TOSSUP

1. Biology - *Multiple Choice* In a certain ecosystem, there are 4 species of organisms. Photosynthetic grass is eaten by rabbits, which are eaten by snakes, which are eaten by hawks. In this ecosystem, which of the following best describes snakes?

W) Primary consumer

X) Primary producer

Y) Secondary consumer

Z) Secondary producer

Answer: Y) SECONDARY CONSUMER [SO]

BONUS

1. Biology - *Short Answer* In genetics, what term describes an organism's physical appearance or visible traits?

ANSWER: PHENOTYPE [AT]

TOSSUP

2. Math - *Short Answer* How many sides does a decagon have?

ANSWER: 10 SIDES

BONUS

2. Math - *Short Answer* How many factors does 40 have?

ANSWER: 8 FACTORS

TOSSUP

3. Earth and Space - *Short Answer* How many seismograms does it take to locate the epicenter of an earthquake?

ANSWER: 3 [EB; RR ESS-G]

BONUS

3. Earth and Space - *Short Answer* What type of volcano is made out of alternating layers of ash and hardened lava?

ANSWER: STRATOVOLCANO [EB; RR ESS-G]

TOSSUP

4. Chemistry - *Multiple Choice* What is the fourth element on the periodic table?
W) Beryllium
X) Helium
Y) Lithium
Z) Sodium

ANSWER: W) BERYLLIUM [SO]

BONUS

4. Chemistry - *Short Answer* What group of elements are often highly toxic in pure elemental form and generally have a -1 oxidation state when forming compounds?

ANSWER: HALOGENS [EB; RR Chem-AE]

TOSSUP

5. Physics - *Short Answer* Bella exerts a 5 Newton force to push a 10 kilogram box across a 6 meter wide room. In joules, how much work does she do?

ANSWER: 30 [EB; RR Phys-ME]

BONUS

5. Physics - *Short Answer* Place the following three wavelengths of light in order of increasing energy. I. Radio; II. Ultraviolet; III. Gamma

ANSWER: 1, 2, 3 [EB; RR Phys-OS]

TOSSUP

6. Energy - *Multiple Choice* Scientists at Argonne National Lab are researching methods to reduce methane emission from combustion engines. Methane makes up the majority of which of the following fossil fuels?
W) lignite
X) natural gas
Y) petroleum
Z) coal

ANSWER: X) NATURAL GAS [SO]

BONUS

6. Energy - *Short Answer* Neuroscientists at the Office of Public Health are studying cellular processes implicated in disease. MRI technology uses strong magnetic fields and radio waves to image parts of the human body. MRI primarily recognizes what molecule, which is the most abundant molecule in cells?

ANSWER: WATER [SO]

TOSSUP

7. Biology - *Multiple Choice* In mitosis, which of the following events occurs during anaphase?
W) Duplication of centrosomes
X) Separation of sister chromatids
Y) Forming of nuclear envelope
Z) Division of cytoplasm

ANSWER: X) SEPARATION OF SISTER CHROMATIDS [AT]

BONUS

7. Biology - *Multiple Choice* Which of the following is NOT a primary function of plant roots?
W) Photosynthesis
X) Food storage
Y) Water absorption
Z) Structural support

ANSWER: W) PHOTOSYNTHESIS [AT]

TOSSUP

8. Math - *Short Answer* What is the 6th smallest prime number?

ANSWER: 13

BONUS

8. Math - *Short Answer* How many ways are there to rearrange 4 books in a row on a bookshelf if 2 of them are identical?

ANSWER: 12 WAYS

TOSSUP

9. Earth and Space - *Short Answer* On what planet would you find the tallest mountain in the solar system?

ANSWER: MARS [EB; RR ESS-SS]

BONUS

9. Earth and Space - *Multiple Choice* Which of the following stellar remnants is the smallest?
W) White dwarf
X) Neutron star
Y) Black hole
Z) Planetary nebula

ANSWER: X) NEUTRON STAR [EB; RR ESS-SA]

TOSSUP

10. Chemistry - *Short Answer* What type of bond is characterized by the sharing of electrons between two adjacent atoms?

ANSWER: COVALENT [EB; RR Chem-AE]

BONUS

10. Chemistry - *Short Answer* If the molar mass of oxygen is 16 grams per mole and the molar mass of carbon is 12 grams per mole, what is the mass, in grams, of one mole of carbon dioxide with chemical formula CO_2?

ANSWER: 44 [SO]

TOSSUP

11. Physics - *Short Answer* What type of heat transfer is primarily responsible for the heating of the Earth by the Sun?

ANSWER: RADIATION [RE; RR Phys-OS]

BONUS

11. Physics - *Multiple Choice* What name is given to the process in which a material transitions from a liquid to a gas?

W) Condensation
X) Sublimation
Y) Melting
Z) Vaporization

ANSWER: Z) VAPORIZATION [RE]

TOSSUP

12. Energy - *Short Answer* Scientists at Oak Ridge National Lab are developing methods to improve the reliability of the ITER fusion facility. This facility does research on what state of matter, created when high temperatures strip electrons away from atoms?

ANSWER: PLASMA [RE; RR Energy-ESS]

BONUS

12. Energy - *Short Answer* Researchers at Los Alamos National Lab are analyzing the LK-99 sensation to stress the importance of reproducibility in scientific studies. What kind of material, with near-zero resistance, was LK-99 purported to be?

ANSWER: SUPERCONDUCTOR [RE; RR Energy-PS]

TOSSUP

13. Biology - *Short Answer* What is the primary carbohydrate consumed during the process of cellular respiration?

ANSWER: GLUCOSE [RE]

BONUS

13. Biology - *Short Answer* By name or number, order the functions of the following structures from least to most specific: I. Organ; II. Tissue ; III. Organ system.

ANSWER: III, I, II [AT]

TOSSUP

14. Math - *Short Answer* Mr. Piggles rolls a fair six-sided die. What is the probability that he rolls a prime number?

ANSWER: 1/2

BONUS

14. Math - *Short Answer* Solve the following equation for x: (x+2)/3=5 (quantity x plus 2 end quantity divided by 3 is equal to 5)

ANSWER: 13

TOSSUP

15. Earth and Space - *Multiple Choice* Which of the following rocks is igneous?
W) Limestone
X) Conglomerate
Y) Basalt
Z) Marble

ANSWER: Y) BASALT [EB; RR ESS-RM]

BONUS

15. Earth and Space - *Short Answer* Place the following three reservoirs in increasing stored amounts of Earth's total freshwater: I. Groundwater; II. Glaciers; III. Atmosphere

ANSWER: III, I, II [EB; RR ESS-G]

TOSSUP

16. Chemistry - *Short Answer* Order the following three states of matter by increasing amount of kinetic energy per particle: I Gas; II. Solid; III. Liquid.

ANSWER: II, III, I [SO]

BONUS

16. Chemistry - *Short Answer* In the neutralization of hydrochloric acid with sodium hydroxide, HCl plus NaOH yields sodium chloride and what other molecule?

ANSWER: H2O (ACCEPT: WATER) [SO]

TOSSUP

17. Physics - *Multiple Choice* Which of the following circuit parts converts electrical energy into mechanical energy?
W) Motor
X) Resistor
Y) Battery
Z) Light bulb

ANSWER: W) MOTOR [RE]

BONUS

17. Physics - *Short Answer* Identify all of the following 3 materials you would expect to float in liquid water. I. Polyurethane; II. Aluminum; III. Ice

ANSWER: III only [RE]

TOSSUP

18. Energy - *Short Answer* Researchers at Lawrence Berkeley National Lab are using the Dark Energy Spectroscopic Instrument to model our universe. Identify all of the following 3 statements that are true of the universe. I. It is continually expanding; II. It is continually contracting; III. The universe is predicted to exist in perpetuity.

ANSWER: I ONLY [RE]

BONUS

18. Energy - *Short Answer* Scientists at Argonne National Lab are investigating gene editing technology in the hopes of being able to reduce human genetic diseases. Heterozygotes for the sickle cell trait are often evolutionarily favored. This is because sickle cell trait protects against what protozoan disease?

ANSWER: MALARIA [SO]

TOSSUP

19. Biology - *Multiple Choice* What human anatomical system provides a physical barrier between the body and the outside world?

W) Digestive system

X) Integumentary system

Y) Immune system

Z) Reproductive system

Answer: X) INTEGUMENTARY SYSTEM [SO]

BONUS

19. Biology - *Multiple Choice* What type of macromolecule would allow large, charged, or polar solvents to pass through the plasma membrane?

W) Proteins

X) Carbohydrates

Y) Lipids

Z) Nucleic acids

ANSWER: W) PROTEINS [RE]

TOSSUP

20. Math - *Short Answer* What is the smaller angle formed by the hands of a clock at 3:00?

ANSWER: 90 DEGREES

BONUS

20. Math - *Short Answer* How many diagonals does a convex 6-sided polygon have?

ANSWER: 9 DIAGONALS

TOSSUP

21. Earth and Space - *Multiple Choice* In which of the following constellations would you find the brightest star in the night sky?

W) Canis major

X) Orion

Y) Hydra

Z) Aquarius

ANSWER: W) CANIS MAJOR [EB; RR ESS-OA]

BONUS

21. Earth and Space - *Multiple Choice* Which of the following best explains why scientists build space-based telescopes?
W) To eliminate atmospheric distortion
X) To have the instruments closer to what they're observing
Y) To reduce costs
Z) To image more of the sky

ANSWER: W) TO ELIMINATE ATMOSPHERIC DISTORTION [EB; RR ESS-OA]

TOSSUP

22. Chemistry - *Multiple Choice* Which of the following properties of water allows leaves to float on its surface?
W) Boiling point
X) Surface tension
Y) Adhesion
Z) Viscosity

ANSWER: X) SURFACE TENSION [SO]

BONUS

22. Chemistry - *Short Answer* Ryan, an aspiring chemist, is studying the absorption spectra of gas at different temperatures. He does trials at various temperatures, and measures the absorption spectra of the gasses at each temperature using a spectrometer. What is the independent variable in Ryan's experiment?

ANSWER: TEMPERATURE (ACCEPT: TEMPERATURE) [SO]

TOSSUP

23. Physics - *Multiple Choice* Which of the following types of energy is gravitational potential energy converted into as an object falls?
W) Chemical potential
X) Heat
Y) Kinetic
Z) Elastic potential

ANSWER: Y) KINETIC [RE]

BONUS

23. Physics - *Multiple Choice* At which of the following angles should a ball be launched with some velocity v to maximize the distance it travels?

W) 0 degrees

X) 30 degrees

Y) 45 degrees

Z) 60 degrees

ANSWER: Y) 45 DEGREES [RE; RR Phys-ME]