

ROUND 13

TOSS-UP

1) LIFE SCIENCE *Multiple Choice* Of the following, which is true of type I diabetes?

- W) It most often occurs later in life
- X) It is characterized by the inability of receptors to recognize insulin
- Y) It is characterized by the inability of the pancreas to produce insulin
- Z) It is most often due to unhealthy lifestyle choices

ANSWER: Y) IT IS CHARACTERIZED BY THE INABILITY OF THE PANCREAS TO PRODUCE INSULIN

BONUS

1) LIFE SCIENCE *Multiple Choice* Which of the following structures in the chicken egg is analogous to the mammalian placenta?

- W) Chorion
- X) Amnion
- Y) Yolk sac
- Z) Allantois [**uh-LAN-toh-is**]

ANSWER: Z) ALLANTOIS

TOSS-UP

2) EARTH AND SPACE *Multiple Choice* Who, from the Western history of science, first proposed the heliocentric model of the solar system?

- W) Galileo
- X) Kepler
- Y) Aristarchus [**ar-uh-STAIR-kuhs**]
- Z) Hubble

ANSWER: Y) ARISTARCHUS

BONUS

2) EARTH AND SPACE *Multiple Choice* Which of the following rocks tends to break into parallel layers or sheets?

- W) Quartzite
- X) Granite
- Y) Schist [**SHIST**]
- Z) Marble

ANSWER: Y) SCHIST

TOSS-UP

3) PHYSICAL SCIENCE *Multiple Choice* Which of the following can occur with light but NOT sound?

- W) Refraction
- X) Reflection
- Y) Resonance
- Z) Polarization

ANSWER: Z) POLARIZATION

BONUS

3) PHYSICAL SCIENCE *Multiple Choice* Which of the following forces is felt by an electron with charge e between two parallel plates with area A , carrying a potential difference V , separated by a distance d ?

- W) V/d
- X) eV/d [**$e V$ over d**]
- Y) eVd
- Z) eVd/A [**$e V d$ over A**]

ANSWER: X) eV/d

TOSS-UP

4) MATH *Short Answer* When a number is tripled, then tripled once more, the result equals 1. What was the original number?

ANSWER: $1/9$

BONUS

4) MATH *Short Answer* What is the fiftieth term in the arithmetic sequence with first term -23 and second term -18 ?

ANSWER: 222

TOSS-UP

5) GENERAL SCIENCE *Short Answer* Identify all of the following four processes that are endothermic reactions: 1) exploding dynamite, 2) burning wood, 3) baking bread, 4) melting ice cubes.

ANSWER: 3, 4 (ACCEPT: BAKING BREAD, MELTING ICE CUBES)

BONUS

5) GENERAL SCIENCE *Multiple Choice* Which of the following coordinate cell division?

- W) Peroxisomes [*pe-ro-KSI-sohms*]
- X) Microtubules
- Y) Centrioles [*SEN-tree-ohls*]
- Z) Lysosomes

ANSWER: Y) CENTRIOLES

TOSS-UP

6) ENERGY *Multiple Choice* Which of the following is the approximate percentage of the United States' total energy use supplied by oil, coal, and natural gas?

- W) 10%
- X) 25%
- Y) 55%
- Z) 85%

ANSWER: Z) 85%

BONUS

6) ENERGY *Multiple Choice* Smart meters, a new type of electrical energy meter developed by Center Point Energy, allow the user to do which of the following?

- W) Monitor rates of energy consumption, as well as instantaneous savings, when not using certain home appliances
- X) See the decrease of energy usage from fossil fuels when users inject energy from renewable sources
- Y) Find out which appliances are creating issues in power quality through the grid
- Z) Know the time it will take for electricity services to be re-established when a failure occurs

ANSWER: W) MONITOR RATES OF ENERGY CONSUMPTION, AS WELL AS INSTANTANEOUS SAVINGS, WHEN NOT USING CERTAIN HOME APPLIANCES

TOSS-UP

7) LIFE SCIENCE *Multiple Choice* Which of the following phenomena does NOT contribute to water's ability to move against gravity through a plant's vascular system?

- W) Capillary action
- X) Transpiration pull
- Y) Phloem pressure **[FLOH-em]**
- Z) Osmotic pressure

ANSWER: Y) PHLOEM PRESSURE

BONUS

7) LIFE SCIENCE *Multiple Choice* Which of the following is involved in a frameshift DNA mutation?

- W) Part of one chromosome breaking off and attaching to another chromosome
- X) A segment of a chromosome is repeated at least once
- Y) The insertion or deletion of a nucleotide in the coding sequence of a gene
- Z) Only a single point in the DNA sequence

ANSWER: Y) THE INSERTION OR DELETION OF A NUCLEOTIDE IN THE CODING SEQUENCE OF A GENE

TOSS-UP

8) EARTH AND SPACE *Multiple Choice* Pluto and Charon are which of the following?

- W) Extremely different in mass
- X) Satellites of gas giant planets
- Y) In different equatorial planes
- Z) In synchronous rotation

ANSWER: Z) IN SYNCHRONOUS ROTATION

BONUS

8) EARTH AND SPACE *Short Answer* NASA'S James Webb Space Telescope has telescope mirrors coated with a microscopically thin layer of what element, selected for its ability to effectively reflect infrared light from the mirrors into the observatory's science instruments?

ANSWER: GOLD

TOSS-UP

9) PHYSICAL SCIENCE *Multiple Choice* Highly energetic objects, such as binary pulsars, can be best observed on Earth through measuring which of the following forms of electromagnetic radiation?

- W) X-rays
- X) Infrared light
- Y) Radio waves
- Z) Visible light

ANSWER: W) X-RAYS

BONUS

9) PHYSICAL SCIENCE *Multiple Choice* A mass is held at 20 meters above the ground. Given that g is 10 meters per second squared, how fast in meters per second is it moving after it has been dropped and half of its potential energy has been converted into kinetic energy?

- W) 50
- X) 40
- Y) 20
- Z) $10\sqrt{2}$

ANSWER: Z) $10\sqrt{2}$

TOSS-UP

10) MATH *Short Answer* What is the domain of the relation consisting of the four ordered pairs (3, -1), (4, 2), (-2, 5), (1, 0)?

ANSWER: {3, 4, -2, 1} (in any order)

BONUS

10) MATH *Multiple Choice* Which of the following sets of numbers can be the side lengths of an acute triangle?

- W) 9, 12, 17
- X) 10, 18, 20
- Y) 5, 18, 19
- Z) 8, 15, 17

ANSWER: X) 10, 18, 20

TOSS-UP

11) GENERAL SCIENCE *Multiple Choice* Which of the following frequently and most likely exhibits incomplete dominance?

- W) Flowers
- X) Blood type
- Y) Tongue rolling
- Z) Hair color

ANSWER: W) FLOWERS

BONUS

11) GENERAL SCIENCE *Multiple Choice* Which of the following structures is NOT part of the human eye?

- W) Hyoid [**HY-oid**]
- X) Fovea [**FOH-vee-uh**]
- Y) Retina
- Z) Cornea [**KOHR-nee-uh**]

ANSWER: W) HYOID

TOSS-UP

12) ENERGY *Short Answer* What is the term for a usually short-term state of decreased physiological activity in an animal, usually characterized by a reduced body temperature?

ANSWER: TORPOR (ACCEPT: TEMPORARY HIBERNATION)

BONUS

12) ENERGY *Multiple Choice* Which of the following statements is NOT true about hummingbirds?

- W) They have the highest metabolic rates of any animals
- X) They may become torpid at night
- Y) At their active metabolic rate, they can survive without food for about three days
- Z) They have to consume about their body weight in nectar daily

ANSWER: Y) AT THEIR ACTIVE METABOLIC RATE, THEY CAN SURVIVE WITHOUT FOOD FOR ABOUT THREE DAYS

TOSS-UP

13) LIFE SCIENCE *Multiple Choice* A plant produces flagellated sperm and the dominant stage in its life cycle is haploid. Which of the following plants best fits this description?

- W) Fern
- X) Moss
- Y) Cycad [**SY-kad**]
- Z) Ginkgo

ANSWER: X) MOSS

BONUS

13) LIFE SCIENCE *Multiple Choice* Which of the following portions of the small intestine receives food directly from the stomach?

- W) Jejunum [**ji-JOO-nuhm**]
- X) Duodenum [**doo-uh-DEE-nuhm**]
- Y) Ileum [**IL-ee-uhm**]
- Z) Plenum

ANSWER: X) DUODENUM

TOSS-UP

14) EARTH AND SPACE *Multiple Choice* Which of the following is most closely associated with a cold front?

- W) Short, intense downpours
- X) Drizzle or steady rain
- Y) Rise in temperature
- Z) Cirrus clouds

ANSWER: W) SHORT, INTENSE DOWNPOURS

BONUS

14) EARTH AND SPACE *Multiple Choice* Which of the following statements best explains why it can become very hot in the deep shaft of a mine?

- W) There is little air circulation
- X) There is a lot of magma near mines
- Y) There is a natural geothermal gradient within Earth's crust
- Z) Mines extend deep into Earth's mantle

ANSWER: Y) THERE IS A NATURAL GEOTHERMAL GRADIENT WITHIN EARTH'S CRUST

TOSS-UP

15) PHYSICAL SCIENCE *Multiple Choice* A wave travels through air and hits the surface of water at an angle of 90° . Which of the following will be true about the wave?

- W) Its angle of incidence will increase
- X) Its angle of incidence will decrease
- Y) Its angle of incidence will not change, and its speed will not change
- Z) Its angle of incidence will not change, and its speed may increase or decrease

ANSWER: Z) ITS ANGLE OF INCIDENCE WILL NOT CHANGE, AND ITS SPEED MAY INCREASE OR DECREASE

BONUS

15) PHYSICAL SCIENCE *Multiple Choice* Which of the following statements about a wave is incorrect regarding refraction?

- W) Its wavelength may increase or decrease
- X) Its direction may change.
- Y) Its frequency may increase or decrease
- Z) Its speed may increase or decrease

ANSWER: Y) ITS FREQUENCY MAY INCREASE OR DECREASE

TOSS-UP

16) MATH *Short Answer* To which real number is i^8 equivalent?

ANSWER: 1

BONUS

16) MATH *Short Answer* John sails his 10 meter sailboat due west for 10 kilometers, then due north for 7 kilometers, then another 14 kilometers due west. How far in kilometers is John from his original position?

ANSWER: 25

TOSS-UP

17) GENERAL SCIENCE *Multiple Choice* Which of the following is NOT a base found in DNA?

- W) Adenine [**AD-n-eeen**]
- X) Guanine [**GWAH-neeen**]
- Y) Uracil [**YOOR-uh-sil**]
- Z) Thymine

ANSWER: Y) URACIL

BONUS

17) GENERAL SCIENCE *Multiple Choice* Hydrogen bonding results from intermolecular attractions in molecules where a compound or molecule that is significantly more electronegative than hydrogen is bonded to hydrogen atoms. Which of the following compounds would NOT hydrogen bond with itself?

- W) Water
- X) Methane
- Y) Hydrofluoric acid
- Z) Ammonia

ANSWER: X) METHANE

TOSS-UP

18) ENERGY *Multiple Choice* Charcoal created by pyrolysis [**py-ROL-uh-sis**] of biomass is referred to as which of the following?

- W) Carbonyl
- X) Biochar
- Y) Biofuel
- Z) Potash

ANSWER: X) BIOCHAR

BONUS

18) ENERGY *Multiple Choice* When carbon in soils is buried due to accumulation of overlying soil, that carbon is unavailable for which of the following chemical reaction mechanisms that forms carbon dioxide?

- W) Oxidation-reduction
- X) Acid-base
- Y) Single replacement
- Z) Double replacement

ANSWER: W) OXIDATION-REDUCTION

TOSS-UP

19) LIFE SCIENCE *Short Answer* Identify the polar and non-polar components in a phospholipid.

ANSWER: POLAR = PHOSPHATE, NONPOLAR = LIPID

BONUS

19) LIFE SCIENCE *Multiple Choice* Which of the following enzymes assists in digestion of starches and complex sugars?

- W) Endopeptidase [*en-doh-PEP-ti-days*]
- X) Amylase [*AM-uh-lays*]
- Y) Lipase
- Z) Saccharidase [*sa-ka-RY-days*]

ANSWER: X) AMYLASE

TOSS-UP

20) EARTH AND SPACE *Multiple Choice* Which of the following is a characteristic of an area with Karst topography?

- W) Sinkholes
- X) Mountains
- Y) Eskers
- Z) Canyons

ANSWER: W) SINKHOLES

BONUS

20) EARTH AND SPACE *Multiple Choice* Which of the following is NOT a compositional classification of a magma?

- W) Phaneritic [*fan-uh-RIT-ik*]
- X) Rhyolitic [*ray-uh-LIT-ik*]
- Y) Andesitic
- Z) Basaltic

ANSWER: W) PHANERITIC

TOSS-UP

21) PHYSICAL SCIENCE *Multiple Choice* For an object placed in front of a lens with a negative focal length, which of the following could be true?

- W) The image is virtual and the lens is plano-concave
- X) The image is virtual and the lens is plano-convex
- Y) The image is real and the lens is plano-convex
- Z) The image is real and the lens is plano-concave

ANSWER: W) THE IMAGE IS VIRTUAL AND THE LENS IS PLANO-CONCAVE

BONUS

21) PHYSICAL SCIENCE *Multiple Choice* A beam of light passes through a material A, with a refractive index of 1.5, to material B with a refractive index of 1. Which of the following is the critical angle of the light?

- W) $\sin^{-1}(2/3)$ [*inverse sine of two thirds*]
- X) $\cos^{-1}(2/3)$ [*inverse cosine of two thirds*]
- Y) $\cos^{-1}(3/2)$ [*inverse cosine of three halves*]
- Z) $\sin^{-1}(3/2)$ [*inverse sine of three halves*]

ANSWER: W) $\sin^{-1}(2/3)$

TOSS-UP

22) MATH *Short Answer* A circle of radius r is inscribed in a square. What is the area of the square in terms of r ?

ANSWER: $4r^2$

BONUS

22) MATH *Short Answer* What are the coordinates of the image of the point $(2, -4)$ after a 90° rotation clockwise around the origin?

ANSWER: $(-4, -2)$

TOSS-UP

23) GENERAL SCIENCE *Short Answer* What is the name of the process that threatened the survival of osprey because of tissue DDT accumulation from pesticide ingestion in their food source?

ANSWER: BIOMAGNIFICATION (ACCEPT: BIOLOGICAL MAGNIFICATION)

BONUS

23) GENERAL SCIENCE *Multiple Choice* Assume that the Sun in its current state and in its future state as a white dwarf will have exactly the same mass. How will acceleration due to gravity at the surface of the Sun at this moment compare to acceleration due to gravity at the surface of the Sun as a white dwarf in the future?

- W) The acceleration due to gravity will be greater at the surface of the Sun in its current state
- X) The acceleration due to gravity will be greater at the surface of the white dwarf in the future
- Y) The acceleration due to gravity will be equal at the surface of either location
- Z) Acceleration due to gravity cannot be compared without knowing the density of each object

ANSWER: X) THE ACCELERATION DUE TO GRAVITY WILL BE GREATER AT THE SURFACE OF THE WHITE DWARF IN THE FUTURE

TOSS-UP

24) EARTH AND SPACE *Multiple Choice* There are many beautiful colors in an aurora. Which of the following primarily determines the colors you see?

- W) Whether you are observing the aurora borealis or the aurora australis
- X) What atoms or molecules the solar wind ions collide with
- Y) What time of night it is
- Z) How close you are to city light

ANSWER: X) WHAT ATOMS OR MOLECULES THE SOLAR WIND IONS COLLIDE WITH

BONUS

24) EARTH AND SPACE *Short Answer* Which greenhouse gas is most abundant, yet is not significantly increasing due to human activity?

ANSWER: WATER VAPOR

TOSS-UP

25) LIFE SCIENCE *Short Answer* What hormone can be injected in emergencies to treat the life-threatening allergic response known as anaphylaxis [**an-uh-fuh-LAK-sis**]?

ANSWER: EPINEPHRINE

BONUS

25) LIFE SCIENCE *Short Answer* By number, identify all of the following four effects that epinephrine [**e-puh-NE-fruhn**] has on the human body: 1) stimulates the heart; 2) reduces swelling; 3) dilates blood vessels; 4) relaxes airway muscles.

ANSWER: 1, 2, 4