature.

ANSWER: 1

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**TOSS-UP**

20) Life Science – *Short Answer* In humans, chemical digestion of sugars begins in what organ?

ANSWER: MOUTH

**BONUS**

20) Life Science – *Short Answer* Besides carbon and oxygen, what other two elements compose the largest portion of the mass of human beings?

ANSWER: HYDROGEN AND NITROGEN (ACCEPT: H AND N)

**TOSS-UP**

21) Math – *Short Answer* For what real numbers is the following rational function not defined: the fraction with numerator  $x^2$  times open parenthesis  $x^2 + 1$  close parenthesis and denominator open parenthesis  $x^2 - 1$  close parenthesis times open parenthesis  $x + 8$  close parenthesis?

ANSWER: -8, -1, AND 1 (ACCEPT: -8 AND  $\pm 1$ )

**BONUS**

21) Math – *Short Answer* Rounding your answer to the nearest 10,000, what is 449 times 382?

ANSWER: 170,000

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TOSS-UP

22) Physical Science – *Short Answer* Democritus [*dih-MOCK-ri-tuss*] was an early Greek philosopher whose theories about matter gave what particle its name?

ANSWER: ATOM

BONUS

22) Physical Science – *Short Answer* Jonathan starts at one corner of a square field and walks along the four edges forming the perimeter until he reaches his starting point. Identify all of the following three statements that are true of his journey: 1) After walking along one edge, his displacement and distance traveled are equal in magnitude; 2) After walking along two edges, his displacement and distance traveled are equal in magnitude; 3) After walking along four edges, his displacement and distance traveled are equal in magnitude.

ANSWER: 1

TOSS-UP

23) Earth and Space – *Short Answer* One consequence of Arctic warming is permafrost melting. What is the primary greenhouse gas being released by melting permafrost?

ANSWER: METHANE

BONUS

23) Earth and Space – *Multiple Choice* Crater Lake in Oregon is an example of a caldera [*kahl-DARE-ah*]. Which of the following statements best describes how this caldera formed?

- W) A lava dam blocked a river and later broke free, forming the caldera
- X) A mega-eruption blew off the side of Mount Mazama [*mah-ZAH-mah*]
- Y) A lava dome formed in the crater and later eroded leaving the caldera behind
- Z) The summit of Mount Mazama collapsed into the empty magma chamber below

ANSWER: Z) THE SUMMIT OF MOUNT MAZAMA COLLAPSED INTO THE EMPTY MAGMA CHAMBER BELOW