

Middle School  
Set 2

TOSS-UP

1) Earth and Space – *Multiple Choice* The sedimentary layers of sandstones, shales, and limestones that make up the Grand Canyon and vast regions of the southwest United States were primarily deposited by which of the following?

- W) A shallow ocean
- X) Wind
- Y) Receding glaciers
- Z) Freshwater streams

ANSWER: W) A SHALLOW OCEAN

BONUS

1) Earth and Space – *Multiple Choice* What is the name of the type of concordant [***kon-KOR-dent***] igneous intrusion that splits apart two strata, pushing the overlying strata upwards in a dome-like structure, but has a generally horizontal base?

- W) Dike
- X) Sill
- Y) Laccolith [***LACK-ah-lith***]
- Z) Batholith [***BATH-eh-lith***]

ANSWER: Y) LACCOLITH

## TOSS-UP

2) Energy – *Short Answer* Scientists at Lawrence Berkeley National Lab are studying *Neurospora*. What kingdom is this organism classified under?

ANSWER: FUNGI (ACCEPT: FUNGUS)

## BONUS

2) Energy – *Short Answer* Scientists at the Joint Genome Institute are studying the genomes of mosses. These plants are part of what plant division?

ANSWER: BRYOPHYTA (ACCEPT: BRYOPHYTES)

## TOSS-UP

3) Life Science – *Short Answer* What common illness is most frequently caused by rhinoviruses, but can also be caused by certain coronaviruses or adenoviruses [*AD-an-oh-viruses*]?

ANSWER: COLD (ACCEPT: COMMON COLD; do not accept: RESPIRATORY ILLNESS)

## BONUS

3) Life Science – *Multiple Choice* What part of the brain plays a major role in endocrine [*EN-doh-krin*] regulation, and is primarily responsible for maintaining homeostasis?

- W) Pons
- X) Cerebellum
- Y) Thalamus
- Z) Hypothalamus

ANSWER: Z) HYPOTHALAMUS

TOSS-UP

4) Math – *Short Answer* What value of  $x$  produces the smallest value of  $x^2 - 22x + 121$ ?

ANSWER: 11

BONUS

4) Math – *Short Answer* A student club sells tickets to a school play. They sell 226 tickets, averaging 5.8 tickets per member, rounded to the nearest tenth. How many members are in the club?

ANSWER: 39

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## TOSS-UP

5) Physical Science – *Short Answer* How many valence electrons does neutral sodium possess?

ANSWER: ONE

## BONUS

5) Physical Science – *Short Answer* Rank the following three elements in terms of increasing atomic mass: 1) Cesium; 2) Copper; 3) Lithium.

ANSWER: 3, 2, 1

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## TOSS-UP

6) Earth and Space – *Short Answer* Galileo's observations of the Sun contradicted the Ptolemaic [*Tall-eh-MAY-ik*] model regarding celestial bodies being perfect and unchanging. What is the term for the solar features he observed that resulted in this contradiction?

ANSWER: SUNSPOTS

## BONUS

6) Earth and Space – *Short Answer* Identify all of the following three statements that are true of both Uranus and Neptune: 1) They have rings; 2) They have prominent surface features; 3) They are classified as ice giants.

ANSWER: 1, 3

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## TOSS-UP

7) Energy – *Short Answer* Ames Lab scientists are studying a quantum mechanical effect in  $\text{NaVOPO}_4$ , in which its magnetic behavior qualitatively changes after passing a critical threshold, analogous to changes between states of matter. What is the general term for these transitions?

ANSWER: PHASE TRANSITION (ACCEPT: PHASE, PHASE CHANGE)

## BONUS

7) Energy – *Short Answer* Researchers at Fermi National Accelerator Lab are studying the interaction of neutrinos with tritium [*TRIH-tee-um*]. What element in the periodic table is isotopic to tritium?

ANSWER: HYDROGEN



## TOSS-UP

8) Life Science – *Short Answer* What theory did Charles Darwin propose as the mechanism for evolution?

ANSWER: NATURAL SELECTION

## BONUS

8) Life Science – *Short Answer* Consider a single double-helix of DNA, which then undergoes three rounds of replication. What percentage of the resulting DNA molecules contain the original DNA strands?

ANSWER: 25 (ACCEPT: 25%)



TOSS-UP

9) Math – *Short Answer* What is the product of the two radical expressions  $6\sqrt{2}$  and  $7\sqrt{2}$ ?

ANSWER: 84

BONUS

9) Math – *Short Answer* From a point 40 feet from the base of a tree, the angle of elevation to the top is 60 degrees. To the nearest foot, what is the height of the tree?

ANSWER: 69

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## TOSS-UP

10) Physical Science – *Short Answer* In terms of hydronium ion concentration, how many times as concentrated is a solution of pH 4 as a solution of pH 7?

ANSWER: 1000

## BONUS

10) Physical Science – *Short Answer* Identify all of the following three reactions that are synthesis reactions: 1) Hydrogen gas plus bromine gas yield hydrobromic acid; 2) Calcium bromide plus chlorine gas yields calcium chloride and bromine; 3) Solid tin plus oxygen gas yields tin oxide.

ANSWER: 1, 3

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## TOSS-UP

11) Earth and Space – *Short Answer* The rainband, eye, and eyewall are all features of what major weather phenomenon that can include hurricanes and typhoons?

ANSWER: TROPICAL CYCLONE (do not accept: CYCLONE, TROPICAL STORM)

## BONUS

11) Earth and Space – *Short Answer* The North Pole receives 24-hour sunlight during the summer, but is still colder than most temperate latitudes. Identify all of the following three phenomena that significantly contribute to this effect: 1) The pole is farther away from the Sun; 2) Light passes through more atmosphere before hitting the surface at the poles; 3) The incident angle of the Sun's rays is more oblique at the poles.

ANSWER: 2, 3

## TOSS-UP


12) Energy – *Short Answer* Oak Ridge National Lab scientists are studying how certain bacteria defend themselves from foreign DNA by using enzymes that cut DNA strands when they recognize a certain sequence. What is the term for these enzymes?

ANSWER: RESTRICTION ENZYME (ACCEPT: RESTRICTION ENDONUCLEASE, RESTRICTASE)

## BONUS

12) Energy – *Short Answer* Argonne National Lab researchers are observing how amino acids adhere to copper surfaces. Adhesion occurs because copper atoms bind to what negatively-charged functional group found in all amino acids?

ANSWER: CARBOXYL (ACCEPT: CARBOXYLATE, CARBOXYLIC ACID)



TOSS-UP

13) Life Science – *Short Answer* What clade of mammals is characterized by the carrying of youth in an external pouch following live birth?

ANSWER: MARSUPIALS (ACCEPT: MARSUPIALIA)

BONUS

13) Life Science – *Multiple Choice* During the summer months, which of the following plant structures is NOT a sugar sink?

- W) Flower
- X) Root
- Y) Leaf
- Z) Fruit

ANSWER: Y) LEAF

## TOSS-UP

14) Math – *Short Answer* What is the remainder when 88 is divided by 13?

ANSWER: 10

## BONUS

14) Math – *Short Answer* Three blue marbles, 3 green marbles, and 5 red marbles are in a jar. Two marbles are selected without replacement. What is the probability that the two marbles are the same color?

ANSWER:  $16/55$

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## TOSS-UP

15) Physical Science – *Short Answer* In newtons with one significant figure, what is the magnitude of the gravitational force that a 30-kilogram child exerts on Earth while standing on its surface?

ANSWER: 300

## BONUS

15) Physical Science – *Short Answer* How many double bonds are present in one molecule of butyl-amine [*BYOO-til-ah-MEEN*]?

ANSWER: ZERO