

ROUND 8

TOSS-UP

1) CHEMISTRY *Multiple Choice* The reaction $\text{Fe}_3\text{O}_4 + 4\text{H}_2 \rightarrow 3\text{Fe} + 4\text{H}_2\text{O}$, is an example of what class of chemical reaction:

- W) decomposition
- X) single replacement
- Y) combustion
- Z) combination

ANSWER: X) SINGLE REPLACEMENT

BONUS

1) CHEMISTRY *Short Answer* Find the mass percent composition, rounded to the nearest whole number, for each atom in KClO_3 . Assume the atomic masses of potassium = 39, chlorine = 35, and oxygen = 16

ANSWER: K = 32%; Cl = 29%; O = 39%

(Solution: $\text{K} = 39\text{g}/122\text{g} \times 100\% = 32\%$; $\text{Cl} = 35/122 \times 100\% = 29\%$; $\text{O} = 48/122 \times 100\% = 39\%$)

TOSS-UP

2) BIOLOGY *Multiple Choice* Which of the following is the highest level of structural organization in myoglobin:

- W) primary
- X) secondary
- Y) tertiary
- Z) quaternary

ANSWER: Y) TERTIARY

BONUS

2) BIOLOGY *Short Answer* Name all of the following 4 choices that are characteristic of *E. coli*: gram negative; an enteric organism; non-motile; bacillus

ANSWER: GRAM NEGATIVE; AN ENTERIC ORGANISM; BACILLUS
(ACCEPT: ALL BUT NON-MOTILE)

TOSS-UP

3) PHYSICS *Multiple Choice* Which of the following colors of light has the greatest angle of refraction in normal glass:

- W) yellow
- X) green
- Y) orange
- Z) blue

ANSWER: Z) BLUE

BONUS

3) PHYSICS *Multiple Choice* If a beam of white light passes through a prism, which of the following colors color will emerge on the other side at the lowest angle with respect to the incident beam:

- W) orange
- X) indigo
- Y) green
- Z) blue

ANSWER: W) ORANGE

TOSS-UP

4) MATH *Multiple Choice* Which of the following is NOT true:

- W) all central angles in a regular polygon are equal
- X) irregular polygons are not considered to have centers and have no central angles
- Y) the circumcircle of a regular polygon is the circle that passes through at least one vertex
- Z) all regular polygons are convex

ANSWER: Y) THE CIRCUMCIRCLE OF A REGULAR POLYGON IS THE CIRCLE THAT PASSES THROUGH AT LEAST ONE VERTEX

BONUS

4) MATH *Short Answer* Find the sum of all interior angles, in degrees, in a regular polygon having 100 sides:

ANSWER: 17,640

(Solution: $(100 - 2)(180) = 17,640^\circ$)

TOSS-UP

5) EARTH SCIENCE *Multiple Choice* Because of Earth's rotation and shape, ocean currents are intensified along which of the following borders of all oceans:

- W) northern
- X) southern
- Y) eastern
- Z) western

ANSWER: Z) WESTERN

BONUS

5) EARTH SCIENCE *Multiple Choice* Which of the following is NOT generally characteristic of a passive continental margin:

- W) relatively wide continental shelf
- X) oceanic trench
- Y) terrigenous sediment
- Z) continental rise

ANSWER: X) OCEANIC TRENCH

TOSS-UP

6) GENERAL SCIENCE *Multiple Choice* The sea nettle is the Bering Sea's most common:

- W) jellyfish
- X) crab
- Y) sea urchin
- Z) walleye pollock

ANSWER: W) JELLYFISH

BONUS

6) GENERAL SCIENCE *Multiple Choice* 1 cubic foot per second equals approximately how many gallons per minutes:

- W) 256
- X) 449
- Y) 646
- Z) 724

ANSWER: X) 449

TOSS-UP

7) ASTRONOMY *Short Answer* Which of the terrestrial planets has the lowest albedo?

ANSWER: MERCURY

BONUS

7) ASTRONOMY *Short Answer* Most of the hydrogen that makes up the planet Jupiter is in what phase?

ANSWER: LIQUID

TOSS-UP

8) CHEMISTRY *Multiple Choice* Which of the following is the theoretical end of a titration:

- W) end point
- X) indicator point
- Y) equivalence point
- Z) standardization point

ANSWER: Y) EQUIVALENCE POINT

(Solution: end point is the observed end of a titration)

BONUS

8) CHEMISTRY *Short Answer* In a strong acid-base titration, what is the pH of the solution when the equivalence point is reached?

ANSWER: 7

TOSS-UP

9) **BIOLOGY** *Short Answer* What specific class of antibodies is most commonly responsible for degranulation of basophils or mast cells?

ANSWER: IgE (ACCEPT: IMMUNOGLOBULIN E)

BONUS

9) **BIOLOGY** *Multiple Choice* Which of the following is a group of about 20 proteins that aid in the attraction and phagocytosis of microorganisms by macrophages:

- W) alpha interferons
- X) complement system
- Y) TNF
- Z) hemopoietins

ANSWER: X) COMPLEMENT SYSTEM

TOSS-UP

10) **PHYSICS** *Short Answer* What property of a wave is generally said to increase during constructive interference?

ANSWER: AMPLITUDE

BONUS

10) **PHYSICS** *Short Answer* What is the most common name for the Law or principal dictating that the amount of a substance that is released or deposited from an electrode is directly proportional to the amount of electric current passing through the circuit?

ANSWER: FARADAY'S FIRST LAW OF ELECTROLYSIS
(ACCEPT: FARADAY'S FIRST LAW or FARADAY'S LAW OF ELECTROLYSIS)

TOSS-UP

11) MATH *Short Answer* Find 2 mean proportionals between the numbers 3 and 24:

ANSWER: 6 AND 12

(Solution: $3r^3 = 24$, $r = 2$)

BONUS

11) MATH *Short Answer* Find the numerical value of the geometric mean of the following 4 values: 2^1 ; 2^3 ; 2^8 ; 2^8

ANSWER: 32 (DO NOT ACCEPT: 2^5)

(Solution: $1 + 3 + 8 + 8 = 20/4 = 5$; $2^5 = 32$)

TOSS-UP

12) EARTH SCIENCE *Multiple Choice* Many of the driest locales on Earth are situated between which of the following latitudes:

- W) 0° to 15°
- X) 15° to 30°
- Y) 30° to 45°
- Z) 45° to 60°

ANSWER: X) 15° to 30°

BONUS

12) EARTH SCIENCE *Multiple Choice* Which of the following is NOT true of breccia rock:

- W) it is sedimentary
- X) its color is variable
- Y) its texture consists of rounded pebbles, cobbles and boulders
- Z) fragments may be any type of igneous, metamorphic, or sedimentary rocks

ANSWER: Y) ITS TEXTURE CONSISTS OF ROUNDED PEBBLES, COBBLES AND BOULDERS

(Solution: constituent clasts are angular)

TOSS-UP

13) GENERAL SCIENCE *Multiple Choice* In the northern hemisphere, which of the following degrees latitude would experience a length of day of 6 months:

- W) 0
- X) 30
- Y) 60
- Z) 90

ANSWER: Z) 90

BONUS

13) GENERAL SCIENCE *Multiple Choice* Which of the following is a substance that is generally considered friable:

- W) concrete
- X) topaz
- Y) quartz
- Z) perlite

ANSWER: Z) PERLITE

(Solution: it is easily reduced to smaller pieces with little effort)

TOSS-UP

14) ASTRONOMY *Short Answer* From what specific celestial body do meteor showers originate?

ANSWER: COMET(S)

BONUS

14) ASTRONOMY *Multiple Choice* Of which of the following is the Hubble Law most directly a consequence:

- W) Doppler shift
- X) Kirchoff's second law
- Y) Kepler's second law
- Z) Drake's equation

ANSWER: W) DOPPLER SHIFT

TOSS-UP

15) CHEMISTRY *Multiple Choice* A sample of gas is heated from 300K to 500K. If the container is sealed and of fixed volume, which of the following will remain constant:

- W) the average kinetic energy of the gas molecules
- X) the average speed of the gas molecules
- Y) the density of the gas
- Z) the pressure of the gas

ANSWER: Y) THE DENSITY OF THE GAS

BONUS

15) CHEMISTRY *Multiple Choice* Which of the following does NOT have the electron configuration of argon:

- W) O^{2-}
- X) Cl^-
- Y) S^{2-}
- Z) K^+

ANSWER: W) O^{2-}

(Solution: O^{2-} has configuration of neon)

TOSS-UP

16) BIOLOGY *Short Answer* In angiosperm seed development, what fuses with the second sperm nucleus to form the endosperm?

ANSWER: 2 POLAR NUCLEI (ACCEPT: 2 OR BOTH POLAR NUCLEI or POLAR NUCLEI)
(DO NOT ACCEPT: POLAR NUCLEUS)

BONUS

16) BIOLOGY *Short Answer* In what specific part of a eukaryotic cell will pyruvate be converted into acetyl Co-enzyme A?

ANSWER: MITOCHONDRION (ACCEPT: MITOCHONDRIA)

TOSS-UP

17) PHYSICS *Multiple Choice* Which of the following are the most important calibration references that Celsius used to devise his temperature scale:

- W) melting point and boiling point of water
- X) ice-point and freeze-thaw point of water
- Y) specific gravity of water
- Z) boiling point and steam point of water

ANSWER: W) MELTING POINT AND BOILING POINT OF WATER

BONUS

17) PHYSICS *Multiple Choice* Which of the following is the MOST reliable measure of the remaining percentage of stored energy in a lead acid battery:

- W) pH of the electrolyte
- X) voltage remaining in the battery as measured on a voltmeter
- Y) amount of oxygen gas released
- Z) specific gravity of the electrolyte

ANSWER: Z) SPECIFIC GRAVITY OF THE ELECTROLYTE

TOSS-UP

18) MATH *Short Answer* There are 10 people on a bus who, when ranked from youngest to oldest, all differ from those on the bus closest in age to them by the same number of years. If the youngest is 6 and the oldest is 51, what is the common difference in their age?

ANSWER: 5

(Solution: 6-11-16-21-26-31-36-41-46-51)

BONUS

18) MATH *Short Answer* Solve the following equation for all real values of x : $(x + 3)^2 = 16$

ANSWER: 1 AND -7

TOSS-UP

19) EARTH SCIENCE *Multiple Choice* When geologists find pillow basalts in ancient rock sequences, which of the following BEST explains their presence:

- W) the area was once underwater
- X) volcanic bombs and lapilli landed on snow or ice and quickly cooled
- Y) they hardened in mid-air, sometimes forming a tear-drop shape
- Z) nearby volcanoes erupted enormous quantities of ash

ANSWER: W) THE AREA WAS ONCE UNDERWATER

BONUS

19) EARTH SCIENCE *Short Answer* What is the general name for the myriad of suspended particles or aerosols in the Earth's atmosphere that allow rain droplets to undergo coalescence?

ANSWER: CONDENSATION NUCLEI

TOSS-UP

20) GENERAL SCIENCE *Multiple Choice* Which of the following is closest to the meaning of the suffix 'tropic' (read as: troh-PIK):

- W) hot
- X) wet
- Y) changing
- Z) under

ANSWER: Y) CHANGING

BONUS

20) GENERAL SCIENCE *Multiple Choice* In which of the following locations has water at its highest temperature ever been recorded in nature:

- W) within gullies on Venus
- X) in very deep ocean hydrothermal vents along the mid-Atlantic ridge
- Y) at the bottom of Yellowstone Lake in Yellowstone National Park
- Z) within volcanic vents high atop Hawaii's Kilauea volcano

ANSWER: X) IN VERY DEEP OCEAN HYDROTHERMAL VENTS ALONG THE MID-ATLANTIC RIDGE

TOSS-UP

21) ASTRONOMY *Short Answer* What is the most accurate term astronomers use for the time it takes for a planet to orbit the Sun relative to the stars?

ANSWER: SIDEREAL PERIOD

BONUS

21) ASTRONOMY *Short Answer* What terrestrial planet has the longest sidereal period?

ANSWER: MARS

TOSS-UP

22) CHEMISTRY *Short Answer* In the electrolysis of a copper chloride solution, what forms at the cathode and anode, respectively?

ANSWER: CATHODE = COPPER (ACCEPT: Cu); ANODE = CHLORINE (ACCEPT: CHLORINE GAS or Cl₂)

BONUS

22) CHEMISTRY *Short Answer* According to standard chemical nomenclature, what is the formula for ammonium sulfate?

ANSWER: (NH₄)₂SO₄

TOSS-UP

23) **BIOLOGY** *Short Answer* How many human ova are produced by a full round of meiosis from a single primary oocyte?

ANSWER: 1

(Solution: mammals produce 1 ovum and 3 polar bodies per primary oocyte)

BONUS

23) **BIOLOGY** *Short Answer* Name all of the following 4 animals for which L-ascorbate is an essential nutrient: humans; dogs; cats; horses

ANSWER: HUMANS

TOSS-UP

24) **PHYSICS** *Short Answer* In triboelectric charging, when one object loses electrons, the object that accepts the charges acquires the same number of charges that the other object has lost. What law most directly governs this equal exchange?

ANSWER: CONSERVATION OF CHARGE

BONUS

24) **PHYSICS** *Short Answer* Consider an organ pipe open at both ends. For a standing wave in the pipe, what is the wavelength of the fundamental tone, in terms of the pipe's length?

ANSWER: 2 (ACCEPT: 2 PIPE LENGTHS)

TOSS-UP

25) MATH *Short Answer* Giving your answer in standard form, give the equation of the circle with center at (0, 0) and diameter of 6:

ANSWER: $x^2 + y^2 = 9$

BONUS

25) MATH *Short Answer* What is the degree measure of the angle formed by 2 secants intersecting outside a circle if the measures of the intercepted arcs are 80° and 34° ?

ANSWER: 23

(Solution: $\frac{1}{2}(80^\circ - 34^\circ) = 23^\circ$)