

TOSS-UP

1) BIOLOGY *Short Answer* What diagram is used to predict an outcome of a particular cross or breeding experiment?

ANSWER: Punnett Square

BONUS

1) BIOLOGY *Short Answer* Given that brown eyes are dominant and blue eyes are recessive. If a woman with blue eyes has a child with a man who is homozygous dominant for brown eyes, what is the probability that their child will have brown eyes?

ANSWER: 100%

TOSS-UP

2) PHYSICS *Short Answer* Calculate the frequency of a wavelength whose speed is 294 meters per second and whose wavelength is 3 meters.

ANSWER: 98 Hertz

BONUS

2) PHYSICS *Short Answer* Which famous scientist is credited for first experimentally measuring the universal gravitational constant?

ANSWER: Cavendish

TOSS-UP

3) CHEMISTRY *Short Answer* Mass is measured in terms of which SI unit?

ANSWER: kilogram (kg)

BONUS

3) CHEMISTRY *Short Answer* What is the molarity of 0.2 moles of sucrose dissolved in 250 mL of water?

ANSWER: 0.8 M

TOSS-UP

4) MATH *Multiple Choice* Which of the following describes the sum of the first 10 positive integers?

W) Less than 30

X) Between 30 and 40

Y) Greater than 55

Z) Equal to 55

ANSWER: Z) Equal to 55

BONUS

4) MATH *Short Answer* Jason has 3 pumps that fill a pool in 7 hours, and 4 pumps that fill a pool in 5 hours. If he uses 5 of the pumps, what is the shortest amount of time for him to fill up the pool? Express your answer as a fraction.

ANSWER: $\frac{105}{26}$ hours

TOSS-UP

5) EARTH SCIENCE *Multiple Choice* How many official constellations are there?

W) 58

X) 68

Y) 78

Z) 88

ANSWER: Z) 88

BONUS

5) EARTH SCIENCE *Short Answer* Name all of Mars' moons.

ANSWER: Phobos and Deimos

TOSS-UP

6) BIOLOGY *Short Answer* What tissue in the plant is responsible for conducting water and minerals in a vascular plant?

ANSWER: Xylem

BONUS

6) BIOLOGY *Multiple Choice* What part of the leaf helps prevent it from desiccation?

W) Cuticle

X) Palisade Mesophyll

Y) Spongy Mesophyll

Z) Epidermis

ANSWER: W) Cuticle

TOSS-UP

7) PHYSICS *Short Answer* What term represents the derivative of velocity with respect to time?

ANSWER: Acceleration

BONUS

7) PHYSICS *Short Answer* Two objects have the same kinetic energy. Object 1 has twice the velocity of object 2. What is the mass of object 1 if the mass of object 2 is 800 kilograms?

ANSWER: 200 kilograms

TOSS-UP

8) CHEMISTRY *Short Answer* How many elements on the periodic table are metalloids?

ANSWER: 7

BONUS

8) CHEMISTRY *Multiple Choice* Gases that obey the kinetic theory of gases are called what?

W) Boltzmann gases

X) Kinetic gases

Y) Stable gases

Z) Ideal gases

ANSWER: Z) Ideal gases

TOSS-UP

9) MATH *Short Answer* Express the following in scientific notation: 1.2×10^{12} multiplied by 4.8×10^{25} divided by the quantity 2.4×10^{50} .

ANSWER: 2.4×10^{-13}

BONUS

9) MATH *Short Answer* What is the probability of flipping heads 3 times out of 5 on an unfair coin, where the probability of flipping a tails is 40%? Express your answer as a fraction.

ANSWER: $\frac{216}{625}$

TOSS-UP

10) EARTH & SPACE *Multiple Choice* The Precambrian eon represents approximately what percent of all geologic time? (Karen)

W) 65%

X) 77%

Y) 88%

Z) 93%

ANSWER: Y) 88%

BONUS

10) EARTH & SPACE *Multiple Choice* What is the debris flow that occurs when volcanic ash and debris become saturated?

W) Lava Flow

X) Lahar

Y) Nuée Ardente (read as: new-ay are-dent)

Z) Pyroclastic Flow

ANSWER: X) Lahar

TOSS-UP

11) BIOLOGY *Multiple Choice* Where in the body do B cells and T cells mature, respectively?

W) Bone marrow, thyroid

X) Spleen, thyroid

Y) Bone marrow, thymus

Z) Appendix, thymus

ANSWER: Y) Bone marrow, thymus

BONUS

11) BIOLOGY *Short Answer* What hormone, secreted by the corpus luteum, maintains the uterine lining in females?

ANSWER: Progesterone

TOSS-UP

12) PHYSICS *Multiple Choice* Which of the following has the shortest wavelength?

W) Microwaves

X) Radio waves

Y) X-rays

Z) Ultraviolet radiation

ANSWER: Y) X-rays

BONUS

12) PHYSICS *Short Answer* If a wave has a wavelength of 3 meters and a frequency of 60 Hertz, what is the wave velocity, in meters per second?

ANSWER: 180

TOSS-UP

13) CHEMISTRY *Short Answer* How many molecules of carbon are in one mole of pure carbon? Give your answer in scientific notation to two significant figures.

ANSWER: 6.0×10^{23}

BONUS

13) CHEMISTRY *Short Answer* Acetic acid dissociates around 4% in water. This makes it

W) A strong electrolyte

X) A weak electrolyte

Y) Not any type of electrolyte

Z) A large electrolyte

ANSWER: X) A weak electrolyte

TOSS-UP

14) MATH *Short Answer* A painting has a width of 9 in. and a length of 18 in. The museum is trying to create a scale model of the painting, only with a length of 45. What is the scale factor the painting has to be scaled up by?

ANSWER: 2.5

BONUS

14) MATH *Short Answer* Simplify the expression $\frac{1-i}{40+6i}$.

ANSWER: $\frac{23-23i}{818}$

TOSS-UP

15) EARTH & SPACE *Short Answer* List the following in order of increasing albedo:

1. Green meadows
2. Fresh-fallen snow
3. White sand

ANSWER: 1, 3, 2

BONUS

15) EARTH & SPACE *Short Answer* What is the term for a cyclone whose strongest winds do not exceed 61 km/hr? (Karen)

ANSWER: Tropical depression

TOSS-UP

16) BIOLOGY *Short Answer* James Watson and Francis Crick won the Nobel prize for deciphering the structure of what macromolecule?

ANSWER: DNA

BONUS

16) BIOLOGY *Multiple Choice* Which of the following biomes has the greatest productivity?

W) Wetland

X) Desert

Y) Savannah

Z) Chaparral

ANSWER: W) Wetland

TOSS-UP

17) PHYSICS *Multiple Choice* Robert pushes a box of 100N across a pathway that is 3 meters long. How much work has he done?

W) 3 Joules

X) 30 Joules

Y) 300 Joules

Z) 3000 Joules

ANSWER: Y) 300 Joules

BONUS

17) PHYSICS *Short Answer* By name or number, which of the following states of matter are fluids?

1. Solids

2. Liquids

3. Gases

4. Plasma

ANSWER: 2, 3, 4 (Liquids, Gases, Plasma)

TOSS-UP

1) CHEMISTRY *Short Answer* The subatomic particle of an atom that determines its elemental identity is its number of

W) Electrons

X) Neutrons

Y) Protons

Z) Positrons

ANSWER: Y) protons

BONUS

1) CHEMISTRY *Multiple Choice* Which of the following compounds does not obey the octet rule?

W) NH₃

X) CH₄

Y) SF₄

Z) O₂

ANSWER: Y) SF₄

TOSS-UP

19) MATH *Short Answer* Two trains are 500 miles apart at 3:00 PM, but are speeding towards one another. Train A has a speed of 50mph, and Train B has a speed of 75mph. What time will they crash?

ANSWER: 7:00 PM

BONUS

19) MATH *Short Answer* Find the product of the roots of the equation $9x^5 + 6x^4 + x^3 + 2x^2 + x + 9 = 0$.

ANSWER: 1

TOSS-UP

20) EARTH & SPACE *Multiple Choice* Which of the following minerals would be able to scratch a penny?

W) Gypsum

X) Calcite

Y) Talc

Z) Fluorite

ANSWER: Z) Fluorite

BONUS

20) EARTH & SPACE *Short Answer* What type of drainage pattern forms in areas with alternating bands of resistant and less resistant rock?

ANSWER: Trellis

TOSS-UP

21) BIOLOGY *Short Answer* What is the term for the localized physical condition in which part of the body becomes reddened, swollen, and painful?

ANSWER: Inflammation

BONUS

21) BIOLOGY *Multiple Choice* Prions are best described as:

W) Pieces of naked RNA

X) A type of virus

Y) Misfolded proteins

Z) Bacterial toxins

ANSWER: Y) Misfolded proteins

TOSS-UP

22) PHYSICS *Short Answer* There are three types of “particles” that exist on the standard model, for example, Bosons. Besides the Higgs Boson, name the other two types.

ANSWER: Quarks, Leptons

BONUS

22) PHYSICS *Short Answer* What is the name of the particles that give rise to force interactions between other particles, namely electromagnetic, strong, and weak forces?

ANSWER: Gauge Bosons (accept: Force Carriers)

TOSS-UP

23) CHEMISTRY *Multiple Choice* Which scientist was credited with the plum pudding model of the atom?

W) Niels Bohr

X) Ernest Rutherford

Y) J.J. Thompson

Z) Robert Millikan

ANSWER: Y) J.J. Thompson

BONUS

23) CHEMISTRY *Short Answer* In Thompson's plum pudding model, what were formerly known as corpuscles, or plums, are now known as what?

ANSWER: Electrons

TOSS-UP

24) MATH *Short Answer* What is the first positive integer with 5 distinct positive factors?

ANSWER: 16

BONUS

24) MATH *Short Answer* The Euler-Euclid theorem relates Mersenne primes to what type of number?

ANSWER: Perfect numbers

TOSS-UP

25) EARTH & SPACE *Multiple Choice* In what periods were fishes dominant?

W) Cambrian-Ordovician

X) Ordovician-Silurian

Y) Silurian-Devonian

Z) Carboniferous-Permian

ANSWER: Y) Silurian-Devonian

BONUS

25) EARTH & SPACE *Short Answer* What is the type of bed load transportation in a river that involves particles being removed from the bed, carried by the water, and then returned to the surface?

ANSWER: Saltation
