

**TOSS-UP**

1) EARTH AND SPACE *Short Answer* What are the two most abundant elements in the Earth's inner core?

ANSWER: Iron and nickel

**BONUS**

1) EARTH AND SPACE *Short Answer* If the earth did not rotate, near what latitude would there be the most rain?

ANSWER: 0 degrees (accept: the equator)

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**TOSS-UP**

2) BIOLOGY *Short Answer* By what process do amoeboid cells engulf large food particles?

ANSWER: Phagocytosis

**BONUS**

2) BIOLOGY *Short Answer* By name or by number, indicate all of the following that are digested in the small intestine:

1. Cellulose
2. Nucleic acids
3. Disaccharides

ANSWER: 2, 3

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**TOSS-UP**

3) CHEMISTRY *Short Answer* Which of the following bonds has the shortest length?

- W) Carbon single bond carbon
- X) Carbon double bond carbon
- Y) Carbon triple bond carbon
- Z) Tie between choices W, X, Y

ANSWER: Y) Carbon triple bond carbon

**BONUS**

3) CHEMISTRY *Multiple Choice* Which of the following elements does not react with water to product alkaline solution in gel electrophoresis?

- W) Magnesium

X) Beryllium

Y) Sodium

Z) Lithium

ANSWER: X) Beryllium

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**TOSS-UP**

4) PHYSICS *Short Answer* Dividing the energy of a wave by its frequency will yield what familiar constant?

ANSWER: Planck's Constant

**BONUS**

4) PHYSICS *Short Answer* By name or number, order the following types of electromagnetic radiation in order of increasing energy

1. Radiowaves
2. Gamma Rays
3. Ultraviolet light
4. X-Rays

ANSWER: 1, 3, 4, 2

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**TOSS-UP**

5) MATH *Multiple Choice* Which of the following is equal to 20 cents in value?

W) 10 Pennies and 2 Dimes

X) 5 Pennies and 3 Quarters

Y) 2 Nickels and 1 Dime

Z) 3 Dimes

ANSWER: Y) 2 Nickels and 1 Dime

**BONUS**

5) MATH *Short Answer* Which Russian mathematician proved Poincare Conjecture, a Millennium Prize Problem?

ANSWER: Grigori Perelman

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**TOSS-UP**

6) BIOLOGY *Short Answer* By name or by number, indicate all of the following that are ways by which seeds can be dispersed:

1. Water
2. Herbivores
3. Wind

ANSWER: 1, 2, 3 (ALL)

**BONUS**

1) BIOLOGY *Short Answer* One-celled algae enclosed by intricate silica shells are called what?

ANSWER: Diatoms

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**TOSS-UP**

7) CHEMISTRY *Short Answer* Acid rain results from the production of what acid?

ANSWER: Sulfuric acid

**BONUS**

7) CHEMISTRY *Short Answer* What strong acid is known as muriatic acid in the household?

ANSWER: Hydrochloric acid

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**TOSS-UP**

8) EARTH AND SPACE *Multiple Choice* Which of the following contributed most to the formation of Earth's early atmosphere?

- W) Comets crashing into the earth
- X) Early earth's gravity
- Y) Cosmic background radiation
- Z) Volcanism

ANSWER: Z) Volcanism

**BONUS**

8) EARTH AND SPACE *Short Answer* By name or number, express the following in chronological order, from earliest to latest.

1. Moon forms
2. The nebular hypothesis occurs
3. The Big Bang
4. Animal life forms on Earth

ANSWER: 3, 2, 1, 4

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**TOSS-UP**

9) PHYSICS *Multiple Choice* If the distance between two objects is doubled, by what factor is the gravitational force multiplied?

W) 1/4

X) 1/2

Y) 2

Z) 4

ANSWER: W) 1/4

**BONUS**

9) PHYSICS *Short Answer* What is the energy released if 3 kg of mass is completely converted to energy? Express your answer in scientific notation with two significant figures.

ANSWER:  $2.7 \times 10^{17} J$

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**TOSS-UP**

10) MATH *Short Answer* What is the first prime number with 3 factors?

ANSWER: None exist

**BONUS**

10) MATH *Short Answer* Danny gets 7 points out of 20 possible on the math team tryout. Given that each problem is either worth 1 point for a correct answer or 0 points for all other answers, what percent of the problems did Danny answer correctly?

ANSWER: 35%

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**TOSS-UP**

11) EARTH AND SPACE *Short Answer* By name or number, rank the following four items in order of increasing hardness

1. Copper penny
2. Talc
3. Corundum

4. Quartz

ANSWER: 2, 1, 4, 3

**BONUS**

11) EARTH AND SPACE *Multiple Choice* Which of the following is most similar to the formation of an Indian summer monsoon?

W) Sea Breeze

X) Land breeze

Y) Wind

Z) Hurricane

ANSWER: W) Sea Breeze

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**TOSS-UP**

12) BIOLOGY *Multiple Choice* What is another name for “milk sugar”?

W) Glucose

X) Lactose

Y) Fructose

Z) Sucrose

ANSWER: X) Lactose

**BONUS**

12) BIOLOGY *Multiple Choice* What vitamin is deficient in people suffering from rickets and osteomalacia (read as: aus-tee-o-mal-ay-sha)?

W) Vitamin A

X) Vitamin B12

Y) Vitamin C

Z) Vitamin D

ANSWER: Z) Vitamin D

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**TOSS-UP**

13) CHEMISTRY *Multiple Choice* The term inert best describes which group of elements?

W) Alkali metals

X) Alkaline earth metals

Y) Halogens

Z) Noble gases

ANSWER: Z) Noble gases

**BONUS**

13) CHEMISTRY *Short Answer* What are the sum of the coefficients of the reactants and products of the balanced equation  $\_\_H_2 + \_\_N_2 \rightarrow \_\_NH_3$  (read as: hydrogen gas reacts with nitrogen gas to form ammonia)

ANSWER: 6

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**TOSS-UP**

14) PHYSICS *Multiple Choice* Which of the following is closest to the number of Joules in one British Thermal Unit?

W) 10

X) 100

Y) 1000

Z) 10000

ANSWER: Y) 1000

**BONUS**

14) PHYSICS *Multiple Choice* A 2 kg mass traveling at 3 m/s undergoes a net force and its speed increases to 4 m/s in the same direction. In  $N \cdot s$  (read as: Newton-seconds), what is the impulse applied to the object?

W) 1

X) 2

Y) 3

Z) 4

ANSWER: X) 2

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**TOSS-UP**

15) MATH *Short Answer* When a really big class is told to get into groups of 5, there are 4 students left over. When they are told to get into groups of 6, there are 5 students left over. When

they are asked to get into groups of 7, there are 6 students left over. Calculate the least number of possible students in the class.

ANSWER: 209

**BONUS**

15) MATH *Short Answer* Calculate the area of the region bounded between the y-axis, the line  $x = \frac{\pi}{4}$ , and the two curves  $y = \sin(x)$  and  $y = \cos(x)$ .

ANSWER:  $\sqrt{2} - 1$

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**TOSS-UP**

16) EARTH AND SPACE *Short Answer* By name or number, list the following latitudes generally associated with low pressure systems?

1. 0°
2. 30°
3. 90°

ANSWER: 1

**BONUS**

16) EARTH AND SPACE *Short Answer* What is the latitudinal degree of the horse latitudes?

ANSWER: 30° (accept 30° north and south)

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**TOSS-UP**

17) BIOLOGY *Short Answer* What metabolic pathway breaks glucose down into two pyruvate molecules, generating ATP?

ANSWER: Glycolysis

**BONUS**

17) BIOLOGY *Multiple Choice* Plants respond to drought by:

- W) Increasing surface area of leaves
- X) Closing stomata
- Y) Releasing large amounts of auxin
- Z) Undergoing emergency flowering

ANSWER: X) Closing stomata

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**TOSS-UP**

18) CHEMISTRY *Short Answer* What is the chemical formula for hydrogen peroxide?

ANSWER: H<sub>2</sub>O<sub>2</sub>

**BONUS**

18) CHEMISTRY *Multiple Choice* Which of the following is not a use for hydrogen peroxide?

W) Wound disinfectant

X) Boost plant growth

Y) Remove algae from an aquarium

Z) Flame retardant

ANSWER: Z) Flame retardant

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**TOSS-UP**

19) PHYSICS *Short Answer* What is the shape of the trajectory of a projectile fired a certain angle upwards assuming that gravity is constant?

ANSWER: Parabolic

**BONUS**

19) PHYSICS *Short Answer* What states that the orbital paths of the planets around the sun is elliptical?

ANSWER: Kepler's First Law

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**TOSS-UP**

20) MATH *Short Answer* How many positive factors does 84 have?

ANSWER: 12

**BONUS**

20) MATH *Short Answer* What is the sum of the positive factors of 85?

ANSWER: 108

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**TOSS-UP**



21) EARTH AND SPACE *Short Answer* What type of igneous rock is characterized by its transparency, flakiness, and high melting point, and often appears as shiny flecks in other igneous rocks?

ANSWER: Mica

**BONUS**

21) EARTH AND SPACE *Multiple choice* Which of the following is an Iron ore?

W) Cinnabar

X) Galena

Y) Bauxite

Z) Hematite

ANSWER: Z) Hematite

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**TOSS-UP**

22) BIOLOGY *Short Answer* Binomial nomenclature consists of what two taxonomic ranks?

ANSWER: Genus, Species

**BONUS**

22) BIOLOGY *Short Answer* By name or number, indicate all of the following that occur after the consumption of a carbohydrate-rich meal:

1. Blood glucose decreases

2. Insulin secretion increases

3. Glucose breakdown increases

ANSWER: 2, 3

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**TOSS-UP**

23) CHEMISTRY *Multiple Choice* Which of the following functional groups is acidic?

W) Amino

X) Carboxyl

Y) Carbonyl

Z) Hydroxyl

ANSWER: X) Carboxyl

**BONUS**

23) CHEMISTRY *Short Answer* A goldfish can see which of the following spectrum or spectra of electromagnetic radiation?

1. Infrared
2. Visible Light
3. Ultraviolet

ANSWER: 1, 2, 3 (ALL)

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**TOSS-UP**

24) PHYSICS *Multiple Choice* What is the SI unit for inertia?

- W) Kilogram
- X) Newton
- Y) Webber
- Z) Meters per second squared

ANSWER: W) Kilogram

**BONUS**

24) PHYSICS *Multiple Choice* Which of the following is the best explanation for why astronauts in space seem to be weightless?

- W) They are far from the Earth's center and therefore don't feel any gravity.
- X) The gravitational effect from the moon and the Earth cancel.
- Y) They are in free fall around the Earth.
- Z) The spacecraft is spinning so that the force of gravity is negated.

ANSWER: Y) They are in free fall around the Earth.

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**TOSS-UP**

25) MATH *Short Answer* How many integer values pairs of a and b exist such that  $a^2 - b^2 = 32$ ?

ANSWER: 2

**BONUS**

25) MATH *Short Answer* A book is sold for a price of \$49.99. A commercial is selling the book for three payments of \$13.99 and a shipping fee of \$7.99. How much do you save by purchasing from the commercial?

ANSWER: 3 cents

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