

C-TEAM 03-05-13

TOSS-UP

1) BIOLOGY *Short Answer* What are the two major types of protein secondary structure?

ANSWER: alpha helix and beta strand/sheet

BONUS

1) BIOLOGY *Short Answer* Which of the following types of forces play a role in stabilizing a protein's tertiary structure: 1. hydrogen bond 2. ionic bond 3. van der Waals 4. covalent bonds

ANSWER: 1, 2, 3, 4

TOSS-UP

2) MATH Multiple Choice At $x = -1/2$ the graph of $y = x^3$ is:

W) increasing and concave up

X) increasing and concave down

Y) decreasing and concave up

Z) decreasing and concave down

ANSWER: X) INCREASING AND CONCAVE DOWN

BONUS

2) MATH Short Answer The point (3, 2) is reflected across the graph of $y = 6$ and the resulting point is then reflected across the graph of $y = x$. What are the coordinates of the final point?

ANSWER: (10, 3)

TOSS-UP

3) CHEMISTRY *Short Answer* Who was the first to transform old ideas of atoms into a scientific theory?

ANSWER: Dalton

BONUS

3) CHEMISTRY *Short Answer* Which of the following are stated in Dalton's atomic theory: 1. all elements are made of atoms 2. atoms of the same element are identical 3. there is only one kind of atom for each element 4. atoms of different elements can combine physically or chemically

ANSWER: 1, 2, 4

TOSS-UP

4) EARTH AND SPACE *Multiple Choice* Which of the following rocks is formed from basaltic magma?

- W) Gabbro
- X) Andesite
- Y) Rhyolite
- Z) Diorite

ANSWER: W

BONUS

4) EARTH AND SPACE *Short Answer* Classify the following rocks as felsic, intermediate, mafic, or ultramafic. Granite, Basalt, Peridotite, Rhyolite.

ANSWER: Felsic, Mafic, ultramafic, felsic

TOSS-UP

5) BIOLOGY *Short Answer* What is the protein shell enclosing a viral genome called?

ANSWER: capsid

BONUS

5) BIOLOGY *Short Answer* What is the cycle called that allows replication of a phage genome without destruction of the host cell?

ANSWER: lysogenic

TOSS-UP

6) MATH *Short Answer* Express 600° in radians as a reduced fraction in terms of π :

ANSWER: $3/10\pi$

BONUS

6) MATH *Short Answer* Giving your answers in terms of π and in inches squared, find the total surface area of a closed right circular cone whose altitude is 8 inches and radius is 6 inches:

ANSWER: 96π

TOSS-UP

7) CHEMISTRY *Short Answer* Which English scientist discovered the electron?

ANSWER: J. J. Thomson

BONUS

7) CHEMISTRY *Short Answer* What is the glowing beam called that traveled from the cathode to the anode during Thomson's experiment?

ANSWER: cathode ray

TOSS-UP

8) EARTH AND SPACE *Short Answer* Which mineral is rated 9 on Moh's hardness scale?

ANSWER: corundum

BONUS

8) EARTH AND SPACE *Short answer* What is the chemical formula of corundum?

ANSWER: Al_2O_3

TOSS-UP

9) BIOLOGY Multiple Choice In which of the following wavelengths does DNA absorb the best:

- W) 3,900 angstroms
- X) 260 nanometers
- Y) 340 nanometers
- Z) 540 nanometers

ANSWER: X) 260 NANOMETERS

BONUS

9) BIOLOGY Multiple Choice Which of the following is closest to the diameter of a plasmodesmata?

- W) 2 angstroms
- X) 60 nanometers
- Y) 80 microns
- Z) 180 microns

ANSWER: X) 60 NANOMETERS

TOSS-UP

10) MATH Short Answer If a point has polar coordinates $(3, \pi)$, what are the rectangular coordinates?

ANSWER: $(-3, 0)$

BONUS

10) MATH Short Answer The graph of the polar equation, $r = 5 - 5 \cos \theta$, is a cardioid. In which two quadrants is most of the area of this cardioid?

ANSWER: II AND III

TOSS-UP

11) CHEMISTRY *Short Answer* How many pi bonds are in a molecule of acetylene?

ANSWER: 2

BONUS

11) CHEMISTRY *Short answer* How many pi bonds are in 2, 3 dibromo octane?

ANSWER: 0

TOSS-UP

12) EARTH AND SPACE *Short Answer* What is the name of the current that flows southward between Canada and Greenland?

ANSWER: Labrador current

BONUS

12) EARTH AND SPACE *Short answer* What is the name of the sea in the middle of the north atlantic ocean, named for its seaweed?

ANSWER: Sargasso Sea

TOSS-UP

13) MATHEMATICS *Short Answer* What are the solutions to quadratic $x^2+3x-10$?

ANSWER: -5, 2

BONUS

13) MATHEMATICS *Short Answer* Geometry is the mathematical study of shapes, as ____ is the mathematical study of change. Fill in the blanks.

ANSWER: Calculus

TOSS-UP

14) CHEMISTRY *Short Answer* What chemist invented the pH meter, and other inventions, and donated most of the fortune he made from inventing to research institutes and universities?

ANSWER: Arnold Beckman (accept: Beckman)

BONUS

14) CHEMISTRY *Short Answer* What is the pH and pOH of 1.0×10^{-3} M OH⁻ at 25 degrees celsius?

ANSWER: pH: 11, pOH: 3

TOSS-UP

15) EARTH AND SPACE *Short Answer* Which Jovian planet rotates faster than the Earth?

ANSWER: All of them

BONUS

15) EARTH AND SPACE *Short Answer* Which gas giant emits the lowest amount of energy?

ANSWER: Uranus

TOSS-UP

16) MATHEMATICS *Short Answer* What Greek mathematician invented heuristics which resemble the methods of integral calculus?

ANSWER: Archimedes

BONUS

16) MATHEMATICS *Short Answer* What method is used for finding the local maxima and minima of a function subject to equality constraints?

ANSWER: Lagrange Multipliers

TOSS-UP

17) CHEMISTRY *Short Answer* What principle states that if a change is imposed on a system at equilibrium, the position of the equilibrium will shift in a direction that tends to reduce that change?

ANSWER: Le Chatelier's principle

BONUS

17) CHEMISTRY *Short Answer* The relationship between the moles of solute dissolved and the mole of particles in solution is usually expressed using what?

ANSWER: Van't Hoff Factor

TOSS - UP

18) MATH *Short Answer* Of the following 5 functions identify all that are NOT differentiable for all real numbers: $|x|$ (read as: absolute value of x); $\cos(x)$; $\tan(x)$; e^x ; the greatest integer function

ANSWER: $|x|$; $\tan(x)$; THE GREATEST INTEGER FUNCTION

BONUS

18) MATH *Short Answer* The curve defined by the equation, $Ax^2 + Bx + Cy^2 + D^y + E = 0$, can be an ellipse if which of the constants are positive?

ANSWER: A AND C

TOSS-UP

19) CHEMISTRY *Short Answer* List the three particles that make up an atom in order of lowest to highest mass.

ANSWER: electron, proton, neutron

BONUS

19) CHEMISTRY *Multiple Choice* About how many electrons equal one proton in terms of mass?

W) 1540

X) 1640

Y) 1740

Z) 1840

ANSWER: Z

TOSS-UP

20) EARTH AND SPACE *Short Answer* What is the most commonly accepted driving force for plate tectonic motion?

ANSWER: Mantle Convection

BONUS

20) EARTH AND SPACE *Multiple Choice* What is most likely to form in a crater of a stratovolcano after a large eruption?

W) Cinder Cones

X) Mud Volcanoes

Y) Lava Domes

Z) Spatter Cones

ANSWER: Y

TOSS-UP

21) CHEMISTRY *Short Answer* Which element has the atomic number 82?

ANSWER: lead (Pb)

BONUS

21) CHEMISTRY *Short answer* How many protons are in a molecule of propane?

ANSWER: 44

TOSS-UP

22) EARTH AND SPACE *Short Answer* What object in our solar system has the greatest apparent magnitude?

ANSWER: Sun

BONUS

22) EARTH AND SPACE *Short Answer* Order the following objects in order of lowest absolute magnitude to greatest. Rigel, Sirius, Sun, Venus

ANSWER: Venus, Sun, Sirius, Rigel

TOSS-UP

23) CHEMISTRY *Short Answer* Water and sulfur trioxide react to form what?

ANSWER: Sulfuric Acid (accept: H₂SO₄)

BONUS

23) CHEMISTRY *Short Answer* What is the chemical formula of the hypochlorite ion?

ANSWER: OCl⁻

TOSS-UP

24) EARTH AND SPACE *Short Answer* What are the 5 planets visible with the naked eye?

ANSWER: mercury, venus, mars, jupiter, saturn

BONUS

24) EARTH AND SPACE *Short answer* What are the 2 planets whose atmosphere consists of primarily CO₂?

ANSWER: Venus and Mars

TOSS-UP

25) EARTH AND SPACE *Multiple Choice* A small body that generally revolves about the Sun in an elongated orbit is known as a:

W) Meteorite

X) Meteor

Y) Asteroid

Z) Comet

ANSWER: Z

BONUS

25) EARTH AND SPACE *Short Answer* What is the fuzzy, gaseous component of a comet's head called?

ANSWER: COMA

TOSS-UP

26) BIOLOGY *Multiple choice* The muscular system develops primarily from what germ layer in the developing embryo?

- W) Ectoderm
- X) Mesoderm
- Y) Endoderm
- Z) Mesoglea

ANSWER: X) Mesoderm

BONUS

26) BIOLOGY *Short answer* Name 3 other organ systems that develops from the mesoderm.

ANSWER: Skeletal, Muscular, Circulatory, Lymphatic, Excretory, Reproductive

TOSS-UP

27) BIOLOGY *Multiple choice* What hormone is not released by anterior pituitary gland?

- W) oxytocin
- X) luteinizing hormone
- Y) thyroid stimulating hormone
- Z) prolactin

ANSWER: W) oxytocin

BONUS

27) BIOLOGY *Short answer* What is another name for the antidiuretic hormone?

ANSWER: Vasopressin

TOSS-UP

28) BIOLOGY *Multiple choice* The hypothalamus, thalamus, and epithalamus make up what region of the brain?

- W) Cerebrum
- X) Cerebellum
- Y) Diencephalon
- Z) Brainstem

ANSWER: Y) Diencephalon

BONUS

28) BIOLOGY *Short answer* Which of the following 4 are actions taken by the parasympathetic division: 1) slowing heart, 2) accelerates heart, 3) stimulates activity of pancreas, 4) relaxes bronchi in lungs

ANSWER: 1, 3

TOSS-UP

29) BIOLOGY *Multiple choice* Depolarization involves which of the following?

W) Increased net flow of K⁺ ions out of the cell

X) Increased net flow of K⁺ ions into the cell

Y) Increased net flow of Na⁺ ions out of the cell

Z) Increased net flow of Na⁺ ions into the cell

ANSWER: Z) Increased net flow of Na⁺ ions into the cell

BONUS

29) BIOLOGY *Short answer* What is the term describing the time period in which a second action potential cannot be initiated?

ANSWER: Refractory period

TOSS-UP

30) BIOLOGY *Multiple choice* Which of the following is not a taste type that is detected by sensory receptor cells on the tongue?

W) Sweet

X) Spicy

Y) Sour

Z) Bitter

ANSWER: X) Spicy

BONUS

30) BIOLOGY *Short answer* What are small raised structures that cover the tongue surface?

ANSWER: Papillae

