

MIDDLE SCHOOL - ROUND 9A

TOSS-UP

1) Physical Science – *Multiple Choice* What property of a fluid would enable a metal wire to float on the surface?

- W) Viscosity
- X) Temperature
- Y) Surface tension
- Z) Compressibility

ANSWER: Y) SURFACE TENSION

BONUS

1) Physical Science – *Short Answer* Identify all of the following three forces that can be considered contact forces: 1) Magnetism; 2) Tension; 3) Gravity.

ANSWER: 2

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### TOSS-UP

2) Math – *Short Answer* For a group of 80 Science Bowl players, 65 percent were eighth-graders, 20 percent were seventh-graders, and the rest were sixth-graders. How many players in the group were sixth-graders?

ANSWER: 12

### BONUS

2) Math – *Multiple Choice* According to Descartes' Rule of Signs, which of the following statements best characterizes the possible real roots of the equation  $x^3 + x^2 - x - 1 = 0$ ?

- W) One positive root, zero negative roots
- X) One positive root, two negative roots
- Y) One positive root, two or zero negative roots
- Z) Two positive roots, one negative root

ANSWER: Y) ONE POSITIVE ROOT, TWO OR ZERO NEGATIVE ROOTS

**TOSS-UP**

3) Energy – *Multiple Choice* Scientists at Oak Ridge National Lab determined the crystal structure of a protease responsible for cleaving Gag and Pol proteins. This protease is important in the life cycle of which clinically-important retrovirus?

- W) Human Immunodeficiency Virus
- X) Influenza
- Y) Smallpox
- Z) Chicken pox

ANSWER: W) HUMAN IMMUNODEFICIENCY VIRUS

**BONUS**

3) Energy – *Short Answer* DOE scientists recently imaged the supercoiling of DNA in a bacterial model system to study its relationship with pathogenicity. What is the genus of the bacteria they studied?

ANSWER: ESCHERICHIA

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TOSS-UP

4) Earth and Space – *Multiple Choice* Which of the following processes is responsible for generating most of the heat that powers Io's [*EYE-ohs*] volcanism?

- W) Radioactive decay
- X) Tidal forces
- Y) Solar insolation
- Z) Jupiter's magnetic field

ANSWER: X) TIDAL FORCES

BONUS

4) Earth and Space – *Short Answer* Rank the following three star colors in increasing order of temperature: 1) Red 2) Blue 3) Yellow.

ANSWER: 1, 3, 2

TOSS-UP

5) Physical Science – *Short Answer* In sodium chloride, the sodium ion has the same electron configuration as what neutral element?

ANSWER: NEON

BONUS

5) Physical Science – *Short Answer* What is the term for a compound that is composed of only carbon and hydrogen and contains one or more double bonds between carbon atoms?

ANSWER: ALKENE (ACCEPT: OLEFIN)

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**TOSS-UP**

6) Life Science – *Short Answer* What organ system in the human body is responsible for removing carbon dioxide from the body?

ANSWER: RESPIRATORY (ACCEPT: PULMONARY)

**BONUS**

6) Life Science – *Multiple Choice* An individual with the monosomy [*MAW-no-soh-mee*] Turner syndrome has what karyotype [*KAIR-ee-oh-type*]?

- W) X-O
- X) Y-O
- Y) XXX
- Z) XXY

ANSWER: W) X-O

**TOSS-UP**

7) Math – *Multiple Choice* Which of the following is closest to the number of cubic inches in a cubic yard?

- W) 400
- X) 4,000
- Y) 40,000
- Z) 400,000

ANSWER: Y) 40,000

**BONUS**

7) Math – *Short Answer* If the ratio of the volumes of two similar circular cones is 36 to 27, what is the ratio of the diameter of the larger cone to that of the smaller cone?

ANSWER: CUBE ROOT OF 36 to 3 (ACCEPT: CUBE ROOT OF 36 DIVIDED BY 3, 1/3 OF THE CUBE ROOT OF 36)



**TOSS-UP**

8) Life Science – *Short Answer* Two plants with yellow peas are heterozygous [*hetero-ZYE-gus*] for that dominant trait. What percentage of their offspring will have yellow peas?

ANSWER: 75

**BONUS**

8) Life Science – *Multiple Choice* A new organism is discovered. Dissection of the creature reveals a digestive tract, segmented body, no vertebrae, and only bilateral symmetry. What phylum [*FYE-lum*] should it be categorized under?

- W) Cnidaria [*nye-DARE-ee-ah*]
- X) Platyhelminthes [*plat-ih-hell-MIN-thees*]
- Y) Nematoda [*NEE-mah-TOH-dah*]
- Z) Annelida [*anna-LEE-dah*]

ANSWER: Z) ANNELIDA

**TOSS-UP**

9) Earth and Space – *Short Answer* The Alpine Fault runs the length of New Zealand’s South Island, marking a boundary between the Pacific Plate and the Indo-Australian Plate. As the two plates slide past each other, the Pacific Plate is being pushed up higher than the Indo-Australian Plate. What type of boundary is the Alpine Fault?

ANSWER: TRANSFORM BOUNDARY

**BONUS**

9) Earth and Space – *Short Answer* Rank the following three water reservoirs in increasing order of the percentage of the world's water they contain: 1) Lakes; 2) Ice; 3) Groundwater.

ANSWER: 1, 3, 2

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TOSS-UP

10) Math – *Short Answer* To the nearest whole number, what is 42.16 plus 96.883?

ANSWER: 139

BONUS

10) Math – *Short Answer* A hexagon has two right angles, and the other 4 angles are congruent. What is the degree measure of each of these other 4 angles?

ANSWER: 135

TOSS-UP

11) Physical Science – *Short Answer* What is the term for an acid that possesses three acidic hydrogens, such as phosphoric acid?

ANSWER: TRIPROTIC

BONUS

11) Physical Science – *Short Answer* What is the oxidation number of iron in ferric oxide?

ANSWER: 3 (ACCEPT: PLUS 3)



TOSS-UP

12) Energy – *Short Answer* Scientists at Oak Ridge National Lab are developing the next generation of lithium ion batteries. Identify all of the following three statements that are TRUE of these batteries: 1) They are rechargeable; 2) They use intercalation reactions; 3) The lithium ions are the charge carriers.

ANSWER: ALL (ACCEPT: 1, 2, AND 3)

BONUS

12) Energy – *Short Answer* Identify all of the following three types of batteries that are rechargeable: 1) Alkaline; 2) Nickel-cadmium; 3) Nickel-hydride.

ANSWER: 2 AND 3

TOSS-UP

13) Math – *Short Answer* The line with equation $y = 3x + 7$ contains points in each quadrant except which one?

ANSWER: 4 (ACCEPT: FOURTH)

BONUS

13) Math – *Short Answer* Eight marbles marked one through eight are placed into a bag, and you draw two of them at random. What is the probability that the two marbles you draw are marked 4 and 2?

ANSWER: 1/28

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**TOSS-UP**

14) Life Science – *Short Answer* What genetic disorder is caused by trisomy of the 21st chromosome?

ANSWER: DOWN SYNDROME

**BONUS**

14) Life Science – *Multiple Choice* Hemophilia is an X-chromosome-linked recessive trait. Which of the following percentages is the probability that the daughter of a male with the disease and a female carrier is a hemophiliac?

- W) 0
- X) 25
- Y) 50
- Z) 100

ANSWER: Y) 50

**TOSS-UP**

15) Physical Science – *Multiple Choice* Which of the following processes can best be used to separate a mixture of miscible liquids?

- W) Distillation
- X) Filtration
- Y) Sedimentation
- Z) Centrifugation

ANSWER: W) DISTILLATION

**BONUS**

15) Physical Science – *Short Answer* Identify all of the following three statements that are true: 1) Water molecules are dipoles; 2) All bonds involve the sharing of electrons between two atoms; 3) In conducting metals, certain electrons can move freely throughout the metal.

ANSWER: 1 AND 3



**TOSS-UP**

16) Earth and Space – *Short Answer* What force is primarily responsible for the formation of protostars from nebular [*NEB-yoo-lar*] clouds?

ANSWER: GRAVITY

**BONUS**

16) Earth and Space – *Short Answer* Order the following three stages of a “shooting star” from before it enters the Earth’s atmosphere to when it hits the Earth’s surface: 1) Meteor; 2) Meteorite; 3) Meteoroid.

ANSWER: 3, 1, 2



**TOSS-UP**

17) Energy – *Short Answer* Researchers at Argonne National Lab are developing spintronic materials that rely on manipulating the spin of what subatomic particles?

ANSWER: ELECTRONS

**BONUS**

17) Energy – *Short Answer* In a Leclanche [*lah-KLAN-shay*] zinc-carbon battery, an oxide of what transition metal reacts at the positive electrode?

ANSWER: MANGANESE

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TOSS-UP

18) Life Science – *Short Answer* What is the term for a cross in genetics that is used to track the inheritance of only a single characteristic?

ANSWER: MONOHYBRID

BONUS

18) Life Science – *Short Answer* Identify all of the following four organelles that are thought to have evolved from endosymbionts [*endo-SIM-by-awnts*]: 1) Mitochondrion [*my-tow-KON-dree-on*]; 2) Chloroplast; 3) Nucleus; 4) Lysosome [*LYE-soh-sohm*].

ANSWER: 1 AND 2

TOSS-UP

19) Math – *Short Answer* How many real solutions are there to the equation $x^2 - 22x + 121 = 0$?

ANSWER: ONE

BONUS

19) Math – *Short Answer* How many prime numbers are between 75 and 100?

ANSWER: 4



TOSS-UP

20) Earth and Space – *Multiple Choice* Which of the following numbers of kilometers is closest to the altitude at which Earth's atmospheric pressure is half that of the surface?

W) 3

X) 5.5

Y) 7.5

Z) 10.5

ANSWER: X) 5.5

BONUS

20) Earth and Space – *Short Answer* The Saffir-Simpson [*SAH-fur-SIMP-sun*] scale is used to classify what?

ANSWER: HURRICANES (ACCEPT: HURRICANE WIND SPEED, MAXIMUM SUSTAINED HURRICANE WIND SPEED)

TOSS-UP

21) Life Science – *Short Answer* What molecule is responsible for carrying oxygen in the mammalian red blood cell?

ANSWER: HEMOGLOBIN

BONUS

21) Life Science – *Short Answer* Crossing over during prophase I forms what point of contact between homologous [*ha-MAWL-uh-gus*] chromosomes?

ANSWER: CHIASMA



TOSS-UP

22) Physical Science – *Short Answer* J.J. Thomson was an English scientist who studied cathode ray tubes. In his experiments, the so-called cathode rays were made up of what subatomic particle?

ANSWER: ELECTRON

BONUS

22) Physical Science – *Short Answer* To the nearest whole number, what temperature in degrees Fahrenheit is equivalent to 103 degrees Celsius?

ANSWER: 217

TOSS-UP

23) Earth and Space – *Multiple Choice* Which of the following is not one of the Big-Five mass extinctions?

- W) End Permian [*PURR-mee-en*]
- X) Late Devonian [*deh-VOH-nee-an*]
- Y) Mid Carboniferous [*car-bon-IH-fur-us*]
- Z) Ordovician [*OR-doh-VIH-shin*]-Silurian [*suhl-UR-ee-an*]

ANSWER: Y) MID CARBONIFEROUS

BONUS

23) Earth and Space – *SHORT ANSWER* Identify all of the following three rocks that are sedimentary:

- 1) Coquina [*koh-KEE-nah*]; 2) Dolostone [*DOH-low-stone*], 3) Breccia [*BREH-chee-ah*].

ANSWER: ALL