

TOSS-UP

1) CHEMISTRY *Short Answer* What is the chemical formula for calcium carbonate?

ANSWER: CaCO_3

BONUS

1) CHEMISTRY *Multiple Choice* What is the systematic IUPAC name for CH_3COOH ?

W) Vinegar

X) Acetic acid

Y) Methanoic acid

Z) Ethanoic acid

ANSWER: Z) Ethanoic acid

TOSS-UP

2) MATH *Short Answer* Ricky can write 5 science bowl questions every 5 minutes and Julian can write 10 science bowl questions every 5 minutes. How many minutes will it take the both of them to write a total of 60 questions?

ANSWER: 20 min

BONUS

2) MATH *Short Answer* Compute $2017!/2015!$ [Read as: 2017 factorial over 2015 factorial]

ANSWER: 4066272

TOSS-UP

3) BIOLOGY *Short Answer* Lactose, a disaccharide, is formed by the dehydration synthesis of which two monosaccharides?

ANSWER: Glucose and galactose

BONUS

3) BIOLOGY *Short Answer* Which of the following are NOT amino acids?

I. Cysteine

II. Methionine

III. Glutamine

IV. Chaperonin

ANSWER: IV only

TOSS-UP

4) EARTH & SPACE *Multiple Choice* Which of the following could be the cause of a long gamma ray burst?

W) pulsar collision

X) ionized accretion disk

Y) hypernova

Z) type 1a supernova

ANSWER: Y

BONUS

4) EARTH & SPACE *Short Answer* What kind of soil consists of equal parts clay, sand, and silt?

ANSWER: Loam

TOSS-UP

5) PHYSICS *Short Answer* One singer sings at 340 hertz while the other sings at 300 hertz. What is the beat frequency?

ANSWER: 40

BONUS

5) PHYSICS *Short Answer* Which scientist discovered the neutron?

ANSWER: Chadwick

TOSS-UP

6) CHEMISTRY *Short Answer* Given that xenon is element 54, how many protons, neutrons, and electrons are there in an atom of Xe-136?

ANSWER: 54 protons, 82 neutrons, 54 electrons

BONUS

6) CHEMISTRY *Short Answer* Balance the following reaction: $\text{KClO}_3 \rightarrow \text{KCl} + \text{O}_2$

ANSWER: $2 \text{KClO}_3 \rightarrow 2 \text{KCl} + 3 \text{O}_2$

TOSS-UP

7) MATH *Short Answer* In the hexadecimal number system, what letter is typically used to represent the base-10 number 11?

ANSWER: B

BONUS

7) MATH *Multiple Choice* Let $f(x)$ equal the fraction with numerator $x^2-12x+36$ and denominator x^2-5x-6 . Which of the following most accurately describes what $f(x)$ experiences at the point $x=6$?

W) Hole

X) Horizontal Asymptote

Y) Vertical Asymptote

Z) Tilted Asymptote

ANSWER: W) Hole

TOSS-UP

8) BIOLOGY *Multiple Choice* Which of the following is a fat soluble vitamin?

W) A

X) B_{12}

Y) B_1

Z) C

ANSWER: W) A

BONUS

8) BIOLOGY *Multiple Choice* Professor Ashish is trying read a biology textbook when he discovers that hibernation is a type of torpor. From this, which of the following can he conclude about the levels of activity and metabolism in Jason, an imaginary organism who is exhibiting torpor?

W) Torpor is a physiological state of of decreased activity and decreased metabolism

X) Torpor is a physiological state of of increased activity and increased metabolism

Y) Torpor is a physiological state of of increased activity and decreased metabolism

Z) Torpor is a physiological state of of decreased activity and increased metabolism

ANSWER: W) Torpor is a physiological state of of decreased activity and decreased metabolism

TOSS-UP

9) EARTH & SPACE *Short Answer* The Hubble Space Telescope will soon be replaced by what telescope?

ANSWER: James Webb

BONUS

9) EARTH & SPACE *Short Answer* What is the name of the largest valley system in the solar system, and what planet is it located on?

ANSWER: Valles Marineris, Mars

TOSS-UP

10) PHYSICS *Multiple Choice* Which of the following elementary particles is not a part of a typical atom?

W) Up quark

X) Down quark

Y) Electron

Z) Top quark

ANSWER: Z) Top quark

BONUS

10) PHYSICS *Short Answer* A circuit has 3 resistors in series, which have 1, 2, and 3 Ohms of resistance respectively. If the battery of the circuit ran on 24 volts, what is the current throughout the circuit?

ANSWER: 4

TOSS-UP

11) CHEMISTRY *Multiple Choice* Which of the following compounds will produce a lavender flame in a flame test?

W) LiNO_3
X) NaNO_3
Y) KNO_3
Z) $\text{Ca}(\text{NO}_3)_2$
ANSWER: Y) KNO_3

BONUS

11) CHEMISTRY *Short Answer* By name or number, identify the following compounds which will produce a blue flame in a flame test.

1. $\text{Al}(\text{NO}_3)_3$
2. $\text{Ca}(\text{NO}_3)_2$
3. $\text{Cu}(\text{NO}_3)_2$
4. $\text{Sr}(\text{NO}_3)_2$

ANSWER: NONE

TOSS-UP

12) MATH *Multiple Choice* How many digits are in the number 10^{2017} ?

- W) 1
X) 10
Y) 2017
Z) 2018

ANSWER: Z) 2018

BONUS

12) MATH *Short Answer* In Science Bowl, buzzers have infinitesimal length and width and arbitrary height. Find the largest possible height of a buzzer that can be enclosed in a rectangular box with dimensions 2, 3, and 6.

ANSWER: 7

TOSS-UP

13) BIOLOGY *Short Answer* What is the large, central cavity in sponges called?

ANSWER: Spongocoel

BONUS

13) BIOLOGY *Multiple Choice* Which of the following is unlikely to be found in a cnidarian?

- W) Nematocyst
X) Gastrovascular cavity
Y) Brain
Z) Mouth

ANSWER: Y) Brain

TOSS-UP

14) EARTH & SPACE *Multiple Choice* Meteors are best described as:

W) the streak of light seen in the sky when a particle collides with the atmosphere

X) a piece of a comet that collides with the atmosphere

Y) a large orbiting body between Mars and Jupiter

Z) a piece of space rock that falls onto the surface of the earth

ANSWER: W

BONUS

14) EARTH & SPACE *Short Answer* By name or by number, indicate all of the following that are TRUE of meteors:

1. Exceptionally bright meteors are called bolides

2. The Perseid meteor shower occurs in December

3. Most meteors are iron-rich

ANSWER: 1, 3

TOSS-UP

15) PHYSICS *Short Answer* Upon seeing a red light, a car comes to a complete stop after traveling for 32 meters. If the car decelerated at a rate of 1 meters per second squared, what was the initial velocity of the car?

ANSWER: 8 m/s

BONUS

15) PHYSICS *Multiple Choice* If an object is compressed to a radius smaller than its Schwarzschild radius, which of the following will happen?

W) The object will break up into many pieces

X) A supernova

Y) The formation of a star

Z) The formation of a black hole

ANSWER: Z) The formation of a black hole

TOSS-UP

16) PHYSICS *Multiple Choice* What principle in fluid dynamics states that pressured applied to a confined fluid will increase the pressure throughout by the same amount?

ANSWER: Pascal's principle

BONUS

16) PHYSICS *Multiple Choice* An object of unknown weight is put into a fluid, and the amount of fluid that was displaced by the object was recorded. Using just this piece of information, what principle can be used to determine the weight of the object?

W) Bernoulli's

X) Pascal's

Y) Archimedes's

Z) Torricelli's

ANSWER: Y) Archimedes's

TOSS-UP

17) CHEMISTRY *Short Answer* A flask containing 0.4 moles of nitrogen gas and 1.6 moles of oxygen gas has a pressure of 8 atm. What is the partial pressure of oxygen gas in the flask?

ANSWER: 6.4 atm

BONUS

17) CHEMISTRY *Short Answer* 1 L of gas was collected at 27 degrees C. The total pressure in the container was 30 atm. How many moles of gas were collected? Report the answer to three decimal points.

ANSWER: 1.219 moles of gas

TOSS-UP

18) MATH *Short Answer* Find the sum of the following two vectors: $8i+3j$ and $-4i+9j$.

ANSWER: $4i+12j$ or $\langle 4,12 \rangle$

BONUS

18) MATH *Short Answer* By name or number, indicate all of the following 4 numbers that are transcendental over the reals.

1. Pi
2. 2. E
3. 3. 0
4. 4. the square root of 2

ANSWER: 12

TOSS-UP

19) BIOLOGY *Multiple Choice* H1N1 refers to:

W) Spanish Flu

X) Swine Flu

Y) Russian Flu

Z) Australian Flu

ANSWER: X) Swine Flu

BONUS

19) BIOLOGY *Short Answer* By name or number, which of the following terrestrial biomes is most likely to be found near 30° north and south latitudes?

- I. Desert
- II. Savanna
- III. Tundra

ANSWER: I only

TOSS-UP

20) EARTH & SPACE *Multiple Choice* Which of the following is true of the interstellar medium

W) it is transparent to radio waves

X) it preferentially scatters short wavelengths of light

Y) it produces broad spectral lines

Z) its density is greater than the best vacuums generated on earth

ANSWER: W

BONUS

20) EARTH & SPACE *Multiple Choice* Which of the following is true of Seyfert galaxies?

W) they are radio-quiet

X) they are heavily blue-shifted

Y) they are classified based on orientation relative to earth

Z) they are a type of quasar

ANSWER: Y

TOSS-UP

21) PHYSICS *Short Answer* What is the study and use of frequencies above 20 khz?

ANSWER: Ultrasonics

BONUS

21) PHYSICS *Short Answer* What was invented by Dennis Gabor in 1947, winning him a Nobel prize in 1971?

ANSWER: Holography/Holograms

TOSS-UP

22) CHEMISTRY *Multiple Choice* The Daniell (read as: Dan-yell) cell uses what two elements to obtain electrical energy?

W) Copper, zinc

X) Copper, iron

Y) Zinc, iron

Z) Iron, nickel

ANSWER: W) Copper, zinc

BONUS

22) CHEMISTRY *Short Answer* To two decimal points and with correct units, what is the standard cell potential of the Daniell cell?

ANSWER: +1.10 V (ANSWER must contain (+) and units)

TOSS-UP

23) MATH *Short Answer* Calculate the value of 7 double factorial.

ANSWER: 105

BONUS

23) MATH *Short Answer* Let a_n [read: a sub n] be a sequence with $a_0=2$ and $a_n=n*a_{n-1}$ for all n greater than zero. Find the value of a_6 .

ANSWER: 1440

TOSS-UP

24) BIOLOGY *Short Answer* Name the agricultural practice in which a non legume is planted one year and then a rhizobium bacteria exposed-legume the next year in order to restore the concentration of fixed nitrogen.

ANSWER: Crop rotation

BONUS

24) BIOLOGY *Multiple Choice* Chemoautotrophic prokaryotes are most likely to be found in which of the following aquatic biomes?

W) Marine benthic zone

X) Coral reef

Y) Intertidal zone

Z) Ocean pelagic zone

ANSWER: W) Marine benthic zone

TOSS-UP

25) EARTH & SPACE *Short Answer* Which of the following 3 choices are depositional features?

1. Delta

2. Arete

3. Drumlin

ANSWER: 1, 3

BONUS

25) EARTH & SPACE *Multiple Choice* At which part of the glacier does calving occur?

W) zone of accumulation

X) zone of ablation

Y) zone of neutrality

Z) zone of erosion

ANSWER: X
