

ROUND 14

TOSS-UP

1) MATH *Short Answer* Three points on a graph are connected by lines to form a triangle. If the center of dilation is the origin and one of the points is (4, 6), what is the new point for a dilation factor of 2?

ANSWER: (8, 12)

BONUS

1) MATH *Short Answer* Giving your answer in terms of π , what is the length of a 36° arc in a circle that has a circumference of 50π ?

ANSWER: 5π

(Solution: $C = 50\pi$; $1/10^{\text{th}}$ of $50\pi = 5\pi$)

TOSS-UP

2) GENERAL SCIENCE *Multiple Choice* Which of the following is NOT true of the Moon:

- W) the Moon rotates on its axis at the same rate that it takes to orbit the Earth
- X) over long periods of time, we can see more than 50% of the Moon's surface from Earth
- Y) the Moon is gradually getting closer to the Earth by about 4 centimeters each year
- Z) the Moon's orbit is elliptical

ANSWER: Y) THE MOON IS GRADUALLY GETTING CLOSER TO THE EARTH BY ABOUT 4 CENTIMETERS EACH YEAR

BONUS

2) GENERAL SCIENCE *Short Answer* Name all of the following 3 skin infections that are caused by mold-like fungi called dermatophytes (read as: derr-mat-oh-fights): ringworm; jock itch; athlete's foot

ANSWER: RINGWORM; JOCK ITCH; ATHLETES FOOT (ACCEPT: ALL OF THEM)

TOSS-UP

3) LIFE SCIENCE *Multiple Choice* Antibodies are composed of:

- W) lipids
- X) nucleic acids
- Y) glucose
- Z) amino acids

ANSWER: Z) AMINO ACIDS

BONUS

3) LIFE SCIENCE *Multiple Choice* Consider a cross of a pea plant having white flowers with a pea plant having red flowers. Of 50 seedlings from this cross, 25 produce white flowers and 25 produce red flowers. If white is dominant, which of the following is the BEST description for the genetic makeup of the white flowering parent plant:

- W) homozygous for white flowers
- X) heterozygous
- Y) homozygous for red flowers
- Z) co-dominant for white and red

ANSWER: X) HETEROZYGOUS

TOSS-UP

4) PHYSICAL SCIENCE *Multiple Choice* Which of the following is NOT true:

- W) the temperature of a substance changes during a phase change
- X) a compound can be broken down by chemical means
- Y) some known elements are unstable and only last for fractions of seconds
- Z) the opposite of vaporization is condensation

ANSWER: W) THE TEMPERATURE OF A SUBSTANCE CHANGES DURING A PHASE CHANGE

BONUS

4) PHYSICAL SCIENCE *Short Answer* Name all of the following 4 substances that are bases:
MgCl; NaOH; HCl; H₂SO₄

ANSWER: NaOH (ACCEPT: SODIUM HYDROXIDE)

TOSS-UP

5) EARTH SCIENCE *Multiple Choice* Except for birds, dinosaurs became extinct after which of the following periods:

- W) Jurassic
- X) Triassic
- Y) Cretaceous
- Z) Permian

ANSWER: Y) CRETACEOUS

BONUS

5) EARTH SCIENCE *Multiple Choice* Which of the following dinosaurs is NOT correctly matched with its description:

- W) Hadrosaurus had a beak, web-feet, and a pelvis very similar to modern ducks
- X) Iguanodon was a mid-sized herbivore
- Y) Brachiosaurus had tail spikes and bony plates along the length of its back
- Z) Tyrannosaurus rex was a large carnivorous dinosaur

ANSWER: Y) BRACHIOSAURUS HAD TAIL SPIKES AND BONY PLATES ALONG THE LENGTH OF ITS BACK

TOSS-UP

6) MATH *Short Answer* Express the following radical in its simplest rationalized form: $\frac{3}{\sqrt{8}}$

ANSWER: $\frac{3\sqrt{2}}{4}$

BONUS

6) MATH *Short Answer* Giving your answer in terms of pi, what is the volume, in cubic meters, of a right circular cone that has a height of 10 meters and a radius of 3 meters?

ANSWER: 30π

TOSS-UP

7) GENERAL SCIENCE *Multiple Choice* Which of the following fabrics would most easily be colored by dyes that contain polar molecules or ions:

- W) wool
- X) nylon
- Y) polyester
- Z) rayon

ANSWER: W) WOOL

(Solution: wool being a protein has the most polar molecules)

BONUS

7) GENERAL SCIENCE *Multiple Choice* There are about 24 essential elements needed to maintain a healthy human body. Which of the following is NOT one of these elements:

- W) iodine
- X) selenium
- Y) sodium
- Z) cesium

ANSWER: Z) CESIUM

TOSS-UP

8) LIFE SCIENCE *Multiple Choice* Which of the following is the BEST explanation for the function of nuclear pores:

- W) to prevent damaging hydrogen peroxide from entering the nucleus
- X) to prevent too much pressure from metabolism from building up in the nucleus
- Y) to allow the nucleus to sweat
- Z) to allow substances such as mRNA to leave the nucleus

ANSWER: Z) TO ALLOW SUBSTANCES SUCH AS mRNA TO LEAVE THE NUCLEUS

BONUS

8) LIFE SCIENCE *Short Answer* What is the common name, not the letter abbreviation, of the nucleotide that is present in DNA but not RNA?

ANSWER: THYMINE

TOSS-UP

9) PHYSICAL SCIENCE *Multiple Choice* Which of the following metals is often used to transform a sheet of regular glass into a mirror:

- W) cobalt
- X) silver
- Y) zinc
- Z) iron

ANSWER: X) SILVER

BONUS

9) PHYSICAL SCIENCE *Short Answer* How many grams are in 2 moles of sodium chloride, knowing that sodium chloride has a molecular weight of 58?

ANSWER: 116

(Solution: $58\text{g/mole} \times 2 \text{ moles} = 116 \text{ grams}$)

TOSS-UP

10) EARTH SCIENCE *Multiple Choice* A hurricane originating in the Eastern tropical Atlantic is driven:

- W) westward by the easterly trade winds
- X) westward by the prevailing westerlies
- Y) eastward by the easterly trade winds
- Z) eastward by the prevailing westerlies

ANSWER: W) WESTWARD BY THE EASTERLY TRADE WINDS

BONUS

10) EARTH SCIENCE *Multiple Choice* An organism that inhabits a fluvial environment is one that inhabits:

- W) lakes and ponds
- X) rivers and streams
- Y) deserts
- Z) volcanoes

ANSWER: X) RIVERS AND STREAMS

TOSS-UP

11) MATH *Short Answer* Remove all negative exponents and simplify the following expression:

$$\frac{4x^0 y^{-3} z^4}{4x}$$

ANSWER: $\frac{z^4}{xy^3}$ (ACCEPT: $\frac{z^4}{y^3x}$)

BONUS

11) MATH *Short Answer* Expand the following expression, giving your answer in standard binomial form: $(4x^4y^2 + 3)^2$

ANSWER: $16x^8y^4 + 24x^4y^2 + 9$

TOSS-UP

12) GENERAL SCIENCE *Multiple Choice* Which of the following scientists would most likely use a coronagraph in their experiments:

- W) biologist
- X) astronomer
- Y) paleontologist
- Z) oceanographer

ANSWER: X) ASTRONOMER

BONUS

12) GENERAL SCIENCE *Short Answer* The coronagraph is used to study what celestial object?

ANSWER: THE SUN

TOSS-UP

13) LIFE SCIENCE *Multiple Choice* Which of the following kinds of microscopes typically is used to view the surface of objects ranging in size from cells to small insects like fleas to reveal minute surface details:

- W) bright field microscopy
- X) interference microscopy
- Y) scanning electron microscopy
- Z) transmission electron microscopy

ANSWER: Y) SCANNING ELECTRON MICROSCOPY

BONUS

13) LIFE SCIENCE *Multiple Choice* A small human lymphocyte and a red blood cell are both about how many micrometers across:

- W) 1
- X) 3
- Y) 8
- Z) 16

ANSWER: Y) 8

TOSS-UP

14) PHYSICAL SCIENCE *Short Answer* Name all of the following 3 forms of energy transfer that move in the form of electromagnetic waves: conduction; convection; radiation

ANSWER: RADIATION

BONUS

14) PHYSICAL SCIENCE *Multiple Choice* Which of the following **MUST** be the case for a more massive object versus a less massive object if both are at the same temperature and pressure:

- W) the more massive object will have more thermal energy
- X) the more massive object will have a greater specific heat
- Y) the more massive object will lose heat faster than the smaller object
- Z) the more massive object will have less inertia

ANSWER: W) THE MORE MASSIVE OBJECT WILL HAVE MORE THERMAL ENERGY

TOSS-UP

15) EARTH SCIENCE *Multiple Choice* Which of the following is the BEST example of a littoral ocean current:

- W) rip current
- X) seismic sea wave
- Y) the Gulf Stream
- Z) equatorial tidal current

ANSWER: W) RIP CURRENT

BONUS

15) EARTH SCIENCE *Short Answer* Order the following 4 layers of the Sun from the INNERMOST to the OUTERMOST: core; radiative zone; corona; convective zone

ANSWER: CORE; RADIATIVE ZONE; CONVECTIVE ZONE; CORONA

TOSS-UP

16) MATH *Short Answer* What is the volume, in cubic centimeters, of a rectangular prism that measures 8-centimeters long, 2-centimeter wide, and 3-centimeters high?

ANSWER: 48

(Solution: $V = l \times w \times h$)

BONUS

16) MATH *Short Answer* How many different 3-letter arrangements are there of the first 6 letters of the alphabet?

ANSWER: 120

(Solution: $P(6,3) = 6!/(6-3)! = 6!/3! = 120$)

TOSS-UP

17) GENERAL SCIENCE *Multiple Choice* Which of the following BEST describes the property of light as a transverse wave whereby the plane of vibration of the light is restricted to certain planes:

- W) diffraction
- X) reflection
- Y) refraction
- Z) polarization

ANSWER: Z) POLARIZATION

BONUS

17) GENERAL SCIENCE *Short Answer* Giving your answer in angstroms, add 2 nanometers to 10 angstroms:

ANSWER: 30

(Solution: $2 \text{ nm} = 20\text{A}$; $20\text{A} + 10\text{A} = 30\text{A}$)

TOSS-UP

18) LIFE SCIENCE *Multiple Choice* In which of the following cell types of woody higher plants is lignin most prominent:

- W) phloem
- X) xylem
- Y) parenchyma
- Z) collenchyma

ANSWER: X) XYLEM

BONUS

18) LIFE SCIENCE *Multiple Choice* Which of the following is the LEAST likely method a maple tree uses to regulate water:

- W) storing water in vacuoles
- X) opening and closing stomata in stems and leaves
- Y) transporting water in their heartwood
- Z) absorbing water through root hairs

ANSWER: Y) TRANSPORTING WATER IN THEIR HEARTWOOD

TOSS-UP

19) PHYSICAL SCIENCE *Multiple Choice* Because they contain mercury, which of the following is the BEST classification of silver dental fillings:

- W) amalgam
- X) colloid
- Y) mixture
- Z) solution

ANSWER: W) AMALGAM

(Solution: an amalgam is an alloy of mercury)

BONUS

19) PHYSICAL SCIENCE *Short Answer* A chemistry experiment calls for 10.0 liters of a 0.8 molar solution of a chemical with a molecular weight of 100 grams per mole. How many grams of the chemical will you need to weigh out to make this solution?

ANSWER: 800

(Solution: $10L \times 0.8 \text{ moles/L} = 8 \text{ moles}$; $8 \text{ moles} \times 100 \text{ g/mole} = 800 \text{ grams}$)

TOSS-UP

20) EARTH SCIENCE *Multiple Choice* Which of the following is NOT true about glaciations:

- W) about 12,000 years ago it was possible to walk from Alaska to Siberia through the Bering Strait
- X) throughout history, times of extensive glaciation coincided with low sea levels
- Y) the center of a glacier typically moves slower down a slope than do the edges
- Z) alpine glaciers exist on nearly every continent

ANSWER: Y) THE CENTER OF A GLACIER TYPICALLY MOVES SLOWER DOWN A SLOPE THAN DO THE EDGES

BONUS

20) EARTH SCIENCE *Multiple Choice* If high tide occurs at noon, which of the following is the most likely time that the same beach will experience a low tide:

- W) 3 PM
- X) 4 PM
- Y) 5 PM
- Z) 6 PM

ANSWER: Z) 6 PM

TOSS-UP

21) MATH *Short Answer* Order the following 4 radicals from the smallest to the largest:
 $3\sqrt{2}$; $\sqrt[3]{2}$; $\sqrt{3}$; $\sqrt{2}$

ANSWER: $\sqrt[3]{2}$; $\sqrt{2}$; $\sqrt{3}$; $3\sqrt{2}$

BONUS

21) MATH *Short Answer* Multiply the following 2 radicals, giving your answer to the nearest whole number: $(3\sqrt[3]{4})(2\sqrt[3]{16})$

ANSWER: 24

(Solution: $3 \times 2 \times \sqrt[3]{4} \times \sqrt[3]{16} = 6\sqrt[3]{64} = 24$)

TOSS-UP

22) GENERAL SCIENCE *Short Answer* When all other things are held constant and a star is 1/3 as far from an observer as it originally was, how many times as bright would it appear?

ANSWER: 9

BONUS

22) GENERAL SCIENCE *Short Answer* A forest fire in part of the New York Adirondack mountains wipes out all existing vegetation. Arrange the following 4 choices from the FIRST that is most likely to repopulate the land to the LAST to repopulate: pine trees; scrubs; oak trees; grasses

ANSWER: GRASSES; SCRUBS; PINE TREES; OAK TREES

TOSS-UP

23) LIFE SCIENCE *Short Answer* In the stem of a higher plant, what is the MOST common scientific term for the points where leaves are attached?

ANSWER: NODES

BONUS

23) LIFE SCIENCE *Short Answer* What is the scientific term for the stalk of a leaf that joins the leaf to the node of a plant stem?

ANSWER: PETIOLE

TOSS-UP

24) PHYSICAL SCIENCE *Short Answer* Name all of the following 4 particles that cannot be deflected when passing through a magnetic field: photon; electron; neutron; proton

ANSWER: NEUTRON AND PHOTON

BONUS

24) PHYSICAL SCIENCE *Short Answer* What is the most common scientific term for the back and forth oscillating motion of a swinging pendulum?

ANSWER: HARMONIC (ACCEPT: SIMPLE HARMONIC MOTION)

TOSS-UP

25) EARTH SCIENCE *Short Answer* Giving your answer as north, south, east, or west, plate tectonics show that the eastern side of the North American Plate is moving slowly in what general direction?

ANSWER: WEST

BONUS

25) EARTH SCIENCE *Short Answer* Order the following 3 seismic waves from the FIRST to be detected at a seismographic station to the LAST: S-wave; surface wave; P-wave

ANSWER: P-WAVE; S-WAVE; SURFACE WAVE