

ROUND 13A

TOSS-UP

1) EARTH AND SPACE *Multiple Choice* Non-storm wave action can move fine sand particles in depths of up to how many meters?

- W) 10
- X) 20
- Y) 40
- Z) 80

ANSWER: X) 20

BONUS

1) EARTH AND SPACE *Multiple Choice* The Paleocene-Eocene **[PAY-lee- uh-seen EE-uh-seen]** Thermal Maximum (PETM) was an event marked by major changes on Earth that occurred about 55 million years ago. Which of the following is NOT true of the PETM?

- W) Global temperature rose by about 6°C
- X) Carbonate deposits in the world's oceans dissolved
- Y) Greenhouse gases such as CO₂ were much lower
- Z) Deep-sea extinctions of marine organisms occurred

ANSWER: Y) GREENHOUSE GASES SUCH AS CO₂ WERE MUCH LOWER

TOSS-UP

2) GENERAL SCIENCE *Multiple Choice* Which of the following is NOT a process of plate tectonics?

- W) Continental drift
- X) Seafloor spreading
- Y) Subduction
- Z) Upwelling

ANSWER: Z) UPWELLING

BONUS

2) GENERAL SCIENCE *Short Answer* Geological time charts use Latin or Greek for naming. What is the English translation of the Greek term "Mesozoic"?

ANSWER: MIDDLE LIFE (ACCEPT: MEDIUM or BETWEEN for MIDDLE, ANIMALS or LIVING BEINGS for LIFE)

TOSS-UP

3) PHYSICAL SCIENCE *Multiple Choice* Which of the following best classifies iodine?

- W) Halogen
- X) Inert gas
- Y) Compound
- Z) Alkali metal

ANSWER: W) HALOGEN

BONUS

3) PHYSICAL SCIENCE *Short Answer* In the jungle, Curious George is swinging from a vine between two trees, like a pendulum [**PEN-juh-luhm**], and in a surprisingly regular fashion. Given that the time he takes to swing from one tree to another is 1.5 seconds, assuming no energy is lost from air drag or friction, what is the period if we assume that George is a harmonic oscillator?

ANSWER: 3.0

TOSS-UP

4) MATH *Short Answer* The sum of the ages of 5 people 5 years ago was 50. The sum of their ages 5 years from now will be how many years?

ANSWER: 100

BONUS

4) MATH *Short Answer* Triangle ABC is isosceles. If angle A has a measure of 40° , what are all of the possible degree measures of angle B?

ANSWER: 40, 70, 100

TOSS-UP

5) LIFE SCIENCE *Multiple Choice* Which of the following determines the sex of a turtle egg?

- W) Temperature of the sand
- X) Phase of the moon
- Y) Season of fertilization
- Z) How many eggs are laid

ANSWER: W) TEMPERATURE OF THE SAND

BONUS

5) LIFE SCIENCE *Multiple Choice* Which of the following is least likely to be impacted by decreased environmental pH?

- W) Pteropods [*TER-uh-pods*]
- X) Diatoms
- Y) Coccolithophorids [*koh-koh-lith-uh-FOH-rids*]
- Z) Mussels

ANSWER: X) DIATOMS

TOSS-UP

6) EARTH AND SPACE *Multiple Choice* Worldwide, over 70% of the total length of beaches has retreated at a rate of 10 centimeters per year. Which of the following is primarily responsible for this dramatic change?

- W) Increase in shoreline construction
- X) Decrease in the number of groins permitted
- Y) Damming of the world's rivers
- Z) Increases in ocean acidification

ANSWER: Y) DAMMING OF THE WORLD'S RIVERS

BONUS

6) EARTH AND SPACE *Short Answer* Black holes are thought to eventually evaporate away due to what phenomenon?

ANSWER: HAWKING RADIATION (ACCEPT: BLACK BODY RADIATION)

TOSS-UP

7) ENERGY *Multiple Choice* Harmonics, an issue of power quality, causes which of the following effects?

- W) Distorts the voltage and current waveforms of a circuit
- X) Reduction in the source voltage
- Y) Increase in the source voltage
- Z) Power interruption for more than one minute

ANSWER: W) DISTORTS THE VOLTAGE AND CURRENT WAVEFORMS OF A CIRCUIT

BONUS

7) ENERGY *Multiple Choice* The heat engine utilized in a typical ocean thermal energy conversion system has an efficiency that lies in which of the following ranges?

- W) 0-10%
- X) 20-30%
- Y) 40-50%
- Z) 60-70%

ANSWER: W) 0-10%

TOSS-UP

8) GENERAL SCIENCE *Short Answer* Today we often hear of politicians being given the litmus test to determine their character. However, in science, what chemical property does a litmus test measure?

ANSWER: ACIDITY (ACCEPT: pH, ALKALINITY, ACIDS AND BASE, BASICITY)

BONUS

8) GENERAL SCIENCE *Multiple Choice* Which of the following is NOT a product of the Krebs, or tricarboxylic [*trahy-kahr-bok-SIL-ik*] acid (TCA) cycle?

- W) ATP
- X) NADH
- Y) H₂O
- Z) CO₂

ANSWER: Y) H₂O

TOSS-UP

9) PHYSICAL SCIENCE *Multiple Choice* Formation of a precipitate is one sign that a chemical reaction has occurred. Which of the following is most likely to precipitate in water?

- W) Nitrate
- X) Sulfide
- Y) Acetate
- Z) Chloride

ANSWER: X) SULFIDE

BONUS

9) PHYSICAL SCIENCE *Short Answer* 10 grams of Substance A requires 500 Joules of heat to increase the temperature from 17°C to 167°C. What is the specific heat of Substance A in Joules per gram degrees Celsius, to two significant figures?

ANSWER: 0.33

TOSS-UP

10) MATH *Multiple Choice* A parabola has x-intercept 3 and y-intercept 5. Which of the following can be determined?

- W) Whether the parabola has values in quadrant I [*quadrant one*]
- X) The location of the vertex of the parabola
- Y) The direction the parabola opens
- Z) The equation representing the curve

ANSWER: W) WHETHER THE PARABOLA HAS VALUES IN QUADRANT I

BONUS

10) MATH *Short Answer* If angle ABC is inscribed in a circle and measures 75 degrees, what is the degree measure of arc ABC?

ANSWER: 210

TOSS-UP

11) LIFE SCIENCE *Multiple Choice* Which of the following organisms is most closely related to sharks, rays, and skates?

- W) Chimaera [*ki-MEER-uh*]
- X) Killer whales
- Y) Leopard seals
- Z) Baleen whales

ANSWER: W) CHIMAERA

BONUS

11) LIFE SCIENCE *Short Answer* Two proteins share similar tertiary structure and function, but do NOT have a common ancestor. What specific evolutionary phenomenon can account for their similarity?

ANSWER: CONVERGENT EVOLUTION (DO NOT ACCEPT: EVOLUTION)

TOSS-UP

12) EARTH AND SPACE *Multiple Choice* What kind of spectrum would you expect to see when observing a hot gas through a spectrograph?

- W) Black body spectrum
- X) Emission spectrum
- Y) Absorption spectrum
- Z) Inverted spectrum

ANSWER: X) EMISSION SPECTRUM

BONUS

12) EARTH AND SPACE *Short Answer* What is the name for the specific landscape formed from the dissolution of soluble rocks including limestone, dolomite, and gypsum?

ANSWER: KARST

TOSS-UP

13) GENERAL SCIENCE *Multiple Choice* As the ice freezes around Antarctica in the winter months, what happens to the continent's area?

- W) Increases by half
- X) Increases by 75%
- Y) Doubles
- Z) Triples

ANSWER: Y) DOUBLES

BONUS

13) GENERAL SCIENCE *Short Answer* *Apis mellifera* [**AY-pis muh-LIF-er-uh**] is the scientific name for what insect?

ANSWER: HONEY BEE (ACCEPT: WESTERN HONEY BEE OR EUROPEAN HONEY BEE)

TOSS-UP

14) ENERGY *Multiple Choice* Solar panels derive their power from sunlight. The maximum amount of solar irradiance received at any moment on the surface of the Earth is which of the following?

- W) Solar constant, 1,368 watts per meter squared
- X) Solar variable, 1,268 watts per meter squared
- Y) Solar declination, 1,368 watts per meter squared
- Z) Solar azimuth, 999 watts per meter squared

ANSWER W) SOLAR CONSTANT, 1,368 WATTS PER METER SQUARED

BONUS

14) ENERGY *Multiple Choice* A heat engine operates between temperatures of 100 and 400 degrees Celsius. The maximum possible efficiency of the engine is closest to which of the following?

- W) 25%
- X) 45%
- Y) 55%
- Z) 75%

ANSWER: X) 45%

TOSS-UP

15) PHYSICAL SCIENCE *Short Answer* What device can be constructed by supplying a wire wrapped in loops around an iron core with electrical current?

ANSWER: AN ELECTROMAGNET (ACCEPT: MAGNET)

BONUS

15) PHYSICAL SCIENCE *Multiple Choice* Harry is exerting a force of 10 newtons on a box of mass 5 kilograms in the positive x direction while Sally exerts a force of 15 newtons on the same box but in the negative x direction. What is the magnitude of the acceleration of the box in m/s^2 ?

- W) 0
- X) 0.5
- Y) 1
- Z) 5

ANSWER: Y) 1

TOSS-UP

16) MATH *Multiple Choice* Your average on your first three math tests was an 84. What is the minimum grade you need on the fourth test to have an average of 88 across all four tests?

- W) 90
- X) 94
- Y) 98
- Z) 100

ANSWER: Z) 100

BONUS

16) MATH *Short Answer* Solve for x : $2^{4x} = \frac{1}{16}$ **[2 to the 4x power equals 1/16].**

ANSWER: -1

TOSS-UP

17) LIFE SCIENCE *Multiple Choice* Which of the following events would lead to increased diversity in a population?

- W) Mutation
- X) Founder effect
- Y) Bottleneck event
- Z) Genetic drift

ANSWER: W) MUTATION

BONUS

17) LIFE SCIENCE *Multiple Choice* Which of the following neurons would be capable of conducting an action potential more quickly than the rest?

- W) A myelinated [**MY-uh-luh-nay-tid**] nerve fiber with a narrow diameter
- X) A myelinated nerve fiber with a wide diameter
- Y) An unmyelinated nerve fiber with a wide diameter
- Z) An unmyelinated nerve fiber with a narrow diameter

ANSWER: X) A MYELINATED NERVE FIBER WITH A WIDE DIAMETER

TOSS-UP

18) EARTH AND SPACE *Multiple Choice* The Pleistocene [**PLAY-stuh-seen**] megafauna is a set of species of large animals that lived on Earth during the Pleistocene epoch. Which of following is not part of the Pleistocene megafauna?

- W) Dire wolf
- X) Pterodactyl
- Y) Saber-toothed cat
- Z) Mammoth

ANSWER: X) PTERODACTYL

BONUS

18) EARTH AND SPACE *Multiple Choice* Which of the following occurs for you to witness a partial solar eclipse?

- W) The umbra passes over you, but the penumbra does not
- X) Both the penumbra and umbra pass over you
- Y) The penumbra passes over you, but the umbra does not
- Z) Neither the penumbra nor the umbra pass over you

ANSWER: Y) THE PENUMBRA PASSES OVER YOU, BUT THE UMBRA DOES NOT

TOSS-UP

19) GENERAL SCIENCE *Short Answer* Some people joke that California is going to “break off” from the rest of the United States because of its seismic activity. However, over geologic time, California is actually amassing more land. The Juan de Fuca plate and the continental plate under California are meeting at what kind of tectonic boundary?

ANSWER: CONVERGENT (ACCEPT: DESTRUCTIVE PLATE BOUNDARY)

BONUS

19) GENERAL SCIENCE *Multiple Choice* Which of the following genetic disorders is caused by a deletion of a gene on a chromosome?

- W) Edwards syndrome
- X) Down syndrome
- Y) Phenylketonuria [*fen-l-kee-toh-NOOR-ee-uh*]
- Z) Duchenne [*duh-SHEEN*] muscular dystrophy

ANSWER: Z) DUCHENNE MUSCULAR DYSTROPHY

TOSS-UP

20) PHYSICAL SCIENCE *Short Answer* An isoelectronic series consists of a neutral atom, an anion [*AN-y-uhn*], and a cation [*KAT-eye-uhn*]. Arrange them from the smallest radius to the largest radius.

ANSWER: CATION, NEUTRAL ATOM, ANION

BONUS

20) PHYSICAL SCIENCE *Multiple Choice* Identify which of the following factors must be measured in order to apply Archimedes' principle [*ahr-kuh-MEE-deez*].

- W) Temperature of surrounding air
- X) Temperature of liquid in which an object is submerged
- Y) Surrounding air pressure
- Z) Density of liquid in which an object is submerged

ANSWER: Z) DENSITY OF LIQUID IN WHICH AN OBJECT IS SUBMERGED

TOSS-UP

21) MATH *Multiple Choice* The area of square B is 25% greater than the area of square A. If the area of square B is 80 square inches, then what is the length in inches of the perimeter of square A?

- W) 12
- X) 16
- Y) 32
- Z) 64

ANSWER: Y) 32

BONUS

21) MATH *Short Answer* What is the sum of the first 50 terms of the arithmetic sequence with second term 11 and fifth term 29?

ANSWER: 7600

TOSS-UP

22) ENERGY *Short Answer* Name two of the three major components of syngas.

ANSWER: HYDROGEN, CARBON MONOXIDE, CARBON DIOXIDE (ACCEPT: any two)

BONUS

22) ENERGY *Multiple Choice* A resistive AC circuit supplied by a voltage of 120 root mean squared dissipates 120 watts of power. A secondary resistive circuit, identical to the first one, dissipates 180 watts of power. What is a possible reason the second circuit dissipates more power than the first one?

- W) The power factor for circuit #2 is not equal to 1
- X) The voltage source from circuit #2 contains harmonics
- Y) The higher power dissipation for circuit #2 occurs only during the transitory period
- Z) Parasitic losses are present in circuit #2

ANSWER: X) THE VOLTAGE SOURCE FROM CIRCUIT #2 CONTAINS HARMONICS

TOSS-UP

23) LIFE SCIENCE *Multiple Choice* Which of the following DNA mutations is most likely to occur?

- W) A to C
- X) A to T
- Y) A to U
- Z) A to G

ANSWER: Z) A TO G

BONUS

23) LIFE SCIENCE *Short Answer* By number, identify all of the following four characteristics that distinguish fungi from plants: 1) chitin [**KY-tin**] in cell walls of fungi; 2) fungi do not perform photosynthesis; 3) fungi have hyphae [**HY-fee**]; 4) fungi do not have xylem [**ZY-luhm**].

ANSWER: 1, 2, 3, 4 (ACCEPT: ALL OF THEM)