TOSS-UP

1) BIOLOGY *Short Answer* What is the purpose of cones in gymnosperms?

ANSWER: SEXUAL REPRODUCTION

BONUS

1) BIOLOGY *Short Answer* Name the plant type that has one seed leaf when it germinates, leaf veins that are parallel to each other, and includes plants such as corn, wheat, lilies, daffodils, and palms.

ANSWER: MONOCOTS [ACCEPT: MONOCOTYLEDON (read as: moh-noh-koh-ti-LEE-dohn)]

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TOSS-UP

2) MATH *Short Answer* The lengths of two sides of a triangle are 4 and 9. If the triangle is isosceles, what is the length of the third side?

ANSWER: 9

BONUS

2) MATH *Short Answer* Rebekah wants to fill a spherical piñata with candy. If the radius of her piñata is 6 inches, what is the volume in cubic inches of her piñata in terms of pi?

ANSWER: 288π

TOSS-UP

3) EARTH AND SPACE *Short Answer* What ice sheet on Earth contains the largest volume of ice?

ANSWER: EAST ANTARCTIC ICE SHEET

BONUS

3) EARTH AND SPACE *Multiple Choice* The West Antarctic Ice Sheet and the East Antarctic Ice Sheet are separated by what mountain range?

W) Transantarctic Mountains
X) Admiralty Mountains
Y) Shackleton Range
Z) East Antarctic Ranges

ANSWER: W) TRANSANTARCTIC MOUNTAINS

_____

TOSS-UP

4) MATH *Short Answer* If the volume of a cube is 64 cubic centimeters, then what is the surface area of the cube in square centimeters?

ANSWER: 96

BONUS

4) MATH *Multiple Choice* Which of the following categories of statistical plots displays the first, second, and third quartiles for the data that it represents?

W) Box plot
X) Scatter plot
Y) Histogram
 Z) Pie chart

ANSWER: W) BOX PLOT

TOSS-UP

5) CHEMISTRY *Multiple Choice* What are the products for the complete combustion of methane?

W) Carbon and hydrogen
X) Carbon dioxide and hydrogen
Y) Carbon monoxide and water
Z) Carbon dioxide and water

ANSWER: Z) CARBON DIOXIDE AND WATER

BONUS

5) CHEMISTRY *Short Answer* For the complete combustion of butane, butane plus oxygen produces carbon dioxide and water vapor. What is the balanced equation for the combustion of butane?

ANSWER: $2C_4H_{10} + 13O_2 \rightarrow$ (read as: yields) $8CO_2 + 10H_2O$

_____

TOSS-UP

6) PHYSICS *Multiple Choice* The mass of a raindrop is 4 milligrams. Which of the following represents the correct mass in grams of the raindrop?

W) 4×10^{-3}
X) 4×10^{-1}
Y) 4×10^{3}
Z) 4×10^{6}

ANSWER: W) 4×10^{-3}

BONUS

6) PHYSICS *Multiple Choice* A freely falling object has a constant acceleration of 9.8 meters per second squared. Which of the following is correct?

W) The object's displacement changes by 9.8 meters every second squared
X) The object's acceleration increases by 9.8 meters per second squared each second
Y) The object travels 9.8 meters each second
Z) The object's speed increases by 9.8 meters per second each second

ANSWER: Z) THE OBJECT'S SPEED INCREASES BY 9.8 METERS PER SECOND EACH SECOND

TOSS-UP

7) EARTH AND SPACE *Multiple Choice* In which sphere is the "bad" ozone, a volatile compound that contributes to smog, located?

W) Stratosphere
X) Biosphere
Y) Troposphere
Z) Lithosphere

ANSWER: Y) TROPOSPHERE

BONUS

7) EARTH AND SPACE *Short Answer* In which sphere is the "good" ozone that absorbs harmful ultraviolet rays located?

ANSWER: STRATOSPHERE

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TOSS-UP

8) BIOLOGY *Multiple Choice* Ducklings learn to recognize and follow the first moving object that they see, usually their mother. What is this behavior called?

W) Instinct
X) Imprinting
Y) Remote sensing
Z) Classical conditioning

ANSWER: X) IMPRINTING

BONUS

8) BIOLOGY *Multiple Choice* A pigeon is placed in a box. Sooner or later, the pigeon accidentally presses a button or lever that releases food. Eventually, the pigeon learns how to press the button whenever it wants food. This kind of learning is called:

W) Habituation
X) Classical conditioning
Y) Insight learning
Z) Operant conditioning

ANSWER: Z) OPERANT CONDITIONING

TOSS-UP

9) CHEMISTRY *Multiple Choice* Determine the solubility product constant (or K_{sp}) of silver bromide, given that its molar solubility is 5.71×10^{-7} moles per liter.

W) 3.26×10^{-13}
X) 5.71×10^{-7}
Y) 1.14×10^{-6}
Z) 2.14×10^{-4}

ANSWER: W) 3.26×10^{-13}

BONUS

9) CHEMISTRY *Short Answer* Which of the following are strong bases in aqueous solution: 1) potassium hydroxide, 2) ammonia, 3) sodium chloride, 4) calcium hydroxide, or 5) beryllium hydroxide?

ANSWER: POTASSIUM HYDROXIDE AND CALCIUM HYDROXIDE (ACCEPT: 1 AND 4)

_____

TOSS-UP

10) BIOLOGY *Multiple Choice* Which of the following is most likely a descendent of dinosaurs?

W) Frog
X) Cockroach
Y) Turtle
Z) Robin

ANSWER: Z) ROBIN

BONUS

10) BIOLOGY *Short Answer* Oxygen-rich blood leaves the left ventricle to enter the largest blood vessel in the body. What is this blood vessel called?

ANSWER: AORTA

11) PHYSICS *Multiple Choice* A poorly designed fishing bob does not float in a sucrose solution. Which of the following actions could be taken so the fishing bob would float?

W) Increase the volume of the solution
X) Decrease the volume of the solution
Y) Increase the concentration of the solution
Z) Decrease the concentration of the solution

ANSWER: Y) INCREASE THE CONCENTRATION OF THE SOLUTION

BONUS

11) PHYSICS *Multiple Choice* Water tank A has width W1 and tank B has width W2, where W1 > W2. The two water tanks are the same height, H. If both tanks are completely filled with water, which of the following is true about the water pressure at the bottom of the tank?

W) Pressure cannot be determined
X) The pressure is greater in tank A
Y) The pressure is greater in tank B
Z) Both tanks have the same pressure

ANSWER: Z) BOTH TANKS HAVE THE SAME PRESSURE

_____

TOSS-UP

12) EARTH AND SPACE *Short Answer* What is the most abundant element in the universe?

ANSWER: HYDROGEN

BONUS

12) EARTH AND SPACE *Multiple Choice* Our solar system formed approximately how many billion years ago?

W) 2
X) 3
Y) 5
Z) 7

ANSWER: Y) 5

TOSS-UP

13) MATH *Short Answer* Given the function $y = 4x - x^2$, what is the largest possible value for y?

ANSWER: 4

BONUS

13) MATH *Short Answer* Express the following in standard polynomial form: $(3x + 2)^3$ (read as: the quantity 3x plus 2 cubed)

ANSWER: $27x^3 + 54x^2 + 36x + 8$

_____

TOSS-UP

14) BIOLOGY *Multiple Choice* In the 1980s, Europeans began to be diagnosed with mad cow disease, a disease which affects the brain. What is the type of infectious agent that causes this disease?

W) Virus
X) Bacteria
Y) Fungi
Z) Prion

ANSWER: Z) PRION

BONUS

14) BIOLOGY *Short Answer* The prions that cause mad cow disease lack DNA. What does current research suggest that prions are?

ANSWER: ABNORMAL ISOFORM PROTEINS (ACCEPT: MISSHAPED ISOFORM PROTEINS, ABNORMAL PROTEINS)

TOSS-UP

15) CHEMISTRY *Multiple Choice* What is the mass of an electron relative to a proton?

W) 9.1×10^{-31}
X) 8.2×10^{-14}
Y) 1/1836
Z) 0.51

ANSWER: Y) 1/1836

BONUS

15) CHEMISTRY *Short Answer* Sulfuric acid is used to neutralize a solution of sodium hydroxide. Calculate the number of moles of sodium hydroxide required to completely neutralize two moles of sulfuric acid.

ANSWER: 4

_____

TOSS-UP

16) PHYSICS *Multiple Choice* Which of the following describes an electromagnet?

W) Straight wire carrying a current
X) Current-carrying wire wrapped around a core
Y) Permanent bar magnet
Z) Rock that is iron attracting

ANSWER: X) CURRENT-CARRYING WIRE WRAPPED AROUND A CORE

BONUS

16) PHYSICS *Short Answer* A voltage difference of 10 volts delivers how much power, in watts, to a 1-ohm resistor?

ANSWER: 100

TOSS-UP

17) CHEMISTRY *Multiple Choice* Which of the following is NOT a strong acid?

W) Hydrofluoric acid
X) Hydrochloric acid
Y) Hydrobromic acid
Z) Hydroiodic acid

ANSWER: W) HYDROFLUORIC ACID

BONUS

17) CHEMISTRY *Multiple Choice* Which of the following would be the resulting pH from the reaction of equal amounts of a strong acid with a strong base?

W) Less than 7
X) Equal to 7
Y) More than 7
Z) The reaction is independent of the pH

ANSWER: X) EQUAL TO 7

_____

TOSS-UP

18) MATH *Short Answer* Where do the lines $y = (2x/3) + 5$ and $3y = 2x - 21$ intersect?

ANSWER: THEY DON'T (ACCEPT: THEY'RE PARALLEL, NULL SET, EMPTY SET)

BONUS

18) MATH *Short Answer* Where do the lines $3x - 4y = 12$ and $5x + 4y = 20$ intersect?

ANSWER: (4,0)   ALSO ACCEPT: X = 4 AND Y = 0

TOSS-UP

19) ENERGY *Multiple Choice* The largest reserve of energy in the United States is in which of the following?

W) Natural gas
X) Coal
Y) Nuclear
Z) Offshore oil

ANSWER: X) COAL

BONUS

19) ENERGY *Multiple Choice* The Organization of the Petroleum Exporting Countries (OPEC) produces about what percentage of the world's crude oil?

W) 20%
X) 40%
Y) 60%
Z) 80%

ANSWER: X) 40%

_____

TOSS-UP

20) EARTH AND SPACE *Short Answer* The world's largest desert is on which continent?

ANSWER: ANTARCTICA

BONUS

20) EARTH AND SPACE *Short Answer* What property of many meteors makes Antarctica a good place to go meteor hunting?

ANSWER: DARK COLOR

TOSS-UP

21) PHYSICS *Multiple Choice* What type of collision occurs when two objects collide and stick together?

W) Partially elastic
X) Perfectly elastic
Y) Partially inelastic
Z) Perfectly inelastic

ANSWER: Z) PERFECTLY INELASTIC

BONUS

21) PHYSICS *Multiple Choice* For all collisions, all of the following properties are conserved except:

W) Total mass
X) Center of mass
Y) Kinetic energy
Z) Momentum

ANSWER: Y) KINETIC ENERGY

_____

TOSS-UP

22) ENERGY *Short Answer* What is the final three-carbon product of glycolysis?

ANSWER: PYRUVATE (read as: py-RUH-vayt) [ACCEPT: PYRUVIC (read as: py-RUH-vik) ACID, CH_3COCO_2H]

BONUS

22) ENERGY *Short Answer* Which acidic compound is the major product of fermentation in skeletal muscle?

ANSWER: LACTIC ACID

TOSS-UP

23) MATH *Short Answer* Two triangles are similar. If the smaller one has a perimeter of 18 and the ratio between them is 5:3 (read as: 5 to 3), what is the perimeter of the larger triangle?

ANSWER: 30

BONUS

23) MATH *Short Answer* If all of the interior angles of a polygon sum to 3060 degrees, how many sides does the polygon have?

ANSWER: 19

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TOSS-UP

24) ENERGY *Multiple Choice* Ocean thermal energy conversion systems convert solar radiation to electric power. Which of the following describes the source of energy in ocean thermal energy conversion systems?

W) Magma below the ocean floor
X) Oceanic thermal vents
Y) Wave motion
Z) The difference in temperatures between surface and deep waters

ANSWER: Z) THE DIFFERENCE IN TEMPERATURES BETWEEN SURFACE AND DEEP WATERS

BONUS

24) ENERGY *Multiple Choice* What is the minimum temperature difference, in degrees Celsius, needed to develop an ocean thermal energy conversion system?

W) 10˚
X) 15˚
Y) 20˚
Z) 25˚

ANSWER: Y) 20˚

TOSS-UP

25) EARTH AND SPACE *Multiple Choice* Which of the following describes Jupiter's great red spot?

W) A storm
X) An aurora
Y) A magnetotail
Z) A volcano

ANSWER: W) A STORM

BONUS

25) EARTH AND SPACE *Short Answer* Saturn's rings are made mostly of:

ANSWER: ICE