

## ROUND 10 A

### TOSS-UP

1. *COMPUTER SCIENCE Short Answer* What is the special text file that controls certain aspects of operating system behavior in MS-DOS and OS/2, including enabling/disabling system features and setting limits on the number of open resources?

ANSWER: CONFIG.SYS

### BONUS

1. *COMPUTER SCIENCE Short Answer* What is the term used to describe an area of memory that preserves the most recent Cut or Copy operation?

ANSWER: CLIPBOARD

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### TOSS-UP

2. *ASTRONOMY Multiple Choice* The intrinsic brightness (luminosity) of a Cepheid (Pronounce: SEF-EE-ID) variable star compared to that of the Sun is

- W) significantly less
- X) about the same
- Y) much larger
- Z) cannot be measured

ANSWER: Y) MUCH LARGER

### BONUS

2. *ASTRONOMY Multiple Choice* The principal difficulty with the idea that the Moon formed separately from the Earth is

- W) There isn't enough room for other planets in the Solar System
- X) It is made of rocks that are also found on Earth
- Y) It is very difficult for planets to capture other objects as satellites
- Z) The Earth's gravity isn't strong enough

ANSWER: Y) IT IS VERY DIFFICULT FOR PLANETS TO CAPTURE OTHER OBJECTS AS SATELLITES

**TOSS-UP**

3. *CHEMISTRY Multiple Choice* Of the following substances, the least polar bonds are those found in
- W) H<sub>2</sub>
  - X) H<sub>2</sub>O
  - Y) H<sub>2</sub>S
  - Z) CH<sub>4</sub>

ANSWER: W) H<sub>2</sub>

**BONUS**

3. *CHEMISTRY Short Answer* What principle states that no two electrons in an atom can have the same set of quantum numbers?

ANSWER: PAULI EXCLUSION PRINCIPLE

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**TOSS-UP**

4. *COMPUTER SCIENCE Short Answer* What does the acronym URL mean?

ANSWER: UNIFORM RESOURCE LOCATOR

**BONUS**

4. *COMPUTER SCIENCE Multiple Choice* In HTML, what defines the basic layout or arrangement of pages in frames on a single Web page?

- W) frameset document
- X) frame rate adjustment
- Y) frame pager
- Z) None of the above

ANSWER: W) FRAMESET DOCUMENT

**TOSS-UP**

5. *MATH Short Answer* Consider a cube that has an edge length of 4 centimeters. Find the cube's surface area in square centimeters.

ANSWER: 96

**BONUS**

5. *MATH Short Answer* A term used to describe a square, non-invertible matrix is

ANSWER: SINGULAR MATRIX (ACCEPT SINGULAR)

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**TOSS-UP**

6. *GENERAL SCIENCE Multiple Choice* Mutations can be caused by

- W) ultraviolet light
- X) X rays
- Y) certain chemicals
- Z) all of the above

ANSWER: Z) ALL OF THE ABOVE

**BONUS**

6. *GENERAL SCIENCE Short Answer* What is the term for a solid with four sides, each of which is a triangle?

ANSWER: TETRAHEDRON

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**TOSS-UP**

7. *BIOLOGY Short Answer* In what Organelle does aerobic respiration occur?

ANSWER MITOCHONDRION (accept: MITOCHONDRIA)

**BONUS**

7. *BIOLOGY Short Answer* A small subset of a larger population that becomes isolated and establishes a new population is referred to as a:

ANSWER: FOUNDER POPULATION

**TOSS-UP**

8. *EARTH SCIENCE Multiple Choice* Which of these metamorphic rocks has the highest grade?
- W) phyllite
  - X) gneiss (pron: nice)
  - Y) slate
  - Z) schist

ANSWER: X) GNEISS

**BONUS**

8. *EARTH SCIENCE Short Answer* Shales deposited in lakes often exhibit summer and winter layers that differ in color and texture and can be counted much like growth rings in trees. What are these layers called?

ANSWER: VARVES

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**TOSS-UP**

9. *COMPUTER SCIENCE Short Answer* What is the term used to describe a list of World Wide Web addresses or URLs that are saved by the browser program for later reference and use?

ANSWER: BOOKMARK LIST

**BONUS**

9. *COMPUTER SCIENCE Multiple Choice* Which of the following is considered to be relational data model?
- W) DB2
  - X) Informix
  - Y) FoxBase
  - Z) all of the above

ANSWER: Z) ALL OF THE ABOVE

**TOSS-UP**

10. *ASTRONOMY Multiple Choice* How are the Moon and eclipses related?

- W) The Moon's shadow falls on the Earth at a solar eclipse
- X) Earth blocks sunlight from reaching the Moon at a lunar eclipse
- Y) The Moon's gravity bends light away from the Earth at a solar eclipse
- Z) Both W and X

ANSWER: Z) BOTH W AND X

**BONUS**

10. *ASTRONOMY Multiple Choice* Colors are perceived differently by our eyes because of their different

- W) speeds
- X) wavelengths
- Y) particles
- Z) amplitudes

ANSWER: X) WAVELENGTHS

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**TOSS-UP**

11. *PHYSICS Multiple Choice* Two blocks are released from the top of a building. One falls straight down while the other slides down a smooth ramp. If all friction is ignored, which one is moving faster when it reaches the bottom?

- W) the block that went straight down
- X) the block that went down the ramp
- Y) they both have the same speed
- Z) insufficient information to work the problem

ANSWER: Y) THEY BOTH HAVE THE SAME SPEED

**BONUS**

11. *PHYSICS Multiple Choice* If  $a$  is acceleration,  $v$  is velocity,  $x$  is position, and  $t$  is time, then which equation is not dimensionally correct?

- W)  $t = x/v$  (Read:  $t$  equals  $x$  divided by  $v$ )
- X)  $a = v^2/x$  (Read:  $a$  equals  $v$  squared divided by  $x$ )
- Y)  $v = a/t$  (Read:  $v$  equals  $a$  divided by  $t$ )
- Z)  $t^2 = 2x/a$  (Read:  $t$  squared equals two  $x$  divided by  $a$ )

ANSWER: Y)  $V = A/T$

**TOSS-UP**

12. *GENERAL SCIENCE Multiple Choice* The most important factor in determining which biome is found in a particular area is

- W) soil type
- X) topography
- Y) magnetic fields
- Z) climate

ANSWER: Z) CLIMATE

**BONUS**

12. *GENERAL SCIENCE Short Answer* What is the term of Japanese origin for the waves generated by abrupt displacement of the sea floor or by landslides entering the sea?

ANSWER: TSUNAMI ( PRON: SEW – NAH - ME)

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**TOSS-UP**

13. *BIOLOGY Multiple Choice* Through the process of phagocytosis, macrophages

- W) block antigens
- X) engulf bacteria
- Y) produce antibodies
- Z) synthesize interferon

ANSWER: X) ENGULF BACTERIA

**BONUS**

13. *BIOLOGY Short Answer* Regions of DNA that control the expression of structural genes are called what kind of genes?

ANSWER: REGULATORY

**TOSS-UP**

14. *COMPUTER SCIENCE Short Answer* What does the acronym CGI stand for which defines communications between information servers and resources on the server's host computer?

ANSWER: COMMON GATEWAY INTERFACE

**BONUS**

14. *COMPUTER SCIENCE Multiple Choice* The number of bits required to represent the pixel values for an image is called

- W) bitplane
- X) pitch
- Y) bit-mapped graphic
- Z) binary image

ANSWER: W) BITPLANE

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**TOSS-UP**

15. *GENERAL SCIENCE Short Answer* What is the name for a chemical that kills a plant or inhibits its growth?

ANSWER: HERBICIDE

**BONUS**

15. *GENERAL SCIENCE Multiple Choice* In the environment, all of the following are abiotic factors except

- W) light
- X) temperature
- Y) bacteria
- Z) size of soil particles

ANSWER: Y) BACTERIA

**TOSS-UP**

16. *BIOLOGY Short Answer* Encephalitis is an infection of what organ?

ANSWER: BRAIN

**BONUS**

16. *BIOLOGY Multiple Choice* Select the human trait that is not polygenic.

- W) ABO blood type
- X) body weight
- Y) height
- Z) skin color

ANSWER: W) ABO BLOOD TYPE

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**TOSS-UP**

17. *COMPUTER SCIENCE Multiple Choice* How many bits of color information per pixel does Joint Photographic Experts Group (JPEG) file support?

- W) 8
- X) 16
- Y) 24
- Z) 32

ANSWER: Y) 24

**BONUS**

17. *COMPUTER SCIENCE Multiple Choice* What is the term used to describe a strategy employed in distributed processing and other multi-user situations to prevent more than one user at a time from writing data to a record?

- W) record blocking
- X) recoverable blocking
- Y) record locking
- Z) record structure

ANSWER: Y) RECORD LOCKING



**TOSS-UP**

18. *EARTH SCIENCE Multiple Choice* Magma that fills vertical cracks and solidifies forms a

- W) dike
- X) batholith
- Y) laccolith
- Z) volcanic neck

ANSWER: W) DIKE

**BONUS**

18. *EARTH SCIENCE Multiple Choice* The bedrock in a karst region would most likely be

- W) granite
- X) volcanic tuff
- Y) limestone
- Z) colluvium

ANSWER: Y) LIMESTONE

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**TOSS-UP**

19. *CHEMISTRY Multiple Choice* Which of the following elements exists in allotropic forms?

- W) silicon
- X) germanium
- Y) tin
- Z) lead

ANSWER: Y) TIN

**BONUS**

19. *CHEMISTRY Short Answer* A 1:1 mixture of enantiomers is called what kind of mixture?

ANSWER: RACEMIC (accept: RACEMATE)

**TOSS-UP**

20. *MATH Short Answer* The smallest positive integer that is not a prime number is

ANSWER: 1

**BONUS**

20. *MATH Multiple Choice* The area bounded by  $\sin x$  and  $x$ -axis over  $[0, 2\pi]$  is (read as: the closed interval zero comma two pie)

- W) 1
- X) 2
- Y) 4
- Z)  $2\pi$

ANSWER: Y) 4

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**TOSS-UP**

21. *CHEMISTRY Short Answer* The relative electron-attracting or electron-donating effect exerted by a substituent as the result of electronegativity differences is known as this.

ANSWER: INDUCTIVE EFFECT

**BONUS**

21. *CHEMISTRY Multiple Choice* Which one of the following has the lowest ionization energy?

- W) Fluorine
- X) Cobalt
- Y) Strontium
- Z) Beryllium

ANSWER: Y) STRONTIUM

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**TOSS-UP**

22. *BIOLOGY Short Answer* What organelle packages proteins into secretory vesicles?

ANSWER: GOLGI COMPLEX (OR GOLGI BODY)

**BONUS**

22. *BIOLOGY Short Answer* In the laboratory, the separation of molecules according to their charge, size, and/or shape can be done by

ANSWER: ELECTROPHORESIS

**TOSS-UP**

23. *COMPUTER SCIENCE Short Answer* What is the term used to describe the fastest speed at which a device can operate without interruption?

ANSWER: BURST SPEED OR BURST RATE

**BONUS**

23. *COMPUTER SCIENCE Short Answer* A network in which the nodes are connected in a cycle, each node having a single predecessor and successor and all transmissions are repeated around a closed path has what type of topology?

ANSWER: RING

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**TOSS-UP**

24. *EARTH SCIENCE Short Answer* What was the name of Alfred Wegener's super continent?

ANSWER: PANGAEA

**BONUS**

24. *EARTH SCIENCE Short Answer* What is a hill of salt found in a rock layer called?

ANSWER: SALT DOME

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**TOSS-UP**

25. *CHEMISTRY Short Answer* Which state of matter is characterized by having a definite shape and a definite volume?

ANSWER: SOLID

**BONUS**

25. *CHEMISTRY Multiple Choice* Aluminum reacts with oxygen in the air to form a protective oxide coating. Silver also reacts with compounds in air to form a black coating. What substance is formed?

- W) silver oxide
- X) silver chloride
- Y) silver sulfide
- Z) silver carbonate

ANSWER: Y) SILVER SULFIDE

## ROUND 11 A

### TOSS-UP

1. *CHEMISTRY Multiple Choice* The name given to numbers which are placed in front of symbols or formulas, and used to balance the number of atoms in an equation is

ANSWER: COEFFICIENT OF STOICHIOMETRY (STOICHIOMETRIC COEFFICIENT)

### BONUS

1. *CHEMISTRY Short Answer* What is the volume (in liters) occupied by 71 grams of chlorine gas at STP?

ANSWER: 22.4 LITERS (accept 22 to 23 LITERS)

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### TOSS-UP

2. *BIOLOGY Multiple Choice* In plants, cells that retain the ability to divide are called

- W) parenchyma cells
- X) meristematic cells
- Y) ground cells
- Z) epidermal cells

ANSWER: X) MERISTEMATIC CELLS

### BONUS

2. *BIOLOGY Short Answer* The internal membrane system of the chloroplast is called a

ANSWER: THYLAKOID DISK (accept: GRANA)

### TOSS-UP

3. *GENERAL SCIENCE Short Answer* What is the term for a molecule that stimulates the production of an antibody or another immune response?

ANSWER: ANTIGEN

### BONUS

3. *GENERAL SCIENCE Multiple Choice* Of the four types of magnetism, which one occurs at very cold temperatures when an ordered array of atomic magnetic moments spontaneously forms in which alternate moments have opposite directions?

- W) diamagnetism
- X) paramagnetism
- Y) ferromagnetism
- Z) antiferromagnetism

ANSWER: Z) ANTIFERROMAGNETISM

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### TOSS-UP

4. *PHYSICS Short Answer* A series of ocean waves, 5.0 meters between crests, moves past at 2 waves per second. What is their velocity?

ANSWER: 10.0 METERS PER SECOND

### BONUS

11. *PHYSICS Short Answer* If the intensity of a sound is increased by a factor of 100, the new decibel level will be increased by how many units?

ANSWER: TWENTY

**TOSS-UP**

5. *CHEMISTRY Multiple Choice* Which of these covalent bonds is the most polar?
- W) Flourine-Flourine
  - X) Flourine-Sulphur
  - Y) Flourine-Arsenic
  - Z) Flourine-Oxygen

ANSWER: Y) FLOURINE-ARSENIC

**BONUS**

5. *CHEMISTRY Multiple Choice* The detailed molecular-level picture of how a reaction might take place is the
- W) reaction mechanism
  - X) transition state
  - Y) reaction coordinate
  - Z) reaction profile

ANSWER: W) REACTION MECHANISM

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**TOSS-UP**

6. *EARTH SCIENCE Short Answer* What types of fossils represent the remains of a living thing that was widespread but existed for only a few million years in Earth's history?

ANSWER: INDEX FOSSILS

**BONUS**

6. *EARTH SCIENCE Short Answer* What are long, narrow chains of underwater mountains called?

ANSWER: (MID-OCEAN) RIDGES

**TOSS-UP**

7. *COMPUTER SCIENCE Short Answer* What does the acronym DBMS mean?

ANSWER: DATABASE MANAGEMENT SYSTEM

**BONUS**

7. *COMPUTER SCIENCE Short Answer* What organization, formed in 1993, is charged with registering domain names and IP addresses as well as distributing information about the Internet?

ANSWER: INTERNIC OR INTERNET NETWORK INFORMATION CENTER

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**TOSS-UP**

8. *BIOLOGY Short Answer* Most plants and animals use what molecule as their final hydrogen acceptor in cellular respiration

ANSWER: OXYGEN

**BONUS**

8. *BIOLOGY Short Answer* What is the main neurotransmitter that excites skeletal muscles?

ANSWER: ACETYLCHOLINE

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**TOSS-UP**

9. *GENERAL SCIENCE Multiple Choice* The heat island effect can be counteracted by all of the following means except

- W) planting trees
- X) using darker paints and building materials
- Y) mixing light-colored sand with asphalt
- Z) establishing higher energy-efficiency standard

ANSWER: X) USING DARKER PAINTS AND BUILDING MATERIALS

**BONUS**

9. *GENERAL SCIENCE Short Answer* Warm Chinook and Santa Ana winds that originate from air descending down mountains are referred to as what type of winds?

ANSWER: KATABATIC

**TOSS-UP**

10. *EARTH SCIENCE Multiple Choice* A deep valley carved into the continental shelf and continental slope is called a
- W) abyssal plain
  - X) submersible
  - Y) submarine canyon
  - Z) continental rise

ANSWER: Y) SUBMARINE CANYON

**BONUS**

10. *EARTH SCIENCE Short Answer* Through what process does water carry dissolved minerals from horizon A to horizon B?

ANSWER: LEACHING

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**TOSS-UP**

11. *CHEMISTRY Multiple Choice* The electronegativity of an atom is a consequence of its
- W) position in the periodic table
  - X) nuclear charge
  - Y) ionic charge
  - Z) negatively charged electrons

ANSWER: W) POSITION IN THE PERIODIC TABLE

**BONUS**

11. *CHEMISTRY Multiple Choice* What type of bond would you expect in Cesium Iodine?
- W) Ionic
  - X) Covalent
  - Y) Metallic
  - Z) van der Waals

ANSWER: W) IONIC

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**TOSS-UP**

12. *MATH Short Answer* In the basic study of calculus, "areas under a curve" is to integral calculus as "what" is to differential calculus?

ANSWER: TANGENTS (ACCEPT: SLOPE OF TANGENTS)

**BONUS**

12. *MATH Short Answer* If  $y = x^2 + x$ , find  $dy/dx$  at  $x = 2$ .

ANSWER: 5

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**TOSS-UP**

13. *COMPUTER SCIENCE Short Answer* What is the term used to describe the amount of time required for a magnetic disk to rotate into the proper position for the read/write head to locate the appropriate data block on that track?

ANSWER: LATENCY

**BONUS**

13. *COMPUTER SCIENCE Multiple Choice* In printing or screen display, a measure of the number of characters per unit of area or of linear distance is called

- W) character set
- X) character density
- Y) character string
- Z) character code

ANSWER: X) CHARACTER DENSITY

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**TOSS-UP**

14. *CHEMISTRY Short Answer* What is another name for a reaction in which at least one element undergoes a change in oxidation number?

ANSWER: REDOX (ACCEPT OXIDATION/REDUCTION)

**BONUS**

14. *CHEMISTRY Multiple Choice* Which of the following elements is used in high-speed semiconductors?

- W) zinc
- X) gallium
- Y) tellurium
- Z) antimony

ANSWER: X) GALLIUM

**TOSS-UP**

15. *PHYSICS Short Answer* A block has a known density,  $p$ . Another block has the same mass as the first block but half its volume. What is the density of the second block?

ANSWER: TWICE P **OR**  $2p$

**BONUS**

15. *PHYSICS Multiple Choice* In a mass spectrometer, an ion will have a smaller radius for its circular path if

- W) its speed is greater
- X) its mass is greater
- Y) its charge is greater
- Z) the magnetic field is weaker

ANSWER: Y) ITS CHARGE IS GREATER

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**TOSS-UP**

16. *EARTH SCIENCE Multiple Choice* Water particles of open ocean waves move in what direction?

- W) toward shore
- X) in a circle
- Y) sideways
- Z) up and down

ANSWER: X) IN A CIRCLE

**BONUS**

16. *EARTH SCIENCE Multiple Choice* Hawaii's black sands form from

- W) olivine
- X) quartz
- Y) basalt
- Z) coral and shell fragments

ANSWER: Y) BASALT

**TOSS-UP**

17. *GENERAL SCIENCE Short Answer* What term describes the process where pore space is reduced within a body of fine grained sediments in response to the weight of overlying material?

ANSWER: COMPACTION

**BONUS**

17. *GENERAL SCIENCE Short Answer* What is the term for changes in frequency of electromagnetic waves resulting from relative motion between source and receiver?

ANSWER: DOPPLER SHIFT (ACCEPT: DOPPLER EFFECT)

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**TOSS-UP**

18. *EARTH SCIENCE Multiple Choice* Approximately how many million years ago did dinosaurs become extinct?

- W) 65 million
- X) 6.5 million
- Y) 120 million
- Z) 5 million

ANSWER: W) 65 MILLION

**BONUS**

18. *EARTH SCIENCE Multiple Choice* A large hole in a sea cliff formed when waves cut under the cliff is called a

- W) wave-cut terrace
- X) sea stack
- Y) sea cave
- Z) spit

ANSWER: Y) SEA CAVE

**TOSS-UP**

19. *BIOLOGY Short Answer* What is the rough endoplasmic reticulum covered with?

ANSWER: RIBOSOMES

**BONUS**

19. *BIOLOGY Short Answer* A molecule that gives up an electron becomes what?

ANSWER "IONIZED" OR "OXIDIZED"

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**TOSS-UP**

20. *CHEMISTRY Multiple Choice* Which of the following substances will form an aqueous solution that is a strong electrolyte?

- W) hydrogen bromide gas
- X) silver chloride solid
- Y) nitrogen gas
- Z) mercury sulfide solid

ANSWER: W) HYDROGEN BROMIDE GAS

**BONUS**

20. *CHEMISTRY Multiple Choice* Which of the following ions could exist in only the high- spin state in an octahedral complex?

- W)  $\text{Cr}^{2+}$  (read as: chromium two plus)
- X)  $\text{Mn}^{4+}$  (read as: manganese four plus)
- Y)  $\text{Fe}^{3+}$  (read as: iron three plus)
- Z)  $\text{Co}^{3+}$  (read as: cobalt three plus)

ANSWER: X)  $\text{Mn}^{4+}$

**TOSS-UP**

21. *GENERAL SCIENCE Short Answer* What is the name for the art and science of designing and building structures?

ANSWER: ARCHITECTURE

**BONUS**

21. *GENERAL SCIENCE Multiple Choice* The formula for determining the area of a hexagon is

- W) Square of the length of one side times 6
- X) Square of the length of one side times 1.72
- Y) Square of the length of one side times 2.60
- Z) Square of the length of one side times 4.83

ANSWER: Y) SQUARE OF THE LENGTH OF ONE SIDE TIMES 2.60

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**TOSS-UP**

22. *EARTH SCIENCE Short Answer* What term applies to any matter in which the molecules consist of only one kind of matter?

ANSWER: ELEMENT

**BONUS**

22. *EARTH SCIENCE Multiple Choice* Water vapor in a parcel of air begins to condense when the air's temperature

- W) rises above the dew point
- X) decreases slightly below the dew point
- Y) drops below freezing
- Z) is greater than its relative humidity

ANSWER: X) DECREASES SLIGHTLY BELOW THE DEW POINT

**TOSS-UP**

23. *MATH Short Answer* In Euclidean geometry, the angle sum of a convex quadrilateral (in degrees) is

ANSWER: 360

**BONUS**

23. *MATH Multiple Choice* What sort of curve does the equation  $x^2 + 8xy + y^2 - 16 = 0$  determine

- W) circle
- X) parabola
- Y) straight line
- Z) hyperbola

ANSWER: Z) HYPERBOLA

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**TOSS-UP**

24. *GENERAL SCIENCE Short Answer* What group of minerals contain halogens such as fluorine, chlorine, bromine, or iodine?

ANSWER: HALIDES

**BONUS**

24. *GENERAL SCIENCE Short Answer* What is the term for the relatively steep seafloor that lies seaward of a continental shelf?

ANSWER: CONTINENTAL SLOPE

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**TOSS-UP**

25. *BIOLOGY Short Answer* If a parent cell has 16 chromosomes, how many sister chromatids will be present at metaphase of mitosis?

ANSWER: 32

**BONUS**

25. *BIOLOGY Short Answer* What hormone stimulates the production of red blood cells?

ANSWER: ERYTHROPOIETIN





## ROUND 12 A

### TOSS-UP

1. *CHEMISTRY Multiple Choice* Within the structure of most addition polymers can be found a backbone polymer of

- W) polyethylene
- X) polyvinyl chloride
- Y) polystyrene
- Z) Saran

ANSWER: W) POLYETHYLENE

### BONUS

1. *CHEMISTRY Short Answer* What type of cleavage generates free-radicals?

ANSWER: HOMOLYTIC CLEAVAGE

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### TOSS-UP

2. *GENERAL SCIENCE Short Answer* What is the name for a device used to vary the volume of air passing through a duct or air vent?

ANSWER: DAMPER

### BONUS

2. *GENERAL SCIENCE Short Answer* What is the term used to describe the shallow water zone of a sea between high and low tides lines?

ANSWER: LITTORAL ZONE OR INTERTIDAL ZONE

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### TOSS-UP

3. *COMPUTER SCIENCE Short Answer* What is the term used to describe the type of mathematical methods devoted to the analysis, representation, and manipulation of complex waveforms?

ANSWER: FOURIER ANALYSIS

### BONUS

3. *COMPUTER SCIENCE Short Answer* In HTML, What are the beginning and ending tags for a definition list?

ANSWER: <DL> AND </DL> (read as: ANGLE BRACKETS DL AND ANGLE

BRACKETS FORWARD SLASH DL)

**TOSS-UP**

4. *PHYSICS Multiple Choice* If a mass  $m$  is executing simple harmonic motion, its acceleration is proportional to its
- W) mass
  - X) displacement
  - Y) velocity
  - Z) amplitude

ANSWER: X) DISPLACEMENT

**BONUS**

4. *PHYSICS Short Answer* A ball is pushed with an initial velocity of 4 meters per second. The ball rolls down a hill with a constant acceleration of 2 meters per second squared. The ball reaches the bottom of the hill in 8 seconds. What is the ball's velocity at the bottom of the hill?

ANSWER: 20 METERS PER SECOND

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**TOSS-UP**

5. *GENERAL SCIENCE Short Answer* What is the name for the scientific study of the properties and transformations of elements?

ANSWER: CHEMISTRY

**BONUS**

5. *GENERAL SCIENCE Short Answer* What type of barometer often used in altimeters uses variations in atmospheric pressure to force the lid of a bellowed container to rise or fall?

ANSWER: ANEROID BAROMETER

**TOSS-UP**

6. *ASTRONOMY Multiple Choice* What will happen to the absorption and/or emission spectral lines of an object moving away from the Earth at high speed?
- W) they will be made more intense
  - X) they will be made less intense
  - Y) they will be shifted towards the red end of the spectrum
  - Z) they will be shifted towards the blue end of the spectrum

ANSWER: Y) THEY WILL BE SHIFTED TOWARDS THE RED END OF THE SPECTRUM

**BONUS**

6. *ASTRONOMY Multiple Choice* The large number of craters on the lunar highlands compared to those on the maria is evidence that
- W) material in the highlands is very soft and easily cratered
  - X) objects that struck the moon were aimed at certain areas
  - Y) maria are much younger than the highlands
  - Z) maria are much older than the highlands

ANSWER: Y) MARIA ARE MUCH YOUNGER THAN THE HIGHLANDS

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**TOSS-UP**

7. *CHEMISTRY Multiple Choice* Which of the following is a chemical property of iron?
- W) occurs in an abundance of 4.7% in the earth's crust
  - X) melts at 1535 degrees C
  - Y) attracted to a magnet
  - Z) rusts when exposed to moist air

ANSWER: Z) RUSTS WHEN EXPOSED TO MOIST AIR

**BONUS**

7. *CHEMISTRY Short Answer* 63.55 is the atomic weight of what element?

ANSWER: COPPER (Cu)

**TOSS-UP**

8. *COMPUTER SCIENCE Short Answer* What is the file extension that identifies sound files stored in waveform audio format?

ANSWER: .WAV (READ AS: DOT W A V)

**BONUS**

8. *COMPUTER SCIENCE Short Answer* What is the multi-user, multitasking operating system originally developed by Ken Thompson and Dennis Ritchie at AT&T Laboratories for use on minicomputers?

ANSWER: UNIX

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**TOSS-UP**

9. *MATH Short Answer* If  $n$  is greater than 2, then the equation  $x^n + y^n = z^n$  has no positive integer solutions  $x, y, z$ . This result is known as

ANSWER: FERMAT'S (PRONOUNCE: FAIR-MAH'S) LAST THEOREM

**BONUS**

9. *MATH Multiple Choice* The critical points of  $f(x) = \sqrt{x^2 + 1}$  are: (read as: f of x equals the square root of the quantity x squared plus 1)

- W) 1 and - 1
- X) 1 and 0
- Y) 0
- Z) the function has no critical points

ANSWER: Y) 0

---

**TOSS-UP**

10. *COMPUTER SCIENCE Short Answer* What is the term used to describe the scattering of parts of the same disk file over different areas of the disk causing slow disk access and performance degradation?

ANSWER: FRAGMENTATION

**BONUS**

10. *COMPUTER SCIENCE Short Answer* What does the acronym ISDN stand for?

ANSWER: INTEGRATED SERVICES DIGITAL DOMAIN

**TOSS-UP**

11. *MATH Multiple Choice* If the first derivative of a function  $f$  at  $c$  equals 0 and the second derivative at  $c$  is greater than zero, then  $f$  has a

- W) local maximum at  $x = c$
- X) local maximum at  $x = -c$
- Y) local minimum at  $x = c$
- Z) local minimum at  $x = -c$

ANSWER: Y) LOCAL MINIMUM AT  $x = c$

**BONUS**

11. *MATH Short Answer* What is a conic section for which the sum of the distances of any point from two fixed points, the foci (pron: foh- sigh), is constant?

ANSWER: ELLIPSE

---

**TOSS-UP**

12. *CHEMISTRY Multiple Choice* Which of the following would be considered a Lewis base?

- W)  $\text{BCl}_3$
- X)  $\text{Cu}^{2+}$
- Y)  $\text{Cl}^-$
- Z)  $\text{Mn}^{2+}$

ANSWER: Y)  $\text{Cl}^-$

**BONUS**

12. *CHEMISTRY Short Answer* What is the charge on the strontium ion?

ANSWER: 2+

---

**TOSS-UP**

13. *COMPUTER SCIENCE Short Answer* What is the term for hardware and software systems that act as interfaces between networks having entirely different protocols?

ANSWER: GATEWAYS

**BONUS**

13. *COMPUTER SCIENCE Short Answer* What is the term in computer graphics that describes the process of enlarging or reducing a graphical image?

ANSWER: SCALING

**TOSS-UP**

14. *BIOLOGY Multiple Choice* The absence of which of the following pigments would prevent a plant from responding to the duration of light and darkness?
- W) chlorophyll
  - X) xanthophyll
  - Y) carotene
  - Z) phytochrome

ANSWER: Z) PHYTOCHROME

**BONUS**

14. *BIOLOGY Short Answer* In the male testes, interstitial cells normally produce what hormone?

ANSWER: TESTOSTERONE

---

**TOSS-UP**

15. *COMPUTER SCIENCE Short Answer* Who was the English mathematician and engineer who designed two early automated computing machines, the Difference Engine and the Analytical Engine?

ANSWER: CHARLES BABBAGE

**BONUS**

15. *COMPUTER SCIENCE Multiple Choice* Hardware devices that boost the strength of the signal on a communications channel are called
- W) repeaters
  - X) bridges
  - Y) routers
  - Z) gateways

ANSWER: W) REPEATERS



**TOSS-UP**

16. *BIOLOGY Multiple Choice* An example of a saturated fat is

- W) beef fat
- X) olive oil
- Y) corn oil
- Z) cellulose

ANSWER: W) BEEF FAT

**BONUS**

16. *BIOLOGY Short Answer* What is the cytoplasmic organelle called where cellular digestion and disposal of biological molecules occur?

ANSWER: LYSOSOME

---

**TOSS-UP**

17. *MATH Multiple Choice* A point moves so that its distance from the origin is always twice its distance from the point (3,0). Its locus is

- W) an ellipse
- X) a hyperbola
- Y) a circle
- Z) a parabola

ANSWER: Y) A CIRCLE

**BONUS**

17. *MATH Multiple Choice* A parabola has focus (2,4) (read as: parenthesis 2 comma 4 end parenthesis) and directrix  $y = -2$ . Its vertex is

- W) (2,3)
- X) (2,1)
- Y) (0,4)
- Z) (4,4)

ANSWER: X) (2,1)

**TOSS-UP**

18. *GENERAL SCIENCE Short Answer* What is the name for a place where trees are grown for display, educational, or scientific purposes?

ANSWER: ARBORETUM

**BONUS**

18. *GENERAL SCIENCE Short Answer* What is the term for the steep temperature gradient that exists in the middle zone of a lake and gives rise to thermally induced vertical stratification of the water?

ANSWER: THERMOCLINE

---

**TOSS-UP**

19. *ASTRONOMY Multiple Choice* Cepheid (Pronounce: SEF-EE-ID) variable stars are important in astronomy mainly because they allow us to determine

- W) distance
- X) mass
- Y) temperature
- Z) color

ANSWER: W) DISTANCE

**BONUS**

19. *ASTRONOMY Multiple Choice* What do astronomers believe is the source of the extra heat that Saturn is giving off (over and above what is received from the sun)?

- W) electrical discharges
- X) magnetic storms in the upper atmosphere
- Y) the slow falling in of inner ring particles
- Z) the precipitation of helium inside Saturn

ANSWER: Z) THE PRECIPITATION OF HELIUM INSIDE SATURN

**TOSS-UP**

20. *CHEMISTRY Short Answer* What law states that the rate of effusion of a gas is inversely proportional to the square root of its molar mass?

ANSWER: GRAHAM'S LAW

**BONUS**

20. *CHEMISTRY Multiple Choice* Which of the following configurations represents a neutral transition element?

W)  $1s^2 2s^2 2p^2$  (read as: one s two, two s two, two p two)

X)  $1s^2 2s^2 2p^6 3s^2$

Y)  $1s^2 2s^2 2p^6 3s^2 3p^6$

Z)  $1s^2 2s^2 2p^6 3s^2 3p^6 3d^8 4s^2$

ANSWER: Z)  $1s^2 2s^2 2p^6 3s^2 3p^6 3d^8 4s^2$

---

**TOSS-UP**

21. *MATH Short Answer* If a triangle ABC is congruent to triangle XYZ, then state the relationship between side AB and side XY.

ANSWER: THEY ARE EQUAL (ACCEPT: CONGRUENT OR SAME LENGTH)

**BONUS**

21. *MATH Short Answer* In the integers modulo twelve, the product of 7 and 9 is

ANSWER: 3

---

**TOSS-UP**

22. *BIOLOGY Short Answer* In animals, bile pigments are formed from the breakdown of what type of cells?

ANSWER: RED BLOOD CELLS (ERYTHROCYTES)

**BONUS**

22. *BIOLOGY Short Answer* What vitamin is involved in blood clotting?

ANSWER: VITAMIN K

**TOSS-UP**

23. *CHEMISTRY Short Answer* How many moles of sugar are required to make 4 liters of a sugar solution having a concentration of 0.6 mole per liter?

ANSWER: 2.4 MOLES

**BONUS**

23. *CHEMISTRY Short Answer* When a hydronium ion concentration equals  $1 \times 10^{-13}$  moles per liter, what is the pH of the solution?

ANSWER: 13

---

**TOSS-UP**

24. *COMPUTER SCIENCE Short Answer* What is the unit of measure that signifies one billion bytes?

ANSWER: GIGABYTE

**BONUS**

24. *COMPUTER SCIENCE Multiple Choice* Which of the following is a nonvolatile memory storage device?

- W) flash memory
- X) bubble memory
- Y) battery-packed CMOS
- Z) all of the above

ANSWER: Z) ALL OF THE ABOVE

---

**TOSS-UP**

25. *ASTRONOMY Short Answer* The Asteroid Belt is directly between the orbits of which two planets?

ANSWER: MARS AND JUPITER

**BONUS**

25. *ASTRONOMY Multiple Choice* How does the wavelength of red light compare to the wavelength of blue light?

- W) red is shorter
- X) they are the same
- Y) red is longer
- Z) they vary so we cannot tell

ANSWER: Y) RED IS LONGER

## ROUND 13 A

### TOSS-UP

1. *PHYSICS Multiple Choice* When we add a displacement vector to another displacement vector, the result is
- W) a velocity
  - X) an acceleration
  - Y) another displacement
  - Z) a scalar

ANSWER: Y) ANOTHER DISPLACEMENT

### BONUS

1. *PHYSICS Multiple Choice* Consider a point on a bicycle tire that is momentarily in contact with the ground as the bicycle rolls across the ground with constant speed. The direction for the acceleration for this point at the moment is
- W) upward
  - X) down toward the ground
  - Y) forward
  - Z) zero

ANSWER: W) UPWARD

---

### TOSS-UP

2. *GENERAL SCIENCE Short Answer* An "mcf" of natural gas contains one million BTUs. What quantity of natural gas is equivalent to 100,000 BTUs?

ANSWER: THERM

### BONUS

2. *GENERAL SCIENCE Short Answer* What is the term for the deflecting force on air and other moving bodies due to the earth's rotation?

ANSWER: CORIOLIS FORCE (OR EFFECT)

**TOSS-UP**

3. *CHEMISTRY Multiple Choice* What type of organic molecule may have the chemical formula  $C_2H_4O$ ?
- W) an ether
  - X) an aldehyde
  - Y) an alcohol
  - Z) an amine

ANSWER: X) AN ALDEHYDE

**BONUS**

3. *CHEMISTRY Short Answer* What term is used to describe a hydrocarbon that contains a halogen substituent, such as fluorine, chlorine, bromine, or iodine?

ANSWER: ALKYL HALIDE

---

**TOSS-UP**

4. *PHYSICS Multiple Choice* If both the temperature and the volume of an ideal gas are doubled, the pressure will be
- W) halved
  - X) doubled
  - Y) unchanged
  - Z) quadrupled

ANSWER: Y) UNCHANGED

**BONUS**

4. *PHYSICS Short Answer* What is the term for the velocity at which charge carriers in an electrical current move through a conductor?

ANSWER: DRIFT VELOCITY

**TOSS-UP**

5. *EARTH SCIENCE Multiple Choice* Thunderstorms can form due to
- W) convection
  - X) high winds
  - Y) a high-pressure area
  - Z) all of the above

ANSWER: W) CONVECTION

**BONUS**

5. *EARTH SCIENCE Multiple Choice* The San Andreas fault
- W) is a strike-slip fault
  - X) is a monocline
  - Y) is a thrust fault
  - Z) is a magnitude 5 fault

ANSWER: W) IS A STRIKE-SLIP FAULT

---

**TOSS-UP**

6. *MATH Multiple Choice* A normal curve is a
- W) unimodal symmetric curve
  - X) multimodal symmetric curve
  - Y) unimodal positively skewed curve
  - Z) unimodal negatively skewed curve

ANSWER: W) UNIMODAL SYMMETRIC CURVE

**BONUS**

6. *MATH Short Answer* Let  $f(x) = (\sin x)^2$ . (read as: F of X equals open parenthesis sine X end parenthesis to the second power) What is  $f'(x)$ ? (read: f prime of x)

ANSWER:  $2 \sin x \cos x$  (read: two sine x cosine x)



**TOSS-UP**

7. *BIOLOGY Multiple Choice* Osmosis is a process most similar to
- W) simple diffusion
  - X) active transport
  - Y) endocytosis
  - Z) exocytosis

ANSWER: W) SIMPLE DIFFUSION

**BONUS**

7. *BIOLOGY Multiple Choice* Agent Orange is:
- W) an insecticide
  - X) a herbicide
  - Y) an organic nutrient
  - Z) a plant growth factor

ANSWER: X) A HERBICIDE

---

**TOSS-UP**

8. *CHEMISTRY Short Answer* What is the maximum number of d orbitals in a principle energy level?

ANSWER: FIVE

**BONUS**

8. *CHEMISTRY Short Answer* According to the uncertainty principle, if the position of a moving particle is known, what other quantity cannot be known?

ANSWER: MOMENTUM (ACCEPT: VELOCITY)

**TOSS-UP**

9. *COMPUTER SCIENCE Multiple Choice* What was the name of the electronic computing machine designed by Alan Turing for use in breaking complex coding schemes employed by the Germans during World War II?
- W) Colossus
  - X) ENIAC
  - Y) ABC
  - Z) EDVAC

ANSWER: W) COLOSSUS

**BONUS**

9. *COMPUTER SCIENCE Short Answer* What is the term for a hardware device that connects two networks of the same topology and protocol?

ANSWER: BRIDGE

---

**TOSS-UP**

10. *EARTH SCIENCE Multiple Choice* Chemical weathering of feldspars results in hydrous alumino-silicates otherwise known as
- W) evaporites
  - X) clay minerals
  - Y) amphiboles (am-fee-bowls)
  - Z) micas

ANSWER: X) CLAY MINERALS

**BONUS**

10. *EARTH SCIENCE Multiple Choice* Which of these features of sedimentary rocks is related to superposition?
- W) texture
  - X) cementation
  - Y) stratification
  - Z) geodes

ANSWER: Y) STRATIFICATION

**TOSS-UP**

11. *BIOLOGY Short Answer* Osmosis is a process that involves the net movement of what?

ANSWER: WATER

**BONUS**

11. *BIOLOGY Multiple Choice* Select the correct association.

- W) nucleic acid/ amino acid
- X) polysaccharide/ amino acid
- Y) polysaccharide/ fatty acid
- Z) protein/ amino acid

ANSWER: Z) PROTEIN/AMINO ACID

---

**TOSS-UP**

12. *GENERAL SCIENCE Short Answer* At what temperature does air become saturated with water vapor and below which moisture is likely to condense?

ANSWER: DEW POINT (accept: DEW POINT TEMPERATURE)

**BONUS**

12. *GENERAL SCIENCE Short Answer* A technique for separating components of an azeotrope by adding a third liquid to form a new azeotrope with one of the original components is called what?

ANSWER: AZEOTROPIC DISTILLATION

**TOSS-UP**

13. *MATH Multiple Choice* Find the smallest value in the domain of the function  $f(x)$  = square root of the quantity  $2x - 5$

- W) 2
- X)  $5/2$
- Y) 5
- Z)  $2/5$

ANSWER: X)  $5/2$

**BONUS**

13. *MATH Multiple Choice* Which of the following equations is the equation of a positive- radius circle?

- W)  $x^2 = y^2$  (Note: be sure to distinguish between the letter and the answer)
- X)  $x^2 = y^2 + 1$
- Y)  $x^2 + y^2 - 2x - 2y + 4 = 0$
- Z)  $x^2 + y^2 + 2x + 2y + 1 = 0$

ANSWER: Z)  $x^2 + y^2 + 2x + 2y + 1 = 0$

---

**TOSS-UP**

14. *CHEMISTRY Multiple Choice* When a weak acid is titrated with a strong base, the pH at the equivalence point

- W) is greater than 7.0
- X) is equal to 7.0
- Y) is less than 7.0
- Z) is equal to the  $Pk_a$  of the acid

ANSWER: W) IS GREATER THAN 7.0

**BONUS**

14. *CHEMISTRY Short Answer* What term is used to describe a molecule that can be superimposed on its mirror image?

ANSWER: ACHIRAL (accept: NONCHIRAL)

**TOSS-UP**

15. *GENERAL SCIENCE Short Answer* What is the name of the process where ice is transformed directly to vapor?

ANSWER: SUBLIMATION

**BONUS**

15. *GENERAL SCIENCE Multiple Choice* When nitrogen is added to aquatic systems, it is least likely to result in

- W) depletion of oxygen in the water
- X) stimulated algae growth
- Y) immediate decrease in gross primary productivity
- Z) fish kills

ANSWER: Y) IMMEDIATE DECREASE IN GROSS PRIMARY PRODUCTIVITY

---

**TOSS-UP**

16. *COMPUTER SCIENCE Short Answer* What does the acronym HTTP stand for?

ANSWER: HYPERTEXT TRANSFER PROTOCOL

**BONUS**

16. *COMPUTER SCIENCE Short Answer* Through version 3.1 of Windows, two .ini (read as: dot I N I) files were required to run the Windows operating system. What were they?

ANSWER: WIN.INI AND SYSTEM.INI

**TOSS-UP**

17. *BIOLOGY Short Answer* What blood vessel transports blood directly to the kidney?

ANSWER: RENAL ARTERY

**BONUS**

17. *BIOLOGY Short Answer* What brain lobe is associated with the sensory area for hearing?

ANSWER: TEMPORAL LOBE

---

**TOSS-UP**

18. *PHYSICS Multiple Choice* The dimensional equivalent of the quantity impulse in terms of the fundamental quantities (mass, length, time) is which of the following?

- W)  $MLT^{-1}$  (read as: M L T to the minus one power)
- X)  $ML^2T^{-2}$  (read as: M L to the second T to the minus two power)
- Y)  $MLT$
- Z)  $MLT^{-2}$ (read as: M L T to the minus two power)

ANSWER: W)  $MLT^{-1}$  (read as: M L T to the minus one power)

**BONUS**

18. *PHYSICS Multiple Choice* The unit of work, Joule, is dimensionally the same as

- W) Newton/second (PRON: Newton per second)
- X) Newton/kilogram (PRON: Newton per kilogram)
- Y) Newton-second (PRON: Newton second)
- Z) Newton-meter (PRON: Newton meter)

ANSWER: Z) NEWTON-METER

**TOSS-UP**

19. *BIOLOGY Multiple Choice* Fibrinogen is a blood protein that functions in

- W) blood clotting
- X) energy
- Y) transporting gases
- Z) immunity

ANSWER: W) BLOOD CLOTTING

**BONUS**

19. *BIOLOGY Multiple Choice* Which of the following would NOT be characteristic of living organisms?

- W) complex structural organization
- X) capacity to adapt and respond
- Y) reproductive capacity
- Z) uniformity of size and form

ANSWER: Z) UNIFORMITY OF SIZE AND FORM

---

**TOSS-UP**

20. *GENERAL SCIENCE Multiple Choice* Since they operate essentially all of the time at nearly constant output, coal-fired and nuclear power plants are referred to as

- W) Peaking Units
- X) Base Load Units
- Y) Intermittent Units
- Z) Non-Firm Units

ANSWER: X) BASE LOAD UNITS

**BONUS**

20. *GENERAL SCIENCE Multiple Choice* All of the following are given off by natural radioactivity except

- W) alpha particles
- X) delta rays
- Y) gamma rays
- Z) beta particles

ANSWER: X) DELTA RAYS

**TOSS-UP**

21. *EARTH SCIENCE Short Answer* The eon in which we live is called the

ANSWER: PHANEROZOIC EON (PRON: FAN-ER-O-ZOE-IC)

**BONUS**

21. *EARTH SCIENCE Multiple Choice* Solifluction occurs in regions

- W) of heavy rainfall
- X) underlain by limestone
- Y) with mean annual temperatures of 66 degrees
- Z) underlain by permafrost

ANSWER: Z) UNDERLAIN BY PERMAFROST

---

**TOSS-UP**

22. *CHEMISTRY Short Answer* The third number in Schrodinger's electron wave equation, which tells the orientation of the orbital in space, is called what?

ANSWER: MAGNETIC QUANTUM NUMBER

**BONUS**

22. *CHEMISTRY Short Answer* A straight- or branched chain hydrocarbon (an alkane, alkene, or alkyne) is known as what kind of compound?

ANSWER: ALIPHATIC

---

**TOSS-UP**

23. *MATH Short Answer* How many faces does an icosahedron have?

ANSWER: 20

**BONUS**

23. *MATH Short Answer* Evaluate  $\sin(\pi/4) + \cos(3\pi/4)$  (read as: sine of pie over four plus cosine of three pie over four)

ANSWER: 0



**TOSS-UP**

24. *COMPUTER SCIENCE Short Answer* What is the term used to describe a special memory subsystem in which frequently used data values are duplicated for quick references?

ANSWER: CACHE

**BONUS**

24. *COMPUTER SCIENCE Short Answer* The logical layout or geometric organization of how the nodes in a network are connected is called its what?

ANSWER: TOPOLOGY

---

**TOSS-UP**

25. *PHYSICS Short Answer* When an insulating material is placed between the plates of a capacitor, the capacitance increases. What is the name for the factor by which the capacitance increases?

ANSWER: DIELECTRIC CONSTANT

**BONUS**

25. *PHYSICS Multiple Choice* The area under the velocity-time curve between two time intervals

- W) is the displacement
- X) is the velocity
- Y) is the acceleration
- Z) has no physical significance

ANSWER: W) IS THE DISPLACEMENT

## ROUND 14 A

### TOSS-UP

1. *BIOLOGY Multiple Choice* Two or more equally dangerous species that evolve similar colors or forms that represent similar dangers to their common predators exhibit a defense mechanism called
- W) camouflage
  - X) mullerian mimicry
  - Y) secondary mimicry
  - Z) batesian mimicry

ANSWER: X) MULLERIAN MIMICRY

### BONUS

1. *BIOLOGY Multiple Choice* The most abundant white blood cell is the
- W) basophil
  - X) eosinophil
  - Y) lymphocyte
  - Z) neutrophil

ANSWER: Z) NEUTROPHIL

---

### TOSS-UP

2. *MATH Multiple Choice* We are given two numbers that sum to 100, and we wish to make their product as large as possible. How large is that product?
- W) 2100
  - X) 2700
  - Y) 3200
  - Z) 2500

ANSWER: Z) 2500

### BONUS

2. *MATH Multiple Choice* For the curve  $y = x^2$ , find the slope of the tangent line at the point (3,9)
- W) 2
  - X) 1
  - Y) 3
  - Z) 6

ANSWER: Z) 6

**TOSS-UP**

3. *ASTRONOMY Multiple Choice* Differentiation appears to have occurred to a large extent on all of the terrestrial planets except

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

ANSWER: Z) MARS

**BONUS**

3. *ASTRONOMY Multiple Choice* Which moon is closer in size to its planet than any other moon in the Solar System?

W) Miranda  
X) Charon (PRON: Karen)  
Y) Triton (PRON: Trite-en)  
Z) Nereid (PRON: Near-ee-id)

ANSWER: X) CHARON (PRON: Karen)

---

**TOSS-UP**

4. *CHEMISTRY Short Answer* What functional group is characteristic of alcohols?

ANSWER: OH ( accept: HYDROXYL)

**BONUS**

4. *CHEMISTRY Multiple Choice* Which of the following elements combines with uranium to form a compound used to enrich nuclear fuel?

W) sulfur  
X) iodine  
Y) fluorine  
Z) astatine

ANSWER: Y) FLUORINE

**TOSS-UP**

5. *GENERAL SCIENCE Multiple Choice* The flap that prevents food from entering the air tube of the throat during swallowing is called the
- W) pharynx
  - X) epiglottis
  - Y) glottis
  - Z) esophagus

ANSWER: X)EPIGLOTTIS

**BONUS**

5. *GENERAL SCIENCE Short Answer* What is the name for a monumental four-sided stone shaft, usually monolithic and tapering to a pyramidal tip?

ANSWER: OBELISK

---

**TOSS-UP**

6. *COMPUTER SCIENCE Multiple Choice* Name the American scientist who developed electromechanical computers in the late 1930s and during World War II. His innovations at Bell Labs include floating decimal arithmetic and taped computer programs.
- W) Leo Szilard
  - X) Henry Tinken
  - Y) Charles Martin Hall
  - Z) George R. Stibitz

ANSWER: Z) GEORGE R. STIBITZ

**BONUS**

6. *COMPUTER SCIENCE Short Answer* What term is used to describe the science that seeks to explain intelligence by deriving and testing models of how humans reason, perceive and understand?

ANSWER: COGNITIVE SCIENCE

**TOSS-UP**

7. *MATH Multiple Choice* Comparing number systems, which of the following ordered lists of sets and subsets of numbers, from smallest to largest, is most correct?
- W) integers, natural numbers, rational numbers, irrational numbers
  - X) real numbers, irrational number, integers, rational numbers
  - Y) real numbers, rational numbers, natural numbers, integers
  - Z) natural numbers, integers, rational numbers, real numbers

ANSWER: Z) NATURAL NUMBERS, INTEGERS, RATIONAL NUMBERS, REAL NUMBERS

**BONUS**

7. *MATH Multiple Choice* The polynomial  $x^2 + 2xy + y^2$  is
- W) not homogeneous
  - X) homogeneous in the first degree
  - Y) homogeneous in the second degree
  - Z) homogeneous in the third degree

ANSWER: Y) HOMOGENEOUS IN THE SECOND DEGREE

---

**TOSS-UP**

8. *EARTH SCIENCE Short Answer* What process cuts a canyon through solid rock?

ANSWER: EROSION

**BONUS**

8. *EARTH SCIENCE Multiple Choice* Which type of volcano is associated with violent eruptions?
- W) shield
  - X) fissure
  - Y) oceanic ridge
  - Z) composite cone

ANSWER: Z) COMPOSITE CONE

**TOSS-UP**

9. *CHEMISTRY Short Answer* The pressure above a liquid in a sealed container caused by collision of vaporized particles within the walls of the container is what kind of pressure?

ANSWER: VAPOR (ACCEPT: VAPOR PRESSURE)

**BONUS**

9. *CHEMISTRY Multiple Choice* Hydrogen peroxide is

- W) used in the production of polymers
- X) used as a drying agent
- Y) colored liquid with a low boiling point
- Z) strong acid

ANSWER: W) USED IN THE PRODUCTION OF POLYMERS

---

**TOSS-UP**

10. *BIOLOGY Short Answer* Which vitamin increases the absorption of iron in the small intestine?

ANSWER: VITAMIN C

**BONUS**

10. *BIOLOGY Short Answer* The portion of the brain responsible for emotional states, which lies beneath the cerebral cortex is the

ANSWER: AMYGDALA (PRON: AH-MIG-DA-LAH)

**TOSS-UP**

11. *PHYSICS Multiple Choice* In an isovolumetric process by an ideal gas, the system's heat gain is proportional to a change in
- W) mass
  - X) volume
  - Y) pressure
  - Z) internal energy

ANSWER: Z) INTERNAL ENERGY

**BONUS**

11. *PHYSICS Multiple Choice* When I stand half way between two speakers, with one on my left and one on my right, a musical note from the speakers gives me constructive interference. How far to my left should I move to obtain destructive interference?
- W) one fourth of a wavelength
  - X) half a wavelength
  - Y) one wavelength
  - Z) one and a half wavelengths

ANSWER: W) ONE FOURTH OF A WAVELENGTH

---

**TOSS-UP**

12. *EARTH SCIENCE Multiple Choice* The reference line for longitude is the
- W) geographic North Pole
  - X) prime meridian
  - Y) equator
  - Z) magnetic North Pole

ANSWER: X) PRIME MERIDIAN

**BONUS**

12. *EARTH SCIENCE Multiple Choice* Which of the following substances would likely be found on a beach with a strong undertow?
- W) pebbles
  - X) sand-size grains of quartz
  - Y) tiny shell fragments
  - Z) all of the above

ANSWER: W) PEBBLES

**TOSS-UP**

13. *ASTRONOMY Multiple Choice* The Local group of galaxies contains approximately

- W) 10 galaxies
- X) 30 galaxies
- Y) 100 galaxies
- Z) 300 galaxies

ANSWER: X) 30 GALAXIES

**BONUS**

13. *ASTRONOMY Multiple Choice* The most common molecule in a molecular cloud is:

- W) Hydrogen
- X) Carbon Monoxide
- Y) Water
- Z) Ammonia

ANSWER: W) HYDROGEN

---

**TOSS-UP**

14. *GENERAL SCIENCE Short Answer* The sun is composed primarily of what element?

ANSWER: HYDROGEN

**BONUS**

14. *GENERAL SCIENCE Short Answer* What is the term for the first arriving body wave from an earthquake?

ANSWER: PRIMARY WAVE



**TOSS-UP**

15. *BIOLOGY Multiple Choice* Where in a plant cell is chlorophyll found?

- W) on the outer chloroplast membrane
- X) inside the mitochondria
- Y) in the stroma
- Z) in the thylakoids

ANSWER: Z) IN THE THYLAKOIDS

**BONUS**

15. *BIOLOGY Multiple Choice* Two individuals are members of the same species if they

- W) possess the same number of chromosomes
- X) breed at the same time
- Y) can mate and produce fertile offspring
- Z) all of the above

ANSWER: Y) CAN MATE AND PRODUCE FERTILE OFFSPRING

---

**TOSS-UP**

16. *CHEMISTRY Short Answer* In the compound magnesium nitride, the ratio of magnesium to nitrogen is

ANSWER: 3:2

**BONUS**

16. *CHEMISTRY Short Answer* What is the value of  $K_b$  for the cyanide anion,  $CN^-$  (given  $K_a$  (HCN) =  $4 \times 10^{-10}$ )?

ANSWER:  $3 \times 10^{-5}$

**TOSS-UP**

17. *COMPUTER SCIENCE Short Answer* What is the term used to describe the processing of items or information in the order in which they are stored or input?

ANSWER: SEQUENTIAL PROCESSING OR SERIAL ACCESS

**BONUS**

17. *COMPUTER SCIENCE Short Answer* What is the term for a group of Web sites that deal with a common topic and are connected together?

ANSWER: WEB RING

---

**TOSS-UP**

18. *BIOLOGY Multiple Choice* Human erythrocytes contain what mineral?

- W) calcium
- X) iron
- Y) copper
- Z) zinc

ANSWER: X) IRON

**BONUS**

18. *BIOLOGY Multiple Choice* In the human digestive system, starch is broken down into

- W) amino acids
- X) fatty acids
- Y) glucose
- Z) glycerol

ANSWER: Y) GLUCOSE

**TOSS-UP**

19. *GENERAL SCIENCE Short Answer* Glucose and oxygen are required for what type of respiration?

ANSWER: AEROBIC

**BONUS**

19. *GENERAL SCIENCE Multiple Choice* If a material is "ferruginous" it:

- W) doesn't smell good
- X) doesn't taste good
- Y) contains iron
- Z) highly unstable

ANSWER: Y) CONTAINS IRON

---

**TOSS-UP**

20. *EARTH SCIENCE Multiple Choice* Which way do breezes tend to move near a large body of water?

- W) toward the water during the day only
- X) toward the land during the day only
- Y) toward the land all the time
- Z) toward the water all the time

ANSWER: X) TOWARD THE LAND DURING THE DAY ONLY

**BONUS**

20. *EARTH SCIENCE Short Answer* What term refers to the study of magnetism imparted to ancient rocks at the time of their formation and preserved down to the present time?

ANSWER: PALEOMAGNETISM LEVEL

**TOSS-UP**

21. *PHYSICS Short Answer* A closed 2-liter container holds 3 moles of an ideal gas. If 200 Joules of heat is added, what is the change in internal energy of the system?

ANSWER: 200 JOULES

**BONUS**

21. *PHYSICS Short Answer* A 2.5 meter long organ pipe is open at one end and closed at the other. Its fundamental tone has a wavelength of

ANSWER: 10 METERS

---

**TOSS-UP**

22. *BIOLOGY Short Answer* Oxygen, carbon dioxide, and other small molecules cross the plasma membrane principally through the passive process of

ANSWER: DIFFUSION

**BONUS**

22. *BIOLOGY Short Answer* What term refers to the chest pain associated with a heart attack?

ANSWER: ANGINA

---

**TOSS-UP**

23. *CHEMISTRY Short Answer* The Downs cell is used in the production of what element?

ANSWER: SODIUM

**BONUS**

23. *CHEMISTRY Multiple Choice* Which of the following could participate in linkage isomerism?

- W) Ammonia
- X) Water
- Y) Nitrite
- Z) Hydroxyl

ANSWER: Y) NITRITE

---

**TOSS-UP**

24. *EARTH SCIENCE Short Answer* The Earth is closest to the sun in what month?

ANSWER: JANUARY

**BONUS**

24. *EARTH SCIENCE Short Answer* Outside of Alaska, what is the name of the North America's longest continuous mountain range?

ANSWER: SIERRA NEVADA

---

**TOSS-UP**

25. *BIOLOGY Short Answer* Prosimians and anthropoids are subgroups of what taxonomic order?

ANSWER: PRIMATES

**BONUS**

25. *BIOLOGY Short Answer* Sickle-cell anemia has been traced to what type of genetic mutation?

ANSWER: BASE PAIR SUBSTITUTION

## ROUND 15 A

### TOSS-UP

1. *GENERAL SCIENCE Multiple Choice* The leading causes of death in developed countries are
- W) bacteria
  - X) viruses
  - Y) vectors
  - Z) environmental and lifestyle factors

ANSWER: Z) ENVIRONMENTAL AND LIFESTYLE FACTORS

### BONUS

1. *GENERAL SCIENCE Short Answer* At the cellular level, what is the name for the observation often thought to explain why organisms do not live forever, and which now is a topic of much study?

ANSWER: HAYFLICK LIMIT

---

### TOSS-UP

2. *BIOLOGY Multiple Choice* In a cell, the net direction that an ion or molecule moves without an additional investment of energy is
- W) dependent upon the size of the molecule
  - X) unpredictable because movement is random
  - Y) controlled by the temperature of the medium
  - Z) the result of concentration differences

ANSWER: Z) THE RESULT OF CONCENTRATION DIFFERENCES

### BONUS

2. *BIOLOGY Multiple Choice* Cancers that originate in muscle tissue are known as
- W) Melanomas
  - X) Sarcomas
  - Y) Leukemias
  - Z) Neuromas

ANSWER: X) SARCOMAS

**TOSS-UP**

3. *MATH Multiple Choice* A polynomial of odd degree with real coefficients always has
- W) at least one imaginary zero
  - X) at least one real zero
  - Y) at least two real zeros
  - Z) none of the above

ANSWER: X) AT LEAST ONE REAL ZERO

**BONUS**

3. *MATH Multiple Choice* A radioactive substance decays exponentially. After 10 years, there are 100 grams of the substance left. After 12 years, there are only 50 grams of the substance left. How many grams of the substance were there to begin with?
- W) 250
  - X) 1600
  - Y) 800
  - Z) 3200

ANSWER: Z) 3200

---

**TOSS-UP**

4. *GENERAL SCIENCE Multiple Choice* Phosphorus is used in the composition of all of the following except
- W) fats in cell membranes
  - X) DNA molecules
  - Y) bones and teeth
  - Z) proteins

ANSWER: Z) PROTEINS

**BONUS**

4. *GENERAL SCIENCE Short Answer* One mile equals how many furlongs?

ANSWER: 8 FURLONGS IN ONE MILE

**TOSS-UP**

5. *MATH Multiple Choice* Evaluate  $\int \cos x \, dx = ?$  (read as: integral cosine x d x equals)
- W)  $\cos x + C$  (read: cosine x plus c)
  - X)  $-\cos x + C$  (read: minus cosine x plus c)
  - Y)  $\sin x + C$  (read: sine x plus c)
  - Z)  $-\sin x + C$  (read: minus sine x plus c)

ANSWER: Y)  $\sin x + C$  (read: sine x plus c)

**BONUS**

5. *MATH Multiple Choice* The polar equation of the circle with radius 1 and polar center (1,0) is
- W)  $r^2 = 2 + 2\cos\theta$  (read as: r squared equals 2 plus 2 cosine theta)
  - X)  $r^2 = 1 - \cos\theta$  (read as: r squared equals 1 minus cosine theta)
  - Y)  $r^2 = 1 + \cos\theta$
  - Z)  $r = 2\cos\theta$

ANSWER: Z)  $r = 2\cos\theta$

---

**TOSS-UP**

6. *ASTRONOMY Multiple Choice* A diffuse cloud of gas and dust behind a hot star may be visible as a
- W) planetary nebula
  - X) reflection nebula
  - Y) emission nebula
  - Z) dark nebula

ANSWER: X) REFLECTION NEBULA

**BONUS**

6. *ASTRONOMY Multiple Choice* What are interstellar clouds made of?
- W) swarms of uranium atoms that gradually decay into water
  - X) mostly iron and carbon atoms
  - Y) mostly hydrogen and a small amount of dust grains
  - Z) mostly helium and mercury droplets

ANSWER: Y) MOSTLY HYDROGEN AND A SMALL AMOUNT OF DUST GRAINS



### TOSS-UP

7. *GENERAL SCIENCE Multiple Choice* Organs of the body that make products that are carried by ducts to specific body targets such as digestive enzymes to the small intestine are called:
- W) Exergonic organs
  - X) Excretion organs
  - Y) Endocrine organs
  - Z) Exocrine organs

ANSWER: Z) EXOCRINE ORGANS

### BONUS

7. *GENERAL SCIENCE Short Answer* What is the name for an organism that can make its own food?

ANSWER: AUTOTROPH

---

### TOSS-UP

8. *CHEMISTRY Multiple Choice* The central atom in which of the following molecules is  $sp^3$  (Pronounce: S-Pee-Three) hybridized?
- W)  $SO_2$
  - X)  $SiH_4$
  - Y)  $CO_2$
  - Z)  $HCN$

ANSWER: X)  $SiH_4$

### BONUS

8. *CHEMISTRY Multiple Choice* What product forms at the anode during the electrolysis of molten  $NaBr$ ?

- W)  $Na^+$
- X)  $Na$
- Y)  $Br^-$
- Z)  $Br_2$

ANSWER: Z)  $Br_2$

**TOSS-UP**

9. *ASTRONOMY Multiple Choice* A planet in retrograde motion

- W) rises in the west and sets in the east
- X) shifts westward with respect to the stars
- Y) shifts eastward with respect to the stars
- Z) will be at the north celestial pole

ANSWER: X) SHIFTS WESTWARD WITH RESPECT TO THE STARS

**BONUS**

9. *ASTRONOMY Multiple Choice* Scientists think the Earth's core is composed mainly of

- W) silicate rocks
- X) uranium
- Y) lead
- Z) iron

ANSWER: Z) IRON

---

**TOSS-UP**

10. *CHEMISTRY Short Answer* What term describes the vaporization of an uncontained liquid?

ANSWER: EVAPORATION

**BONUS**

10. *CHEMISTRY Short Answer* Four numbers assigned to each electron in an atom that describe the energy and other properties of an electron are known as what kind of numbers?

ANSWER: QUANTUM

**TOSS-UP**

11. *PHYSICS Short Answer* A series of ocean waves, 5.0 meters between crests, moves past at 2 waves per second. What is their velocity?

ANSWER: 10.0 METERS PER SECOND

**BONUS**

11. *PHYSICS Short Answer* If the intensity of a sound is increased by a factor of 100, the new decibel level will be increased by how many units?

ANSWER: TWENTY

---

**TOSS-UP**

12. *BIOLOGY Multiple Choice* Select the incorrect association.

- W) cellulose/ polysaccharide
- X) glucose/ monosaccharide
- Y) glycogen/ monosaccharide
- Z) sucrose/ disaccharide

ANSWER: Y) GLYCOGEN/MONOSACCHARIDE

**BONUS**

12. *BIOLOGY Short Answer* Rhodopsin is a pigment found in what photoreceptor of the eye?

ANSWER: ROD

---

**TOSS-UP**

13. *CHEMISTRY Short Answer* What is the name of  $\text{KH}_2\text{PO}_4$

ANSWER: POTASSIUM DIHYDROGENPHOSPHATE

**BONUS**

13. *CHEMISTRY Multiple Choice* Which one of the following substances will give an aqueous solution of pH less than 7?

- W) KI
- X)  $\text{NH}_4\text{Br}$
- Y)  $\text{Na}_2\text{CO}_3$
- Z)  $\text{CH}_3\text{OH}$

ANSWER: X)  $\text{NH}_4\text{Br}$

**TOSS-UP**

14. *BIOLOGY Short Answer* The complete oxidative breakdown of one mole of glucose produces a net yield of how many ATP molecules?

ANSWER: 36

**BONUS**

14. *BIOLOGY Multiple Choice* In the cell, energy transfers take place at what organizational level?

- W) molecular
- X) organelle
- Y) cell
- Z) organ

ANSWER: W) MOLECULAR

---

**TOSS-UP**

15. *ASTRONOMY Multiple Choice* About how big is the Moon's radius compared to the Earth's?

- W) One half
- X) One quarter
- Y) One tenth
- Z) One one hundredth

ANSWER: X) ONE QUARTER

**BONUS**

15. *ASTRONOMY Multiple Choice* What part of the spectrum penetrates the clouds of Venus and allows us to study the surface?

- W) visible light
- X) ultraviolet light
- Y) radio waves
- Z) infrared light

ANSWER: Y) RADIO WAVES

**TOSS-UP**

16. *CHEMISTRY Short Answer* What is the ratio between the density of a substance and the density of water called?

ANSWER: SPECIFIC GRAVITY

**BONUS**

16. *CHEMISTRY Multiple Choice* Which of the following is considered a Lewis acid?

- W)  $\text{CH}_3\text{NH}_2$
- X)  $\text{BCl}_3$
- Y)  $\text{F}^-$
- Z)  $\text{BF}_4^-$

ANSWER: X)  $\text{BCl}_3$

---

**TOSS-UP**

17. *ASTRONOMY Multiple Choice* Planetary rings are

- W) solid sheets
- X) streams of gas
- Y) orbiting swarms of particles
- Z) liquid

ANSWER: Y) ORBITING SWARMS OF PARTICLES

**BONUS**

17. *ASTRONOMY Multiple Choice* Which of these events takes place in the later stages of crater formation?

- W) formation of a transient crater
- X) rebound of the central peak
- Y) collapse of the crater walls to form terraces
- Z) both X and Y

ANSWER: Z) BOTH X AND Y

**TOSS-UP**

18. *EARTH SCIENCE Short Answer* What is a sheet of igneous rock that cuts through layers of older rocks called?

ANSWER: DIKE

**BONUS**

18. *EARTH SCIENCE Multiple Choice* Bauxite, the chief ore of aluminum, is related by weathering to the mineral

- W) potassium feldspar
- X) olivine
- Y) Muscovite
- Z) hornblende

ANSWER: W) POTASSIUM FELDSPAR

---

**TOSS-UP**

19. *ASTRONOMY Multiple Choice* Telescope A's mirror has three times the diameter of telescope B's. How much greater is A's light-gathering power?

- W) 3 times
- X) 6 times
- Y) 8 times
- Z) 9 times

ANSWER: Z) 9 TIMES

**BONUS**

19. *ASTRONOMY Multiple Choice* A motion induced change in the observed wavelength of a wave is known as

- W) an energy burst
- X) the Doppler Effect
- Y) kirchhoff's laws
- Z) the Bohr model

ANSWER: X) THE DOPPLER EFFECT

**TOSS-UP**

20. *COMPUTER SCIENCE Short Answer* What is the term used to describe a program that converts machine code to assembly language source code?

ANSWER: DISASSEMBLER

**BONUS**

20. *COMPUTER SCIENCE Multiple Choice* In Java, a data structure that allows the user to access different kinds of information (text, images, sound, video, applications) by traversing links is called

- W) hypermedia
- X) hypertext
- Y) HTML
- Z) HTTP

ANSWER: W) HYPERMEDIA

---

**TOSS-UP**

21. *MATH Short Answer* In the basic study of calculus, "areas under a curve" is to integral calculus as "what" is to differential calculus?

ANSWER: TANGENTS (ACCEPT: SLOPE OF TANGENTS)

**BONUS**

21. *MATH Multiple Choice* Using natural logarithms, the combination natural log of x plus the natural log of y equals

- W) natural log of  $(x + y)$
- X) natural log of  $(xy)$
- Y) natural log of  $(x - y)$
- Z) none of the above

ANSWER: X) NATURAL LOG OF  $(XY)$



**TOSS-UP**

22. *BIOLOGY Short Answer* To promote cell division in plants, cytokinin must have which other plant hormone present?

ANSWER: AUXIN

**BONUS**

22. *BIOLOGY Short Answer* What protein traps red blood cells to form a clot?

ANSWER: FIBRIN

---

**TOSS-UP**

23. *CHEMISTRY Short Answer* The strain caused by repulsion between groups in an eclipsed conformation is known as what kind of strain?

ANSWER: TORSIONAL

**BONUS**

23. *CHEMISTRY Multiple Choice* Which one of the following is a Lewis acid but not a Bronsted-Lowry acid?

- W)  $\text{Fe}^{3+}$
- X)  $\text{H}_3\text{O}^+$
- Y)  $\text{HSO}_4^-$
- Z)  $\text{NH}_3$

ANSWER: W)  $\text{Fe}^{3+}$

---

**TOSS-UP**

24. *MATH Short Answer* The derivative of the velocity of an object is

ANSWER: ACCELERATION

**BONUS**

24. *MATH Short Answer* What is the focus and the formula for the directrix for the parabola given by the equation  $y^2 = 4ax$  ?

ANSWER: FOCUS:  $(a,0)$  (read as: a zero) DIRECTRIX:  $x = -a$

**TOSS-UP**

25. *COMPUTER SCIENCE Short Answer* What is the scaled-down version of Windows platform used with handheld PCs called?

ANSWER: WINDOWS CE

**BONUS**

25. *COMPUTER SCIENCE Multiple Choice* The method of duplicating the pixels from a selected portion of an image to another area is called

- W) clip logging
- X) cloning
- Y) painting
- Z) retouching

ANSWER: X) CLONING

## ROUND 16 A

### TOSS-UP

1. *EARTH SCIENCE Multiple Choice* What evidence indicates that part of the Earth's interior is liquid?
- W) we know the core is lead, and we know the core's temperature is far above lead's melting point
  - X) deep bore holes have brought up liquid from a depth of about 4,000 kilometers
  - Y) no S type of seismic waves are detectable at some locations after an earthquake
  - Z) s type waves are especially pronounced at all locations around the Earth after an earthquake

ANSWER: Y) NO S TYPE OF SEISMIC WAVES ARE DETECTABLE AT SOME LOCATIONS AFTER AN EARTHQUAKE

### BONUS

1. *ASTRONOMY Multiple Choice* The Doppler effect will shift what spectra from a star?
- W) continuous spectra
  - X) emission spectra
  - Y) absorption spectra
  - Z) all types of spectra

ANSWER: Z) ALL TYPES OF SPECTRA

---

### TOSS-UP

2. *CHEMISTRY Multiple Choice* The following substance with a Lewis structure that does not obey the octet rule is
- W)  $\text{BCl}_3$
  - X)  $\text{PH}_3$
  - Y)  $\text{SO}_3$
  - Z)  $\text{ClO}_3^-$

ANSWER: W)  $\text{BCl}_3$

### BONUS

2. *CHEMISTRY Multiple Choice* Which of the following would you predict to have the greatest thermal stability?
- W)  $\text{AsF}_3$
  - X)  $\text{AsCl}_3$
  - Y)  $\text{AsBr}_3$
  - Z)  $\text{AsI}_3$

ANSWER: W) AsF<sub>3</sub>

**TOSS-UP**

3. *BIOLOGY Short Answer* DNA sequences from viruses, plasmids, and other mobile genes which are capable of carrying recombinant DNA into cells are called

ANSWER: VECTORS

**BONUS**

3. *BIOLOGY Short Answer* The enzymes for the conversion of nitrites into carcinogens are found in what organ?

ANSWER: LIVER

---

**TOSS-UP**

4. *MATH Multiple Choice* For the curve  $y = x^2$ , find the slope of the tangent line at the point (3,9)

- W) 2
- X) 1
- Y) 3
- Z) 6

ANSWER: Z) 6

**BONUS**

4. *MATH Multiple Choice* In general, when solving two-equation, two-variable systems by matrices, if we end up with a row of all zeroes then

- W) there are infinitely many solutions
- X) there are no solutions
- Y) there is exactly two solutions
- Z) there is only one solution

ANSWER: W) THERE ARE INFINITELY MANY SOLUTIONS

**TOSS-UP**

5. *GENERAL SCIENCE Short Answer* What is the name for an automatic behavior pattern with motor activity directly responding to a sensory stimulus?

ANSWER: REFLEX

**BONUS**

5. *GENERAL SCIENCE Multiple Choice* The upper layer of a body of water through which sunlight can penetrate and support photosynthesis is

- W) the euphotic zone
- X) the surface boundary
- Y) the biotic layer
- Z) the tidal layer

ANSWER: W) THE EUPHOTIC ZONE

---

**TOSS-UP**

6. *CHEMISTRY Short Answer* Whose hypothesis states that equal volumes of gases at the same temperature and pressure contain equal numbers of particles?

ANSWER: AVOGADRO LAW THEORY

**BONUS**

6. *CHEMISTRY Multiple Choice* Atoms can be blended in any proportion within

- W) an ionic compound
- X) a covalent compound
- Y) a metal
- Z) an alloy

ANSWER: Z) AN ALLOY

**TOSS-UP**

7. *EARTH SCIENCE Short Answer* Name the uppermost layer of the atmosphere?

ANSWER: EXOSPHERE (ACCEPT ALSO: THERMOSPHERE)

**BONUS**

7. *EARTH SCIENCE Multiple Choice* What would happen to cold air on the surface of the earth if the earth did not rotate?

- W) warm air would move along the earth's surface
- X) no air would move along the earth's surface
- Y) cold air would move along the earth's surface
- Z) none of the above

ANSWER: Y) COLD AIR WOULD MOVE ALONG THE EARTH'S SURFACE

---

**TOSS-UP**

8. *ASTRONOMY Multiple Choice* How are the Moon and eclipses related?

- W) The Moon's shadow falls on the Earth at a solar eclipse
- X) Earth blocks sunlight from reaching the Moon at a lunar eclipse
- Y) The Moon's gravity bends light away from the Earth at a solar eclipse
- Z) Both W and X

ANSWER: Z) BOTH W AND X

**BONUS**

8. *ASTRONOMY Multiple Choice* What is the Moon's phase at a lunar eclipse?

- W) New
- X) Full
- Y) First Quarter
- Z) Third Quarter

ANSWER: X) FULL

**TOSS-UP**

9. *COMPUTER SCIENCE Short Answer* What is the three key combination used on IBM- standard keyboards to restart (reboot) the machine?

ANSWER: CTRL-ALT-DELETE (ACCEPT: CONTROL-ALT-DELETE)

**BONUS**

9. *COMPUTER SCIENCE Multiple Choice* What is the term used to describe a network technology capable of transmitting data, voice, video and frame relay traffic in real time, currently used in local area networks?

- W) ATM
- X) ATDT
- Y) ATA
- Z) ATX

ANSWER: W) ASYNCHRONOUS TRANSFER MODE (ACCEPT: ATM)

---

**TOSS-UP**

10. *BIOLOGY Multiple Choice* The first known primates are characterized as

- W) arboreal and nocturnal
- X) ground-dwelling and nocturnal
- Y) arboreal and diurnal
- Z) ground-dwelling and diurnal

ANSWER: W) ARBOREAL AND NOCTURNAL

**BONUS**

10. *BIOLOGY Short Answer* The Krebs cycle takes place in which cytoplasmic organelle?

ANSWER: THE MITOCHONDRION



**TOSS-UP**

11. *ASTRONOMY Multiple Choice* Which of the following objects has the least luminosity?

- W) Sun
- X) hot O-type star
- Y) white dwarf
- Z) diffuse cloud

ANSWER: Z) DIFFUSE CLOUD

**BONUS**

11. *ASTRONOMY Multiple Choice* What is a planetary nebula?

- W) A type of young, medium mass star
- X) A planet surrounded by a glowing shell of gas
- Y) The disc of gas and dust surrounding a young star that will soon form a solar system
- Z) The ejected envelope of a red giant surrounding a stellar core remnant

ANSWER: Z) THE EJECTED ENVELOPE OF A RED GIANT SURROUNDING A STELLAR CORE REMNANT

---

**TOSS-UP**

12. *COMPUTER SCIENCE Short Answer* What term is used to describe a measure of frequency equivalent to 1 billion hertz or 1 billion cycles per second?

ANSWER: GIGAHERTZ (ACCEPT: GHZ)

**BONUS**

12. *COMPUTER SCIENCE Multiple Choice* If you suspect that you have written a loop that contains a logic error, inspect the code and verify that the following are true:

- W) variables are initialized correctly before entering the loop
- X) the statements in the body are correct
- Y) the terminating condition stops the iterations when the test variables have reached the intended limit
- Z) all of the above

ANSWER: Z) ALL OF THE ABOVE

**TOSS-UP**

13. *MATH Multiple Choice* Find the value of log base 2 of 1.

- W) -1
- X) 0
- Y) 100
- Z) 1

ANSWER: X) 0

**BONUS**

13. *MATH Multiple Choice* The polynomial  $x^2 + 2xy + y^2$  is

- W) not homogeneous
- X) homogeneous in the first degree
- Y) homogeneous in the second degree
- Z) homogeneous in the third degree

ANSWER: Y) HOMOGENEOUS IN THE SECOND DEGREE

---

**TOSS-UP**

14. *CHEMISTRY Multiple Choice* Radioactive decay in which the mass of the nuclide decreases by four and the nuclear charge decreases by 2 is

- W) alpha decay
- X) beta decay
- Y) multiple electron capture
- Z) multiple neutron capture

ANSWER: W) ALPHA DECAY

**BONUS**

14. *CHEMISTRY Short Answer* A projection that uses perpendicular lines to depict the absolute configuration of chiral molecules on a planar surface is known as what kind of projection?

ANSWER: FISCHER

**TOSS-UP**

15. *ASTRONOMY Multiple Choice* The surface temperature of the Sun is approximately

- W) 60 K
- X) 6000 K
- Y) 6 million K
- Z) 60 million K

ANSWER: X) 6000 K

**BONUS**

15. *ASTRONOMY Multiple Choice* Differentiation appears to have occurred to a large extent on all of the terrestrial planets except

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

ANSWER: Z) MARS

---

**TOSS-UP**

16. *GENERAL SCIENCE Short Answer* What extremely abundant subatomic particles, previously believed to be massless, were found in 1998 to have mass?

ANSWER: NEUTRINOS

**BONUS**

16. *GENERAL SCIENCE Short Answer* On what list are the black rhinoceros, the North African leopard, the giant kangaroo rat, the West Indian manatee, and other animals found?

ANSWER: ENDANGERED SPECIES LIST

**TOSS-UP**

17. *CHEMISTRY Multiple Choice* An example of allotropes would be

- W) ice and liquid water
- X) graphite and diamond
- Y) water and hydrogen peroxide
- Z) NaCl and window glass

ANSWER: X) GRAPHITE AND DIAMOND

**BONUS**

17. *CHEMISTRY Multiple Choice* A situation in which nothing appears to be happening because two opposing changes are taking place at the same rate is called

- W) deposition
- X) sublimation
- Y) evaporation
- Z) dynamic equilibrium

ANSWER: Z) DYNAMIC EQUILIBRIUM

---

**TOSS-UP**

18. *ASTRONOMY Multiple Choice* Kepler's third law

- W) Relates a planet's orbital period to the size of its orbit around the Sun
- X) Relates a body's mass to its gravitational attraction
- Y) Allowed him to predict when eclipses occur
- Z) Allowed him to measure the distance to nearby stars

ANSWER: W) RELATES A PLANET'S ORBITAL PERIOD TO THE SIZE OF ITS ORBIT AROUND THE SUN

**BONUS**

18. *ASTRONOMY Multiple Choice* The slow shifts of our planet's crust are believed to arise from

- W) The gravitational force of the Moon pulling on the crust
- X) The gravitational force of the Sun pulling on our planet's crust
- Y) Heat from the interior causing convective motion, which pushes on the crust
- Z) The great weight of mountain ranges forcing the crust down and outward from their bases

ANSWER: Y) HEAT FROM THE INTERIOR CAUSING CONVECTIVE MOTION, WHICH PUSHES ON THE CRUST

**TOSS-UP**

19. *EARTH SCIENCE Short Answer* What large, flat areas of sediment cover much of the deep ocean basin?

ANSWER: ABYSSAL PLAINS

**BONUS**

19. *EARTH SCIENCE Multiple Choice* The earth gives off

- W) visible light
- X) ultraviolet radiation
- Y) short wavelengths of energy
- Z) infrared radiation

ANSWER: Z) INFRARED RADIATION

---

**TOSS-UP**

20. *BIOLOGY Multiple Choice* Pyrogens are chemicals released by

- W) macrophages
- X) neurons
- Y) platelets
- Z) red blood cells

ANSWER: W) MACROPHAGES

**BONUS**

20. *BIOLOGY Short Answer* Veins consist of how many different cellular layers?

ANSWER: THREE

**TOSS-UP**

21. *CHEMISTRY Short Answer* What device is used to measure atmospheric pressure?

ANSWER: BAROMETER

**BONUS**

21. *CHEMISTRY Short Answer* How many neutrons are there in an alpha particle?

ANSWER: TWO

---

**TOSS-UP**

22. *GENERAL SCIENCE Short Answer* What is the name for an especially narrow and steep walled canyon?

ANSWER: GORGE

**BONUS**

22. *GENERAL SCIENCE Multiple Choice* Animals whose embryonic development takes place within the uterus of the mother are called

- W) Echinoderms
- X) Eutherians
- Y) Eutrophiles
- Z) Amphibians

ANSWER: X) EUTHERIANS

**TOSS-UP**

23. *MATH Short Answer* The number  $-x$  is not necessarily a negative number; it is positive if

ANSWER:  $X$  IS NEGATIVE

**BONUS**

23. *MATH Short Answer* The graph of an equation of the form  $x^2/a^2 + y^2/b^2 = 1$  is a

ANSWER: ELLIPSE

---

**TOSS-UP**

24. *CHEMISTRY Short Answer* How many mL of 3Molar HCl are needed to make 300 mL of 0.1Molar HCl?

ANSWER: 10 ML

**BONUS**

24. *CHEMISTRY Multiple Choice* Select which of the following is not ionic

- W)  $\text{HSiCl}_3$
- X)  $\text{BaSO}_4$
- Y)  $(\text{NH}_4)_2\text{SO}_4$
- Z)  $\text{PbSO}_4$

ANSWER: W)  $\text{HSiCl}_3$

---

**TOSS-UP**

25. *BIOLOGY Short Answer* A virus that infects a bacterium is called a

ANSWER: BACTERIOPHAGE

**BONUS**

25. *BIOLOGY Multiple Choice* In bacteriophages, what stimulus is well known to cause an episome to enter the lytic phase?

- W) cold
- X) heat
- Y) ultraviolet light
- Z) electric shock

ANSWER: Y) ULTRAVIOLET LIGHT



## ROUND 17 A

### TOSS-UP

1. *MATH Multiple Choice* Evaluate  $\int dx = ?$  (read as: integral d x equals)

- W) 1
- X) C
- Y)  $x + C$
- Z) is not defined

ANSWER: Y)  $x + C$

### BONUS

1. *MATH Short Answer* If  $f(x) = x^n$  (read as: f derivative of the function of  $x = x$  to the nth power) , then  $f^{(n+1)}(x)$  (read as: f to the n + 1 derivative of the function of x) equals what?

ANSWER: 0

---

### TOSS-UP

2. *CHEMISTRY Short Answer* What is the general name given to a process or path in which no heat is transferred between a system and its surroundings?

ANSWER: ADIABATIC

### BONUS

2. *CHEMISTRY Multiple Choice* The chemical that ranks first in production among all industrial chemicals is

- W) ammonia
- X) phosphoric acid
- Y) sodium hydroxide
- Z) sulfuric acid

ANSWER: Z) SULFURIC ACID

**TOSS-UP**

3. *GENERAL SCIENCE Short Answer* In the troy weight system used to weigh precious metals, how many ounces in a troy pound?

ANSWER: 12

**BONUS**

3. *GENERAL SCIENCE Short Answer* In fishes and amphibians, what is the tissue called that is positioned between gill slits?

ANSWER: BRANCHIAL ARCHES

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**TOSS-UP**

4. *BIOLOGY Multiple Choice* The first haploid cell in the life cycle of a plant is the

- W) zygote
- X) gamete
- Y) gametophyte plant
- Z) spore

ANSWER: Z) SPORE

**BONUS**

4. *BIOLOGY Short Answer* The cells in a plant that surround stomata are called what?

ANSWER: GUARD CELLS

**TOSS-UP**

5. *PHYSICS Short Answer* A large spring requires a force of 150 Newtons to compress it only 0.010 meters. What is the spring constant of the spring?

ANSWER: 15000 NEWTONS PER METER

**BONUS**

5. *PHYSICS Multiple Choice* The number of overtones, and their relative intensities, is associated with what property of the tone generated by a musical instrument?

- W) quality
- X) interference pattern
- Y) range
- Z) attack pattern

ANSWER: W) QUALITY

---

**TOSS-UP**

6. *EARTH SCIENCE Short Answer* What is a dark-colored substance made of small bits of decaying plants and animals called?

ANSWER: HUMUS

**BONUS**

6. *EARTH SCIENCE Short Answer* What are long, narrow chains of underwater mountains called?

ANSWER: (MID-OCEAN) RIDGES

**TOSS-UP**

7. *COMPUTER SCIENCE Short Answer* What is the term used to describe the procedure in which the computer acts as an electronic combination of scissors and glue for reorganizing a document or for compiling a document from different sources?

ANSWER: CUT AND PASTE

**BONUS**

7. *COMPUTER SCIENCE Multiple Choice* What is the term used to describe a security mechanism organizations use to protect their intranet from the Internet?

- W) separator
- X) internalizing
- Y) firewall
- Z) security fence

ANSWER: Y) FIREWALL

---

**TOSS-UP**

8. *GENERAL SCIENCE Multiple Choice* All of the following are naturally occurring toxic chemicals except

- W) cadmium
- X) botulinum toxin
- Y) cobra venom
- Z) hemlock

ANSWER: W) CADMIUM

**BONUS**

8. *GENERAL SCIENCE Short Answer* What is the term that means to pass time in a sleeplike state during the hottest and driest months of the year?

ANSWER: ESTIVATE

**TOSS-UP**

9. *ASTRONOMY Multiple Choice* Terrestrial planets have

- W) differential rotation
- X) solid cores
- Y) weak magnetic fields
- Z) all of the above

ANSWER: Z) ALL OF THE ABOVE

**BONUS**

9. *ASTRONOMY Multiple Choice* If the shape of the Earth's orbit were unaltered but its rotation axis was shifted so that it had no tilt with respect to the orbit, seasons would be

- W) essentially as they are now
- X) more extreme, with colder winters and hotter summers
- Y) essentially nonexistent, with little temperature change at a given place throughout the year
- Z) not enough information is given to make a reasonable guess

ANSWER: Y) ESSENTIALLY NONEXISTENT, WITH LITTLE TEMPERATURE CHANGE AT A GIVEN PLACE THROUGHOUT THE YEAR

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**TOSS-UP**

10. *BIOLOGY Multiple Choice* In the lac operon, the sugar lactose functions as a

- W) inducer
- X) inhibitor
- Y) regulator
- Z) structural gene

ANSWER: W) INDUCER

**BONUS**

10. *BIOLOGY Short Answer* What vitamin increases the responsiveness of bone to PTH (parathyroid hormone)?

ANSWER: VITAMIN D

**TOSS-UP**

11. *EARTH SCIENCE Short Answer* Name the driest continent.

ANSWER: ANTARCTICA

**BONUS**

11. *EARTH SCIENCE Short Answer* Outside of Alaska, what is the name of the North America's longest continuous mountain range?

ANSWER: SIERRA NEVADA

---

**TOSS-UP**

12. *CHEMISTRY Short Answer* A gas occupies a volume of 0.2 liters at 10.1 kilopascals. What volume in liters will the gas occupy at 101 kilopascals?

ANSWER: 0.02 LITERS

**BONUS**

12. *CHEMISTRY Multiple Choice* Roasting in oxygen is the first step in isolating

- W) phosphorus from its ore
- X) antimony from its ore
- Y) manganese from its ore
- Z) chromium from its ore

ANSWER: X) ANTIMONY FROM ITS ORE

**TOSS-UP**

13. *GENERAL SCIENCE Multiple Choice* Point sources of pollution include all of the following except

- W) an automobile tailpipe
- X) a factory smokestack
- Y) a drainpipe from a power plant
- Z) runoff from cropland

ANSWER: Z) RUNOFF FROM CROPLAND

**BONUS**

13. *GENERAL SCIENCE Multiple Choice* All of the following are given off by natural radioactivity except

- W) alpha particles
- X) delta rays
- Y) gamma rays
- Z) beta particles

ANSWER: X) DELTA RAYS

---

**TOSS-UP**

14. *ASTRONOMY Multiple Choice* Proper motion is

- W) the true, not apparent, motion of a star in space
- X) the annual apparent motion of a star across the sky
- Y) the motion of a star towards or away from us
- Z) the orbital motion of a star around the Galaxy

ANSWER: X) THE ANNUAL APPARENT MOTION OF A STAR ACROSS THE SKY

**BONUS**

14. *ASTRONOMY Multiple Choice* What are Cepheid variable stars?

- W) yellow giants
- X) white dwarfs
- Y) red giants
- Z) blue-white Main Sequence stars

ANSWER: W) YELLOW GIANTS

**TOSS-UP**

15. *BIOLOGY Short Answer* What is the clear, gelatinous material in the posterior chamber of the eye?

ANSWER: VITREOUS HUMOR

**BONUS**

15. *BIOLOGY Multiple Choice* In meiosis, paired homologous chromosomes are found at the spindle equator during

- W) metaphase I
- X) anaphase II
- Y) prophase II
- Z) metaphase II

ANSWER: W) METAPHASE I

---

**TOSS-UP**

16. *GENERAL SCIENCE Short Answer* Named after a 19th century British scientist, what are the jerky movements of molecules resulting from random thermal motion?

ANSWER: BROWNIAN MOTION

**BONUS**

16. *GENERAL SCIENCE Short Answer* What is the name for a pit, tank, or basin which receives water or liquid waste located below normal grade and which must be emptied by mechanical means?

ANSWER: SUMP



**TOSS-UP**

17. *ASTRONOMY Multiple Choice* A telescope's resolving power measures its ability to see
- W) Fainter sources
  - X) More distance sources
  - Y) Finer details in sources
  - Z) Larger sources

ANSWER: Y) FINER DETAILS IN SOURCES

**BONUS**

17. *ASTRONOMY Multiple Choice* Stars which have ejected a planetary nebula go on to become
- W) protostars
  - X) supernovae
  - Y) red giants
  - Z) white dwarfs

ANSWER: Z) WHITE DWARFS

---

**TOSS-UP**

18. *GENERAL SCIENCE Multiple Choice* Cone-bearing trees are characteristic of the
- W) taiga (Pronounce tye-gah)
  - X) tropical rain forest
  - Y) temperate deciduous forest
  - Z) savanna

ANSWER: W) TAIGA

**BONUS**

18. *GENERAL SCIENCE Short Answer* What is a plant said to be if it is bending toward a light source?

ANSWER: PHOTOTROPIC

**TOSS-UP**

19. *CHEMISTRY Short Answer* What type of bonding would you expect between two potassium atoms?

ANSWER: METALLIC

**BONUS**

19. *CHEMISTRY Multiple Choice* Constitutional isomers of complexes include

- W) mirror image isomers
- X) geometric isomers
- Y) linkage isomers
- Z) stereoisomers

ANSWER: Y) LINKAGE ISOMERS

---

**TOSS-UP**

20. *PHYSICS Short Answer* The two ends of a 3 Ohm resistor are connected to a 9 Volt battery. What is the current (in amperes) through the resistor?

ANSWER: 3.0 AMPERES

**BONUS**

20. *PHYSICS Multiple Choice* What phenomenon is created by two tuning forks, side by side, emitting frequencies which differ by only a small amount?

- W) resonance
- X) interference
- Y) the Doppler effect
- Z) beats

ANSWER: Z) BEATS

**TOSS-UP**

21. *GENERAL SCIENCE Short Answer* Name one of the alien bivalve species invading the Great Lakes?

ANSWER: QUAGGA MUSSEL or ZEBRA MUSSEL

**BONUS**

21. *GENERAL SCIENCE Multiple Choice* Chemicals put into the atmosphere have resulted in

- W) alkaline rain
- X) global cooling
- Y) urban air pollution
- Z) depletion of tropospheric ozone

ANSWER: Y) URBAN AIR POLLUTION

---

**TOSS-UP**

22. *ASTRONOMY Short Answer* Planets orbit the Sun because of the combined effects of gravity and what?

ANSWER: INERTIA

**BONUS**

22. *ASTRONOMY Multiple Choice* Nearly all the elements found in our environment were formed inside stars. The major exceptions are:

- W) iron and nickel
- X) oxygen and carbon
- Y) silver and technetium
- Z) hydrogen and helium

ANSWER: Z) HYDROGEN AND HELIUM

**TOSS-UP**

23. *BIOLOGY Short Answer* A haploid nucleus contains how many sets of chromosomes!?

ANSWER: ONE

**BONUS**

23. *BIOLOGY Multiple Choice* Select the incorrect association.

- W) ectoderm/eyes
- X) ectoderm/nervous system
- Y) endoderm/bone
- Z) mesoderm/cartilage

ANSWER: Y) ENDODERM/BONE

---

**TOSS-UP**

24. *CHEMISTRY Short Answer* What formal charge would you find on a carbon atom with three bonds and no lone pairs?

ANSWER: +1

**BONUS**

24. *CHEMISTRY Multiple Choice* One property that decreases as the intermolecular forces increase is

- W) boiling point
- X) equilibrium vapor pressure
- Y) viscosity
- Z) heat of vaporization

ANSWER: X) EQUILIBRIUM VAPOR PRESSURE

**TOSS-UP**

25. *CHEMISTRY Short Answer* What is the name for the electrode at which reduction occurs?

ANSWER: CATHODE

**BONUS**

25. *CHEMISTRY Multiple Choice* Projectiles with masses greater than the mass of an alpha particle are called

- W) beta particles
- X) omega particles
- Y) heavy ions
- Z) nuclides

ANSWER: Y) HEAVY IONS