

ROUND 12A

TOSS-UP

1) LIFE SCIENCE *Multiple Choice* Which of the following species thrives in a mangrove?

- W) Blue crabs
- X) Sea turtles
- Y) Sea horses
- Z) Alligators

ANSWER: Z) ALLIGATORS

BONUS

1) LIFE SCIENCE *Short Answer* Flow cytometry [**SY-to-muh-tree**] is emerging as a valuable tool for quantifying photosynthetic cells in the environment. What property of photosynthetic cells is exploited in flow cytometry?

ANSWER: FLUORESCENCE

TOSS-UP

2) PHYSICAL SCIENCE *Multiple Choice* What is the name of the collection of galaxies that contains the Milky Way, M31, M33 and the Magellanic Clouds [**maj-uh-LAN-ik**]?

- W) The Local Group
- X) The Horsehead Nebula
- Y) The extended milky way
- Z) The Virgo cluster

ANSWER: W) THE LOCAL GROUP

BONUS

2) PHYSICAL SCIENCE *Short Answer* A neutrally charged atom has an atomic number of 11 and a mass number of 23. Identify the number of protons, neutrons, and electrons.

ANSWER: PROTONS: 11; NEUTRONS: 12; ELECTRONS: 11

TOSS-UP

3) ENERGY *Multiple Choice* Windows can be rated on the rate at which heat flows through them through which of the following measures?

- W) E-factor
- X) W- factor
- Y) U-factor
- Z) H-factor

ANSWER: Y) U-FACTOR

BONUS

3) ENERGY *Short Answer* What is the major end product of glycolysis [*gly-KOL-uh-sis*]?

ANSWER: PYRUVATE (ACCEPT: PYRUVIC ACID)

TOSS-UP

4) GENERAL SCIENCE *Multiple Choice* Clusters of lymph nodes can be found in all EXCEPT which of the following areas?

- W) Axillae [*ak-SIL-ee*]
- X) Brain
- Y) Groin
- Z) Neck

ANSWER: X) BRAIN

BONUS

4) GENERAL SCIENCE *Short Answer* Name the three subdivisions of the small intestine.

ANSWER: DUODENUM, JEJUNUM, ILEUM (IN ANY ORDER)

TOSS-UP

5) EARTH AND SPACE *Short Answer* Mid-ocean ridge valleys are lined with what kind of faults?

ANSWER: NORMAL (ACCEPT: DIP-SLIP)

BONUS

5) EARTH AND SPACE *Multiple Choice* At what point in an inferior planet's orbit will it appear largest in the sky?

- W) Opposition
- X) Greatest elongation
- Y) Inferior conjunction
- Z) Superior conjunction

ANSWER: Y) INFERIOR CONJUNCTION

TOSS-UP

6) MATH *Multiple Choice* If $(x^2)^3$ [***the quantity x squared cubed***] = 64, what is the value of x ?

- W) 2
- X) 4
- Y) 16
- Z) 64

ANSWER: W) 2

BONUS

6) MATH *Short Answer* If the length of each edge of a cube is increased by 10%, by what percentage is its volume increased?

ANSWER: 33.1 (ACCEPT: 33 1/10, 331/100)

TOSS-UP

7) LIFE SCIENCE *Multiple Choice* How does coral reproduce?

- W) It is pollinated by other fish
- X) Eggs and sperm are released in the open water
- Y) Male and female coral attract each other
- Z) It fragments and regrows larger

ANSWER: X) EGGS AND SPERM ARE RELEASED IN THE OPEN WATER

BONUS

7) LIFE SCIENCE *Short Answer* What cellular component, common to bacteria, archaea [**AHR-kee-uh**], and eukaryotes [**yoo-KAR-ee-ohts**], is primarily responsible for protein synthesis?

ANSWER: THE RIBOSOME

TOSS-UP

8) PHYSICAL SCIENCE *Multiple Choice* What phase must the Moon be in for a solar eclipse to occur?

- W) New
- X) Last quarter
- Y) Crescent
- Z) Full

ANSWER: W) NEW

BONUS

8) PHYSICAL SCIENCE *Multiple Choice* A particular material absorbs violet, blue, and green light. Which of the following colors will NOT be observed when light strikes the material?

- W) Blue green
- X) Red
- Y) Yellow green
- Z) Orange

ANSWER: W) BLUE GREEN

TOSS-UP

9) GENERAL SCIENCE *Multiple Choice* Which of the following would be the most accurate glassware to use to measure a volume of water?

- W) Erlenmeyer flask
- X) Graduated cylinder
- Y) Test tube
- Z) Beaker

ANSWER: X) GRADUATED CYLINDER

BONUS

9) GENERAL SCIENCE *Multiple Choice* A population crash is most likely when which of the following occurs?

- W) Unlimited resources are available
- X) The growth rate slows
- Y) The population approaches carrying capacity
- Z) The population overshoots carrying capacity

ANSWER: Z) THE POPULATION OVERSHOOTS CARRYING CAPACITY

TOSS-UP

10) EARTH AND SPACE *Short Answer* The galactic center appears in which constellation?

ANSWER: SAGITTARIUS (DO NOT ACCEPT: SAGITTA)

BONUS

10) EARTH AND SPACE *Multiple Choice* Which of the following describes the relationship between water particles and ocean waves?

- W) Waves move water particles effectively along the surface of water
- X) Waves have no impact on the motion of water particles
- Y) Water moves in vertical orbits in the direction of waves
- Z) Water particles are fragmented in the white caps of waves

ANSWER: Y) WATER MOVES IN VERTICAL ORBITS IN THE DIRECTION OF WAVES

TOSS-UP

11) MATH *Short Answer* Evaluate the following expression for $r = 7$: $((4r-7)/3)^2/7$ [**open parenthesis, the fraction with numerator 4 r minus 7 and denominator 3, close parenthesis, squared, divided by 7**].

ANSWER: 7

BONUS

11) MATH *Multiple Choice* Which of the following ordered pairs is a solution to this set of inequalities: $x < 0$ [**x is less than 0**]; $y < 5$ [**y is less than 5**]; $y < -2x + 4$ [**y is less than negative 2 x plus 4**]; $y > -2x$ [**y is greater than negative 2 x**]?

W) (-1,-2)

X) (-1,3)

Y) (3,-1)

Z) (1,2)

ANSWER: X) (-1,3)

TOSS-UP

12) ENERGY *Short Answer* If 10 incandescent 100 watt light bulbs are replaced with 10 LED lights of equivalent lumens, approximately how many fewer watts/hour will the LED lights consume?

ANSWER: 830 (ACCEPT: ANY VALUE BETWEEN 800-870)

BONUS

12) ENERGY *Multiple Choice* In order to achieve maximum power point tracking in a renewable energy source, a signal is generated and utilized via pulse width modulation. Pulses with variable duty cycle are then sent to which part of the DC/DC converter circuit in order to control it?

W) The inductors

X) The capacitors

Y) The input voltage source

Z) The transistors/switches

ANSWER: Z) THE TRANSISTORS/SWITCHES

TOSS-UP

13) LIFE SCIENCE *Multiple Choice* A bacterium is suddenly immersed in a high salt media. What is the MOST likely response of the cell?

- W) Actively transport water into the cell
- X) Actively transport water out of the cell
- Y) Actively transport potassium into the cell
- Z) Actively transport small organic molecules out of the cell

ANSWER: Y) ACTIVELY TRANSPORT POTASSIUM INTO THE CELL

BONUS

13) LIFE SCIENCE *Short Answer* For decades the Gram stain was the primary tool for distinguishing between broad groups of bacteria. The Gram stain exploits differences in what cellular structure between gram positive and gram negative bacteria?

ANSWER: THE CELL WALL

TOSS-UP

14) PHYSICAL SCIENCE *Multiple Choice* Vinegar is a liquid solution containing acetic acid and water. It could be accurately classified as which of the following?

- W) A colloid
- X) A compound
- Y) A homogeneous mixture [*hoh-muh-JEE-nee-uhs*]
- Z) A heterogeneous mixture [*het-er-uh-JEE-nee-uhs*]

ANSWER: Y) A HOMOGENEOUS MIXTURE

BONUS

14) PHYSICAL SCIENCE *Short Answer* What particle is the smallest indivisible unit of light?

ANSWER: PHOTON

TOSS-UP

15) GENERAL SCIENCE *Short Answer* What type of solution has a higher concentration of hydroxide ions than hydronium ions?

ANSWER: BASE (ACCEPT: BASIC OR ALKALINE OR ARRHENIUS BASE)

BONUS

15) GENERAL SCIENCE *Multiple Choice* Which of the following would NOT be a good characteristic of an index fossil?

- W) The fossil has distinctive characteristics
- X) The species survived for millions of years
- Y) The species lived in many different places
- Z) The species is not a soft-bodied organism

ANSWER: X) THE SPECIES SURVIVED FOR MILLIONS OF YEARS

TOSS-UP

16) ENERGY *Multiple Choice* Why is the angle of incidence of sunlight important for solar panels?

- W) It helps the panel remain cooler, but decreases the power output
- X) It helps the panel remain hotter, and increases the power output
- Y) The closer the angle is to normal, the more power produced by the panel
- Z) The further the angle is from normal, the more power produced by the panel

ANSWER: Y) THE CLOSER THE ANGLE IS TO NORMAL, THE MORE POWER PRODUCED BY THE PANEL

BONUS

16) ENERGY *Short Answer* How many kilowatt-hours does a heater running at 100 watts consume per 24 hour period?

ANSWER: 2.4

TOSS-UP

17) EARTH AND SPACE *Multiple Choice* What is the approximate mass of the largest stars?

- W) 1 solar mass
- X) 10 solar masses
- Y) 100 solar masses
- Z) 1000 solar masses

ANSWER: Y) 100 SOLAR MASSES

BONUS

17) EARTH AND SPACE *Multiple Choice* Which of the following is a sedimentary rock made of microscopic fossil marine shells?

- W) Chalk
- X) Shale
- Y) Coal
- Z) Lignite

ANSWER: W) CHALK

TOSS-UP

18) MATH *Multiple Choice* A triangle has vertices (6, 7), (11, 9) and (3, 8). After undergoing a particular transformation, its corresponding new vertices are (8, 10), (13, 12) and (5, 11), respectively. What type of transformation did it undergo?

- W) Dilation
- X) Translation
- Y) Reflection
- Z) Rotation

ANSWER: X) TRANSLATION

BONUS

18) MATH *Multiple Choice* Which of the following angles cannot be trisected using only compass and straightedge?

- W) 45°
- X) 120°
- Y) 135°
- Z) No angle can be trisected

ANSWER: X) 120°

TOSS-UP

19) LIFE SCIENCE *Multiple Choice* Which of the following was a top predator during the Devonian period?

- W) Coelecanth [**SEE-luh-kanth**]
- X) Trilobite
- Y) Crinoid [**KRY-noid**]
- Z) *Dunkleosteus* [**duhn-kee-uh-STE-uhs**]

ANSWER: Z) DUNKLEOSTEUS

BONUS

19) LIFE SCIENCE *Multiple Choice* A peptide sequence with the amino acid composition proline-glycine [**GLY-seen**]-glycine-tyrosine [**TY-ruh-seen**] would have what percentage of aromaticity?

- W) 25%
- X) 50%
- Y) 75%
- Z) 100%

ANSWER: W) 25%

TOSS-UP

20) PHYSICAL SCIENCE *Multiple Choice* Which of the following statements is NOT part of the standard model of frictional force assumptions?

- W) Frictional force is independent of contact area
- X) Frictional force is proportional to normal force
- Y) Frictional coefficient is proportional to force between objects
- Z) Frictional force is independent of velocity

ANSWER: Y) FRICTIONAL COEFFICIENT IS PROPORTIONAL TO FORCE BETWEEN OBJECTS

BONUS

20) PHYSICAL SCIENCE *Short Answer* What mysterious type of matter is hypothesized to comprise over 80% of the mass of our galaxy?

ANSWER: DARK MATTER

TOSS-UP

21) GENERAL SCIENCE *Multiple Choice* Which of the following is NOT a steroid?

- W) Cholesterol
- X) Triacylglycerols [*try-uh-see-GLIS-uh-rohls*]
- Y) Testosterone
- Z) Estradiol [*es-truh-DY-ol*]

ANSWER: X) TRIACYLGLYCEROLS

BONUS

21) GENERAL SCIENCE *Multiple Choice* Kepler's laws of planetary motion describe the path of two objects, one orbiting the other, as which of the following?

- W) Hyperbolic with the Sun at one extreme end from the object
- X) Spherical with the Sun at a radial distance from the object
- Y) A figure eight with the Sun and the object intersecting periodically
- Z) Elliptical with the Sun at one of the foci

ANSWER: Z) ELLIPTICAL WITH THE SUN AT ONE OF THE FOCI

TOSS-UP

22) EARTH AND SPACE *Multiple Choice* What draws the charged particles from the solar wind to the polar regions of the Earth?

- W) Jet stream currents in Earth's upper atmosphere
- X) Earth's magnetic field
- Y) Earth's electric field
- Z) Centrifugal force

ANSWER: X) EARTH'S MAGNETIC FIELD

BONUS

22) EARTH AND SPACE *Multiple Choice* Which of the following Appalachian Mountain provinces is the eroded remnant of a folded mountain belt?

- W) Valley and Ridge belt
- X) Great Valley
- Y) Piedmont
- Z) Appalachian Plateau

ANSWER: W) VALLEY AND RIDGE BELT

TOSS-UP

23) MATH *Short Answer* A rectangular box has a volume of 200 cubic inches. The length of the box is 10 inches, and the height is 4 inches. What is the ratio of the width of the box to the length of the box?

ANSWER: 1:2 (ACCEPT: $\frac{1}{2}$ OR 0.5)

BONUS

23) MATH *Short Answer* A group of 3 boys and 3 girls are taking a photograph, standing side-by-side in a line. If they must alternate gender, how many different arrangements are possible?

ANSWER: 72