

ROUND 13

TOSS-UP

- 1) ENERGY *Multiple Choice* Which one of the following is an issue of power quality?
- W) Connecting an alarm clock to a battery
 - X) Voltage provided to a blood pressure monitor used in hospitals that is higher than what it should be for long periods of time
 - Y) Wasting nuclear energy produced by nuclear power plants
 - Z) Connecting a ceiling fan to a power outlet

ANSWER: X) VOLTAGE PROVIDED TO A BLOOD PRESSURE MONITOR USED IN HOSPITALS THAT IS HIGHER THAN WHAT IT SHOULD BE FOR LONG PERIODS OF TIME

BONUS

- 1) ENERGY *Short Answer* For an outlet with a voltage of 120, calculate the voltage in volts if the voltage is 30% over the usual value.

ANSWER: 156

TOSS-UP

- 2) PHYSICAL SCIENCE *Multiple Choice* If you shine unpolarized light through a polarizing filter, the light that exits the filter is:
- W) Half as intense
 - X) Equally as intense
 - Y) Dispersed into many colors
 - Z) Scattered in all directions

ANSWER: W) HALF AS INTENSE

BONUS

- 2) PHYSICAL SCIENCE *Short Answer* If you shine white light through two linear polarizing filters that have their directions of polarizations perpendicular to one another, what will you observe about the light at the other end?

ANSWER: NO LIGHT (ACCEPT: NOTHING)

TOSS-UP

3) GENERAL SCIENCE *Short Answer* By words or numbers, name all of the following that are organs in the human digestive system: 1) pancreas, 2) jejunum (read as: ji-JUH-nuhm), 3) duodenum (read as: duh-oh-DEE-nuhm), and/or 4) bladder.

ANSWER: PANCREAS, JEJUNUM, AND DUODENUM (ACCEPT: 1, 2, 3)

BONUS

3) GENERAL SCIENCE *Short Answer* Name the body system to which the trachea belongs.

ANSWER: RESPIRATORY

TOSS-UP

4) EARTH AND SPACE SCIENCE *Multiple Choice* Greenhouse gases heat the atmosphere by allowing sunlight to pass through while trapping heat. Which of the following planets does NOT have an atmosphere that contains greenhouse gases?

- W) Earth
- X) Venus
- Y) Mars
- Z) Mercury

ANSWER: Z) MERCURY

BONUS

4) EARTH AND SPACE SCIENCE *Multiple Choice* Which of the following statements is NOT true about Mercury?

- W) Mercury is the second densest planet in the solar system
- X) Mercury travels around the Sun faster than any other planet
- Y) Mercury has no magnetic field
- Z) Mercury has been visited by spacecraft

ANSWER: Y) MERCURY HAS NO MAGNETIC FIELD

TOSS-UP

5) MATH *Short Answer* What is the smallest angle, in degrees, formed by the intersection of the lines $y = 2$ and $y = x + 3$?

ANSWER: 45

BONUS

5) MATH *Short Answer* What is the equation, in slope intercept form, of the line perpendicular to the line $y = 3x + 4$, that passes through the point $(-5, 7)$?

ANSWER: $y = -\frac{1}{3}x + \frac{16}{3}$ (ACCEPT: $y = -\frac{1}{3}x + 5\frac{1}{3}$)

TOSS-UP

6) PHYSICAL SCIENCE *Multiple Choice* Soundtracks of space movies frequently have sounds of ships exploding or whizzing through space. Why is this an inaccurate depiction of space?

- W) Sound waves are distorted in space so everything would sound like it was under water
- X) Sound cannot travel through a vacuum
- Y) Everything would have a very high pitch in space
- Z) Space vibrations would muffle the explosions

ANSWER: X) SOUND CANNOT TRAVEL THROUGH A VACUUM

BONUS

6) PHYSICAL SCIENCE *Multiple Choice* Matilda plays an instrument which produces a higher pitch than the instrument her friend Matt plays. What can we say about the sound waves of Matilda's music?

- W) Matilda's wave peaks are farther apart than Matt's
- X) Both Matilda and Matt's sound waves have the same wavelength, but Matilda's travel slower
- Y) Matilda's wave peaks are closer together than Matt's
- Z) Both Matilda and Matt's sound waves have the same wavelength, but Matilda's travel faster

ANSWER: Y) MATILDA'S WAVE PEAKS ARE CLOSER TOGETHER THAN MATT'S

TOSS-UP

7) LIFE SCIENCE *Short Answer* How many common amino acids are there?

ANSWER: 20

BONUS

7) LIFE SCIENCE *Short Answer* Name the first amino acid encoded by all eukaryotic (read as: yuh-KEHR-ee-ōetik) mRNAs.

ANSWER: METHIONINE

TOSS-UP

8) MATH *Short Answer* Simplify $y^2 y^{-3}$ (read as y squared times y to the power of negative 3).

ANSWER: $\frac{1}{y}$ ALSO ACCEPT: y^{-1}

BONUS

8) MATH *Short Answer* How many subsets does the set $\{a, b, c, d\}$ have?

ANSWER: 16

TOSS-UP

9) ENERGY *Multiple Choice* Which of the following sectors is the most important factor in assessing future trends in demand for liquid fuels?

- W) World carbon dioxide emissions
- X) Transportation
- Y) Residential buildings
- Z) Commercial buildings

ANSWER: X) TRANSPORTATION

BONUS

9) ENERGY *Short Answer* In 2009, the state of Tennessee had the greatest average residential electricity consumption of 1,248 kilowatt hours per month at an average retail price of about 9 cents per kilowatt hour. The state of Hawaii had the highest average retail price of about 24 cents per kilowatt hour and an average residential electricity consumption of 617 kilowatt hours per month. Giving your answer to the nearest dollar, how much more, on average, was the monthly electricity bill in Hawaii than in Tennessee?

ANSWER: \$36

TOSS-UP

10) PHYSICAL SCIENCE *Short Answer* What type of reaction absorbs energy?

ANSWER: ENDOTHERMIC

BONUS

10) PHYSICAL SCIENCE *Short Answer* If a superconductor's temperature rises above its critical point, the superconductor transitions back to a regular conductor with resistance. If this occurred, and a conductor had a resistance of 1 ohm, what voltage would drive 2 amps of current through the conductor?

ANSWER: 2

TOSS-UP

11) MATH *Multiple Choice* Which of the following values is smallest?

W) 200

X) $(-16)^2$ (read as: open parenthesis negative 16 close parenthesis squared)

Y) 14^2 (read as: 14 squared)

Z) $(\frac{120}{8})^2$ (read as: open parenthesis 120 over 8 close parenthesis squared)

ANSWER: Y) 14^2

BONUS

11) MATH *Short Answer* The radius of the Earth is approximately 6.4×10^6 meters (read as: 6.4 times 10 to the sixth). Giving your answer in scientific notation with one significant digit, what is the surface area of Earth in square meters?

ANSWER: 5×10^{14}

TOSS-UP

12) LIFE SCIENCE *Short Answer* In which kingdom could you find an eukaryotic (read as: yuh-KEHR-ee-ōetik) heterotroph with cell walls?

ANSWER: FUNGI OR PROTISTA

BONUS

12) LIFE SCIENCE *Multiple Choice* Which of the following statements is NOT true about slime mold?

W) It is a fungus*

X) It can move

Y) It lacks chitin in its cell walls

Z) It ingests food

ANSWER: W) IT IS A FUNGUS

*[NOTE: SLIME MOLDS WERE ORIGINALLY CLASSIFIED AS A FUNGUS BUT HAVE BEEN RECLASSIFIED.
SEE: <http://www.ucmp.berkeley.edu/protista/slimemolds.html>]

TOSS-UP

13) ENERGY *Multiple Choice* Which of the following components allows renewable systems to produce energy for later use?

- W) Inductor
- X) Regulator
- Y) Battery bank
- Z) Heater

ANSWER: Y) BATTERY BANK

BONUS

13) ENERGY *Multiple Choice* A component of a solar energy system is the charge controller. What is its function?

- W) To provide electrical protection to the system
- X) To regulate the amount of power that goes into energy storage for later use
- Y) To dissipate excess energy
- Z) To store the energy for later use

ANSWER: X) TO REGULATE THE AMOUNT OF POWER THAT GOES INTO ENERGY STORAGE FOR LATER USE

TOSS-UP

14) EARTH AND SPACE SCIENCE *Multiple Choice* Which of the following is NOT a moon of Jupiter?

- W) Titan
- X) Io
- Y) Europa
- Z) Callisto

ANSWER: W) TITAN

BONUS

14) EARTH AND SPACE SCIENCE *Multiple Choice* Which of the following statements is NOT true about Jupiter's moon Europa?

- W) It was discovered by Galileo
- X) Its atmosphere is primarily composed of methane
- Y) It orbits Jupiter every 3 and a half days
- Z) It has a deep salty ocean which is frozen over

ANSWER: X) ITS ATMOSPHERE IS LARGELY COMPRISED OF METHANE

TOSS-UP

15) MATH *Short Answer* Solve for x in simplest form: $x^2 = 50$.

ANSWER: $5\sqrt{2}$, $-5\sqrt{2}$

BONUS

15) MATH *Short Answer* Factor completely over the integers: $15y^2 - y - 6$.

ANSWER: $(5y + 3)(3y - 2)$

TOSS-UP

16) LIFE SCIENCE *Short Answer* Which organ system is responsible for protecting you against viruses, bacteria, and other pathogens?

ANSWER: IMMUNE

BONUS

16) LIFE SCIENCE *Short Answer* Name the type of immune cell that is attacked by HIV?

ANSWER: T-CELL OR HELPER T-CELL (ACCEPT: CD4 T CELL)

TOSS-UP

17) GENERAL SCIENCE *Multiple Choice* Which genetic disorder is caused by a mutation in one gene, leading to thick, sticky mucus clogging the lungs, pancreas, and passageways in other organs?

- W) Cystic fibrosis
- X) Huntington's disease
- Y) Klinefelter syndrome
- Z) Sickle cell anemia

ANSWER: W) CYSTIC FIBROSIS

BONUS

17) GENERAL SCIENCE *Multiple Choice* A father is colorblind, but his wife is not colorblind and is not a carrier of the gene for colorblindness. If the couple has a son, will he be colorblind?

- W) Yes, because colorblindness is always passed from father to son
- X) No, because the mother is neither colorblind nor a carrier of colorblindness
- Y) There is a 50% chance because colorblindness is autosomal dominant
- Z) Yes, because the gene for colorblindness is located on the Y chromosome

ANSWER: X) NO, BECAUSE THE MOTHER IS NEITHER COLORBLIND NOR A CARRIER OF COLORBLINDNESS

TOSS-UP

18) MATH *Short Answer* What is the largest integer smaller than $\sqrt{150}$?

ANSWER: 12

BONUS

18) MATH *Short Answer* What is the multiplicative inverse of the rational number halfway between $-1/3$ and $-1/4$?

ANSWER: $\frac{-24}{7}$

TOSS-UP

19) EARTH AND SPACE SCIENCE *Multiple Choice* The general paths of storm systems that travel across the continental United States are primarily driven by:

- W) Ocean currents
- X) Local winds
- Y) Mountains
- Z) The jet stream

ANSWER: Z) THE JET STREAM

BONUS

19) EARTH AND SPACE SCIENCE *Multiple Choice* The jet stream separates major air masses over the central continental U.S. The high pressure air mass to the north of the jet stream has which of the following characteristics in winter?

- W) Warm and humid
- X) Warm and dry
- Y) Cold and humid
- Z) Cold and dry

ANSWER: Z) COLD AND DRY

TOSS-UP

20) EARTH AND SPACE SCIENCE *Multiple Choice* What is a meteorite?

- W) An asteroid
- X) A kind of comet
- Y) A natural particle from space that vaporizes upon entering Earth's atmosphere
- Z) A natural particle from space that survives impact with the Earth's surface

ANSWER: Z) A NATURAL PARTICLE FROM SPACE THAT SURVIVES IMPACT WITH THE EARTH'S SURFACE

BONUS

20) EARTH AND SPACE SCIENCE *Multiple Choice* Sea ice is formed by frozen seawater, which contains salt. At what temperature, in Celsius, will sea ice freeze?

- W) -11.20
- X) -1.8
- Y) 0
- Z) +0.001

ANSWER: X) -1.8

TOSS-UP

21) PHYSICAL SCIENCE *Short Answer* According to Charles's law, which property of a gas increases as its temperature increases?

ANSWER: VOLUME

BONUS

21) PHYSICAL SCIENCE *Multiple Choice* Which of the following elements has the highest boiling point?

- W) Copper
- X) Magnesium
- Y) Zinc
- Z) Gold

ANSWER: Z) GOLD

TOSS-UP

22) GENERAL SCIENCE *Short Answer* Not counting the Sun itself, what is the name of the closest star to the Sun?

ANSWER: PROXIMA CENTAURI

BONUS

22) GENERAL SCIENCE *Multiple Choice* What is the largest moon in our Solar System?

- W) Io
- X) Europa
- Y) Ganymede (read as: gah-NY-meed)
- Z) Callisto

ANSWER: Y) GANYMEDE

TOSS-UP

23) LIFE SCIENCE *Multiple Choice* Babies cannot walk well. As they grow older, which of the following parts of their nervous systems will interact with their muscles, allowing for increased coordination?

- W) Somatic
- X) Autonomic
- Y) Sympathetic
- Z) Parasympathetic

ANSWER: W) SOMATIC

BONUS

23) LIFE SCIENCE *Multiple Choice* When you have the flu, what part of the nervous system is responsible for elevating your body temperature?

- W) Medulla oblongata
- X) Pons
- Y) Hypothalamus
- Z) Brain stem

ANSWER: Y) HYPOTHALAMUS

TOSS-UP

24) EARTH AND SPACE SCIENCE *Multiple Choice* Which of the following is the term for the swampy area where a river valley meets the sea?

- W) Playa
- X) Trench
- Y) Spit
- Z) Estuary (read as: EHS-chuh-wehr-ee)

ANSWER: Z) ESTUARY

BONUS

24) EARTH AND SPACE SCIENCE *Short Answer* When fresh water streams meet the salty ocean, water of intermediate salinity forms. What term is used to describe this type of water?

ANSWER: BRACKISH

TOSS-UP

25) GENERAL SCIENCE *Multiple Choice* For what did Marie Curie win the Nobel Prize in chemistry?

- W) Discovering uranium and plutonium
- X) Discovering radon
- Y) Discovering curium
- Z) Discovering radium and polonium

ANSWER: Z) DISCOVERING RADIUM AND POLONIUM

BONUS

25) GENERAL SCIENCE *Short Answer* Who is credited with creating the first vaccine?

ANSWER: EDWARD JENNER