

REGIONAL ROUND 10B

TOSS-UP

1. *ASTRONOMY Multiple Choice* Which is the correct description of the Sun's location within the Milky Way?

- W) at the outer edge of the galactic bulge but in the plane of the disc
- X) in the disc but at its outer edge
- Y) above the disc and about one-third of the galactic radius from the center
- Z) in the disc and about one-half a galactic radius from the center

ANSWER: Z) IN THE DISC AND ABOUT ONE-HALF A GALACTIC RADIUS FROM THE CENTER

BONUS

1. *ASTRONOMY Multiple Choice* Cepheid stars are

- W) stars at an early stage in stellar evolution, pre-main-sequence
- X) members of binary systems, in which one star periodically eclipses the other
- Y) stars which pulsate in brightness, size, and temperature
- Z) white dwarf stars, late in their evolutionary life

ANSWER: Y) STARS WHICH PULSATE IN BRIGHTNESS, SIZE, AND TEMPERATURE

TOSS-UP

2. *PHYSICS Multiple Choice* Which of the following is an example of the type of force which acts at a distance?

- W) gravitational
- X) magnetic
- Y) electrical
- Z) all of the above

ANSWER: Z) ALL OF THE ABOVE

BONUS

2. *PHYSICS Multiple Choice* Calorimetry is based on the idea of

- W) conservation of mechanical energy
- X) conservation of thermal energy
- Y) conservation of momentum
- Z) conservation of electric energy

ANSWER: X) CONSERVATION OF THERMAL ENERGY

TOSS-UP

3. *GENERAL SCIENCE Multiple Choice* The opposite of aquatic is

- W) extraterrestrial
- X) biotic
- Y) hydrologic
- Z) terrestrial

ANSWER: Z) TERRESTRIAL

BONUS

3. *GENERAL SCIENCE Short Answer* What is the term for the boundary layer between the troposphere and the stratosphere?

ANSWER: TROPOPAUSE

TOSS-UP

4. *BIOLOGY Multiple Choice* In the neuron, the Nodes of Ranvier (Ron` - vee- ay) are interruptions in the

- W) dendritic endings
- X) myelin sheath
- Y) number of receptor cells
- Z) synaptic junctions

ANSWER: X) MYELIN SHEATH

BONUS

4. *BIOLOGY Multiple Choice* Which of the following is NOT a neurotransmitter?

- W) GABA
- X) dopamine
- Y) aldosterone
- Z) acetylcholine

ANSWER: Y) ALDOSTERONE

TOSS-UP

5. *PHYSICS Multiple Choice* When you make ice cubes, the entropy of the water

- W) decreases
- X) increases
- Y) is zero
- Z) is unchanged

ANSWER: W) DECREASES

BONUS

5. *PHYSICS Short Answer* What is the index of refraction of a material that transmits light at 75,000 kilometers per second?

ANSWER: 4

TOSS-UP

6. *EARTH SCIENCE Multiple Choice* For Earth, which statement is true?

- W) the core is primarily iron and magnesium
- X) the outer core and the mantle form the lithos
- Y) the lithosphere is a rigid layer
- Z) none of these

ANSWER: Y) THE LITHOSPHERE IS A RIGID LAYER

BONUS

6. *EARTH SCIENCE Multiple Choice* Which of the following divisions of geologic time is the longest?

- W) a period
- X) an epoch
- Y) an era
- Z) an eon

ANSWER: Z) AN EON

TOSS-UP

7. *BIOLOGY Multiple Choice* A synapse involves each of the following except the

- W) postsynaptic membrane
- X) presynaptic membrane
- Y) sarcolemma
- Z) terminal bouton (boo-tonn')

ANSWER: Y) SARCOLEMMA

BONUS

7. *BIOLOGY Multiple Choice* By the endosymbiotic theory, bacteria in host cells were the predecessors of

- W) chloroplasts and mitochondria
- X) chloroplasts and nuclei
- Y) mitochondria and ribosomes
- Z) nuclei and ribosomes

ANSWER: W) CHLOROPLASTS AND MITOCHONDRIA

TOSS-UP

8. *CHEMISTRY Short Answer* How many half- filled orbitals are there in a bromine atom?

ANSWER: ONE

BONUS

8. *CHEMISTRY Short Answer* A particular poisoned catalyst used in alkyne reactions, made of finely divided palladium coated with quinoline and absorbed on barium sulfate is known as what kind of catalyst?

ANSWER: LINDLAR

TOSS-UP

9. *ASTRONOMY Multiple Choice* The presence of hydrogen in the atmospheres of the gas giants suggests that these planets have

- W) a large mass and low temperature
- X) a small mass and low temperature
- Y) a large mass and high temperature
- Z) a small mass and high temperature

ANSWER: W) A LARGE MASS AND LOW TEMPERATURE

BONUS

9. *ASTRONOMY Multiple Choice* Which of the following is one of the many contributions made by Galileo to astronomy?

- W) he discovered that the planets move around the Sun in elliptical orbits
- X) he developed a theory of gravity that could explain orbital motion
- Y) he used a telescope to observe the heavens, thereby reinforcing the notion of heliocentricity
- Z) he made extensive and detailed observations of the positions of planets

ANSWER: Y) HE USED A TELESCOPE TO OBSERVE THE HEAVENS, THEREBY REINFORCING THE NOTION OF HELIOCENTRICITY

TOSS-UP

10. *EARTH SCIENCE Multiple Choice* Stream pebbles become rounded by

- W) exfoliation
- X) pressure relief
- Y) dissolution
- Z) abrasion

ANSWER: Z) ABRASION

BONUS

10. *EARTH SCIENCE Multiple Choice* Which of the following are bowl-shaped basins resulting from plucking on the side of a mountain?

- W) Loess (L_-ess) deposits
- X) Deltas
- Y) Cirques
- Z) Striations

ANSWER: Y) CIRQUES

TOSS-UP

11. *CHEMISTRY Short Answer* What is the approximate effective nuclear charge in the fourth shell of an argon atom?

ANSWER: ZERO

BONUS

11. *CHEMISTRY Short Answer* A suspension in which a solute like phase is dispersed throughout a solvent like substance is known as a

ANSWER: COLLOID

TOSS-UP

12. *GENERAL SCIENCE Multiple Choice* All of the following chemicals could be extracted from the ocean with today's technology at a profit except

- W) magnesium
- X) zinc
- Y) bromine
- Z) sodium chloride

ANSWER X) ZINC

BONUS

12. *GENERAL SCIENCE Short Answer* What is the term for a substance that prevents the formation of blood clots?

ANSWER: ANTICOAGULANT

TOSS-UP

13. *CHEMISTRY Multiple Choice* What heteroatom is characteristic of an amine?

- W) oxygen
- X) nitrogen
- Y) chlorine
- Z) sulfur

ANSWER: X) NITROGEN

BONUS

13. *CHEMISTRY Multiple Choice* The difference between the observed mass of a nucleus and the sum of the masses of the nucleons is called the

- W) fission factor
- X) fusion factor
- Y) mass defect
- Z) binding energy

ANSWER: Y) MASS DEFECT

TOSS-UP

14. *ASTRONOMY Multiple Choice* If the Moon formed initially in orbit around the Earth, we would expect its orbit to be

- W) in the Earth's equatorial plane
- X) in the plane of the ecliptic
- Y) over the Earth's poles
- Z) the same period as the Earth's rotation

ANSWER: W) IN THE EARTH'S EQUATORIAL PLANE

BONUS

14. *ASTRONOMY Multiple Choice* What is stellar nucleosynthesis?

- W) the formation of elements inside stars
- X) the formation of stars from a nucleus of contracting material
- Y) the formation of white dwarfs, neutron stars, and black holes from stars
- Z) the process by which stars form interstellar dust

ANSWER: W) THE FORMATION OF ELEMENTS INSIDE STARS

TOSS-UP

15. COMPUTER SCIENCE Multiple Choice In 1975, the first personal computer was marketed in kit form, with memory of 256 bytes. It was the

- W) MITS Altair 8800
- X) Apple II
- Y) IBM PC
- Z) Apple Iie

ANSWER: W) MITS ALTAIR 8800

BONUS

15. COMPUTER SCIENCE Multiple Choice In computer graphics, changing the shape of an object made up of connected lines by “grabbing” a point on an anchored line and “pulling” it to the new location is called what?

- W) running around
- X) rubber banding
- Y) grabber
- Z) controlling

ANSWER: X) RUBBER BANDING

TOSS-UP

16. CHEMISTRY Multiple Choice HClO_4 is considered

- W) a weak acid
- X) a weak base
- Y) a strong acid
- Z) a strong base

ANSWER: Y) A STRONG ACID

BONUS

16. CHEMISTRY Multiple Choice The following substance likely to be least ionic in character is

- W) LiBr
- X) CaBr_2
- Y) AlCl_3
- Z) CaI_2

ANSWER: Y) AlCl_3

TOSS-UP

17. *EARTH SCIENCE Multiple Choice* Rock formed by the cooling of magma or lava is

- W) sediment
- X) igneous rock
- Y) sedimentary rock
- Z) metamorphic rock

ANSWER: X) IGNEOUS ROCK

BONUS

17. *EARTH SCIENCE Multiple Choice* A layer of volcanic ash has been discovered throughout a wide region. The ash represents a

- W) unconformity
- X) index fossil
- Y) key bed
- Z) organic remain

ANSWER: Y) KEY BED

TOSS-UP

18. *COMPUTER SCIENCE Short Answer* When using the internet, users sometimes employ shorthand for commonly used phrases. What does the phrase AFAIK mean?

ANSWER: AS FAR AS I KNOW

BONUS

18. *COMPUTER SCIENCE Short Answer* What are the three kinds of hyperlinks?

ANSWER: TEXT, IMAGE, AND IMAGE MAP

TOSS-UP

19. *MATH Multiple Choice* Which of the following concepts in experimental design are not key?

- W) randomization
- X) blocking
- Y) control
- Z) stratifying

ANSWER: Z) STRATIFYING

BONUS

19. *MATH Multiple Choice* If $f(x) = x + 1 - 5/x$, then $f'(x)$ equals (read as: the first derivative of F of X)

- W) $1 - 5/x$
- X) $x + 5/x^2$
- Y) $1 - 5/x^2$
- Z) $1 + 5/x^2$

ANSWER: Z) $1 + 5/x^2$

TOSS-UP

20. *ASTRONOMY Multiple Choice* Which of these environmental problems hamper astronomical observations?

- W) scattered light in the sky
- X) increasing emission of radio signals
- Y) particulate matter in the atmosphere
- Z) all of the above

ANSWER: Z) ALL OF THE ABOVE

BONUS

20. *ASTRONOMY Multiple Choice* The biggest single, connected structures are

- W) supernova remnants
- X) giant elliptical galaxies
- Y) double-lobed radio galaxies
- Z) quasars

ANSWER: Y) DOUBLE-LOBED RADIO GALAXIES

TOSS-UP

21. *CHEMISTRY Short Answer* What theory (limited to aqueous systems) defines an acid as a compound that liberates hydrogen ions and a base as a compound that liberates hydroxide ions?

ANSWER: ARRHENIUS THEORY

BONUS

21. *CHEMISTRY Multiple Choice* Which of the following should be the strongest reducing agent?

- W) Iron
- X) Ruthenium
- Y) Osmium
- Z) Rhenium

ANSWER: W) IRON

TOSS-UP

22. *BIOLOGY Short Answer* What part of the wheat grain is composed of starch?

ANSWER: ENDOSPERM

BONUS

22. *BIOLOGY Multiple Choice* Adrenocorticotrophic hormone (ACTH) is secreted by the

- W) adrenal cortex
- X) anterior pituitary
- Y) posterior pituitary
- Z) thyroid

ANSWER: X) ANTERIOR PITUITARY

TOSS-UP

23. *COMPUTER SCIENCE Short Answer* What is the device, connected between a computer and a power source called that ensures that the electrical flow to the computer is not interrupted by a blackout or power surge?

ANSWER: UPS (ACCEPT: UNINTERRUPTIBLE POWER SUPPLY)

BONUS

23. *COMPUTER SCIENCE Short Answer* What is the screen technology used for flat-panel display monitors?

ANSWER: LIQUID CRYSTAL DISPLAY (LCD)

TOSS-UP

24. *ASTRONOMY Short Answer* A large, spherical cluster of stars located in the halo of the galaxy is a type of cluster called what?

ANSWER: GLOBULAR CLUSTER

BONUS

24. *ASTRONOMY Multiple Choice* Which of the following objects would be found on the Moon?

- W) meteoroids
- X) meteors
- Y) meteorites
- Z) asteroids

ANSWER: Y) METEORITES

TOSS-UP

25. *GENERAL SCIENCE Short Answer* What is the study of groundwater called?

ANSWER: HYDROLOGY (ALSO ACCEPT HYDROGEOLOGY)

BONUS

25. *GENERAL SCIENCE Short Answer* What is the name of the colorless gas, when mixed with oxygen burns at a temperature of about 3500 degrees C and is used in welding?

ANSWER: ACETYLENE

REGIONAL ROUND 11B

TOSS-UP

1. *EARTH SCIENCE Short Answer* What is heat energy that comes from the earth called?

ANSWER: GEOTHERMAL ENERGY

BONUS

1. *EARTH SCIENCE Short Answer* Who was the first scientist to state the theory of continental drift?

ANSWER: (ALFRED) WEGENER

TOSS-UP

2. *CHEMISTRY Short Answer* Which stable element has the lowest electronegativity?

ANSWER: CESIUM

BONUS

2. *CHEMISTRY Short Answer* Which state of matter is characterized by low density and high compressibility?

ANSWER: GAS

TOSS-UP

3. *ASTRONOMY Multiple Choice* Jupiter's atmosphere is mainly hydrogen and

- W) nitrogen
- X) helium
- Y) water vapor
- Z) carbon dioxide

ANSWER: X) HELIUM

BONUS

3. *ASTRONOMY Multiple Choice* Saturn's rings are located

- W) close to the planet in a region where any large satellites would break up from tidal forces
- X) at a large distance from the planet near several large satellites
- Y) in an orbit that goes directly over the north and south poles of the planet
- Z) nowhere - Saturn does not have any rings

ANSWER: W) CLOSE TO THE PLANET IN A REGION WHERE ANY LARGE SATELLITES WOULD BREAK UP FROM TIDAL FORCES

TOSS-UP

4. *BIOLOGY Multiple Choice* Gametogenesis is

- W) the pairing of homologous chromosomes
- X) the formation of sex cells
- Y) the fusion of gametes
- Z) a process that occurs only in asexually reproducing forms

ANSWER: X) THE FORMATION OF SEX CELLS

BONUS

4. *BIOLOGY Short Answer* A karyotype from a human somatic cell normally has how many chromosomes?

ANSWER: 46

TOSS-UP

5. *PHYSICS Multiple Choice* Which of the following is not a vector?

- W) average velocity
- X) net displacement
- Y) instantaneous speed
- Z) final acceleration

ANSWER: Y) INSTANTANEOUS SPEED

BONUS

5. *PHYSICS Short Answer* A car with mass M traveling at speed V has kinetic energy KE . What is the kinetic energy of a second car that has half the mass and twice the speed of the first car?

ANSWER: $2KE$

TOSS-UP

6. *ASTRONOMY Short Answer* Which is the only planet whose orbit is more eccentric than Mercury's?

ANSWER: PLUTO

BONUS

6. *ASTRONOMY Multiple Choice* Which of the following is the Hubble Law?

- W) the greater the distance to a galaxy, the greater its redshift
- X) the greater the distance to a galaxy, the fainter it is
- Y) the more distant a galaxy is, the younger it appears
- Z) most galaxies belong to a cluster; most clusters are part of a super cluster

ANSWER: W) THE GREATER THE DISTANCE TO A GALAXY, THE GREATER ITS REDSHIFT

TOSS-UP

7. *MATH Multiple Choice* A system for the representation of a point in space in terms of its distance, measured along a set of mutually perpendicular axes is called

- W) cartesian coordinates
- X) polar coordinates
- Y) cassini coordinates
- Z) weissmann coordinates

ANSWER: W) CARTESIAN COORDINATES

BONUS

7. *MATH Multiple Choice* When the marginal cost of production changes from decreasing to increasing, the second derivative of the cost function is either zero or undefined, this point is called

- W) critical point
- X) point of inflection
- Y) minima
- Z) maxima

ANSWER: X) POINT OF INFLECTION

TOSS-UP

8. *CHEMISTRY Multiple Choice* Which of the following series of elements is listed in order of increasing atomic radius?

- W) Sodium, Magnesium, Aluminum, Silicon
- X) Carbon, Nickel, Oxygen, Flourine
- Y) Oxygen, Sulfur, Selenium, Technetium
- Z) Iodine, Bromine, Chlorine, Flourine

ANSWER: Y) OXYGEN, SULFUR, SELENIUM, TECHNETIUM

BONUS

8. *CHEMISTRY Multiple Choice* Based upon the electronegativities of elements, which of the following bonds should be the most polar?

- W) Silicon-Chlorine
- X) Silicon-Sulfur
- Y) Silicon-Phosphorus
- Z) Silicon-Carbon

ANSWER: W) SILICON-CHLORINE

TOSS-UP

9. *MATH Multiple Choice* A number that can be expressed in the form p/q (read as: p divided by q), where p and q are integers, and q is not equal to zero, is a

- W) integer
- X) irrational number
- Y) imaginary number
- Z) rational number

ANSWER: Z) RATIONAL NUMBER

BONUS

9. *MATH Multiple Choice* An assumption or supposition used in an argument is a

- W) hypotenuse
- X) hypocycloid
- Y) hyperspace
- Z) hypothesis

ANSWER: Z) HYPOTHESIS

TOSS-UP

10. *GENERAL SCIENCE Short Answer* Electric transmission lines are typically rated 69 KV and above. What is the term for electric lines operating at 34.5 KV and below?

ANSWER: DISTRIBUTION LINES

BONUS

10. *GENERAL SCIENCE Short Answer* What is the term for an orifice in the earth's surface that erupts steam and boiling water intermittently?

ANSWER: GEYSER

TOSS-UP

11. *CHEMISTRY Multiple Choice* The process among the following that is exothermic is

- W) melting ice cream
- X) burning a log
- Y) baking a cake
- Z) defogging the windshield

ANSWER: X) BURNING A LOG

BONUS

11. *CHEMISTRY Multiple Choice* Which of the following ligands is most likely to form a high-spin octahedral complex with cobalt (II)?

- W) CN^-
- X) I^-
- Y) NO_2^-
- Z) CO

ANSWER: X) I^-

TOSS-UP

12. *MATH Multiple Choice* In statistics, the mean measures

- W) a standard distance
- X) a normal distance
- Y) central tendency
- Z) dispersion

ANSWER: Y) CENTRAL TENDENCY

BONUS

12. *MATH Short Answer* Relative to the graph of $y = x^3$, the graph of $y = 2x^3$ is changed in what way?

ANSWER: STRETCHED VERTICALLY BY THE FACTOR 2

TOSS-UP

13. *ASTRONOMY Multiple Choice* The Zodiacal Light is due to

- W) scattering of Sunlight from interplanetary dust particles
- X) refraction of Sunlight by the Earth's Atmosphere
- Y) scattering of Sunlight by ice crystals in the stratosphere
- Z) multiple reflection of Sunlight between the Moon and the Earth

ANSWER: W) SCATTERING OF SUNLIGHT FROM INTERPLANETARY DUST PARTICLES

BONUS

13. *ASTRONOMY Multiple Choice* Which event marks the birth of a star?

- W) Fusion of hydrogen atoms into helium atoms
- X) Collapse of an interstellar cloud
- Y) Formation of a photosphere
- Z) Instability in an interstellar cloud

ANSWER: W) FUSION OF HYDROGEN ATOMS INTO HELIUM ATOMS

TOSS-UP

14. *CHEMISTRY Multiple Choice* Synthetic polymers are formed by

- W) pyrolysis
- X) cracking
- Y) halogenation
- Z) chain reaction

ANSWER: Z) CHAIN REACTION

BONUS

14. *CHEMISTRY Short Answer* What is the highest possible oxidation state for molybdenum, Mo?

ANSWER: +6

TOSS-UP

15. *BIOLOGY Short Answer* The vascular tissue in plants that transports water and minerals from the roots to the photosynthesizing parts of the plant is called

ANSWER: XYLEM

BONUS

15. *BIOLOGY Multiple Choice* The eustachian tube functions

- W) as a pressure valve
- X) for body balance
- Y) to detect sound waves
- Z) as a connection between the ovary and the uterus

ANSWER: W) AS A PRESSURE VALVE

TOSS-UP

16. *PHYSICS Short Answer* A 112 pound box rests on the floor of a freight elevator which starts from rest and accelerates downward at 4.9 meters per second squared for 5 seconds. What is the force in Newtons that the box exerts on the floor during the descent?

ANSWER: 250

BONUS

16. *PHYSICS Multiple Choice* Consider a point on a bicycle wheel as the wheel makes exactly four complete revolutions about a fixed axis. Compare the linear and angular displacement of the point.

- W) both are zero
- X) only the angular displacement is zero
- Y) only the linear displacement is zero
- Z) neither is zero

ANSWER: Y) ONLY THE LINEAR DISPLACEMENT IS ZERO

TOSS-UP

17. *ASTRONOMY Multiple Choice* Which Spectral class of stars represents the hottest stars?

- W) O type
- X) A type
- Y) G type
- Z) M type

ANSWER: W) O TYPE

BONUS

17. *ASTRONOMY Multiple Choice* Pulsars are objects that emit extremely regular radio signals. These objects are

- W) neutron stars
- X) supernovas
- Y) protostars
- Z) red giants

ANSWER: W) NEUTRON STARS

TOSS-UP

18. *GENERAL SCIENCE Short Answer* What is the name for a shallow pond or pool completely or almost completely separated from the sea?

ANSWER: LAGOON

BONUS

18. *GENERAL SCIENCE Multiple Choice* The level of stress to which a material can be subjected and still recover to its original shape or volume when the stress is removed is called:

- W) Elastic limit
- X) Elastic stress
- Y) Elastic rebound
- Z) Elasticity

ANSWER: W) ELASTIC LIMIT

TOSS-UP

19. *PHYSICS Multiple Choice* The work done by static friction is always

- W) positive
- X) negative
- Y) along the surface
- Z) zero

ANSWER: Z) ZERO

BONUS

19. *PHYSICS Short Answer* An average force of 2500 N is applied for 1.0 milliseconds to a 10 gram bullet moving with a speed of 250 meters per second as it passes through a target. The final speed of the bullet is

ANSWER: ZERO

TOSS-UP

20. *ASTRONOMY Short Answer* One of the oldest constellations is associated with a legendary early king of Athens and is supposed to be a charioteer. Name it.

ANSWER: AURIGA

BONUS

20. *ASTRONOMY Multiple Choice* The nucleus of our galaxy is composed primarily of

- W) young, hot stars
- X) old, cool stars
- Y) interstellar gas and dust
- Z) planetary nebulae

ANSWER: X) OLD, COOL STARS

TOSS-UP

21. *BIOLOGY Short Answer* What two scientists demonstrated the possibility of producing organic compounds from gases and water if the mixture is heated and bombarded with a continuous spark discharge?

ANSWER: STANLEY MILLER AND HAROLD UREY (ACCEPT: MILLER AND UREY)

BONUS

21. *BIOLOGY Short Answer* What enzyme helps align complementary nucleotides and join the phosphates and sugar molecules in a newly forming DNA strand?

ANSWER: DNA POLYMERASE

TOSS-UP

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

ANSWER: 0

BONUS

22. *MATH Multiple Choice* A point at which the first derivative changes from decreasing to increasing, and second derivative of the cost function is either zero or undefined, is called a

- W) critical point
- X) point of inflection
- Y) minimum
- Z) maximum

ANSWER: X) POINT OF INFLECTION

TOSS-UP

23. *ASTRONOMY Short Answer* The orbit of which planet is so eccentric that it can actually cross the orbit of Neptune?

ANSWER: PLUTO

BONUS

23. *ASTRONOMY Multiple Choice* The effects of gravity acting with different force on opposite sides of a planet are called

- W) inertia
- X) orbital forces
- Y) precession
- Z) tidal forces

ANSWER: Z) TIDAL FORCES

TOSS-UP

24. *PHYSICS Short Answer* The initial velocity of a projectile is v which produces a range R . If the initial velocity is increased to $2v$ while the angle is unchanged, what will the range be?

ANSWER: $4R$

BONUS

24. *PHYSICS Multiple Choice* If $p = mv$, then $p^2 / 2m$ is

- W) impulse
- X) velocity
- Y) force
- Z) kinetic energy

ANSWER: Y) FORCE

TOSS-UP

25. *CHEMISTRY Short Answer* The condition of a molecule containing the most atoms possible (made up of single bonds) is called

ANSWER: SATURATION

BONUS

25. *CHEMISTRY Multiple Choice* The following compound with the greatest lattice energy is

- W) KBr
- X) K₂O
- Y) MgO
- Z) MgBr₂

ANSWER: Y) MgO

REGIONAL ROUND 12B

TOSS-UP

1. *MATH Multiple Choice* For any process in which the rate of change of a quantity is proportional to the quantity itself, the mathematical function describing the process will be

- W) linear
- X) logarithmic
- Y) exponential
- Z) parabolic

ANSWER: Y) EXPONENTIAL

BONUS

1. *PHYSICS Short Answer* A very light cart holding a 300N box is moved at constant velocity across a 15m level surface. What is the net work done in the process?

ANSWER: ZERO

TOSS-UP

2. *EARTH SCIENCE Multiple Choice* Acid mine drainage is related to the presence of the mineral

- W) olivine
- X) calcite
- Y) hematite
- Z) pyrite

ANSWER: Z) PYRITE

BONUS

2. *EARTH SCIENCE Short Answer* What is the name of balloon-mounted packages of instruments which measure temperature, humidity, and wind through the troposphere into the stratosphere?

ANSWER: RADIOSONDES

TOSS-UP

3. *ASTRONOMY Multiple Choice* Space travelers looking out from the front of their spacecraft would note that the light emitted from the star system toward which they were moving seemed to be

- W) getting redder
- X) getting bluer
- Y) staying the same
- Z) hotter

ANSWER: X) GETTING BLUER

BONUS

3. *ASTRONOMY Multiple Choice* In the HR diagram, what is the approximate position of the Sun?

- W) bottom left
- X) top right
- Y) top left
- Z) center

ANSWER: Z) CENTER

TOSS-UP

4. *MATH Multiple Choice* The x-coordinate of the point at which graph of a linear equation crosses the x-axis is called the

- W) zero point
- X) maxima
- Y) minima
- Z) x-intercept

ANSWER: Z) X-INTERCEPT

BONUS

4. *MATH Multiple Choice* Which of the following types of function is NOT a transcendental function?

- W) trigonometric
- X) algebraic
- Y) logarithmic
- Z) exponential

ANSWER: X) ALGEBRAIC

TOSS-UP

5. *PHYSICS Multiple Choice* The rate at which work is done is equivalent to which of the following?

- W) increase in potential energy
- X) thermal energy
- Y) potential energy
- Z) power

ANSWER: Z) POWER

BONUS

5. *PHYSICS Multiple Choice* Which point is nearest the x-axis?

- W) (-3,4)
- X) (4,5)
- Y) (-5,3)
- Z) (5, -2)

ANSWER: Z) (5, -2)

TOSS-UP

6. *CHEMISTRY Multiple Choice* The number of particles that come together to form the activated complex is

- W) the reaction order
- X) the reaction profile
- Y) the molecularity of the process
- Z) none of the above

ANSWER: Y) THE MOLECULARITY OF THE PROCESS

BONUS

6. *CHEMISTRY Multiple Choice* The most common oxidation state for ions of the inner transition elements is

- W) +2
- X) +3
- Y) +5
- Z) +7

ANSWER: X) +3

TOSS-UP

7. *EARTH SCIENCE Multiple Choice* What information can scientists find out by studying P waves and S waves?

- W) how strong an earthquake was
- X) the amount of damage an earthquake caused
- Y) how far away an earthquake occurred
- Z) the speed of the L waves

ANSWER: Y) HOW FAR AWAY AN EARTHQUAKE OCCURRED

BONUS

7. *EARTH SCIENCE Multiple Choice* The force that moves crustal plates is

- W) the wind
- X) running water
- Y) convection currents
- Z) gravity

ANSWER: Y) CONVECTION CURRENTS

TOSS-UP

8. *PHYSICS Multiple Choice* If both mass and velocity of a ball are tripled, the kinetic energy is increased by a factor of

- W) 3
- X) 6
- Y) 9
- Z) 27

ANSWER: Z) 27

BONUS

8. *PHYSICS Short Answer* Suppose a planet exists that has a radius that is twice that of earth and a mass that is four times as great. If the acceleration due to gravity is g on earth, what will it be on the other planet?

ANSWER: g

TOSS-UP

9. *BIOLOGY Multiple Choice* Cytokinesis is

- W) a chromosomal mutation
- X) cytoplasmic division
- Y) muscle cell movement
- Z) a form of cellular locomotion

ANSWER: X) CYTOPLASMIC DIVISION

BONUS

9. *BIOLOGY Short Answer* What disease develops due to the autoimmune destruction of the myelin sheath around a nerve?

ANSWER: MULTIPLE SCLEROSIS

TOSS-UP

10. *ASTRONOMY Multiple Choice* Because of tidal forces

- W) the Moon's gravity slows the Earth's rotation
- X) the Earth has locked the Moon's rotation
- Y) the Earth accelerates the Moon in its orbit, throwing it into a higher orbit
- Z) all of the above

ANSWER: Z) ALL OF THE ABOVE

BONUS

10. *ASTRONOMY Multiple Choice* Which of the following represents the approximate composition of the Earth's atmosphere

- W) 21% Nitrogen, 78% Oxygen, 1% everything else
- X) 78% Carbon Dioxide, 21% oxygen, 1% everything else
- Y) 33% Nitrogen, 33% Oxygen, 33% Carbon Dioxide, 1% everything else
- Z) 78% Nitrogen, 21% Oxygen, 1% everything else

ANSWER: Z) 78% NITROGEN, 21% OXYGEN, 1% EVERYTHING ELSE

TOSS-UP

11. *CHEMISTRY Short Answer* How many moles of sulfate ions are present in 1.0 Liters of 0.5 Molar Li_2SO_4 ?

ANSWER: 0.5 MOL

BONUS

11. *CHEMISTRY Short Answer* An anion of chlorine or other halogen is known as this ion

ANSWER: HALIDE

TOSS-UP

12. *BIOLOGY Short Answer* What are the most extensively branching blood vessels?

ANSWER: CAPILLARIES

BONUS

12. *BIOLOGY Short Answer* The presence of chyme in the small intestine stimulates the release of what hormone?

ANSWER: SECRETIN

TOSS-UP

13. *EARTH SCIENCE Multiple Choice* What holds the mercury in a column in a mercury barometer?

- W) heavy mercury
- X) mercury pressure
- Y) the weight of mercury
- Z) air pressure

ANSWER: Z) AIR PRESSURE

BONUS

13. *EARTH SCIENCE Multiple Choice* Approximately how many different minerals have been identified on earth?

- W) 400
- X) 2000
- Y) 4000
- Z) 10,000

ANSWER: Y) 4000

TOSS-UP

14. *COMPUTER SCIENCE Short Answer* What is the term for errors or mistakes found in the compilation or execution of a software program that are typically human faults?

ANSWER: BUGS

BONUS

14. *COMPUTER SCIENCE Multiple Choice* How many bits of color information per pixel does Graphics Interchange Format support?

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

ANSWER: W) 8

TOSS-UP

15. *CHEMISTRY Multiple Choice* An alkaloid is an organic chemical that always contains which heteroatom

- W) oxygen
- X) sulfur
- Y) chlorine
- Z) nitrogen

ANSWER: Z) NITROGEN

BONUS

15. *CHEMISTRY Multiple Choice* Which of the following materials is put into a nuclear reactor to slow the chain reaction?

- W) heavy water
- X) moderators
- Y) control rods
- Z) reflectors

ANSWER: Y) CONTROL RODS

TOSS-UP

16. *BIOLOGY Multiple Choice* What circuit is between the heart and lungs?

- W) cardiac
- X) coronary
- Y) lymphatic
- Z) pulmonary

ANSWER: Z) PULMONARY

BONUS

16. *BIOLOGY Multiple Choice* A virus is characterized by all but which one of the following?

- W) enzymes of respiration
- X) nucleic acid core
- Y) noncellular organization
- Z) protein coat

ANSWER: W) ENZYMES OF RESPIRATION

TOSS-UP

17. *ASTRONOMY Multiple Choice* Lunar surface features clearly indicate

- W) extensive erosion processes from wind and rain
- X) currently active volcanoes
- Y) current continental drift activity
- Z) none of the above

ANSWER: Z) NONE OF THE ABOVE

BONUS

17. *ASTRONOMY Multiple Choice* What was one of the contributions made to astronomy by Johannes Kepler?

- W) he discovered that the planets move around the Sun in elliptical orbits
- X) he developed a theory of gravity that could explain orbital motion
- Y) he said that the Earth is not at the center of the universe
- Z) he used a telescope to observe the heavens, thereby reinforcing the notion of heliocentricity

ANSWER: W) HE DISCOVERED THAT THE PLANETS MOVE AROUND THE SUN IN ELLIPTICAL ORBITS

TOSS-UP

18. *CHEMISTRY Short Answer* What term describes the energy change accompanying a mole of electrons being added to a mole of gaseous atoms or ions?

ANSWER: ELECTRON AFFINITY

BONUS

18. *CHEMISTRY Short Answer* A material capable of being easily fragmented into free radicals, which in turn initiate a free-radical reaction is known as a

ANSWER: INITIATOR

TOSS-UP

19. *ASTRONOMY Multiple Choice* The Oort Cloud is thought to be

- W) The cloud of gas and dust from which our solar system formed
- X) A cloud of debris that occasionally encounters the Earth, causing a meteor shower
- Y) A cloud of comets surrounding the solar system
- Z) A cloud of asteroids moving between the orbits of mars and Jupiter

ANSWER: Y) A CLOUD OF COMETS SURROUNDING THE SOLAR SYSTEM

BONUS

19. *ASTRONOMY Multiple Choice* In catastrophic theories, material for the planets was provided by

- W) a captured gas cloud passing in its vicinity
- X) matter stripped by tidal forces from the sun or a passing star
- Y) material lost from comets
- Z) the collapsing sun

ANSWER: X) MATTER STRIPPED BY TIDAL FORCES FROM THE SUN OR A PASSING STAR

TOSS-UP

20. *BIOLOGY Multiple Choice* Which of the following characteristics is NOT true of all animal phyla?

- W) are composed of one or more cells
- X) have metabolic systems
- Y) are autotrophic
- Z) contain DNA

ANSWER: Y) ARE AUTOTROPHIC

BONUS

20. *BIOLOGY Short Answer* What hormone stimulates the gallbladder to contract?

ANSWER: CCK (CHOLECYSTYKININ)

TOSS-UP

21. *CHEMISTRY Short Answer* What is the molecular formula for sodium dichromate?

ANSWER: $\text{Na}_2\text{Cr}_2\text{O}_7$

BONUS

21. *CHEMISTRY Multiple Choice* Decay of some radionuclides to stable nuclides requires steps called

- W) induced nuclear reactions
- X) a radioactive decay series
- Y) a band of stability
- Z) a branching chain

ANSWER: X) A RADIOACTIVE DECAY SERIES

TOSS-UP

22. *COMPUTER SCIENCE Short Answer* In encryption, what is the process of verifying the identity of a respondent?

ANSWER: AUTHENTICATION

BONUS

22. *COMPUTER SCIENCE Multiple Choice* What is the term used to describe the extension of a corporate Intranet using WWW technology to facilitate communications with the corporation's suppliers and customers?

- W) intranet
- X) extranet
- Y) suppnet
- Z) extrasup

ANSWER: X) EXTRANET

TOSS-UP

23. *BIOLOGY Short Answer* The excretory organ in the crustacean is called the

ANSWER: GREEN GLAND

BONUS

23. *BIOLOGY Short Answer* Erythropoietin is produced where in the body?

ANSWER: KIDNEY

TOSS-UP

24. *GENERAL SCIENCE Short Answer* What is the term for the minute impurities in air around which rain drops form?

ANSWER: CONDENSATION NUCLEI

BONUS

24. *GENERAL SCIENCE Short Answer* What is the term for a material which has the ability to extract certain substances from gases, liquids, or solids by causing the substance to adhere to its internal surface without changing it physically or chemically?

ANSWER: ADSORBENT

TOSS-UP

25. *ASTRONOMY Short Answer* What was the name of the first successful spacecraft mission to Venus?

ANSWER: MARINER 2

BONUS

25. *ASTRONOMY Multiple Choice* When an Earth scientist says that the Earth is "differentiated", she means that

- W) the ground beneath our feet gets hotter and denser as you go inward
- X) the radioactive heating of the Earth takes place at a slower rate today than it did billions of years ago
- Y) earth is different from any other planet in the solar system
- Z) earth's magnetic field undergoes reversals

ANSWER: W) THE GROUND BENEATH OUR FEET GETS HOTTER AND DENSER AS YOU GO INWARD

REGIONAL ROUND 13B

TOSS-UP

1. *BIOLOGY Short Answer* RNA makes DNA by what process?

ANSWER: REVERSE TRANSCRIPTION

BONUS

1. *BIOLOGY Short Answer* Disposal of CO₂ is controlled by what part of the brain?

ANSWER: MEDULLA

TOSS-UP

2. *GENERAL SCIENCE Short Answer* What is the name for the system in the US to designate wire diameter in electrical wiring or the thickness of metal sheet material?

ANSWER: AMERICAN WIRE GAUGE

BONUS

2. *GENERAL SCIENCE Short Answer* What compound can be created by replacing hydrogen atoms of a hydrocarbon with bromine or other halogen atoms for use in items such as fire extinguishers, yet has been found to be destructive to the earth's ozone layer?

ANSWER: HALONS

TOSS-UP

3. *CHEMISTRY Multiple Choice* Colligative properties depend on

- W) the chemical properties of the solute
- X) the chemical properties of the solvent
- Y) the number of particles dissolved
- Z) the molar mass of the solute

ANSWER: Y) THE NUMBER OF PARTICLES DISSOLVED

BONUS

3. *CHEMISTRY Short Answer* The carbon of the carbonyl is bonded to how many atoms?

ANSWER: THREE

TOSS-UP

4. *GENERAL SCIENCE Short Answer* What is the term for a pronounced bend in layers of rock?

ANSWER: FOLD

BONUS

4. *GENERAL SCIENCE Short Answer* What type of steel contains chromium, nickel, or other elements to impart particular physical, mechanical, or chemical properties?

ANSWER: ALLOY STEEL

TOSS-UP

5. *MATH Multiple Choice* The discovery by Newton and Leibniz, now called the Fundamental Theorem of Calculus, describes the

- W) connection between integration and differentiation
- X) mean value for continuous functions
- Y) existence of Riemann sums
- Z) existence of limits

ANSWER: W) CONNECTION BETWEEN INTEGRATION AND DIFFERENTIATION

BONUS

5. *MATH Short Answer* The focus of the parabola $4y = x^2$ is at the point

ANSWER: (0,1) (read: zero - one)

TOSS-UP

6. *BIOLOGY Short Answer* Which single- celled animals move by means of pseudopodia?

ANSWER: AMOEBAS

BONUS

6. *BIOLOGY Multiple Choice* *E. coli* normally lives in the large intestine. It is a:

- W) bacterium
- X) fungus
- Y) protozoan
- Z) virus

ANSWER: W) BACTERIUM

TOSS-UP

7. *EARTH SCIENCE Short Answer* What is the plowing of a hill along lines of equal elevation rather than up and down called?

ANSWER: CONTOUR PLOWING

BONUS

7. *EARTH SCIENCE Multiple Choice* Which of the following were an important group of animals during the Mesozoic?

- W) Trilobites
- X) jellyfish
- Y) dinosaurs
- Z) mammals

ANSWER: Y) DINOSAURS

TOSS-UP

8. *CHEMISTRY Multiple Choice* The solid in this list NOT expected to dissolve readily in acid is

- W) AgCl
- X) Mg(OH)₂
- Y) CaCO₃
- Z) MnSO₃

ANSWER: W) AgCl

BONUS

8. *CHEMISTRY Multiple Choice* Applying a pressure greater than the osmotic pressure to a solution in contact with a semipermeable membrane to force solvent from the solution is

- W) deliquescence
- X) osmosis
- Y) the Tyndall effect
- Z) reverse osmosis

ANSWER: Z) REVERSE OSMOSIS

TOSS-UP

9. *GENERAL SCIENCE Short Answer* What is the name for the study of the interactions of organisms with one another and with their physical environments?

ANSWER: ECOLOGY

BONUS

9. *GENERAL SCIENCE Short Answer* A person flying over the Chernobyl site two days after the explosion would most probably have experienced what type of exposure to radioactive substances?

ANSWER: ACUTE

TOSS-UP

10. *BIOLOGY Multiple Choice* Which of the following is not one of the three parts of the hindbrain?

- W) pons
- X) thalamus
- Y) medulla oblongata
- Z) cerebellum

ANSWER: X) THALAMUS

BONUS

10. *BIOLOGY Short Answer* Down's Syndrome is trisomy of which chromosome?

ANSWER: #21

TOSS-UP

11. *GENERAL SCIENCE Short Answer* What is the name for the effect caused by the buildup of heat in an urban area due to a concentration of cars, buildings, and road surfaces?

ANSWER: URBAN HEAT ISLAND

BONUS

11. *GENERAL SCIENCE Short Answer* What is the name for the system of water law that gives anyone whose land adjoins a flowing stream the right to use water from a stream as long as some is left for downstream users?

ANSWER: RIPARIAN RIGHTS

TOSS-UP

12. *COMPUTER SCIENCE Short Answer* What is the symbol affixed to systems and components that denotes lower power-consumption design to encourage personal computer manufacturers to build systems that are energy efficient?

ANSWER: ENERGY STAR

BONUS

12. *COMPUTER SCIENCE Short Answer* On the Internet, what is the name for the instructions that govern the breakup of data messages into packets, the routing of the packets from sender to destination network and station, and the reassembly of the packets into the original data messages at the destination?

ANSWER: INTERNET PROTOCOL (ACCEPT: IP)

TOSS-UP

13. *PHYSICS Multiple Choice* As an object is lowered into a deep hole in the surface of the earth, which of the following must be assumed in regard to its potential energy?

- W) increase
- X) decrease
- Y) remain constant
- Z) cannot tell from the information given

ANSWER: X) DECREASE

BONUS

13. *PHYSICS Short Answer* In a 2-dimensional Cartesian coordinate system the y-component of a given vector is equal to that vector's magnitude multiplied by which trigonometric function, with respect to the angle between vector and y axis.

ANSWER: SINE

TOSS-UP

14. *BIOLOGY Multiple Choice* During meiosis, major gene reshuffling takes place as a result of crossing over in

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

ANSWER: W) PROPHASE I

BONUS

14. *BIOLOGY Short Answer* A neuron starts an action potential due to the influx of what ion?

ANSWER: SODIUM

TOSS-UP

15. *GENERAL SCIENCE Short Answer* What is the looplike bend of a river channel called?

ANSWER: MEANDER

BONUS

15. *GENERAL SCIENCE Short Answer* What is the generic term for hydroelectric power systems that use water pressure from a drop of a few hundred feet to drive a generator?

ANSWER: "LOW HEAD" HYDRO

TOSS-UP

16. *COMPUTER SCIENCE Short Answer* What is the application or suite of applications used for viewing or creating maps?

ANSWER: GEOGRAPHIC INFORMATION SYSTEMS (ACCEPT: GIS)

BONUS

16. *COMPUTER SCIENCE Multiple Choice* Which of the following is stored in the system catalogs of a DBMS?

- W) conceptual schema
- X) external schema
- Y) physical schema
- Z) all of the above

ANSWER: Z) ALL OF THE ABOVE

TOSS-UP

17. *EARTH SCIENCE Multiple Choice* The Earth's core consists mainly of

- W) Oxygen
- X) Aluminum
- Y) Silicon
- Z) Iron

ANSWER: Z) IRON

BONUS

17. *CHEMISTRY Short Answer* The energy required to increase the surface area of a liquid by a given amount is known as what?

ANSWER: SURFACE TENSION

TOSS-UP

18. *GENERAL SCIENCE Multiple Choice* The names Watson & Crick are associated with;

- W) early exploration of the African continent
- X) the structure of DNA
- Y) fictional detective mysteries
- Z) the most current theory of star formation

ANSWER: X) THE STRUCTURE OF DNA

BONUS

18. *GENERAL SCIENCE Short Answer* What is the term used to describe the development of an organism from an unfertilized egg?

ANSWER: PARTHENOGENESIS

TOSS-UP

19. *ASTRONOMY Short Answer* Name the swiftest revolving planet in our solar system.

ANSWER: MERCURY

BONUS

19. *ASTRONOMY Multiple Choice* What evidence can we see today of planetesimals?

- W) the asteroid belt
- X) the Oort Cloud and Kuiper Belt
- Y) the many craters seen on the ancient surfaces of Solar System objects
- Z) all of the above

ANSWER: Z) ALL OF THE ABOVE

TOSS-UP

20. *PHYSICS Short Answer* A cyclist applies an average of 100 Newton-meters of torque to the axle of the bicycle. The pedals rotate at 1 revolution per second. What is the average power in Watts produced by the cyclist?

ANSWER: 628 WATTS

BONUS

20. *PHYSICS Multiple Choice* In a 2-dimensional Cartesian system, the x-component of a vector is known, and the angle between the vector and x-axis is known. Which operation is used to calculate the magnitude of the vector (taken with respect to the x-component)?

- W) dividing by cosine
- X) dividing by sine
- Y) multiplying by cosine
- Z) multiplying by sine

ANSWER: W) DIVIDING BY COSINE

TOSS-UP

21. *BIOLOGY Short Answer* What layer of the meninges is closest to the brain?

ANSWER: PIA MATER

BONUS

21. *BIOLOGY Short Answer* Rickets is a disease caused by a deficiency of what vitamin?

ANSWER: VITAMIN D

TOSS-UP

22. *CHEMISTRY Short Answer* What is the atomic number of iodine?

ANSWER: 53

BONUS

22. *CHEMISTRY Short Answer* A stereoisomer in which substituents are located on the same side of a double bond is known as what kind of isomer?

ANSWER: CIS

TOSS-UP

23. *MATH Short Answer* One disk is selected at random from a set of nine disks numbered 1 through 9. What is the probability that the number on the selected disk is 2,3 or 4?

ANSWER: 33_% OR _

BONUS

23. *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

24. *ASTRONOMY Short Answer* Within one year, when were the nine rings of Uranus discovered?

ANSWER: 1977 (ACCEPT 1976-1978)

BONUS

24. *ASTRONOMY Multiple Choice* Neptune's moon Triton differs from all other large satellites in the Solar System in what way?

- W) it orbits backward compared to its planet's rotation
- X) it has an icy surface
- Y) it has enormous fissures
- Z) some of its impact craters have been modified

ANSWER: W) IT ORBITS BACKWARD COMPARED TO ITS PLANET'S ROTATION

TOSS-UP

25. *CHEMISTRY Short Answer* What family of compounds contains a carbonyl group (C=O: carbon double bond oxygen) whose carbon is attached to two other carbon atoms?

ANSWER: KETONES

BONUS

25. *CHEMISTRY Multiple Choice* Based upon position in the periodic table, the least electronegative element of this set is

- W) Rubidium
- X) Silver
- Y) Tin
- Z) Iodine

ANSWER: W) RUBIDIUM

REGIONAL ROUND 14B

TOSS-UP

1. *COMPUTER SCIENCE Multiple Choice* In terms of measures of capacity, 10^{12} bytes of data is abbreviated

- W) kilo or K
- X) tera or T
- Y) mega or M
- Z) giga or G

ANSWER: X) TERA or T

BONUS

1. *COMPUTER SCIENCE Multiple Choice* In the United States what branch of the government would use .gov to identify its Internet address?

- W) federal government agencies
- X) nonmilitary federal government agencies
- Y) state government agencies
- Z) city government agencies

ANSWER: X) NONMILITARY FEDERAL GOVERNMENT AGENCIES

TOSS-UP

2. *CHEMISTRY Short Answer* A solution with a pH of 2 has a hydrogen ion concentration that is how many times as great as a solution with a pH of 5?

ANSWER: 1000

BONUS

2. *CHEMISTRY Multiple Choice* Which of the following is the strongest acid?

- W) HClO_3
- X) HBrO_3
- Y) HIO_3
- Z) HIO_2

ANSWER: W) HClO_3

TOSS-UP

3. *EARTH SCIENCE Multiple Choice* As they move, all waves at the ocean's surface have

- W) breakers
- X) the same frequency
- Y) the same wavelength
- Z) the same general shape

ANSWER: Z) THE SAME GENERAL SHAPE

BONUS

3. *EARTH SCIENCE Short Answer* Coherent, irregularly shaped masses that form in sediments, with compositions different from the surrounding materials, are termed what?

ANSWER: CONCRETIONS

TOSS-UP

4. *COMPUTER SCIENCE Short Answer* What is the term used to describe a freestanding computer or terminal that provides information to the public, usually through a multimedia display?

ANSWER: KIOSK

BONUS

4. *COMPUTER SCIENCE Short Answer* In 1997, in a six-game match, the IBM RS/6000 SP supercomputer defeated a world champion chess player making it the first time a computer had beaten a player of his caliber. Who was the human chess player?

ANSWER: GARY KASPAROV

TOSS-UP

5. *GENERAL SCIENCE Short Answer* What is the name for widespread malnutrition and starvation in a particular area because of a shortage of food caused by catastrophic events?

ANSWER: FAMINE

BONUS

5. *GENERAL SCIENCE Short Answer* When reproductively isolated populations diverge in morphology and behavior, they are said to what?

ANSWER: SPECIATE

TOSS-UP

6. *COMPUTER SCIENCE Short Answer* What was the dimension of the now obsolete floppy disk used before 1987 and the introduction of the 3 ½ inch disk?

ANSWER: 5 ¼ INCH

BONUS

6. *COMPUTER SCIENCE Short Answer* What is the term used to describe a form of computer architecture that uses hundreds or thousands of inexpensive microprocessors to perform many operations simultaneously?

ANSWER: MASSIVELY PARALLEL

TOSS-UP

7. *GENERAL SCIENCE Multiple Choice* An example of potential energy is

- W) electricity flowing through a wire
- X) the chemical energy in a candy bar
- Y) a bullet fired at high velocity
- Z) a leaf falling from a tree

ANSWER: X) THE CHEMICAL ENERGY IN A CANDY BAR

BONUS

7. *GENERAL SCIENCE Multiple Choice* The obvious relationship demonstrated by a food chain is

- W) competition
- X) predation
- Y) parasitism
- Z) commensalism

ANSWER: X) PREDATION

TOSS-UP

8. *EARTH SCIENCE Multiple Choice* The heat that produces magma is caused in part by

- W) gravity
- X) magnetic fields
- Y) radioactivity
- Z) solar energy

ANSWER: Y) RADIOACTIVITY

BONUS

8. *EARTH SCIENCE Short Answer* If the boundary between a cold air mass and a warm air mass doesn't move, what is the name given to the front that is produced between them?

ANSWER: STATIONARY FRONT

TOSS-UP

9. *CHEMISTRY Short Answer* What is the name of the isotope of hydrogen having atomic mass number 3?

ANSWER: TRITIUM

BONUS

9. *CHEMISTRY Multiple Choice* What process uses a boiling 30% sodium hydroxide solution to extract aluminum from its ore?

- W) Bayer
- X) Hall- Heroult
- Y) Dow
- Z) Frasch

ANSWER: X) HALL-HEROULT

TOSS-UP

10. *COMPUTER SCIENCE Short Answer* What is the name of the PC chip that Intel began shipping in 1993 with 3.1 million transistors on it; operating twice as fast as the best previous Intel chip?

ANSWER: PENTIUM

BONUS

10. *COMPUTER SCIENCE Multiple Choice* The digital imaging process that maps graytones in a blank-and-white image to distinct colors, producing sharper color contrasts for improved visibility is called:

- W) pseudocoloring
- X) quantizing
- Y) hue-shifting
- Z) none of the above

ANSWER: W) PSEUDOCOLORING

TOSS-UP

11. *PHYSICS Short Answer* Three 8.0 Ohm resistors are connected in parallel. What is their equivalent resistance?

ANSWER: 2.7 OHMS

BONUS

11. *PHYSICS Multiple Choice* As a gust of wind blows across a field of grain, a wave can be seen to move across the field as the tops of the plants sway back and forth. This wave is a

- W) transverse wave
- X) longitudinal wave
- Y) polarized wave
- Z) interference of waves

ANSWER: X) LONGITUDINAL WAVE

TOSS-UP

12. *EARTH SCIENCE Multiple Choice* Pure compression forces cause what general kind of fault?

- W) normal
- X) strike-slip
- Y) reverse
- Z) oblique-slip

ANSWER: Y) REVERSE

BONUS

12. *EARTH SCIENCE Multiple Choice* Carbon-14 dating is useful for determining the ages of archeological artifacts, but not of most rocks, because

- W) carbon is less abundant than silicon
- X) carbon-14 is radioactive
- Y) rocks absorb carbon dioxide from the air
- Z) the half-life of carbon-14 is too short

ANSWER: Z) THE HALF-LIFE OF CARBON-14 IS TOO SHORT

TOSS-UP

13. *COMPUTER SCIENCE Short Answer* What does the acronym SDSL mean?

ANSWER: SYMMETRIC DIGITAL SUBSCRIBER LINE

BONUS

13. *COMPUTER SCIENCE Multiple Choice* A T3 carrier can:

- W) handle 6,000 Mega bytes per second or 96 voice channels
- X) handle 12,000 Mega bytes per second or 192 voice channels
- Y) handle 24,000 Mega bytes per second or 384 voice channels
- Z) handle 44, 736 Mega bytes per second or 672 voice channels

ANSWER: Z) HANDLE 44, 736 MEGA BYTES PER SECOND OR 672 VOICE CHANNELS

TOSS-UP

14. *BIOLOGY Multiple Choice* In the human body the efficiency of the complete aerobic breakdown of a molecule of glucose is approximately

- W) 5 percent
- X) 20 percent
- Y) 40 percent
- Z) 60 percent

ANSWER: Y) 40 PERCENT

BONUS

14. *BIOLOGY Short Answer* The acceptor molecule that captures carbon dioxide during the Calvin cycle is called

ANSWER: RIBULOSE BISPSPHATE

TOSS-UP

15. *PHYSICS Multiple Choice* If a wave pulse is reflected from a free boundary, which of the following choices best describes what happens to the reflected pulse?

- W) becomes inverted
- X) remains upright
- Y) halved in amplitude
- Z) doubled in amplitude

ANSWER: X) REMAINS UPRIGHT

BONUS

15. *PHYSICS Multiple Choice* If cooking is done using an aluminum pan over an electric burner, which of the following will not promote the rate of heat flow from burner to food?

- W) increase pan bottom thickness
- X) increase pan bottom area
- Y) increase burner temperature
- Z) decrease height of pan sides

ANSWER: W) INCREASE PAN BOTTOM THICKNESS

TOSS-UP

16. *CHEMISTRY Short Answer* What sort of formal charge would you find on a nitrogen atom with two bonds and two lone pairs?

ANSWER: -1

BONUS

16. *CHEMISTRY Multiple Choice* A certain organic compound has a vapor pressure of 132 mm Hg at 54 Degrees C. To determine the vapor pressure of 2.00 moles of the compound at 37 Degrees C, taking the heat of vaporization for the compound to be 4.33×10^4 J/mole, you would use

- W) the Arrhenius equation
- X) the Clausius- Clapeyron equation
- Y) the combined gas laws
- Z) Raoult's law

ANSWER: X) THE CLAUSIUS- CLAPEYRON EQUATION

TOSS-UP

17. *PHYSICS Short Answer* How many radians are there in 360° ?

ANSWER: 2 (π) (READ AS: TWO PIE)

BONUS

17. *PHYSICS Multiple Choice* If the frequency of a traveling wave train is increased by a factor of three in a medium where the velocity is constant, which of the following is the result?

- W) amplitude is one third as big
- X) amplitude is tripled
- Y) wavelength is one third as big
- Z) wavelength is tripled

ANSWER: Y) WAVELENGTH IS ONE THIRD AS BIG

TOSS-UP

18. *CHEMISTRY Multiple Choice* As an electron moves from the $n = 5$ to the $n = 3$ level

- W) a photon is emitted
- X) a photon is absorbed
- Y) energy is absorbed
- Z) the energy of the electron is increased

ANSWER: W) A PHOTON IS EMITTED

BONUS

18. *CHEMISTRY Multiple Choice* Which is the proper order of increasing electronegativity?

- W) Carbon, Oxygen, Nitrogen, Hydrogen
- X) Oxygen, Nitrogen, Carbon, Hydrogen
- Y) Nitrogen, Oxygen, Hydrogen, Carbon
- Z) Oxygen, Carbon, Nitrogen, Hydrogen

ANSWER: X) OXYGEN, NITROGEN, CARBON, HYDROGEN

TOSS-UP

19. *BIOLOGY Multiple Choice* In size, rotifers would be most comparable to which of the following?

- W) flukes
- X) nematodes
- Y) protistans
- Z) jellyfishes

ANSWER: Y) PROTISTANS

BONUS

19. *BIOLOGY Short Answer* Who was the famous 17th century Belgian scientist who contributed to the understanding of photosynthesis by growing a willow tree in 200 lbs of soil for five years?

ANSWER: JOHANN BAPTISTA VAN HELMONT (accept: VAN HELMONT)

TOSS-UP

20. *GENERAL SCIENCE Short Answer* What island in the Caribbean was devastated by volcanic eruption in 1998?

ANSWER: MONTSERRAT

BONUS

20. *GENERAL SCIENCE Short Answer* One acre equals how many square rods?

ANSWER: 160

TOSS-UP

21. *CHEMISTRY Short Answer* What element has the electron configuration: $1s^2 2s^2 2p^6 3s^2$?

ANSWER: MAGNESIUM (ACCEPT: Mg)

BONUS

21. *CHEMISTRY Multiple Choice* What product forms at the cathode during the electrolysis of molten lithium iodide?

- W) Li^+
- X) Li
- Y) I^-
- Z) I_2

ANSWER: X) Li

TOSS-UP

22. *PHYSICS Short Answer* The two ends of a 3 Ohm resistor are connected to a 9 V battery. What is the total power (in watts) delivered by the battery to the circuit?

ANSWER: 27.0 W

BONUS

22. *PHYSICS Multiple Choice* Active solar heating involves the use of

- W) convection currents
- X) air locks
- Y) pumps
- Z) the greenhouse effect

ANSWER: Y) PUMPS

TOSS-UP

23. *GENERAL SCIENCE Short Answer* What is the name for a body of water which separates an island from the mainland?

ANSWER: SOUND

BONUS

23. *GENERAL SCIENCE Short Answer* What is the name for a coral reef that partially or completely surrounds a lagoon?

ANSWER: ATOLL

TOSS-UP

24. *COMPUTER SCIENCE Short Answer* What is the term used to describe a program associated with UNIX systems that performs a housekeeping or maintenance utility function without being caused by the user?

ANSWER: DAEMON

BONUS

24. *COMPUTER SCIENCE Short Answer* A network organization in which all of the nodes are connected to and communicate through a single point or hub has what type of topology?

ANSWER: STAR

TOSS-UP

25. *BIOLOGY Short Answer* Fibrinogen becomes fibrin in the presence of what enzyme?

ANSWER: THROMBIN

BONUS

25. *BIOLOGY Multiple Choice* Urokinase is an enzyme which can be used to

- W) dissolve clots
- X) replace white blood cells
- Y) transfuse blood
- Z) treat wounds

ANSWER: W) DISSOLVE CLOTS

REGIONAL ROUND 15B

TOSS-UP

1. *ASTRONOMY Multiple Choice* We don't get eclipses every month. This is because

- W) the Earth's rotation axis is tilted with respect to its orbit
- X) the Moon's orbit is tilted with respect to the Earth's orbit
- Y) the Earth's orbit is elliptical
- Z) the Moon's orbit is elliptical

ANSWER: X) THE MOON'S ORBIT IS TILTED WITH RESPECT TO THE EARTH'S ORBIT

BONUS

1. *ASTRONOMY Multiple Choice* An astronomer finds that the spectrum of a mysterious object shows bright emission lines. What can she conclude about the source?

- W) it contains cold gas
- X) it is an incandescent solid body
- Y) it contains hot, relatively tenuous gas
- Z) it is moving toward Earth at high speed

ANSWER: Y) IT CONTAINS HOT, RELATIVELY TENUOUS GAS

TOSS-UP

2. *GENERAL SCIENCE Short Answer* What is the term for the instant or the day that the earth is farthest away from the sun?

ANSWER: APOGEE

BONUS

2. *GENERAL SCIENCE Short Answer* What is the term for the transitional zone in which one type of ecosystem tends to merge with another ecosystem?

ANSWER: ECOTONE

TOSS-UP

3. *EARTH SCIENCE Multiple Choice* What forms when streams enter bodies of standing water, undergo an abrupt loss of velocity, and drop their load of sediment?

- W) alluvial fans
- X) meanders
- Y) falls
- Z) deltas

ANSWER: Z) DELTAS

BONUS

3. *EARTH SCIENCE Multiple Choice* The accumulation of clay minerals is the greatest in which of the following horizons of the soil profile?

- W) A
- X) B
- Y) C
- Z) D

ANSWER: X) B

TOSS-UP

4. *ASTRONOMY Multiple Choice* For what type of object is the period-luminosity relation used for determining distances?

- W) RR Lyrae variables (pron: lea-ray)
- X) Cepheids
- Y) Cataclysmic variables
- Z) 21 centimeter radiation

ANSWER: X) CEPHEIDS

BONUS

4. *ASTRONOMY Multiple Choice* During spring tide

- W) the tidal range is unusually small
- X) the tidal range is average
- Y) the tidal range is unusually large
- Z) tides happen more frequently

ANSWER: Y) THE TIDAL RANGE IS UNUSUALLY LARGE

TOSS-UP

5. *GENERAL SCIENCE Short Answer* What is the term for soil or other material which can pass through a 75 micron sieve?

ANSWER: FINES

BONUS

5. *GENERAL SCIENCE Short Answer* Farmers that grow only enough food to feed their families are termed what kind of farmers?

ANSWER: SUBSISTENCE

TOSS-UP

6. *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

6. *MATH Multiple Choice* Find the distance between the two points (0,7) (read as: zero comma seven and (3,3) (read as: three comma three)

- W) 4
- X) square root of 5
- Y) 3
- Z) 5

ANSWER: Z) 5

TOSS-UP

7. *COMPUTER SCIENCE Short Answer* What is the area on the display screen in a Windows or Macintosh application used for accessing a number of single-mouse-click commands?

ANSWER: TOOLBAR

BONUS

7. *COMPUTER SCIENCE Short Answer* What is the name for a serial bus that has a bandwidth of 1.5 Mega bytes per second and is used for connecting multiple peripherals to a microcomputer?

ANSWER: USB OR UNIVERSAL SERIAL BUS

TOSS-UP

8. *GENERAL SCIENCE Multiple Choice* Gasohol is gasoline mixed with

- W) ethanol
- X) methane
- Y) methanol
- Z) butane

ANSWER: W) ETHANOL

BONUS

8. *GENERAL SCIENCE Short Answer* What is the term for a volcanic crater several miles in diameter?

ANSWER: CALDERA

TOSS-UP

9. *MATH Short Answer* Evaluate $\sum_{i=1}^{100} 1 = ?$ (read as: summation from i equals 1 to 100 of the quantity "one" equals)

ANSWER: 100

BONUS

9. *MATH Short Answer* Suppose $f(x) = (x^4 + x + 7)^{100}$, (read as: F of X equals the quantity X to the fourth plus X plus 7 end quantity to the 100th power) what is df/dx ? (read as: D F D X)

ANSWER: $100(x^4 + x + 7)^{99}(4x^3 + 1)$

TOSS-UP

10. *ASTRONOMY Multiple Choice* There is little or no interstellar dust or gas in which of the following galaxy types?

- W) spirals
- X) ellipticals
- Y) barred spirals
- Z) irregulars

ANSWER: X) ELLIPTICALS

BONUS

10. *ASTRONOMY Multiple Choice* Which kind of photon has the highest energy?

- W) Ultraviolet
- X) Visible
- Y) X-Ray
- Z) Infrared

ANSWER: Y) X-RAY

TOSS-UP

11. *GENERAL SCIENCE Multiple Choice* The human population of Ireland experienced a major crash as a result of

- W) the plague
- X) the potato fungus
- Y) an influenza epidemic
- Z) a prolonged drought

ANSWER: X) THE POTATO FUNGUS

BONUS

11. *GENERAL SCIENCE Short Answer* What do materials lose when the surrounding temperature exceeds the "Curie point"?

ANSWER: MAGNETISM

TOSS-UP

12. *MATH Short Answer* Using radians as the unit of angle measurement, what is the number of radians in an arbitrary angle θ placed at the center of a circle with radius r subtending an arc of length s ?

ANSWER: s/r

BONUS

12. *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

13. *CHEMISTRY Short Answer* When subjected to the flame test, a solution that contains Potassium+ ions will produce what color?

ANSWER: VIOLET (ACCEPT: PURPLE)

BONUS

13. *CHEMISTRY Multiple Choice* The most active metals are usually reduced by

- W) electrolysis
- X) roasting sulfide ores in air
- Y) reaction with carbon or hydrogen
- Z) None of these statements is true

ANSWER: W) ELECTROLYSIS

TOSS-UP

14. *BIOLOGY Multiple Choice* The human body contains about how many different amino acids?

- W) 3
- X) 10
- Y) 12
- Z) 20

ANSWER: Z) 20

BONUS

14. *BIOLOGY Multiple Choice* Hominids are characterized as being

- W) insectivores
- X) herbivores
- Y) carnivores
- Z) omnivores

ANSWER: Z) OMNIVORES

TOSS-UP

15. *COMPUTER SCIENCE Short Answer* What does the acronym DVD mean?

ANSWER: DIGITAL VERSATILE DISC

BONUS

15. *COMPUTER SCIENCE Multiple Choice* The binary number 00101010 represents the character

- W) / (read as: forward slash)
- X) & (read as: ampersand)
- Y) - (read as: minus sign)
- Z) + (read as: plus sign)

ANSWER: Z) + (READ AS: PLUS SIGN)

TOSS-UP

16. *GENERAL SCIENCE Short Answer* What is the name for plants that use their roots to attach themselves to branches high in trees?

ANSWER: EPIPHYTES

BONUS

16. *GENERAL SCIENCE Short Answer* What is the name for the condition where a cold front overtakes a warm front and the denser cold air flows under the less dense warm air?

ANSWER: OCCLUDED FRONT

TOSS-UP

17. *BIOLOGY Multiple Choice* Prokaryotic cells do NOT have

- W) ribosomes
- X) membrane-bound nuclei
- Y) cytoplasm
- Z) a plasma membrane

ANSWER: X) MEMBRANE-BOUND NUCLEI

BONUS

17. *BIOLOGY Short Answer* If the cardiac output is 4800 milliliters per minute, and the heart rate is 60 beats per minute, what is the stroke volume?

ANSWER: 80 MILLILITERS/ BEAT

TOSS-UP

18. *CHEMISTRY Short Answer* Structural isomers that easily interconvert are called

ANSWER: TAUTOMERS

BONUS

18. *CHEMISTRY Multiple Choice* The form of spontaneous radioactive decay in which the atomic number increases is

- W) beta decay
- X) positron decay
- Y) fusion
- Z) electron capture

ANSWER: W) BETA DECAY

TOSS-UP

19. *BIOLOGY Short Answer* The body's first line of defense against potentially harmful organisms is what organ?

ANSWER: SKIN

BONUS

19. *BIOLOGY Multiple Choice* Green algae are similar to land plants in all but which of the following characteristics?

- W) types and proportions of photosynthetic pigments
- X) storage of carbohydrate in the form of starch
- Y) cell walls composed of cellulose
- Z) haploid dominant life cycles

ANSWER: Z) HAPLOID DOMINANT LIFE CYCLES

TOSS-UP

20. *EARTH SCIENCE Short Answer* Humans first appeared during which Period of geologic time?

ANSWER: QUATERNARY (ACCEPT: NEOGENE)

BONUS

20. *EARTH SCIENCE Multiple Choice* The minerals found in the B and C horizons were dissolved and carried down to those soil layers by what process?

- W) oxidation
- X) leaching
- Y) disintegration
- Z) precipitation

ANSWER: X) LEACHING

TOSS-UP

21. *GENERAL SCIENCE Short Answer* Furniture stuffing, paneling, particle board, and foam insulation may be sources of which dangerous indoor air pollutant?

ANSWER: FORMALDEHYDE

BONUS

21. *GENERAL SCIENCE Multiple Choice* The greatest threat to human health generally comes from radioisotopes with

- W) short half-lives
- X) intermediate half-lives
- Y) long half-lives
- Z) none of the above

ANSWER: X) INTERMEDIATE HALF-LIVES

TOSS-UP

22. *CHEMISTRY Short Answer* What is the bond angle of a trigonal planar arrangement of electrons in degrees?

ANSWER: 120

BONUS

22. *CHEMISTRY Short Answer* The escape of gas through a small hole in a container is known as

ANSWER: EFFUSION

TOSS-UP

23. *GENERAL SCIENCE Short Answer* Under whose presidency in 1905 was the first wildlife refuge opened and the US Forest Service established?

ANSWER: THEODORE ROOSEVELT

BONUS

23. *GENERAL SCIENCE Short Answer* What is the term used for the movement of particles obliquely up and down the slope of a beach?

ANSWER: BEACH DRIFT

TOSS-UP

24. *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)

BONUS

24. *MATH Multiple Choice* In applying calculus to economics problems of manufacturing costs and revenues, the maximum profit occurs when

- W) marginal revenue equals marginal cost
- X) marginal revenue is greater than marginal cost
- Y) marginal revenue is less than marginal cost
- Z) none of the above

ANSWER: W) MARGINAL REVENUE EQUALS MARGINAL COST

TOSS-UP

25. *BIOLOGY Short Answer* In the cell, the nucleotide most closely associated with energy transfer in the cell is

ANSWER: ATP

BONUS

25. *BIOLOGY Short Answer* In plants, what hormone controls the rate of transpiration?

ANSWER: ABSCISIC ACID

REGIONAL ROUND 16B

TOSS-UP

1. *COMPUTER SCIENCE Multiple Choice* Which of the following is also a UNIX operating system?

- W) AIX
- X) A/UX (read as: A forward slash U X)
- Y) Mach
- Z) all of the above

ANSWER: Z) ALL OF THE ABOVE

BONUS

1. *COMPUTER SCIENCE Short Answer* What is the term used to describe an executable program file that contains one or more compressed text or data files?

ANSWER: SELF-EXTRACTING FILE

TOSS-UP

2. *EARTH SCIENCE Short Answer* What is a wide, flat area of small-grained sediments found on either side of a river called?

ANSWER: FLOOD PLAIN

BONUS

2. *EARTH SCIENCE Multiple Choice* Which of the following rock types is most likely to be composed of shells?

- W) shale
- X) anhydrite
- Y) sandstone
- Z) limestone

ANSWER: Z) LIMESTONE

TOSS-UP

3. *PHYSICS Short Answer* An electrical circuit in which the voltage across every circuit element must be the same is called what kind of circuit?.

ANSWER: PARALLEL

BONUS

3. *PHYSICS Multiple Choice* If an ideal gas does positive work on its surroundings, we may assume, with regard to the gas; its:

- W) temperature increases
- X) volume increases
- Y) pressure increases
- Z) internal energy decreases

ANSWER: X) VOLUME INCREASES

TOSS-UP

4. *CHEMISTRY Short Answer* The isotope that is the starting point in natural radioactive decay is known as what kind of isotope?

ANSWER: PARENT

BONUS

4. *CHEMISTRY Short Answer* What rule states that the major product in the formation of alkenes by elimination reactions will be the more highly substituted alkene?

ANSWER: THE ZAITSEV RULE

TOSS-UP

5. *BIOLOGY Multiple Choice* Which of the following statements is FALSE?

- W) shark's teeth are modified scales that are continuously shed and replaced.
- X) many fish use a swim bladder to provide buoyancy control.
- Y) the bony fishes were the ancestors of the cartilaginous fishes.
- Z) the ray-finned fishes are the most numerous and diverse of the fish groups.

ANSWER: Y) THE BONY FISHES WERE THE ANCESTORS OF THE CARTILAGINOUS FISHES

BONUS

5. *BIOLOGY Multiple Choice* Which of the following bacteria are the least related to the others?

- W) archaeobacteria
- X) extreme halophiles
- Y) chemosynthetic eubacteria
- Z) extreme thermophiles

ANSWER: Y) CHEMOSYNTHETIC EUBACTERIA

TOSS-UP

6. *MATH Multiple Choice* A simple and effective procedure for encoding and decoding messages uses matrices, where the decoding matrix is

- W) the inverse of the encoding matrix
- X) the identity matrix
- Y) a square matrix with the top row of all one's
- Z) none of the above

ANSWER: W) THE INVERSE OF THE ENCODING MATRIX

BONUS

6. *MATH Short Answer* A matrix that does not have an inverse is often referred to as a

ANSWER: SINGULAR MATRIX

TOSS-UP

7. *GENERAL SCIENCE Short Answer* All organic compounds are characterized by the presence of what element?

ANSWER: CARBON

BONUS

7. *GENERAL SCIENCE Short Answer* In 1985, scientists discovered a carbon molecule containing 60 carbon atoms arranged in a geodesic sphere. What is the nickname for this molecule?

ANSWER: BUCKY BALL

TOSS-UP

8. *CHEMISTRY Short Answer* The reactant that determines the amount of product that can be formed in a reaction is termed what reagent?

ANSWER: LIMITING

BONUS

8. *CHEMISTRY Multiple Choice* The functional group in the compound $\text{CH}_3\text{CH}_2\text{CHBrCH}_3$ is

- W) methyl-
- X) bromo-
- Y) ethyl-
- Z) butane

ANSWER: X) BROMO-

TOSS-UP

9. *EARTH SCIENCE Multiple Choice* What are two diseases that can be caused by germs in drinking water?

- W) typhoid and chlorine
- X) chlorine and smallpox
- Y) typhoid and cholera
- Z) cholera and fluoride

ANSWER: Y) TYPHOID AND CHOLERA

BONUS

9. *EARTH SCIENCE Multiple Choice* As an object moves from the mesosphere to the stratosphere, the amount of air pressure exerted on the object

- W) decreases
- X) remains the same
- Y) increases
- Z) increases and then decreases

ANSWER: Y) INCREASES

TOSS-UP

10. *BIOLOGY Short Answer* In plants, the hormones most closely associated with cell division are called what?

ANSWER: CYTOKININS

BONUS

10. *BIOLOGY Multiple Choice* The cell wall

- W) provides skeletal support for plants
- X) controls what enters and leaves a cell
- Y) functions as the plasma membrane in plant cells
- Z) is found in all eukaryotes

ANSWER: W) PROVIDES SKELETAL SUPPORT FOR PLANTS

TOSS-UP

11. *ASTRONOMY Multiple Choice* If a planet had its rotation axis perpendicular to its orbital plan (no tilt), its seasons would be

- W) shorter than those on Earth
- X) longer than those on Earth
- Y) the same as those on Earth
- Z) constant

ANSWER: Z) CONSTANT

BONUS

11. *ASTRONOMY Multiple Choice* If an object's spectral lines are shifted to longer wavelengths, the object is

- W) moving away from us
- X) moving toward us
- Y) very hot
- Z) very cold

ANSWER: W) MOVING AWAY FROM US

TOSS-UP

12. *PHYSICS Multiple Choice* The unit of electric resistance, the ohm, is dimensionally equivalent to which of the following?

- W) Volt/Amp (Volt per amp)
- X) Volt meter
- Y) Amp/Sec (Amp per second)
- Z) Amp meter

ANSWER: W) VOLT PER AMP

BONUS

12. *PHYSICS Short Answer* A 4 mole ideal gas system undergoes an adiabatic process where it expands and does 20 Joules of work on its environment. How much heat is received by the system?

ANSWER: ZERO

TOSS-UP

13. *ASTRONOMY Multiple Choice* A cloud of gases around the solid portion of a comet is known as the

- W) coma
- X) core
- Y) heart
- Z) nucleus

ANSWER: W) COMA

BONUS

13. *ASTRONOMY Multiple Choice* What physical property of a star does the spectral type measure?

- W) luminosity
- X) temperature
- Y) mass
- Z) composition

ANSWER: X) TEMPERATURE

TOSS-UP

14. *PHYSICS Multiple Choice* Which is not a force?

- W) gravity
- X) electrical force
- Y) electromotive force
- Z) friction

ANSWER: Y) ELECTROMOTIVE FORCE

BONUS

14. *PHYSICS Multiple Choice* When a magnetic field causes a charged particle to move in a circular path, the only quantity listed below which the magnetic force changes significantly as the particle goes around in a circle is the particle's

- W) energy
- X) momentum
- Y) radius for the circle
- Z) time to go around the circle once

ANSWER: X) MOMENTUM

TOSS-UP

15. *CHEMISTRY Short Answer* What is the oxidation number of oxygen when it is not in a peroxide?

ANSWER: -2

BONUS

15. *CHEMISTRY Short Answer* What element has the electron configuration: $1s^2 2s^2 2p^6 3s^1$?

ANSWER: SODIUM (ACCEPT: Na)

TOSS-UP

16. *ASTRONOMY Multiple Choice* The following planets are considered "sister" planets:

- W) Mercury and Mars
- X) Neptune and Jupiter
- Y) Uranus and Saturn
- Z) Earth and Venus

ANSWER: Z) EARTH AND VENUS

BONUS

16. *ASTRONOMY Multiple Choice* A ground-based telescope to observe x-rays would

- W) be a powerful tool for studying abnormally cold stars or distant planets
- X) give astronomers the chance to study the insides of stars and planets
- Y) be worthless because x-rays cannot get through the Earth's atmosphere
- Z) be worthless because astronomers have not yet devised detectors for x-rays

ANSWER: Y) BE WORTHLESS BECAUSE X-RAYS CANNOT GET THROUGH THE EARTH'S ATMOSPHERE

TOSS-UP

17. *CHEMISTRY Short Answer* Name the cycloaddition reaction between a conjugated diene and an alkene that produces a 1,4-addition product.

ANSWER: DIELS-ALDER

BONUS

17. *CHEMISTRY Multiple Choice* Calcium oxide will react with carbon dioxide to form calcium carbonate. Which species acts as a Lewis acid in the reaction?

- W) Ca^{2+} (read as: Calcium two-plus)
- X) O^{2-} (read as: Oxygen two minus)
- Y) CO_2 (read as: Carbon Dioxide)
- Z) CaCO_3 (read as: Calcium Carbonate)

ANSWER: Y) CO_2

TOSS-UP

18. *MATH Multiple Choice* If $f(x) = x + 1 - 5/x$, (read as: f of x equals x plus 1 minus five over x) then $f'(x)$ equals (read as: the first derivative of F of X)

- W) $1 - 5/x$
- X) $x + 5/x^2$
- Y) $1 - 5/x^2$
- Z) $1 + 5/x^2$

ANSWER: Z) $1 + 5/x^2$

BONUS

18. *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) 2π

ANSWER: Y) 4

TOSS-UP

19. *ASTRONOMY Multiple Choice* If an object moves along a curved path at a constant speed, you can infer that

- W) a force is acting on it
- X) it is accelerating
- Y) it is in uniform motion
- Z) both W and X are true

ANSWER: Z) BOTH W AND X ARE TRUE

BONUS

19. *ASTRONOMY Multiple Choice* The spoke-like features observed in the rings of Saturn are caused by

- W) holes in the rings-places where no ring material exists
- X) charged dust particles suspended by the magnetic field of the planet
- Y) dust particles within the ring
- Z) carbon dioxide molecules that absorb light incident upon the gas

ANSWER: X) CHARGED DUST PARTICLES SUSPENDED BY THE MAGNETIC FIELD OF THE PLANET

TOSS-UP

20. *COMPUTER SCIENCE Short Answer* What is the file extension that identifies a vector image encoded as a Windows metafile?

ANSWER: .WMF (READ AS: DOT W M F)

BONUS

20. *COMPUTER SCIENCE Short Answer* In an image, the term that expresses the number of horizontal pixels divided by the number of vertical pixels is called what

ANSWER: ASPECT RATIO

TOSS-UP

21. *BIOLOGY Short Answer* Who was the German botanist who first proposed that all plants consist of cells?

ANSWER: MATTHIAS SCHLEIDEN (ACCEPT: SCHLEIDEN)

BONUS

21. *BIOLOGY Multiple Choice* Which is NOT true of a plant hormone called gibberellin.

- W) breaks dormancy in seeds in buds
- X) first isolated from a fungus
- Y) causes stem elongation
- Z) triggers flower production

ANSWER: Z) TRIGGERS FLOWER PRODUCTION

TOSS-UP

22. *CHEMISTRY Short Answer* What type of chemical bond would you expect between a silicon atom and an oxygen atom?

ANSWER: POLAR COVALENT (ACCEPT: COVALENT)

BONUS

22. *CHEMISTRY Multiple Choice* A form of spontaneous radioactive decay in which the n/p ratio decreases is

- W) electron capture
- X) fusion
- Y) positron emission
- Z) beta decay

ANSWER: Z) BETA DECAY

TOSS-UP

23. *GENERAL SCIENCE Short Answer* What is the name for a cluster of islands such as the Galapagos?

ANSWER: ARCHIPELAGO

BONUS

23. *GENERAL SCIENCE Short Answer* The United States has already lost about what fraction of the original topsoil of the cropland in use today?

ANSWER: ONE-THIRD

TOSS-UP

24. *EARTH SCIENCE Short Answer* Older fragments enclosed within younger rock masses are called

ANSWER: INCLUSIONS (ACCEPT: XENOLITHS)

BONUS

24. *EARTH SCIENCE Multiple Choice* A cone of depression on the water table is caused by

- W) the jet flow of a waterfall
- X) an increase in groundwater recharge
- Y) pumping from a well
- Z) ice melting in an outwash plain

ANSWER: Y) PUMPING FROM A WELL

TOSS-UP

25. *CHEMISTRY Short Answer* Which state of matter is characterized by having an indefinite shape, but a definite volume?

ANSWER: LIQUID

BONUS

25. *CHEMISTRY Short Answer* What term describes the difference in energy between the two sets of orbitals that result from considering the approach of six point charges toward the central metal atom?

ANSWER: CRYSTAL FIELD SPLITTING ENERGY

REGIONAL ROUND 17B

TOSS-UP

1. *PHYSICS Multiple Choice* What is the phase difference when two waves, traveling in the same medium, that undergo constructive interference?

- W) 270 degrees
- X) 180 degrees
- Y) 90 degrees
- Z) zero degrees

ANSWER: Z) ZERO DEGREES

BONUS

1. *PHYSICS Short Answer* Name all four states of matter

ANSWER: SOLID, LIQUID, GAS, PLASMA

TOSS-UP

2. *ASTRONOMY Multiple Choice* The one terrestrial planet which rotates in the "wrong" way, meaning opposite to the other planet's spin direction, is

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

ANSWER: W) VENUS

BONUS

2. *ASTRONOMY Multiple Choice* Neptune was the last planet to be visited by which space probe?

- W) Voyager I
- X) Galileo
- Y) Voyager II
- Z) Magellan

ANSWER: Y) VOYAGER II

TOSS-UP

3. *PHYSICS Multiple Choice* Jeff throws a ball straight up. For which situation is the vertical velocity zero?

- W) on the way up
- X) at the top
- Y) on the way back down
- Z) none of the above

ANSWER: X) AT THE TOP

BONUS

3. *PHYSICS Multiple Choice* An object is attached to a spring and its frequency of oscillation is measured. Another object is connected to the first object, and the resulting mass is four times the original value. By what factor is the frequency of oscillation changed?

- W) 1/4
- X) $\frac{1}{2}$
- Y) 1/16
- Z) 4

ANSWER: X) $\frac{1}{2}$

TOSS-UP

4. *BIOLOGY Multiple Choice* Cholesterol is a(n)

- W) amino acid
- X) fatty acid
- Y) polysaccharide
- Z) steroid

ANSWER: Z) STEROID

BONUS

4. *BIOLOGY Multiple Choice* Which of the following animal groups does NOT have tissues?

- W) nematodes
- X) sponges
- Y) echinoderms
- Z) flatworms

ANSWER: X) SPONGES

TOSS-UP

5. *CHEMISTRY Multiple Choice* The most common isotope of hydrogen has

- W) 1 neutron and 1 electron
- X) 1 proton and 1 electron
- Y) 1 proton, 1 neutron, and 1 electron
- Z) 2 protons and 2 electrons

ANSWER: X) 1 PROTON AND 1 ELECTRON

BONUS

5. *CHEMISTRY Multiple Choice* Nuclear binding energies per nucleon are at a maximum around what element?

- W) protium
- X) deuterium
- Y) iron
- Z) uranium

ANSWER: Y) IRON

TOSS-UP

6. *ASTRONOMY Multiple Choice* At very high energies and temperatures, the four fundamental forces become

- W) divided into 7 forces
- X) unified
- Y) one dimensional
- Z) divided into 11 forces

ANSWER: X) UNIFIED

BONUS

6. *ASTRONOMY Multiple Choice* Which type of electromagnetic radiation has the longest wavelength?

- W) Visible
- X) X-ray
- Y) Infrared
- Z) Radio

ANSWER: Z) RADIO

TOSS-UP

7. *BIOLOGY Short Answer* Saturated fatty acids contain more covalently bonded atoms of this element than unsaturated fats.

ANSWER: HYDROGEN

BONUS

7. *BIOLOGY Short Answer* In mammals, water accumulation in the tissues is technically called

ANSWER: EDEMA

TOSS-UP

8. *CHEMISTRY Multiple Choice* Pure aluminum is not used in the fabrication of road signs because pure aluminum is

- W) heavier than alloyed aluminum
- X) too expensive to make
- Y) too soft to be durable
- Z) soluble in water

ANSWER: Y) TOO SOFT TO BE DURABLE

BONUS

8. *CHEMISTRY Short Answer* What is the order in which electrons fill atomic orbitals according to energy factors called?

ANSWER: AUFBAU BUILDUP

TOSS-UP

9. *PHYSICS Multiple Choice* Which of the following demonstrate the property of inertia?

- W) a car skidding on a slippery road
- X) a brick sitting on a table top
- Y) whipping a tablecloth out from under the dishes set on a table
- Z) all of the above

ANSWER: Z) ALL OF THE ABOVE

BONUS

9. *PHYSICS Short Answer* The specific nuclear fusion reaction involving Hydrogen which produces energy in the Sun is called what?

ANSWER: PROTON-PROTON CHAIN (ACCEPT: P-P CHAIN)

TOSS-UP

10. *BIOLOGY Short Answer* Large, round cells distributed throughout the body that are filled with small vesicles containing histamine are called

ANSWER: MAST CELLS

BONUS

10. *BIOLOGY Short Answer* The cellular organelle that is compared to a whip and used in locomotion is a

ANSWER: FLAGELLUM

TOSS-UP

11. *GENERAL SCIENCE Multiple Choice* The system responsible for growth, reproductive development, and much of our behavior is the

- W) circulatory system
- X) endocrine system
- Y) immune system
- Z) digestive system

ANSWER: X) ENDOCRINE SYSTEM

BONUS

11. *GENERAL SCIENCE Short Answer* What is the name for the molecules released by cells in damaged tissue that dilates capillaries and increases their tendency to leak fluid, such as associated with allergies and poison ivy?

ANSWER: HISTAMINES

TOSS-UP

12. *BIOLOGY Short Answer* The method of movement of molecules across a cell membrane that requires the expenditure of ATP molecules is called

ANSWER: ACTIVE TRANSPORT

BONUS

12. *BIOLOGY Short Answer* Desert- adapted plants, such as cacti, use a modified carbon pathway in photosynthesis called what?

ANSWER: CAM PATHWAY (CAM)

TOSS-UP

13. *EARTH SCIENCE Multiple Choice* Which of the following is an example of a biodegradable object?

- W) aluminum can
- X) glass bottle
- Y) plastic bottle
- Z) paper bag

ANSWER: Z) PAPER BAG

BONUS

13. *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

14. *CHEMISTRY Short Answer* What is the proper ratio of Lithium to Bromine?

ANSWER: 1:1 (READ: ONE TO ONE)

BONUS

14. *CHEMISTRY Short Answer* What is the name of FeBr₂.

ANSWER: IRON (II) BROMIDE (READ AS: IRON TWO BROMIDE)

TOSS-UP

15. *GENERAL SCIENCE Short Answer* What is the term for one full cycle of the phases of the moon, equal to 29.5 days?

ANSWER: LUNATION

BONUS

15. *GENERAL SCIENCE Short Answer* What is the scientific name for the study of animal behavior?

ANSWER: ETHOLOGY

TOSS-UP

16. *BIOLOGY Short Answer* Different, or alternative, forms of the same gene are called

ANSWER: ALLELES

BONUS

16. *BIOLOGY Short Answer* Plant tissue involved in regeneration following a wound to the plant is called

ANSWER: PARENCHYMA

TOSS-UP

17. *CHEMISTRY Multiple Choice* The detailed molecular-level picture of how a reaction might take place

- W) is the reaction mechanism
- X) is the transition state
- Y) is the reaction coordinate
- Z) is the activation energy

ANSWER: W) IS THE REACTION MECHANISM

BONUS

17. *CHEMISTRY Short Answer* Rank alpha radiation, beta radiation, and neutrons in terms of decreasing damage produced in tissue

ANSWER: ALPHA RADIATION, NEUTRONS, BETA RADIATION

TOSS-UP

18. *COMPUTER SCIENCE Short Answer* In the 1968 Stanley Kubrick's film 2001:A Space Odyssey, what was the name of the supercomputer?

ANSWER: HAL

BONUS

18. *COMPUTER SCIENCE Short Answer* What does the acronym TIFF mean?

ANSWER: TAGGED (OR TAG) IMAGE FILE FORMAT

TOSS-UP

19. *BIOLOGY Multiple Choice* Dietary or plant fiber is a nondigestible

- W) monosaccharide
- X) nucleic acid
- Y) polysaccharide
- Z) protein

ANSWER: Y) POLYSACCHARIDE

BONUS

19. *BIOLOGY Multiple Choice* A person with type B blood can receive which blood type(s) safely?

- W) A only
- X) B only
- Y) A and O
- Z) B and O

ANSWER: Z) B AND O

TOSS-UP

20. *EARTH SCIENCE Short Answer* What term refers to the part of the earth in which life exists?

ANSWER: BIOSPHERE

BONUS

20. *EARTH SCIENCE Multiple Choice* The layer of the atmosphere that is the coldest of all the layers is the

- W) exosphere
- X) thermosphere
- Y) mesosphere
- Z) troposphere

ANSWER: Y) MESOSPHERE

TOSS-UP

21. *BIOLOGY Short Answer* After pyruvate arrives in the mitochondrion, it is oxidized through a series of steps to a two- carbon compound called

ANSWER: ACETYL-COA

BONUS

21. *BIOLOGY Multiple Choice* Golgi tendon organs are

- W) chemoreceptors
- X) mechanoreceptors
- Y) pain receptors
- Z) position receptors

ANSWER: X) MECHANORECEPTORS

TOSS-UP

22. *CHEMISTRY Short Answer* How many covalent bonds can oxygen form?

ANSWER: TWO

BONUS

22. *CHEMISTRY Multiple Choice* The largest difference between successive ionization energies for Boron is between the

- W) 1st and 2nd ionization energies
- X) 2nd and 3rd ionization energies
- Y) 3rd and 4th ionization energies
- Z) 4th and 5th ionization energies

ANSWER: Y) 3RD AND 4TH IONIZATION ENERGIES

TOSS-UP

23. *BIOLOGY Short Answer* In plants, the primary carbohydrate used in the transport of food from the leaves to the root is

ANSWER: SUCROSE

BONUS

23. *BIOLOGY Multiple Choice* The least inclusive of the taxonomic categories listed here is

- W) family
- X) phylum
- Y) class
- Z) genus

ANSWER: Z) GENUS

TOSS-UP

24. *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

BONUS

24. *COMPUTER SCIENCE Short Answer* Who reinvented the punched card as a means for storing numerical information, which was used for processing the 1890 US census?

ANSWER: HERMAN HOLLERITH (ACCEPT: HOLLERITH)

TOSS-UP

25. *EARTH SCIENCE Short Answer* What kind of desalination of seawater involves electrically charged particles?

ANSWER: ELECTRODIALYSIS (ACCEPT: ELECTROLYSIS)

BONUS

25. *EARTH SCIENCE Multiple Choice* A tributary flowing parallel to the mainstream due to the presence of a natural levee is a

- W) tombigbee
- X) yazoo
- Y) antecedent
- Z) distributary

ANSWER: X) YAZOO