

ROUND 10

TOSS-UP

1) GENERAL SCIENCE *Multiple Choice* All EXCEPT which of the following organisms DOES NOT belong to the phylum Echinodermata [*i-ky-nuh-DUHR-muht-uh*]?

- W) Sea cucumber
- X) Sea urchin
- Y) Sea anemone [*uh-NEM-uh-nee*]
- Z) Brittle star

ANSWER: Y) SEA ANEMONE

BONUS

1) GENERAL SCIENCE *Multiple Choice* The gut of what arthropod serves as a home to the cellulose-digesting protist known as *Trichonympha* [*trik-uh-NIMF-uh*]?

- W) Tarantula hawk
- X) Termite
- Y) Pillbug
- Z) Praying mantis

ANSWER: X) TERMITE

TOSS-UP

2) ENERGY *Multiple Choice* The heat energy stored in water while it flows through a tube has been studied by which of the following scientists?

- W) Maxwell
- X) Archimedes [*ahr-kuh-MEE-deez*]
- Y) Bernoulli
- Z) Pascal

ANSWER: Y) BERNOULLI

BONUS

2) ENERGY *Multiple Choice* Which of the following is NOT a characteristic of the SC Johnson cogeneration project at its Waxdale manufacturing facility in Wisconsin?

- W) It converts methane gas from a landfill to use as electricity
- X) It recovers waste heat to create steam
- Y) It has reduced greenhouse gas emissions
- Z) It has multiple geothermal heat pumps

ANSWER: Z) IT HAS MULTIPLE GEOTHERMAL HEAT PUMPS

TOSS-UP

3) PHYSICAL SCIENCE *Multiple Choice* Which of the following is NOT a true statement about electric and gravitational fields?

- W) Both can act in a vacuum
- X) Both obey an inverse-square law
- Y) Both are only attractive
- Z) Both are proportional to the product of the quantity that causes the field

ANSWER: Y) BOTH ARE ONLY ATTRACTIVE

BONUS

3) PHYSICAL SCIENCE *Short Answer* What is the speed in meters per second of an object that moves 0.3 kilometers in 1 minute?

ANSWER: 5

TOSS-UP

4) LIFE SCIENCE *Multiple Choice* Which of the following statements about wood in a tree is NOT true?

- W) Wood is made of secondary xylem **[ZY-luhm]** and fibers
- X) The oldest wood is at the center of the tree while younger wood is towards the periphery
- Y) Annual rings consist of both early (spring) wood and late (summer) wood
- Z) True wood is only found in monocots, while dicots do not produce true wood

ANSWER: Z) TRUE WOOD IS ONLY FOUND IN MONOCOTS, WHILE DICOTS DO NOT PRODUCE TRUE WOOD

BONUS

4) LIFE SCIENCE *Multiple Choice* Sometimes, there is more of a particular ion inside of a cell than there is outside of the cell. Which of the following will a cell do if it requires even more of this particular ion?

- W) Nothing, since the ions diffuse into the cell across the membrane
- X) The lipid molecules of the membrane "flip" the ions across
- Y) The ions are transported into the cell via channel proteins
- Z) The ions are transported into the cell via transport proteins

ANSWER: Z) THE IONS ARE TRANSPORTED INTO THE CELL VIA TRANSPORT PROTEINS

TOSS-UP

5) MATH *Multiple Choice* Given the equation $x^2 = \sqrt{x}$, which of the following conclusions is true?

- W) The equation is true for all real x
- X) The equation is true when $x = 0$
- Y) The equation is true when x is negative
- Z) The equation is true for no real x

ANSWER: X) THE EQUATION IS TRUE WHEN $x = 0$

BONUS

5) MATH *Short Answer* If the area of a sector of a circle with a central angle of 60° is 24π , what is the radius of the circle?

ANSWER: 12

TOSS-UP

6) EARTH AND SPACE *Multiple Choice* Old sea ice is the category of sea ice that has been around for the longest time. It can be subdivided into which of the following groups?

- W) Second-year ice and multi-year ice
- X) Frazil ice and slush
- Y) 0 to 10 centimeter ice and 10 to 30 centimeter ice
- Z) Dark old sea ice and light old sea ice

ANSWER: W) SECOND-YEAR ICE AND MULTI-YEAR ICE

BONUS

6) EARTH AND SPACE *Short Answer* Organize the following four surfaces from the lowest to highest albedo: 1) fresh snow, 2) snow-free sea ice, 3) sea water, 4) melting snow.

ANSWER: 3, 2, 4, 1 (ACCEPT: SEA WATER, SNOW-FREE SEA ICE, MELTING SNOW, FRESH SNOW)

TOSS-UP

7) GENERAL SCIENCE *Multiple Choice* What is the dominant food source for the largest whale on Earth?

- W) Krill
- X) Squid
- Y) Penguins
- Z) Seals

ANSWER: W) KRILL

BONUS

7) GENERAL SCIENCE *Multiple Choice* Which of the following plants has a life cycle dominated by gametophytes [*guh-MEE-tuh-fyts*]?

- W) Fern
- X) Moss
- Y) Pine tree
- Z) Wheat

ANSWER: X) MOSS

TOSS-UP

8) PHYSICAL SCIENCE *Short Answer* While at the beach, you notice that one ocean wave overtakes another. The two waves then become one wave, which has double the amplitude of the original waves. This is an example of what type of interference?

ANSWER: CONSTRUCTIVE

BONUS

8) PHYSICAL SCIENCE *Short Answer* There are at least seven strong acids. Give the common names of five of them.

ANSWER: (ANY FIVE) HYDROCHLORIC, HYDROBROMIC, HYDROIODIC, NITRIC, SULFURIC, PERCHLORIC, CHLORIC

TOSS-UP

9) LIFE SCIENCE *Short Answer* In addition to carbohydrates and proteins, your body must also digest fats. What chemical, produced in the liver, aids in the digestion of fats?

ANSWER: BILE (ACCEPT: GALL)

BONUS

9) LIFE SCIENCE *Short Answer* While hiking in the remote wilderness, you start to run low on food. You've noted that there is plenty of thistle, prickly pear, sassafras, and foxglove growing nearby. Which of these plants would you absolutely NOT want to eat?

ANSWER: FOXGLOVE

TOSS-UP

10) MATH *Multiple Choice* Ben started with an allowance of \$1.50. His allowance was doubled every week for the next 5 weeks. Which of the following types of function does this represent?

- W) Quadratic
- X) Linear
- Y) Exponential
- Z) Absolute value

ANSWER: Y) EXPONENTIAL

BONUS

10) MATH *Short Answer* A tangent segment to a circle from an exterior point has a length of 12. The radius drawn to the point of tangency has a length of 5. What is the length of the segment drawn from the exterior point to the center of the circle?

ANSWER: 13

TOSS-UP

11) EARTH AND SPACE *Multiple Choice* Which of the following characteristics are exhibited by biota that occur early in the succession of a region?

- W) Deep roots
- X) High productivity
- Y) Long lifespans
- Z) Highly diversified group of species

ANSWER: X) HIGH PRODUCTIVITY

BONUS

11) EARTH AND SPACE *Multiple Choice* What is the major source of heat energy that leads to the melting of sea ice?

- W) Absorption of ocean water radiation by the ice
- X) Convection of heat from the surrounding air
- Y) Conduction of energy from the surrounding water
- Z) Radiation of energy from land

ANSWER: Y) CONDUCTION OF ENERGY FROM THE SURROUNDING WATER

TOSS-UP

12) MATH *Multiple Choice* Looking at a package of 13-watt, energy efficient light bulbs, Debra read that the new 13-watt bulbs give off the same amount of light as an incandescent 60-watt bulb. Using the new bulbs will result in a wattage decrease closest to which of the following percentages?

- W) 70%
- X) 75%
- Y) 78%
- Z) 80%

ANSWER: Y) 78%

BONUS

12) MATH *Short Answer* In degrees, what is the supplement of the complement of $x + 20^\circ$?

ANSWER: $110 + x$

TOSS-UP

13) ENERGY *Multiple Choice* Which of the following statements is NOT true about hydropower?

- W) The first hydropower plant was built at Niagara Falls in 1879
- X) The U.S. is the largest producer of hydropower
- Y) The amount of electricity generated depends on how far the water drops and how much water moves through the system
- Z) It provides about one fifth of the world's electricity

ANSWER: X) THE U.S. IS THE LARGEST PRODUCER OF HYDROPOWER

BONUS

13) ENERGY *Multiple Choice* In a transmission line, the voltage coming from the generator is increased from 25,000 volts to around 400,000 volts. Why must the voltage be raised so high?

- W) Higher voltage produces more power
- X) Higher voltage increases the power lost
- Y) Higher voltage reduces the amount of power lost
- Z) Transformers raise the voltage to protect the generator from overcurrents or overvoltages

ANSWER: Y) HIGHER VOLTAGE REDUCES THE AMOUNT OF POWER LOST

TOSS-UP

14) PHYSICAL SCIENCE *Short Answer* You measure the current through a resistor as 15 amperes. The voltage drop across the resistor is 5 volts. According to Ohm's law, to the nearest tenth of an ohm, what is the resistance?

ANSWER: 0.3

BONUS

14) PHYSICAL SCIENCE *Short Answer* In an alien environment, you find a plant that excretes a liquid. This liquid, over time, separates into two distinct liquids. When mixed again, the two liquids become one, but only for a few hours. What would be the scientific name for this type of mixture?

ANSWER: EMULSION

TOSS-UP

15) LIFE SCIENCE *Short Answer* At the end of meiosis I [**my-OH-sis one**], cell division results in two cells with replicated chromosomes (meaning the sister chromatids are still present), but the chromosomes are no longer in homologous [**huh-MOL-uh-guhs**] pairs. What is the ploidy level of these cells?

ANSWER: HAPLOID (ACCEPT: MONOPOLOID)

BONUS

15) LIFE SCIENCE *Short Answer* In mice, black fur B [**Big B**] is dominant over white fur b [**little b**]. If a bb [**little B little B**] mouse is crossed with a Bb [**big B little b**] mouse, what percentages of white mice and black mice would you expect in the F1 generation?

ANSWER: 50% BLACK MICE, 50% WHITE MICE (ACCEPT: 50/50)

TOSS-UP

16) MATH *Multiple Choice* A wagon wheel has 8 spokes. What percentage of the area of the wheel is represented by a spoke and the space between it and the next spoke?

- W) 8%
- X) 12.5%
- Y) 40%
- Z) 45%

ANSWER: X) 12.5%

BONUS

16) MATH *Short Answer* If a square inscribed in a circle has a side length equal to 8 inches, what is the area in square inches inside the circle but outside the square?

ANSWER: $32\pi - 64$

TOSS-UP

17) EARTH AND SPACE *Short Answer* What is the name of the meteor shower visible in the Northern Hemisphere beginning in mid-July of each year, with a peak in activity between August 9 and 14?

ANSWER: PERSEID

BONUS

17) EARTH AND SPACE *Multiple Choice* What is the current explanation for the formation of the asteroid belt?

- W) There was too big of a gap between Mars and Jupiter to form a planet
- X) Mars had two moons and planetesimals [*plan-i-TEs-uh-muhls*] in that location were not large enough to form another moon
- Y) The planetesimals in that location were moving too slowly to accrete to form a planet
- Z) After Jupiter was formed, planetesimals in that location were perturbed by Jupiter's gravity and could not form a planet

ANSWER: Z) AFTER JUPITER WAS FORMED, PLANETESIMALS IN THAT LOCATION WERE PERTURBED BY JUPITER'S GRAVITY AND COULD NOT FORM A PLANET

TOSS-UP

18) LIFE SCIENCE *Multiple Choice* Which of the following is NOT an example of hydrolysis [*hy-DROL-uh-sis*] of a biomolecule?

- W) Conversion of fats to fatty acids and glycerol [*GLIS-uh-rol*]
- X) Conversion of proteins to amino acids
- Y) Conversion of nucleotides to DNA [*NOO-klee-uh-tyds*]
- Z) Conversion of starch to monosaccharides [*mon-uh-SAK-uh-ryds*]

ANSWER: Y) CONVERSION OF NUCLEOTIDES TO DNA

BONUS

18) LIFE SCIENCE *Multiple Choice* Which of the following would most likely contain an alkaloid?

- W) Plants
- X) Fish
- Y) Reptiles
- Z) Mammals

ANSWER: W) PLANTS

TOSS-UP

19) GENERAL SCIENCE *Multiple Choice* Assuming no errors in cellular or genetic mechanics, which of the following increases genetic diversity in organisms that reproduce sexually as opposed to asexually?

- W) Homologous recombination [*huh-MOL-uh-guhs*]
- X) Translation
- Y) Transcription
- Z) Replication

ANSWER: W) HOMOLOGOUS RECOMBINATION

BONUS

19) GENERAL SCIENCE *Multiple Choice* Atopic dermatitis is a medical condition affecting which part of the human body?

- W) Liver
- X) Hair
- Y) Skin
- Z) Heart

ANSWER: Y) SKIN

TOSS-UP

20) ENERGY *Multiple Choice* Which of the following statements is NOT true about the Grand Coulee Dam?

- W) It is the largest U.S. hydropower producer
- X) It is part of the Columbia Basin Project, which irrigates more than 600,000 acres of land
- Y) It is an arch-gravity dam
- Z) It contains nearly 12 million cubic yards of concrete

ANSWER: Y) IT IS AN ARCH-GRAVITY DAM

BONUS

20) ENERGY *Short Answer* What intermediate device is required for electricity from a photovoltaic panel to be useable with a standard household wall outlet?

ANSWER: INVERTER (ACCEPT: DC/AC CONVERTER)

TOSS-UP

21) PHYSICAL SCIENCE *Short Answer* What are the three elements that compose glucose and fructose?

ANSWER: CARBON, OXYGEN, AND HYDROGEN

BONUS

21) PHYSICAL SCIENCE *Short Answer* In a mad frenzy, you decide to build the world's most powerful electromagnet to wipe out everyone's cell phone SIM cards. While constructing the device, you use low resistance wiring, an iron-iridium core, multiple tight coils, and a high-voltage low-amperage battery. When you activate the device, it generates enough power to wipe out only your own cell phone. Which of these components had the greatest effect on the strength of your electromagnet?

ANSWER: MULTIPLE TIGHT COILS

TOSS-UP

22) LIFE SCIENCE *Multiple Choice* Which of the following is NOT a potential control mechanism for regulating gene expression in eukaryotic **[yoo-KAR-ee-oh-tik]** organisms?

- W) The breakdown of RNA
- X) The transport of mRNA from the nucleus
- Y) The lactose operon
- Z) Transcription

ANSWER: Y) THE LACTOSE OPERON

BONUS

22) LIFE SCIENCE *Multiple Choice* You are looking through a microscope at an unlabeled sample of human tissue. You notice the tissue is multinucleated, and contains striations. What tissue are you examining?

- W) Skeletal muscle
- X) Areolar **[uh-REE-uh-luhr]** connective tissue
- Y) Cardiac muscle
- Z) Fibrocartilage

ANSWER: W) SKELETAL MUSCLE

TOSS-UP

23) MATH *Short Answer* If the area of square is numerically the same as the length of its diagonal, what is the length of its side?

ANSWER: $\sqrt{2}$

BONUS

23) MATH *Short Answer* What is the equation, in slope intercept form, of the perpendicular bisector of the segment whose endpoints are (-3, 5) and (7, 9)?

ANSWER: $y = -\frac{5}{2}x + 12$

TOSS-UP

24) EARTH AND SPACE *Multiple Choice* Which of the following statements is NOT true about light pollution?

- W) Using a short wavelength light at night minimizes the impact of artificial light
- X) Some birds sing at unnatural hours in the presence of artificial light
- Y) It is caused by allowing artificial light to shine outward and upward into the sky at night, rather than focusing it downward
- Z) Brightly lit highways create nocturnal light levels that are as much as a million times brighter than normal, disorienting amphibians and other animals

ANSWER: W) USING A SHORT WAVELENGTH LIGHT AT NIGHT MINIMIZES THE IMPACT OF ARTIFICIAL LIGHT

BONUS

24) EARTH AND SPACE *Multiple Choice* Which of the following would be the most damaging kind of light pollution for an astronomer using a telescope at an observatory?

- W) Everyone on a street leaving on their porch light
- X) A car dealership using a spotlight for advertisement
- Y) Neon lighting on advertisements
- Z) Everyone in town leaving their living room lights on after they go to bed

ANSWER: X) A CAR DEALERSHIP USING A SPOTLIGHT FOR ADVERTISEMENT

TOSS-UP

25) GENERAL SCIENCE *Multiple Choice* While body surfing off the coast of Florida, you are stung by a sea jelly. Which of the following cells is responsible for your irritation?

- W) Nematocyst [**NEM-uh-tuh-sist**]
- X) Choanocyte [**KOH-uh-nuh-syt**]
- Y) Hepatocyte [**HEP-uh-tuh-syt**]
- Z) Trichome [**TRIK-ohm**]

ANSWER: W) NEMATOCYST

BONUS

25) GENERAL SCIENCE *Multiple Choice* A biologist hypothesizes that palatable mocker swallowtail caterpillars mimic non palatable swallowtail caterpillars. She makes hundreds of decoy caterpillars out of modeling clay to put on plants. She will count the number of decoys that are destroyed by experienced predators. How might she paint the decoys to test her hypothesis most efficiently?

- W) Half to look like mocker swallowtails and half to look like non palatable caterpillars of another species
- X) All to look like mocker swallowtails
- Y) Half to look like mocker swallowtails and half to look like swallowtails
- Z) Half to look like mocker swallowtails and half to look like palatable caterpillars of another species

ANSWER: Z) HALF TO LOOK LIKE MOCKER SWALLOWTAILS AND HALF TO LOOK LIKE PALATABLE CATERPILLARS OF ANOTHER SPECIES