

ROUND 3A

TOSS-UP

1) Energy – *Multiple Choice* What state has the largest geothermal power generation capacity?

- W) Arizona
- X) California
- Y) Idaho
- Z) Utah

ANSWER: X) CALIFORNIA

BONUS

1) Energy – *Short Answer* What derived SI unit is used to measure electric potential?

ANSWER: VOLT

TOSS-UP

2) Life Science – *Multiple Choice* Which of the following is true of virus genomes [*JEE-nomes*]?

- W) They are always composed of DNA
- X) They are always circular
- Y) They may be composed of either DNA or RNA
- Z) They are diploid

ANSWER: Y) THEY MAY BE COMPOSED OF EITHER DNA OR RNA

BONUS

2) Life Science – *Multiple Choice* You are using a light microscope to look at cells stained with a dye that detects chromatin [*KROH-mah-tin*] and can see densely-colored regions that you recognize as chromosomes. Which of the following must be true?

- W) The cell is undergoing mitosis [*my-TOW-sis*]
- X) The genome [*JEE-nome*] is diploid [*DIH-ployd*]
- Y) The genome is haploid [*HA-ploid*]
- Z) The cell is in interphase

ANSWER: W) THE CELL IS UNDERGOING MITOSIS

TOSS-UP

3) Math – *Short Answer* What is the area of a circle inscribed in a square of side 14?

ANSWER: 49π

BONUS

3) Math – *Short Answer* What is $3/7$ divided by $8/21$ divided by $15/4$?

ANSWER: $3/10$ (ACCEPT: 0.3)

TOSS-UP

4) Physical Science – *Multiple Choice* Which of the following instruments does not primarily rely on a lens?

- W) Refracting telescope
- X) Reflecting telescope
- Y) Binocular
- Z) Monocular

ANSWER: X) REFLECTING TELESCOPE

BONUS

4) Physical Science – *Short Answer* What principle of fluid mechanics describes the buoyant force?

ANSWER: ARCHIMEDES PRINCIPLE

TOSS-UP

5) Life Science – *Multiple Choice* Which of the following magnifications is most appropriate for viewing bacteria through a light microscope?

- W) 5 times
- X) 50 times
- Y) 500 times
- Z) 5000 times

ANSWER: Y) 500 TIMES

BONUS

5) Life Science – *Multiple Choice* After a signaling molecule binds to a receptor, what enzymes often set off a cascade of phosphorylation [*faws-four-il-AY-shun*] events?

- W) Kinases [*KYE-naysses*]
- X) Phosphatases [*FAWS-fa-tases*]
- Y) Amylases [*AM-ill-aces*]
- Z) Lipases [*LYE-paces*]

ANSWER: W) KINASES

TOSS-UP

6) Earth and Space – *Multiple Choice* Which of the following is the group of minerals formed when metals combine with a halogen element such as iodine, chlorine, bromine, or fluorine?

- W) Halides
- X) Halites
- Y) Tretrahalogens
- Z) Halogens

ANSWER: W) HALIDES

BONUS

6) Earth and Space – *Multiple Choice* Hurricanes are rated by categories on what five-point scale?

- W) Fujita scale
- X) Richter scale
- Y) Torino scale
- Z) Saffir-Simpson scale

ANSWER: Z) SAFFIR-SIMPSON SCALE

TOSS-UP

7) Math – *Short Answer* What is 50^3 ?

ANSWER: 125,000

BONUS

7) Math – *Short Answer* What is the maximum possible number of intersection points of a circle and a rectangle?

ANSWER: 8

TOSS-UP

8) Life Science – *Multiple Choice* Which of the following groups of organic compounds in the human body are the most diverse in size, shape, and function?

- W) Carbohydrates
- X) Lipids
- Y) Proteins
- Z) Nucleic [*new-CLAY-ik*] acids

ANSWER: Y) PROTEINS

BONUS

8) Life Science – *Multiple Choice* Which of the following is a sex-linked trait in humans?

- W) Eye color
- X) Skin tone
- Y) Color blindness
- Z) Freckles

ANSWER: Y) COLOR BLINDNESS

TOSS-UP

9) Physical Science – *Multiple Choice* Which of the following is an example of a radiation detector?

- W) Geiger [*GYE-gur*] counter
- X) Anemometer
- Y) LCR meter
- Z) Refractometer

ANSWER: W) GEIGER COUNTER

BONUS

9) Physical Science – *Multiple Choice* If an object experiences a change in its velocity, which of the following statements must be TRUE about its acceleration?

- W) It is positive
- X) It is negative
- Y) It is non-zero
- Z) It is constant

ANSWER: Y) IT IS NON-ZERO

TOSS-UP

10) Math – *Multiple Choice* For which of the following x -values is x^3 greater than or equal to x^2 ?

- W) -2
- X) $-\frac{1}{2}$
- Y) $\frac{1}{2}$
- Z) 2

ANSWER: Z) 2

BONUS

10) Math – *Short Answer* Express the following in scientific notation rounded to two significant digits: the fraction with numerator 4.5×10^5 and denominator 3.5×10^{-2} .

ANSWER: 1.3×10^7

TOSS-UP

11) Energy – *Multiple Choice* Commercially available photovoltaic [*photo-vawl-TAY-ik*] cells are primarily made of what element?

- W) Germanium [*jer-MAYN-ee-um*]
- X) Arsenic
- Y) Carbon
- Z) Silicon

ANSWER: Z) SILICON

BONUS

11) Energy – *Short Answer* What nonrenewable fuel source represents the largest percentage of US energy consumption?

ANSWER: PETROLEUM (ACCEPT: OIL)

TOSS-UP

12) Earth and Space – *Multiple Choice* The inshore marine environment, from the surface to the sea floor, where water depths do not exceed 200 meters, is known as which of the following?

- W) Oceanic zone
- X) Neritic zone
- Y) Intertidal zone
- Z) Benthic zone

ANSWER: X) NERITIC ZONE

BONUS

12) Earth and Space – *Multiple Choice* Which of the following lists of features is associated with a convergent plate boundary?

- W) Primarily shallow earthquakes, rifting, volcanic activity
- X) Trench, primarily shallow earthquakes, volcanoes
- Y) Hot spots, few earthquakes, trench
- Z) Subduction, trench, volcanic activity, shallow to deep earthquakes

ANSWER: Z) SUBDUCTION, TRENCH, VOLCANIC ACTIVITY, SHALLOW TO DEEP EARTHQUAKES

TOSS-UP

13) Life Science – *Multiple Choice* Which of the following plant phyla [**FYE-lah**] has the most extant species?

- W) Ginkgophyta [**GINK-oh-fitah**]
- X) Coniferophyta [**kaw-nif-er-AW-fih-tah**]
- Y) Psilophyta [**sigh-LAW-fih-tah**]
- Z) Anthophyta [**an-THAW-fih-tah**]

ANSWER: Z) ANTHOPHYTA

BONUS

13) Life Science – *Multiple Choice* Which of the following cytoskeletal [**SIGH-toh-skeletul**] components has the largest diameter?

- W) Intermediate filaments
- X) Keratin filaments
- Y) Microtubules [**micro-TUBE-yules**]
- Z) Microfilaments

ANSWER: Y) MICROTUBULES

TOSS-UP

14) Math – *Short Answer* Increasing a number by 200% is equivalent to multiplying it by what number?

ANSWER: 3

BONUS

14) Math – *Short Answer* Solve the following equation for x : $x^2 - 7x - 120 = 0$.

ANSWER: -8, 15 (must give both answers)

TOSS-UP

15) Physical Science – *Short Answer* To two significant figures and in meters per second squared, what is the acceleration due to gravity near the Earth's surface?

ANSWER: 9.8

BONUS

15) Physical Science – *Multiple Choice* Which of the following best illustrates the particle nature of light?

- W) Diffraction
- X) Interference
- Y) Polarization
- Z) Photoelectric effect

ANSWER: Z) PHOTOELECTRIC EFFECT

TOSS-UP

16) Earth and Space – *Short Answer* What is the term for an object that is so massive that gravity prevents light from escaping it?

ANSWER: BLACK HOLE

BONUS

16) Earth and Space – *Short Answer* What planet was not fully imaged until 2011 when it was visited by the MESSENGER spacecraft?

ANSWER: MERCURY

TOSS-UP

17) Physical Science – *Short Answer* What subatomic particle is composed of two up quarks and one down quark?

ANSWER: PROTON

BONUS

17) Physical Science – *Multiple Choice* Which of the following is NOT a base unit of measure in the metric system?

- W) Meter
- X) Second
- Y) Gram
- Z) Ampere

ANSWER: Y) GRAM

TOSS-UP

18) Energy – *Multiple Choice* Which industrial process is used to separate the many components of crude oil into useful petroleum products?

- W) Absorption
- X) Membrane diffusion
- Y) Refrigeration
- Z) Distillation

ANSWER: Z) DISTILLATION

BONUS

18) Energy – *Multiple Choice* Government agencies and utilities offer various incentives to encourage people to improve the energy efficiency of buildings and vehicles. Which of the following is NOT a typical incentive?

- W) Tax credits
- X) Loans or loan guarantees
- Y) Hardware installation
- Z) Rebates

ANSWER: Y) HARDWARE INSTALLATION

TOSS-UP

19) Physical Science – *Short Answer* How many moles of hydrogen gas may be obtained from one mole of water?

ANSWER: 1

BONUS

19) Physical Science – *Multiple Choice* How many atoms of magnesium are present in two molecules of the compound Mg₃N₂?

- W) 2
- X) 3
- Y) 6
- Z) 8

ANSWER: Y) 6

TOSS-UP

20) Earth and Space – *Multiple Choice* Which of the following degree measures is closest to the angle of repose of cinders in a cinder cone volcano?

- W) 5
- X) 10
- Y) 20
- Z) 30

ANSWER: Z) 30

BONUS

20) Earth and Space – *Multiple Choice* Which of the following minerals has the same chemical composition as glass?

- W) Halite
- X) Fluorite
- Y) Pyrite
- Z) Quartz

ANSWER: Z) QUARTZ

TOSS-UP

21) Life Science – *Short Answer* What long, rope-like structure do some bacteria use to move around?

ANSWER: FLAGELLUM

BONUS

21) Life Science – *Short Answer* A cell's surface protein pump stops working when ATP is not present. What is the type of transport these protein pumps carry out?

ANSWER: ACTIVE TRANSPORT

TOSS-UP

22) Earth and Space – *Short Answer* Identify all of the following three planets that are considered Jovian:

1) Jupiter; 2) Uranus; 3) Saturn.

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

BONUS

22) Earth and Space – *Short Answer* Identify all of the following three minerals that are silicates:

1) Calcite; 2) Halite; 3) Muscovite.

ANSWER: 3 (ACCEPT: MUSCOVITE)

TOSS-UP

23) Math – *Short Answer* Giving your answer as a decimal, what is the sum of the three numbers 2, $\frac{2}{4}$, and $\frac{2}{8}$?

ANSWER: 2.75

BONUS

23) Math – *Short Answer* Simplify the fraction with numerator $1 - \sqrt{3}$ and denominator $1 + \sqrt{3}$.

ANSWER: $-2 + \sqrt{3}$ (ACCEPT: $\sqrt{3} - 2$)