

ROUND 11A

TOSS-UP

1) GENERAL SCIENCE *Multiple Choice* Phytoplankton [*fy-tuh-PLANGK-tuhn*] blooms in the North Atlantic happen on a predictable annual cycle, depending on the availability of light and nutrients. In what month would you expect to find the highest chlorophyll concentration?

- W) December
- X) May
- Y) July
- Z) October

ANSWER: X) MAY

BONUS

1) GENERAL SCIENCE *Multiple Choice* Ants can lift large masses relative to their body mass. Which of the following mathematical terms describes this relationship?

- W) Work/mass
- X) Power/surface area
- Y) Force/mass
- Z) Power/mass

ANSWER: Y) FORCE/MASS

TOSS-UP

2) MATH *Short Answer* Pete the dog breeder is fencing in two square areas in order to separate his male and female dogs. One square region has an area of 100 square feet. The smaller square region has an area of 81 square feet. How many total feet of fencing does he need to enclose both square regions if the regions do not share any fence?

ANSWER: 76

BONUS

2) MATH *Short Answer* The length of a rectangle is increased by 20%, and the width of the rectangle is increased by 30%. By what percentage will the area of the rectangle be increased?

ANSWER: 56

TOSS-UP

3) PHYSICAL SCIENCE *Multiple Choice* What happens to the amount of light reflected as the angle of incidence increases when light passes from air to water?

- W) It increases
- X) It decreases
- Y) It remains the same
- Z) It increases then decreases

ANSWER: W) IT INCREASES

BONUS

3) PHYSICAL SCIENCE *Multiple Choice* What impurity found in coal contributes to acid rain?

- W) Sulfur
- X) Hydrogen
- Y) Carbon
- Z) Chlorine

ANSWER: W) SULFUR

TOSS-UP

4) LIFE SCIENCE *Multiple Choice* Which of the following species thrives in a salt marsh?

- W) Blue crabs
- X) Sea turtles
- Y) Coral reefs
- Z) Alligators

ANSWER: W) BLUE CRABS

BONUS

4) LIFE SCIENCE *Multiple Choice* Another bacterium living in the mud utilizes the hydrogen sulfide in its own metabolism. What molecule is it most likely to use in a redox reaction with hydrogen sulfide?

- W) Ammonia
- X) Hydrogen
- Y) Nitrate
- Z) Iron

ANSWER: Y) NITRATE

TOSS-UP

5) EARTH AND SPACE *Multiple Choice* Which of the following is farthest from the Sun?

- W) Kuiper Belt [*KY-per*]
- X) Oort Cloud
- Y) Persephone [*per-SEF-uh-nee*]
- Z) Neptune

ANSWER: X) OORT CLOUD

BONUS

5) EARTH AND SPACE *Short Answer* An iceberg is formed by the breakage of an ice shelf. What is the term for this event?

ANSWER: CALVING

TOSS-UP

6) GENERAL SCIENCE *Short Answer* What is the name of the mechanism responsible for the evolution of a species?

ANSWER: NATURAL SELECTION

BONUS

6) GENERAL SCIENCE *Short Answer* What is the primary type of intermolecular bond that water molecules are able to form because of their polarity?

ANSWER: HYDROGEN

TOSS-UP

7) MATH *Multiple Choice* Which of the following lines is perpendicular to $y = 6x - 4$?

W) $y = -x/6 + 5$ [***y equals negative x over 6 plus 5***]

X) $2y = 12x + 4$

Y) $y = x + 11$

Z) $y = 1/6(x) - 14$ [***y equals one-sixth x minus 14***]

ANSWER: W) $y = -x/6 + 5$

BONUS

7) MATH *Short Answer* Evaluate the expression: $\sqrt{(617 + \sqrt{(48 + \sqrt{256})})}$ [***the square root of open parenthesis 617 plus the square root of open parenthesis 48 plus the square root of 256 close parenthesis close parenthesis***]

ANSWER: 25

TOSS-UP

8) ENERGY *Short Answer* Name the four parts of the operating cycle of an internal combustion engine.

ANSWER: INTAKE, COMPRESSION, POWER AND EXHAUST

BONUS

8) ENERGY *Multiple Choice* The key factor in deciding an electric car's lifespan is the battery life. Once the electric car's battery can't deliver the required power for a car it must be replaced. What is one possible new use for old electric car batteries?

W) Recycling

X) Energy storage units in neighborhoods

Y) Being used in smaller vehicles like scooters

Z) Rebuilding the battery for a different car

ANSWER: X) ENERGY STORAGE UNITS IN NEIGHBORHOODS

TOSS-UP

9) PHYSICAL SCIENCE *Short Answer* Which family would an element belong to if it was placed in the 7th row, first column of the periodic table?

ANSWER: ALKALI METALS (ACCEPT: GROUP 1, GROUP 1A)

BONUS

9) PHYSICAL SCIENCE *Multiple Choice* The Doppler effect occurs in which of the following?

- W) Only in sound waves
- X) Only in longitudinal waves
- Y) Only in transverse waves
- Z) In all types of waves

ANSWER: Z) IN ALL TYPES OF WAVES

TOSS-UP

10) LIFE SCIENCE *Short Answer* What are primarily responsible for maintenance of and changes in posture, locomotion in animals, as well as movement of internal organs?

ANSWER: MUSCLES

BONUS

10) LIFE SCIENCE *Multiple Choice* You would like to evaluate the distribution of mRNA in a microbial population. Which method is likely to be most helpful to you?

- W) Proteomics [*proh-tee-OM-iks*]
- X) Transcriptomics
- Y) Metagenomics
- Z) Metabolomics

ANSWER: X) TRANSCRIPTOMICS

TOSS-UP

11) EARTH AND SPACE *Multiple Choice* Which of the following is NOT considered a rare earth element?

- W) Neodymium [*nee-oh-DIM-ee-uhm*]
- X) Yttrium [*ih-tree-uhm*]
- Y) Lanthanum [*LAN-thuh-nuhm*]
- Z) Uranium

ANSWER: Z) URANIUM

BONUS

11) EARTH AND SPACE *Short Answer* Of the planets visible to the naked eye, which moves the slowest across the sky on average?

ANSWER: SATURN

TOSS-UP

12) GENERAL SCIENCE *Multiple Choice* What internal layer of Earth allows for isostasy [*eye-SOS-tuh-see*] of the crust?

- W) Outer core
- X) Inner core
- Y) Athenosphere
- Z) Lithosphere

ANSWER: Y) ATHENOSPHERE

BONUS

12) GENERAL SCIENCE *Multiple Choice* Imagine that you conducted an experiment where you tested the effects of different fertilizers on plant growth over the course of one month. You have to present your data in a graph. What variable would you plot on the *y*-axis?

- W) Time of year
- X) Type of fertilizer
- Y) Day of experiment
- Z) Plant height

ANSWER: Z) PLANT HEIGHT

TOSS-UP

13) MATH *Multiple Choice* If $\frac{a}{b} = -1$ [**a over b equals negative 1**] then what is $a + b$?

- W) 1
- X) 0
- Y) -1
- Z) -2

ANSWER: X) 0

BONUS

13) MATH *Short Answer* Convert 147 in base 10 to base 6.

ANSWER: 403

TOSS-UP

14) PHYSICAL SCIENCE *Multiple Choice* When a hydrogen atom is in its ground state, what is TRUE about its electron?

- W) It is in its lowest energy level
- X) It is at rest
- Y) It has escaped from the atom
- Z) It is inside the nucleus

ANSWER: W) IT IS IN ITS LOWEST ENERGY LEVEL

BONUS

14) PHYSICAL SCIENCE *Multiple Choice* Which of the following is NOT a characteristic of a decaying unstable isotope?

- W) It emits new particles
- X) It releases energy
- Y) It forms new atoms
- Z) It is more chaotic than random

ANSWER: Z) IT IS MORE CHAOTIC THAN RANDOM

TOSS-UP

15) LIFE SCIENCE *Multiple Choice* Which of the following elements is found in DNA?

- W) Calcium
- X) Phosphorus
- Y) Zinc
- Z) Helium

ANSWER: X) PHOSPHOROUS

BONUS

15) LIFE SCIENCE *Multiple Choice* Phosphorus is critical to the formation of nucleic acids, ATP and other energy storing molecules. Where are the largest reservoirs for this important mineral on Earth?

- W) Animal biomass
- X) Ground water, particularly fossil water
- Y) Sedimentary rocks of marine origin
- Z) Fossil fuels

ANSWER: Y) SEDIMENTARY ROCKS OF MARINE ORIGIN

TOSS-UP

16) EARTH AND SPACE *Multiple Choice* Which of the following is NOT considered one of the major volcano types?

- W) Basalt dome
- X) Stratovolcano
- Y) Lava dome
- Z) Cinder cone

ANSWER: W) BASALT DOME

BONUS

16) EARTH AND SPACE *Short Answer* What is the name of the type of volcano that is built almost entirely of low viscosity basaltic lava flows?

ANSWER: SHIELD VOLCANO

TOSS-UP

17) ENERGY *Short Answer* Calculate the potential energy, in joules, of a 30 kilogram mass 15 meters above the Earth's surface.

ANSWER: 4500 (ACCEPT: 4410)

BONUS

17) ENERGY *Multiple Choice* UV radiation is most damaging to which human organ?

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

ANSWER: Y) SKIN

TOSS-UP

18) GENERAL SCIENCE *Multiple Choice* Protein shape that results from having multiple polypeptides [**pol-ee-PEP-tyds**] is a part of which level of protein structure?

- W) Primary
- X) Secondary
- Y) Tertiary
- Z) Quaternary

ANSWER: Z) QUATERNARY

BONUS

18) GENERAL SCIENCE *Short Answer* Place the following four items in order from smallest to largest: nucleus, ribosomes [**RY-buh-sohms**], mitochondria [**my-tuh-KON-dree-uh**], myoglobin [**my-uh-GLOH-bin**].

ANSWER: MYOGLOBIN, RIBOSOMES, MITOCHONDRIA, NUCLEUS

TOSS-UP

19) MATH *Multiple Choice* The slope of the line $2y = 10 - 10x$ is which of the following?

- W) -10
- X) -5
- Y) 5
- Z) 10

ANSWER: X) - 5

BONUS

19) MATH *Short Answer* The endpoints of the diameter of a semicircle are represented by the coordinates $(0, a)$ and $(0, -a)$. If the area of the semicircle is 32π , what is the value of a ?

ANSWER: 8

TOSS-UP

20) PHYSICAL SCIENCE *Multiple Choice* Force is equivalent to mass times the acceleration of an object. How could you guarantee a decrease in the acceleration of an object?

- W) Increase the mass and force
- X) Decrease the mass and force
- Y) Increase the mass and decrease the force
- Z) Increase the force and decrease the mass

ANSWER: Y) INCREASE THE MASS AND DECREASE THE FORCE

BONUS

20) PHYSICAL SCIENCE *Multiple Choice* Why are old documents preserved by sealing them in containers filled with helium?

- W) Helium will react with any poisonous gas that enter the container and prevent the gas from harming the document
- X) Helium is inexpensive and easy to find
- Y) Helium is a gas that will not react with any other element including the paper of the document
- Z) Helium will brighten the print on the document

ANSWER: Y) HELIUM IS A GAS THAT WILL NOT REACT WITH ANY OTHER ELEMENT INCLUDING THE PAPER OF THE DOCUMENT

TOSS-UP

21) ENERGY *Multiple Choice* The rate of a reaction is directly dependent on which of the following?

- W) Activation energy
- X) Reactant energy
- Y) Product energy
- Z) Difference between reactant energy and product energy

ANSWER: W) ACTIVATION ENERGY

BONUS

21) ENERGY *Short Answer* What is the quantity obtained by multiplying a uniform object's specific heat by its mass?

ANSWER: HEAT CAPACITY

TOSS-UP

22) LIFE SCIENCE *Multiple Choice* A periwinkle is what type of organism?

- W) Sea urchin
- X) Snail
- Y) Barnacle
- Z) Star fish

ANSWER: X) SNAIL

BONUS

22) LIFE SCIENCE *Multiple Choice* Which of the following statements regarding corals and zooxanthellae [**zoh-uh-zan-THEL-ee**] is FALSE?

- W) Corals can live for a few months without their zooxanthellae
- X) When a coral bleaches the zooxanthellae die
- Y) The color of a coral tissue is largely due to the zooxanthellae
- Z) Increased water temperature can prompt a bleaching event

ANSWER: X) WHEN A CORAL BLEACHES THE ZOOXANTHELLAE DIE

TOSS-UP

23) EARTH AND SPACE *Multiple Choice* Fossils found in the deep ocean are cemented in what kind of rock?

W) Igneous [**I**G-nee-uhs]

X) Extrusive

Y) Sedimentary

Z) Metamorphic

ANSWER: Y) SEDIMENTARY

BONUS

23) EARTH AND SPACE *Short Answer* Rank the following in terms of largest to smallest carbon reservoirs: biosphere, atmosphere, ocean, sedimentary carbonates.

ANSWER: SEDIMENTARY CARBONATES, OCEAN, BIOSPHERE, ATMOSPHERE