

ROUND 8

TOSS-UP

1) PHYSICS *Short Answer* Neglecting friction, what is the acceleration, in meters per second squared, when a force of 144 Newtons is applied to a 12 kilogram object:

ANSWER: 12

(Solution: $A = F/M$; $A = 144/12$; $A = 12 \text{ m/sec}^2$)

BONUS

1) PHYSICS *Multiple Choice* When Johann Schweigger invented the first galvanometer, what did he recognize could be used to measure current:

- W) deflection of a compass needle
- X) movement of iron particles in a magnetic field
- Y) movement of electrons through a potential
- Z) a magneto

ANSWER: W) DEFLECTION OF A COMPASS NEEDLE

TOSS-UP

2) CHEMISTRY *Multiple Choice* Which of the following has the highest specific heat value:

- W) wood
- X) ice water
- Y) sand
- Z) gold

ANSWER: X) ICE WATER

(Solution: wood = 0.42 Cal/g°C; ice water = 0.5; sand = 0.19; gold = 0.031)

BONUS

2) CHEMISTRY *Short Answer* Normal hydrogen at room temperature contains what two forms of hydrogen, as defined by the spins of their electrons and nuclei?

ANSWER: PARA AND ORTHO

TOSS-UP

3) BIOLOGY *Multiple Choice* When the color of an organism alerts predators to stay away it is technically referred to as:

- W) aposematic coloration
- X) homological coloration
- Y) analogous coloration
- Z) camouflage coloration

ANSWER: W) APOSEMATIC COLORATION

BONUS

3) BIOLOGY *Multiple Choice* Which of the following is NOT a hexose:

- W) mannose
- X) glucose
- Y) fructose
- Z) xylulose (pronounced: zyle-YOU-lows)

ANSWER: Z) XYLULOSE

TOSS-UP

4) ASTRONOMY *Multiple Choice* A first quarter Moon will cross the meridian at what time of the day or night:

- W) midnight
- X) sunrise
- Y) sunset
- Z) noon

ANSWER: W) MIDNIGHT

BONUS

4) ASTRONOMY *Short Answer* What is the most common astronomical term for the angle analogous to geographical longitude?

ANSWER: RIGHT ASCENSION (ACCEPT: ASCENSION)

TOSS-UP

5) MATH *Short Answer* What is the equation of a line that has a slope of 4 and a y-intercept of 5?

ANSWER: $y = 4x + 5$

BONUS

5) MATH *Short Answer* Factor the following expression as completely as possible: $x^4 - 16$

ANSWER: $(x - 2)(x + 2)(x^2 + 4)$

TOSS-UP

6) EARTH SCIENCE *Multiple Choice* The salts and ions derived from the chemical weathering of rocks are carried by a stream are part of its:

- W) bed load
- X) suspended load
- Y) dissolved load
- Z) salt load

ANSWER: Y) DISSOLVED LOAD

BONUS

6) EARTH SCIENCE *Multiple Choice* The Sahara desert in Africa is an example of what type of desert:

- W) subtropical
- X) continental
- Y) rainshadow
- Z) coastal

ANSWER: W) SUBTROPICAL

TOSS-UP

7) GENERAL SCIENCE *Multiple Choice* Electric appliances and tools are grounded to:

- W) complete the electrical circuit
- X) balance the voltage in both lines
- Y) prevent the overloading of circuits
- Z) prevent surface static charge buildup

ANSWER: Z) PREVENT SURFACE STATIC CHARGE BUILDUP

BONUS

7) GENERAL SCIENCE *Multiple Choice* Which of the following is an example of a multiple fruit:

- W) apple
- X) sour cherry
- Y) pineapple
- Z) pear

ANSWER: Y) PINEAPPLE

TOSS-UP

8) COMPUTER SCIENCE *Multiple Choice* An email sent over the internet most likely uses what protocol:

- W) HTTP
- X) FTP
- Y) SMTP
- Z) HMTTP

ANSWER: Y) SMTP

BONUS

8) COMPUTER SCIENCE *Short Answer* What is the name for the high-speed serial bus developed by Apple and Texas Instruments that allows for the connection of multiple devices, supports hot-swapping, and transfers data at rates of up to 400 million bytes per second:

ANSWER: FIREWIRE (ACCEPT: IEEE 1394, I-LINK, AND LYNX)

TOSS-UP

9) PHYSICS *Multiple Choice* What branch of mechanics customarily deals with force and why objects move as they do:

- W) kinematics
- X) dynamics
- Y) statics
- Z) mechanics

ANSWER: X) DYNAMICS

BONUS

9) PHYSICS *Multiple Choice* Yellow light has a wavelength of approximately:

- W) 300-350 nanometers
- X) 450-500 nanometers
- Y) 550-600 nanometers
- Z) 650-700 nanometers

ANSWER: Y) 550-600 NANOMETERS

TOSS-UP

10) CHEMISTRY *Multiple Choice* In which of the following pairs are both elements classified as semimetals:

- W) tellurium and tin
- X) selenium and bromine
- Y) scandium and silicon
- Z) arsenic and germanium

ANSWER: Z) ARSENIC AND GERMANIUM

BONUS

10) CHEMISTRY *Short Answer* The f subshell is associated with what L quantum number?

ANSWER: 3

TOSS-UP

11) BIOLOGY *Short Answer* What is the predominant immunoglobulin class found in human saliva?

ANSWER: IgA

BONUS

11) BIOLOGY *Short Answer* What is the common name for the part of a compound light microscope that functions to converge a light source so that it passes through the specimen:

ANSWER: CONDENSER

TOSS-UP

12) ASTRONOMY *Multiple Choice* Because of precession, the celestial pole traces out a complete circle on the sky about every:

- W) 26,000 years
- X) 12,000 years
- Y) 6,000 years
- Z) 600 years

ANSWER: W) 26,000 YEARS

BONUS

12) ASTRONOMY *Multiple Choice* The ecliptic is:

- W) the line that divides the sky into the northern half and the southern half
- X) the Sun's apparent path across the celestial sphere
- Y) the point directly overhead
- Z) the line on the celestial sphere directly above the celestial equator

ANSWER: X) THE SUN'S APPARENT PATH ACROSS THE CELESTIAL SPHERE

TOSS-UP

13) MATH *Short Answer* If the universal set is represented by the numbers 1, 2, 3, 4, 5, 6, 7, and set A is represented by the numbers 1, 2, 3; set B by the numbers 3, 4, 5, 6; and set C by the numbers 2, 3, 4, then what set is represented by the union of sets A and B?

ANSWER: 1, 2, 3, 4, 5, 6

BONUS

13) MATH *Short Answer* In the US Senate, Senator Bill received four-sixths of the votes, Senator George received two-tenths of the votes, and Senator Mary received the remaining votes. If 48 votes were cast for Senator Mary, how many votes did Senator Bill receive?

ANSWER: 240

TOSS-UP

14) EARTH SCIENCE *Multiple Choice* Which of the following make up approximately 80% of all magma erupted by volcanoes on Earth:

- W) andesitic
- X) rhyolitic
- Y) basaltic
- Z) andesitic and rhyolitic

ANSWER: Y) BASALTIC

(Solution: andesitic and rhyolitic 10% each)

BONUS

14) EARTH SCIENCE *Short Answer* A mixture of molten rock, suspended mineral grains, and dissolved gasses that forms in the crust or mantle when temperatures are sufficiently high, is a definition of what?

ANSWER: MAGMA

TOSS-UP

15) GENERAL SCIENCE *Multiple Choice* Which of the following is an example of a modular organism that grows by producing additional units of body construction that are very similar to the units of which it is already composed:

- W) sea sponge
- X) cockroach
- Y) spider
- Z) turtle

ANSWER: W) SEA SPONGE

BONUS

15) GENERAL SCIENCE *Short Answer* A widely used dental amalgam is formed by reacting metallic mercury with an alloy consisting primarily of which 2 metals?

ANSWER: SILVER AND TIN

TOSS-UP

16) COMPUTER SCIENCE *Multiple Choice* Which of the following is TRUE about resolution:

- W) printed images resolve with dots per inch and displayed images resolve with pixels
- X) printed images resolve with dots per inch and displayed images resolve with dots per inch
- Y) printed images resolve with pixels and displayed images resolve with dots per inch
- Z) printed images resolve with pixels and displayed images resolve with pixels

ANSWER: W) PRINTED IMAGES RESOLVE WITH DOTS PER INCH AND DISPLAYED IMAGES RESOLVE WITH PIXELS

BONUS

16) COMPUTER SCIENCE *Multiple Choice* Fonts that are digital representations of fonts that are not scalable are called:

- W) bitmap fonts
- X) outline fonts
- Y) TrueType fonts
- Z) vector fonts

ANSWER: W) BITMAP FONTS

TOSS-UP

17) PHYSICS *Short Answer* What scientist was the first to propose that in the absence of air resistance, all objects fall with the same constant acceleration?

ANSWER: GALILEO

BONUS

17) PHYSICS *Short Answer* If a piano string is 1.6 meters long and has a fundamental frequency of 320 Hertz, what is the wavelength, in meters, of the fundamental?

ANSWER: 3.2

(Solution: wavelength = $2L$; = $(2)(1.6) = 3.2$ meters)

TOSS-UP

18) CHEMISTRY *Multiple Choice* Which of the following is considered a nonpolar molecule:

W) H₂S

X) NH₃

Y) NO₂

Z) BeH₂

ANSWER: Z) BeH₂

BONUS

18) CHEMISTRY *Short Answer* What general term describes a substance whose electrons are all spin-paired and that are weakly repelled by magnetic fields?

ANSWER: DIAMAGNETIC

TOSS-UP

19) BIOLOGY *Short Answer* What is the name for the group of muscles that stabilize the shoulder joint by holding the head of the humerus in its socket?

ANSWER: ROTATOR CUFF

BONUS

19) BIOLOGY *Short Answer* The “one gene one enzyme” rule proposed by Beadle and Tatum was mostly based upon their work with what genus of organisms?

ANSWER: NEUROSPORA

TOSS-UP

20) MATH *Short Answer* An arc of length 2π is cut off by a central angle of $\frac{\pi}{4}$ radians. What is the radius of the circle?

ANSWER: 8

(Solution: $r = S/\alpha; = 2\pi / (\pi/4); = 8$)

BONUS

20) MATH *Short Answer* Simplify the following equation: $\sqrt{9x+9} - \sqrt{4x+4}$

ANSWER: $\sqrt{x+1}$ (ACCEPT: $\sqrt{1+x}$)

TOSS-UP

21) EARTH SCIENCE *Multiple Choice* Which of the following types of plutons is a cylindrical conduit of igneous rock below a volcanic vent:

- W) laccolith
- X) dike
- Y) volcanic stock
- Z) volcanic pipe

ANSWER: Z) VOLCANIC PIPE

BONUS

21) EARTH SCIENCE *Multiple Choice* Trellis drainage patterns are most likely to form on:

- W) coastal plains
- X) folded terrains
- Y) glacial outwash
- Z) permafrost

ANSWER: X) FOLDED TERRAINS

TOSS-UP

22) GENERAL SCIENCE *Short Answer* What contemporary of Autolycus wrote a set of thirteen books titled “Elements”, which remains among the most studied works in human thought and was a culmination of classical geometry?

ANSWER: EUCLID

BONUS

22) GENERAL SCIENCE *Multiple Choice* In the tempering of steel, the slower the hot steel cools in the quenching process:

- W) the softer its core and the less the outer hardness penetrates
- X) the softer its core and the more the outer hardness penetrates
- Y) the harder its core and the less the outer hardness penetrates
- Z) the harder its core and the more the outer hardness penetrates

ANSWER: W) THE SOFTER ITS CORE AND THE LESS THE OUTER HARDNESS PENETRATES

TOSS-UP

23) PHYSICS *Multiple Choice* Which of the following explains why a sailboat can sail into the wind:

- W) Archimedes' Principle
- X) Bernoulli's Law
- Y) Pascal's Law
- Z) Reynolds' Numbers

ANSWER: X) BERNOULLI'S LAW

BONUS

23) PHYSICS *Multiple Choice* If the resolution of the human eye is about 0.1 millimeter and the resolution of a light microscope is about 2,000 angstroms, what is the approximate useful magnification of a human eye combined with a light microscope:

- W) 250 times
- X) 500 times
- Y) 1,000 times
- Z) 2,000 times

ANSWER: X) 500 TIMES

TOSS-UP

24) CHEMISTRY *Multiple Choice* Liver enzymes oxidize ethanol to:

- W) methanol
- X) formaldehyde
- Y) oxalic acid
- Z) acetaldehyde

ANSWER: Z) ACETALDEHYDE

BONUS

24) CHEMISTRY *Short Answer* Which of the gas laws describes how the volume of a gas is affected by changes in pressure, temperature, and amount?

ANSWER: IDEAL GAS LAW

TOSS-UP

25) BIOLOGY *Short Answer* In bacterial transference of genes, what is the term for when naked DNA enters the cell from the surroundings:

ANSWER: TRANSDUCTION

BONUS

25) BIOLOGY *Multiple Choice* Which of the following is the type of plant leaf that lacks a palisade and spongy mesophyll:

- W) common crabgrass
- X) dandelion
- Y) apple tree
- Z) lotus plant

ANSWER: W) COMMON CRABGRASS