

ROUND 14

TOSS-UP

1) GENERAL SCIENCE *Multiple Choice* Naked mole rats are mammals, but they differ from every other species of mammal in one defining characteristic. What is this characteristic?

W) They lack mammary glands

X) They lack fur or hair

Y) They are nearly poikilothermic (read as: pohi-KEE-loh-thehr-mik)

Z) They do not give live birth

ANSWER: Y) THEY ARE NEARLY POIKILOTHERMIC

BONUS

1) GENERAL SCIENCE *Short Answer* In what class of fish do sharks belong?

ANSWER: CHONDRICHTHYES

TOSS-UP

2) MATH *Short Answer* A tic-tac-toe game is played by placing Xs or Os at consecutive lattice points of a coordinate system. If your opponent had marks at (-1, -2) and (1, -4), what are the coordinates of the point where you would place your mark in order to block your opponent?

ANSWER: (0, -3)

BONUS

2) MATH *Short Answer* Solve the inequality $3^{3x-2} > 1$ (read as: 3 to the power of the quantity 3x minus 2 is greater than 1).

ANSWER: $x > 2/3$

TOSS-UP

3) PHYSICAL SCIENCE *Short Answer* What is the name of the change in energy of an atom in the gaseous state when an electron is added to the neutral atom to form a negative ion?

ANSWER: ELECTRON AFFINITY

BONUS

3) PHYSICAL SCIENCE *Short Answer* By number, identify all of the following three statements that are TRUE about Lewis acids and bases: 1) Lewis acids accept an electron pair; 2) Lewis bases donate an electron pair; 3) Lewis acids and bases do not require the presence of water.

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

TOSS-UP

4) LIFE SCIENCE *Short Answer* What are the common names of the two main groups of cetaceans (read as: si-TAY-shehns)?

ANSWER: BALEEN WHALES AND TOOTHED WHALES

BONUS

4) LIFE SCIENCE *Multiple Choice* What effect does the wobble position in a codon have on protein synthesis?

- W) The 1st and 2nd bases are interchangeable
- X) The 2nd base can change and have no effect
- Y) The 3rd base is an absolute determinant
- Z) The 3rd base is often irrelevant

ANSWER: Z) THE 3RD BASE IS OFTEN IRRELEVANT

TOSS-UP

5) GENERAL SCIENCE *Multiple Choice* Which of the following functional groups does NOT contain an oxygen atom?

- W) Carboxyl
- X) Amine
- Y) Hydroxyl
- Z) Carbonyl

ANSWER: X) AMINE

BONUS

5) GENERAL SCIENCE *Multiple Choice* Which of the following countries is most likely to experience droughts during an El Niño event?

- W) Peru
- X) India
- Y) Kenya
- Z) South Africa

ANSWER: Z) SOUTH AFRICA

TOSS-UP

6) PHYSICAL SCIENCE *Short Answer* For a given pair of atoms, which of the following kinds of bonds are the shortest: single, double, or triple?

ANSWER: TRIPLE

BONUS

6) PHYSICAL SCIENCE *Multiple Choice* Which of the following ions has a noble gas configuration?

- W) P^{2-}
- X) N^{3-}
- Y) Ca^{3+}
- Z) F^{2-}

ANSWER: X) N^{3-}

TOSS-UP

7) EARTH AND SPACE SCIENCE *Short Answer* Give the name of the most frequently occurring iron-bearing oxide mineral in soil that has a characteristic yellowish brown color and often forms under cool temperatures, moist soil conditions, and in the presence of comparatively large amounts of organic matter.

ANSWER: GEOTHITE

BONUS

7) EARTH AND SPACE SCIENCE *Multiple Choice* Stromatolites were once very common but are now quite rare. Which of the following is a plausible explanation?

W) Light conditions are no longer favorable for the photosynthetic organisms that form stromatolites

X) Ocean acidification makes the formation of stromatolites difficult

Y) Few places are warm enough for the organisms that form stromatolites

Z) The organisms that produce stromatolites were not able to compete effectively enough with other organisms

ANSWER: Z) THE ORGANISMS THAT PRODUCE STROMATOLITES WERE NOT ABLE TO COMPETE EFFECTIVELY ENOUGH WITH OTHER ORGANISMS

TOSS-UP

8) PHYSICAL SCIENCE *Short Answer* As electrons are gained by an element in a redox reaction, what happens to the oxidation state of that element?

ANSWER: IT DECREASES (ACCEPT: BECOMES MORE NEGATIVE)

BONUS

8) PHYSICAL SCIENCE *Short Answer* What is the oxidation state of tin in $(\text{NH}_4)_2\text{SnCl}_6$?

ANSWER: +4

TOSS-UP

9) ENERGY *Multiple Choice* In which of the following years did the U.S. have the highest energy consumption per person?

- W) 1949
- X) 1959
- Y) 1979
- Z) 1989

ANSWER: Y) 1979

BONUS

9) ENERGY *Short Answer* What is the adjective for a material that generates an electric charge when mechanically deformed?

ANSWER: PIEZOELECTRIC

TOSS-UP

10) MATH *Multiple Choice* If $f(x) = 1/x$, then $f^{-1}(x)$ (read as: f inverse of x) equals which of the following?

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

ANSWER: Z) $\frac{1}{x}$

BONUS

10) MATH *Short Answer* If local sales tax is 9%, and tax is rounded to the nearest cent, what is the most a purchase can cost, before tax, to not exceed a total of \$25 including tax?

ANSWER: \$22.94

TOSS-UP

11) EARTH AND SPACE SCIENCE *Short Answer* As sea ice melts, the Earth reflects less sunlight back into space, resulting in further warming and more loss of ice. What kind of feedback relationship is this?

ANSWER: POSITIVE

BONUS

11) EARTH AND SPACE SCIENCE *Multiple Choice* Which of the following rocks likely formed from the lowest temperature melt?

- W) Granite
- X) Basalt
- Y) Diorite
- Z) Andesite (read as: AHN-di-zyt)

ANSWER: W) GRANITE

TOSS-UP

12) PHYSICAL SCIENCE *Multiple Choice* Which of the following reactions is NOT an example of oxidation-reduction?

- W) $\text{CuSO}_{4(aq)} + 2\text{NaOH}_{(aq)} \rightarrow$ (read as: yields) $\text{Cu}(\text{OH})_{2(s)} + \text{Na}_2\text{SO}_{4(aq)}$
- X) $3\text{CuS}_{(s)} + 8\text{HNO}_{3(aq)} \rightarrow 3\text{CuSO}_{4(aq)} + 8\text{NO}_{(g)} + 4\text{H}_2\text{O}_{(l)}$
- Y) $\text{Fe}_{(s)} + \text{CuSO}_{4(aq)} \rightarrow \text{FeSO}_{4(aq)} + \text{Cu}_{(s)}$
- Z) $\text{Cu}_{(s)} + \text{HNO}_{3(aq)} \rightarrow \text{Cu}(\text{NO}_3)_{2(aq)} + \text{NO}_{2(g)}$

ANSWER: W) $\text{CUSO}_{4(AQ)} + 2\text{NAOH}_{(AQ)} \rightarrow \text{CU}(\text{OH})_{2(S)} + \text{NA}_2\text{SO}_{4(AQ)}$

[NOTE: AQ = AQUEOUS; S = SOLID; L = LIQUID]

BONUS

12) PHYSICAL SCIENCE *Multiple Choice* John and Michael look from their 80 meter high balcony to a swimming pool with a 20 meter horizontal distance from the base of their building. If they were to jump off the balcony into the pool, how fast in meters per second would they have to jump horizontally to succeed in reaching the pool?

- W) 4
- X) 5
- Y) 9.8
- Z) 12

ANSWER: X) 5

TOSS-UP

13) EARTH AND SPACE SCIENCE *Multiple Choice* Which of the following types of geologic folds are pointed, not curved, around the axial plane?

- W) Recumbent
- X) Chevron
- Y) Isoclinal
- Z) Symmetrical

ANSWER: X) CHEVRON

BONUS

13) EARTH AND SPACE SCIENCE *Short Answer* On a topographic map, a river runs from east to west. If a north-south-trending contour line crosses the river and forms a V that points to the right, in which direction is the river likely flowing?

ANSWER: WEST

TOSS-UP

14) ENERGY *Short Answer* If you live near a nuclear power plant, you may be issued tablets of what compound, which, in the event of a release of radioactive iodine, can prevent it from being collected in your thyroid?

ANSWER: POTASSIUM IODIDE

BONUS

14) ENERGY *Short Answer* By number, rank the following four sources of radiation from least to greatest annual relative millirem doses: 1) diagnostic radiology, 2) natural radioactivity in the body, 3) radon in the average home, 4) living near a normally operating nuclear power station.

ANSWER: 4, 2, 1, 3

TOSS-UP

15) LIFE SCIENCE *Short Answer* What is the common name of the land bird with the largest wingspan of any North American bird?

ANSWER: CALIFORNIA CONDOR

BONUS

15) LIFE SCIENCE *Short Answer* What is the stage of the insect life cycle, lacking in hemimetabolous (read as: heh-mi-meh-TAH-boh-luhs) insects, during which many tissues degenerate and are reorganized?

ANSWER: PUPA

TOSS-UP

16) MATH *Short Answer* What is the degree of the polynomial $6x^2y + 3yx^4 - 2x$?

ANSWER: 5

BONUS

16) MATH *Short Answer* Consider the system of two equations: $3x + 4y = 23$ and $2x + 5y = 20$. What is the value of $x + y$?

ANSWER: 3

TOSS-UP

17) LIFE SCIENCE *Short Answer* What small, regularly-shaped cell fragments circulate in the blood of mammals and lead to the formation of blood clots?

ANSWER: PLATELETS

BONUS

17) LIFE SCIENCE *Multiple Choice* Which of the following processes is MOST under the influence of the hormone aldosterone?

- W) Sodium and potassium electrolyte balance
- X) Spermatogenesis
- Y) Heart rate
- Z) Gastric motility

ANSWER: W) SODIUM AND POTASSIUM ELECTROLYTE BALANCE

TOSS-UP

18) ENERGY *Multiple Choice* About what fraction of the petroleum consumed in the United States is used for transportation?

- W) 1/4
- X) 1/2
- Y) 3/4
- Z) 7/8

ANSWER: Y) 3/4

BONUS

18) ENERGY *Short Answer* By name or number, rank the following five renewable energy sources in order from least to greatest according to their contribution to U.S. energy production in 2009: 1) geothermal, 2) biofuels, 3) wind, 4) hydropower, 5) solar.

ANSWER: SOLAR, GEOTHERMAL, WIND, BIOFUELS, HYDROPOWER (ACCEPT: 5, 1, 3, 2, 4)

TOSS-UP

19) PHYSICAL SCIENCE *Multiple Choice* The Aufbau principle is used to determine which of the following?

- W) Spin of an electron
- X) Electron configuration of an atom
- Y) Position and momentum of an electron
- Z) Relative mass of an atom

ANSWER: X) ELECTRON CONFIGURATION OF AN ATOM

BONUS

19) PHYSICAL SCIENCE *Short Answer* What is the chemical name for the compound $\text{HC}_8\text{H}_4\text{O}_4^1$?

ANSWER: HYDROGEN PHTHALATE

TOSS-UP

20) LIFE SCIENCE *Multiple Choice* Which of the following is NOT a characteristic of regular echinoids (read as: i-KY-nohids)?

- W) Pentamerism
- X) Tube feet
- Y) Globoid shape
- Z) Branched tentacles

ANSWER: Z) BRANCHED TENTACLES

BONUS

20) LIFE SCIENCE *Short Answer* Identify the term used to describe the process of humans purposely ingesting insects.

ANSWER: ENTOMOPHAGY

TOSS-UP

21) MATH *Short Answer* If a 20 meter tree casts a $20\sqrt{3}$ meter shadow, what is the angle of elevation, in degrees, of the Sun?

ANSWER: 30°

BONUS

21) MATH *Short Answer* Solve the inequality: $15x^2 - 2 > x$.

ANSWER: $x < -1/3$ OR $x > 2/5$

(NOTE: STUDENTS MUST GIVE BOTH ANSWERS)

TOSS-UP

22) GENERAL SCIENCE *Short Answer* What rare earth element with atomic number 73 is used in GPS systems, laptop computers, cellular phones, hearing aids, and some video game systems?

ANSWER: TANTALUM

BONUS

22) GENERAL SCIENCE *Short Answer* For many types of bees, fertilized eggs become females while unfertilized eggs become males, and females have two sets of chromosomes while males only have one set. For sister bees that have the same parents, what is the average percentage of DNA that they share?

ANSWER: 75%

TOSS-UP

23) EARTH AND SPACE SCIENCE *Short Answer* What is the name of the common point around which both the Earth and the Moon revolve?

ANSWER: BARYCENTER

BONUS

23) EARTH AND SPACE SCIENCE *Short Answer* Earth is nearest the Sun around January 3rd. What is the term for this point in Earth's orbit?

ANSWER: PERIHELION

TOSS-UP

24) LIFE SCIENCE *Multiple Choice* In eukaryotic cells, which of the following portions of an mRNA molecule is translated?

- W) Poly (A) tail
- X) Exon
- Y) Intron
- Z) Guanosine (read as: GWAH-noh-seen) triphosphate cap

ANSWER: X) EXON

BONUS

24) LIFE SCIENCE *Short Answer* Which group of amphibians is characterized by their surficial resemblance to earthworms or snakes?

ANSWER: CAECILIANS (ACCEPT: AMPHISBAENIDS)

TOSS-UP

25) GENERAL SCIENCE *Multiple Choice* Which of the following molecular formulas corresponds to an organic acid?

- W) CH_3Cl
- X) CH_3OH
- Y) CH_3COOH
- Z) $\text{CH}_3\text{COOCH}_3$

ANSWER: Y) CH_3COOH

BONUS

25) GENERAL SCIENCE *Multiple Choice* A segment of unlabeled DNA undergoes replication in a solution containing all necessary materials and in which the nitrogenous bases in the solution are radioactively labeled. Two complete, double-stranded DNA segments form. Following replication, which of the following is likely to be observed?

- W) One strand on each of the two DNA segments is radioactively labeled, while the other strand on each of the two segments is unlabeled
- X) Both strands of one DNA segment are radioactively labeled, while both strands of the other segment are unlabeled
- Y) Both strands on each segment of DNA contain a mixture of radioactively labeled and unlabeled base pairs
- Z) Both segments of DNA have all their nitrogenous bases in both strands labeled

ANSWER: W) ONE STRAND ON EACH OF THE TWO DNA SEGMENTS IS RADIOACTIVELY LABELED, WHILE THE OTHER STRAND ON EACH OF THE TWO SEGMENTS IS UNLABELED