

MIDDLE SCHOOL - ROUND 6A

TOSS-UP

- 1) Earth and Space – *Short Answer* What river in North America has the largest drainage area?

ANSWER: MISSISSIPPI RIVER

BONUS

- 1) Earth and Space – *Short Answer* Identify all of the following three rocks that have a phaneritic **[fan-er-IT-ik]** texture: 1) Diorite; 2) Andesite; 3) Rhyolite.

ANSWER: 1

TOSS-UP

- 2) Math – *Short Answer* Evaluate $8 - |\underline{11} - \underline{16}|$.

ANSWER: 3

BONUS

- 2) Math – *Short Answer* A triangle has two exterior angles that have degree measures of 136 and 117, respectively. What is the degree measure of their common remote interior angle?

ANSWER: 73

TOSS-UP

3) Physical Science – *Short Answer* What is the term for the substances that are mixed together at the beginning of a chemical reaction and are consumed?

ANSWER: REACTANTS

BONUS

3) Physical Science – *Short Answer* Identify all of the following three properties that are generally shared by nonmetals: 1) Malleable; 2) Good conductors of electricity; 3) Form anions *[AN-eye-ons]*.

ANSWER: 3

TOSS-UP

4) Earth and Space – Short Answer What is the name of the high-pressure region in the atmosphere of Jupiter that has been continuously observed for almost 200 years, but may be dissipating?

ANSWER: GREAT RED SPOT

BONUS

4) Earth and Space – *Short Answer* As a low-mass star begins to burn out, it can produce some oxygen-16 by fusing alpha particles with the nucleus of what element?

ANSWER: CARBON

TOSS-UP

5) Energy – *Multiple Choice* Scientists at the National Renewable Energy Lab are studying magnesium batteries as an alternative to current lithium-ion technology. What is the charge on the magnesium ions in these batteries?

- W) +1
- X) +2
- Y) +3
- Z) -1

ANSWER: X) +2

BONUS

5) Energy – *Short Answer* Fermi National Accelerator Lab is now in the possession of the ICARUS [*IH-kah-rus*] neutrino detector. Results from this detector were important in showing that neutrinos could not travel superluminally [*super-LOO-min-uh-lee*], which means they cannot travel faster than what?

ANSWER: LIGHT (ACCEPT: SPEED OF LIGHT, PHOTONS)

TOSS-UP

6) Life Science – *Short Answer* Butterflies, spiders, and shrimp are all part of what phylum [*FYE-lum*] that is thought to contain the largest number of animal species?

ANSWER: ARTHROPODA (DO NOT ACCEPT: ARTHROPODS)

BONUS

6) Life Science – *Short Answer* What process can produce energy from glucose in the absence of oxygen and produces ethanol or lactic acid as products?

ANSWER: FERMENTATION

TOSS-UP

7) Physical Science – *Short Answer* What is the general term for a material, such as rubber or glass, that is a poor conductor of electrical current?

ANSWER: INSULATOR

BONUS

7) Physical Science – *Multiple Choice* An aspiring science student has a quantity of an unknown liquid in an unmarked, irregularly-shaped container. If a hydrometer [*high-DRAW-meh-tur*] reads 1.0 after being placed in the liquid, what other physical property of the liquid could be used to obtain the volume of liquid in the container?

- W) Temperature
- X) Mass
- Y) Color
- Z) Boiling point

ANSWER: X) MASS

TOSS-UP

8) Math – *Short Answer* What is the area of a right triangle with legs of lengths 6 and 13?

ANSWER: 39

BONUS

8) Math – *Short Answer* A student club sells tickets to a school play. They sell 253 tickets, averaging 6.7 tickets per member, rounded to the nearest tenth. How many members are in the club?

ANSWER: 38

TOSS-UP

9) Life Science – *Short Answer* What part of an egg functions to store nutrients for the developing embryo?

ANSWER: YOLK (ACCEPT: VITELLUS)

BONUS

9) Life Science – *Multiple Choice* Which of the following statements is true about meiosis [*my-OH-sis*]?

- W) In the first meiotic division, sister chromatids separate
- X) The second meiotic division results in four haploid daughter cells
- Y) Crossing over occurs during the second meiotic [*my-AW-tik*] division
- Z) Individual chromatids line up at the midzone for separation during metaphase I

ANSWER: X) THE SECOND MEIOTIC DIVISION RESULTS IN FOUR HAPLOID DAUGHTER CELLS

TOSS-UP

10) Energy – *Multiple Choice* Oak Ridge National Lab scientists have been studying a new derivative of vitamin B12 that must be bound to a certain enzyme for that enzyme to function. The derivative can therefore be classified as what?

- W) Catalyst
- X) Reactant
- Y) Cofactor
- Z) Protein

ANSWER: Y) COFACTOR

BONUS

10) Energy – *Short Answer* Researchers at Lawrence Berkeley National Lab are incorporating graphene into fuel cells. Of what element is graphene composed?

ANSWER: CARBON

TOSS-UP

11) Earth and Space – *Multiple Choice* What layer of Earth’s atmosphere is primarily responsible for absorbing harmful radiation?

- W) Thermosphere
- X) Troposphere
- Y) Stratosphere
- Z) Mesosphere

ANSWER: Y) STRATOSPHERE

BONUS

11) Earth and Space – *Short Answer* Identify all of the following three statements that are true of minerals: 1) Native elements like gold and silver are considered minerals; 2) Organic sedimentary rocks like coal are considered minerals; 3) Silicates are the most abundant mineral class in Earth’s crust.

ANSWER: 1, 3

TOSS-UP

12) Math – *Short Answer* To the nearest whole number, what is 35.26 plus 97.843?

ANSWER: 133

BONUS

12) Math – *Short Answer* Two six-sided dice are rolled. What is the probability that the sum of the two numbers is prime?

ANSWER: 5/12

TOSS-UP

13) Earth and Space – *Short Answer* What disc-shaped region of the solar system contains Pluto and other plutinos?

ANSWER: KUIPER BELT

BONUS

13) Earth and Space – *Short Answer* In 2017, the Nobel Prize in physics was awarded to a team of scientists at LIGO for the discovery of gravitational waves. The gravitational waves that were observed resulted from the collision of two of what type of celestial body?

ANSWER: BLACK HOLE

TOSS-UP

14) Physical Science – *Multiple Choice* An element in the second column of the periodic table will have the most similar chemical reactivity to which of the following?

- W) The element directly to the left
- X) The element directly to the right
- Y) The element directly below
- Z) The element at the end of the row

ANSWER: Y) THE ELEMENT DIRECTLY BELOW

BONUS

14) Physical Science – *Short Answer* Rank the following four hydrocarbons in order of increasing number of carbon atoms: 1) Ethane; 2) Butane; 3) Propane; 4) Methane.

ANSWER: 4, 1, 3, 2

TOSS-UP

15) Energy – *Multiple Choice* Lawrence Berkeley National Lab researchers are studying the structure of PRC2, an enzyme that silences genes. Which of the following best characterizes PRC2?

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

ANSWER: X) PROTEIN

BONUS

15) Energy – *Short Answer* Scientists at SLAC National Lab use brilliant, ultrafast pulses produced by the Linac Coherent Light Source, or LCLS, to perform mix-and-inject serial crystallography. From what portion of the electromagnetic spectrum do these pulses originate?

ANSWER: X-RAY

TOSS-UP

16) Life Science – *Short Answer* What is the term for a mutualistic association between a fungus and a photosynthetic bacteria?

ANSWER: LICHEN

BONUS

16) Life Science – *Short Answer* What type of selection occurs when organisms at one end of the curve for a distribution of a certain trait have higher fitness than those at the other end?

ANSWER: DIRECTIONAL SELECTION

TOSS-UP

17) Physical Science – *Short Answer* What is the adjective for a force that acts on a circularly-traveling object and is directed towards the center of rotation?

ANSWER: CENTRIPETAL (DO NOT ACCEPT: CENTRIFUGAL)

BONUS

17) Physical Science – *Short Answer* Rank the following three entities in order of increasing heat capacity: 1) Earth's atmosphere; 2) A liter of water; 3) An iron nail.

ANSWER: 3, 2, 1

TOSS-UP

18) Math – *Short Answer* What is the additive inverse of $-5/7$?

ANSWER: $5/7$

BONUS

18) Math – *Short Answer* The base-six numeral five-four-three is equivalent to what in base 10?

ANSWER: 207

TOSS-UP

19) Earth and Space – *Short Answer* What term is given to the brittle upper layer of the Earth that extends from the Earth's surface into the upper mantle and makes up Earth's tectonic plates?

ANSWER: LITHOSPHERE (DO NOT ACCEPT: CRUST)

BONUS

19) Earth and Space – *Short Answer* What is the most abundant element in Earth's crust?

ANSWER: OXYGEN

TOSS-UP

20) Life Science – *Multiple Choice* What will occur to an animal cell if it is placed in a hypotonic environment?

- W) It will shrivel
- X) It will plasmolyse *[PLAZ-moh-lyes]*
- Y) It will remain the same
- Z) It will explode

ANSWER: Z) IT WILL EXPLODE

BONUS

20) Life Science – *Multiple Choice* In an amoeba, which of the following is the primary purpose of the pseudopods?

- W) Structural support
- X) Movement
- Y) Reproduction
- Z) Protein synthesis

ANSWER: X) MOVEMENT

TOSS-UP

21) Math – *Short Answer* In which quadrant does the point $(5, -6)$ lie?

ANSWER: FOURTH (ACCEPT: 4)

BONUS

21) Math – *Short Answer* Solve the following equation for x : the square root of open parenthesis $3x - 8$ close parenthesis = $x - 6$.

ANSWER: 11 (DO NOT ACCEPT: 4)

TOSS-UP

22) Life Science – *Short Answer* What small particles of RNA and protein are responsible for synthesizing proteins by reading mRNA?

ANSWER: RIBOSOMES

BONUS

22) Life Science – *Short Answer* Identify all of the following four animals that are contained within the phylum **[FYE-lum]** Mollusca: 1) Clam; 2) Jellyfish; 3) Octopus; 4) Snail.

ANSWER: 1, 3, 4

TOSS-UP

23) Physical Science – *Short Answer* A car traveling at a certain speed requires 1200 joules of work to be brought to rest. How much energy, in joules, is required to stop the car if it is traveling at twice that initial speed?

ANSWER: 4800

BONUS

23) Physical Science – *Short Answer* Kate picks up her dog, who has a mass of 10 kilograms, and lifts the dog 2 meters directly up into the air. To the nearest joule, how much work did she do?

ANSWER: 196