

ROUND ROBIN – ROUND 11

TOSS-UP

1) Life Science – *Multiple Choice* Which of the following portions of the nervous system controls involuntary responses during times of stress?

- W) Somatic
- X) Enteric
- Y) Sympathetic
- Z) Parasympathetic

ANSWER: Y) SYMPATHETIC

BONUS

1) Life Science – *Multiple Choice* During which of the following phases of meiosis [*my-OH-sis*] do homologous [*ha-MAWL-uh-gus*] chromosomes break apart?

- W) Telophase I
- X) Anaphase I
- Y) Prophase II
- Z) Anaphase II

ANSWER: X) ANAPHASE I

TOSS-UP

2) Physical Science – *Short Answer* When light is shined through a mixture made by suspending colloidal [*kaw-LOY-dul*] nanoparticles in water, the light is scattered. What is the name of this effect?

ANSWER: TYNDALL EFFECT

BONUS

2) Physical Science – *Short Answer* Rank the following three molecules by increasing magnitude of their net dipole moment: 1) Carbon monoxide; 2) Carbon dioxide; 3) Hydrogen fluoride.

ANSWER: 2, 1, 3

TOSS-UP

3) Energy – *Multiple Choice* Scientists at SLAC [*slack*] National Accelerator Lab are studying the reactions that alkenes can undergo. Which of the following descriptions most accurately describes alkenes?

- W) Molecules containing a carbon-carbon double bond
- X) Molecules containing only carbon and hydrogen
- Y) Molecules that contain an organic acid group
- Z) Molecules that are saturated with carbon-hydrogen bonds

ANSWER: W) MOLECULES CONTAINING A CARBON-CARBON DOUBLE BOND

BONUS

3) Energy – *Multiple Choice* Scientists at the Joint BioEnergy Institute are studying the synthesis of macrolides, which are protein synthesis inhibitors. These molecules are often used for which of the following purposes?

- W) Lubricants
- X) Antibiotics
- Y) Antivirals
- Z) Lactamases [*LACK-tah-mases*]

ANSWER: X) ANTIBIOTICS

TOSS-UP

4) Life Science – *Short Answer* What general type of microscope uses visible wavelengths and lenses to enlarge an image of a sample?

ANSWER: LIGHT MICROSCOPE (ACCEPT: OPTICAL MICROSCOPE)

BONUS

4) Life Science – *Multiple Choice* Which of the following animals has the highest osmolarity in their extracellular fluids?

- W) Trout
- X) Eagle
- Y) Squid
- Z) Human

ANSWER: Y) SQUID

TOSS-UP

5) Math – *Short Answer* What is the coefficient of the bc term in the trinomial expansion of open parenthesis $3a - 4b - 5c$ close parenthesis squared?

ANSWER: 40

BONUS

5) Math – *Short Answer* In the alternating arithmetic sequence with first 3 terms $-8, 11, -14$, what is the sum of the first 11 terms in the sequence?

ANSWER: -23

TOSS-UP

6) Earth & Space – *Short Answer* The Crab Nebula is an example of a remnant of what cataclysmic [*katah-KLIZ-mik*] event?

ANSWER: SUPERNOVA (ACCEPT: TYPE 2 SUPERNOVA, SN 1054)

BONUS

6) Earth & Space – *Short Answer* What principle of astronomy assumes that the Universe is isotropic and homogeneous?

ANSWER: COSMOLOGICAL PRINCIPLE

TOSS-UP

7) Energy – *Multiple Choice* As a part of the DESI [*DEH-zee*] collaboration, Lawrence Berkeley National Lab scientists seek to explain differences in the heterogeneities [*hetero-jeh-NAY-ih-tees*] in the cosmic microwave background and the matter distribution in the universe. Which of the following best describes these differences?

- W) The cosmic microwave background is more heterogeneous [*hetero-JEE-nee-us*] than the matter distribution
- X) The matter distribution is more heterogeneous than the cosmic microwave background
- Y) The cosmic microwave background and the matter distribution are perfectly homogeneous
- Z) The matter distribution is more homogeneous than the cosmic microwave background

ANSWER: X) THE MATTER DISTRIBUTION IS MORE HETEROGENEOUS THAN THE COSMIC MICROWAVE BACKGROUND

BONUS

7) Energy – *Short Answer* Scientists supported by the Department of Energy are using computational models to predict the electronic structure of atoms by incorporating all of the electrons in the atom into the model. How many electrons would be contained in the computational model of a neutral neon atom?

ANSWER: 10

TOSS-UP

8) Life Science – *Multiple Choice* A Gram stain would be most useful in distinguishing organisms from which of the following groups?

- W) Bacteria
- X) Fungi
- Y) Protozoans
- Z) Plants

ANSWER: W) BACTERIA

BONUS

8) Life Science – *Short Answer* What membrane transmits sound from the external auditory canal to the middle ear?

ANSWER: TYMPANIC MEMBRANE (ACCEPT: EARDRUM)

TOSS-UP

9) Math – *Multiple Choice* If a polynomial has 3, 4, –5, and –6 as zeroes, which of the following must be a factor of the polynomial?

- W) $x - 6$
- X) $x + 3$
- Y) $x + 4$
- Z) $x + 5$

ANSWER: Z) $x + 5$

BONUS

9) Math – *Short Answer* Identify all of the following 3 numbers that are divisible by 18: 1) 414; 2) 702; 3) 836.

ANSWER: 1, 2

TOSS-UP

10) Physical Science – *Short Answer* Two beams of light with wavelengths of 500 nanometers are projected onto the same point. For these beams to destructively interfere, what is the minimal path length difference, in nanometers, between the beams?

ANSWER: 250

BONUS

10) Physical Science – *Short Answer* Consider a spaceship that is orbiting the Earth. Identify all of the following three statements that are TRUE: 1) The spaceship experiences no net gravitational force; 2) The spaceship experiences no net acceleration; 3) The spaceship's velocity is changing.

ANSWER: 3

TOSS-UP

11) Energy – *Short Answer* Scientists at the Joint Genome Institute are studying the specialized DNA sequence that links sister chromatids. What is the name of this sequence?

ANSWER: CENTROMERE

BONUS

11) Energy – *Short Answer* Scientists supported by the Department of Energy who are studying enzymes that reduce nitrogen to ammonia have found that they can also be used to reduce carbon dioxide to what fuel-relevant, single carbon molecule?

ANSWER: METHANE (ACCEPT: CH₄)

TOSS-UP

12) Earth & Space – *Multiple Choice* Phosphorite is an ore rock of phosphate, a common component of fertilizer. Phosphorite typically contains phosphate in what mineral phase?

- W) Apatite
- X) Fluorite
- Y) Muscovite [*MUS-cah-vite*]
- Z) Talc

ANSWER: W) APATITE

BONUS

12) Earth & Space – *Short Answer* What type of fold occurs when a sequence of sedimentary layers is upfolded?

ANSWER: ANTICLINE

TOSS-UP

13) Math – *Short Answer* Convert two-five in base 6 to base 10.

ANSWER: 17

BONUS

13) Math – *Short Answer* To the nearest integer, what is the length of a space diagonal in a right rectangular prism with edges of lengths 5, 6, and 9?

ANSWER: 12

TOSS-UP

14) Life Science – *Multiple Choice* A nonsense mutation is most likely to result in which of the following events?

- W) Transcriptional run-on
- X) Intron inclusion
- Y) Protein truncation
- Z) Post-translational modification

ANSWER: Y) PROTEIN TRUNCATION

BONUS

14) Life Science – *Short Answer* How many mature sperm cells are formed from the development of a single diploid primary spermatocyte [*spur-MAT-oh-site*]?

ANSWER: 4

TOSS-UP

15) Physical Science – *Short Answer* It is typically more difficult to start moving a heavy object sitting on the ground than it is to keep it moving. This is because of what type of friction?

ANSWER: STATIC

BONUS

15) Physical Science – *Short Answer* Rank the following three ranges of the electromagnetic spectrum in terms of increasing wavelength: 1) X rays; 2) Radio waves; 3) Visible light.

ANSWER: 1, 3, 2

TOSS-UP

16) Math – *Short Answer* A group of 14 people took a trivia test. Jack's score of 55 ranked him 8th on the list, right after Jill. If the median of all scores was 58.5, what was Jill's score?

ANSWER: 62

BONUS

16) Math – *Short Answer* A rectangle has an area of 338 square meters. It can be divided into 2 congruent squares with one segment. In meters, what is the perimeter of the rectangle?

ANSWER: 78

TOSS-UP

17) Earth & Space – *Multiple Choice* Which of the following best explains why Titan has an atmosphere while Enceladus [*en-SELL-ah-dus*] does not?

- W) Titan's orbit shields it from solar wind
- X) Titan is more massive
- Y) Titan has a lower average temperature
- Z) Titan has a high orbital eccentricity

ANSWER: X) TITAN IS MORE MASSIVE

BONUS

17) Earth & Space – *Multiple Choice* Which of the following values, in solar-masses, is closest to the maximum mass a main sequence star can possess and still end its life as a white dwarf?

- W) 0.2
- X) 1
- Y) 3
- Z) 7

ANSWER: Z) 7

TOSS-UP

18) Physical Science – *Multiple Choice* Angular momentum can be expressed in which of the following combinations of SI units?

- W) Kilogram meters per second
- X) Kilogram meters squared per second
- Y) Kilogram seconds
- Z) Kilograms per meter second

ANSWER: X) KILOGRAM METERS SQUARED PER SECOND

BONUS

18) Physical Science – *Short Answer* Andrew is tuning the A string on his violin by comparing the sound it makes to that of a tuning fork that emits a 440 hertz frequency. If his violin string is 437 hertz, then, in hertz, what beat frequency will he hear when both sounds are played together?

ANSWER: 3

TOSS-UP

19) Life Science – *Multiple Choice* Which of the following locations primarily consists of smooth muscle?

- W) Bicep
- X) Stomach
- Y) Heart
- Z) Deltoid

ANSWER: X) STOMACH

BONUS

19) Life Science – *Multiple Choice* Which of the following biomes would be characterized by a large proportion of coniferous trees, populations of hibernating mammals, moraine lakes, and bogs?

- W) Tundra
- X) Deciduous forest
- Y) Grassland
- Z) Taiga [*TYE-gah*]

ANSWER: Z) TAIGA

TOSS-UP

20) Earth & Space – *Multiple Choice* Which of the following types of tectonic boundaries most immediately precedes the creation of a new ocean basin?

- W) Ocean-ocean convergent
- X) Ocean-continent divergent
- Y) Continent-continent divergent
- Z) Ocean-continent convergent

ANSWER: Y) CONTINENT-CONTINENT DIVERGENT

BONUS

20) Earth & Space – *Short Answer* Low-grade metamorphism of shale will transform it into what rock?

ANSWER: SLATE

TOSS-UP

21) Math – *Short Answer* The endpoints of a diameter of a circle have coordinates (7, -4) and (-3, 16). What is the y -coordinate of the center of the circle?

ANSWER: 6

BONUS

21) Math – *Short Answer* Solve the following equation for x : the square root of open parenthesis $x + 13$ close parenthesis = $x + 7$.

ANSWER: -4 (DO NOT ACCEPT: -9)

TOSS-UP

22) Physical Science – *Short Answer* What type of heat transfer BEST describes the heat that the Sun transmits to the Earth?

ANSWER: RADIATION

BONUS

22) Physical Science – *Short Answer* A particle is moving with a horizontal velocity of 6 meters per second and a vertical velocity of negative 8 meters per second. In meters per second, what is its speed?

ANSWER: 10

TOSS-UP

23) Earth & Space – *Short Answer* Cities along the southern and eastern coasts of the Great Lakes often receive more precipitation during the winter than their counterparts across the Lakes due to what phenomenon?

ANSWER: LAKE-EFFECT SNOW (ACCEPT: LAKE-EFFECT)

BONUS

23) Earth & Space – *Short Answer* Identify all of the following three planets that do not have a significant planetary magnetic field: 1) Mercury; 2) Jupiter; 3) Mars.

ANSWER: 3