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Science Bowl Team Round (24 Questions)   
  
Toss-up   
  
1) BIOLOGY Short Answer: Which protein is responsible for removing RNA nucleotides of the primer from the 5’ end and replacing them with DNA nucleotides?  
  
ANSWER: DNA Pol I  
  
BONUS   
  
BIOLOGY Multiple Choice: Which of the following statements is true?   
W) Okazaki fragments are only replicated after the leading strand has been replicated.  
X) Genes in euchromatin have higher gene expression than those in heterochromatin.   
Y) Bacteria, archaea, and eukarya all have mRNA beginning with Methionine.   
Z) RNA polymerase requires a DNA primer to start transcription.   
  
ANSWER: X  
  
Toss-up  
  
2) Math Short Answer: For a right triangle, if tan(a) is equal to 5/12, what is sin(a)?  
  
ANSWER: 5/13

BONUS   
  
Math Short Answer: Convert the base 10 number 100 to binary.  
  
ANSWER: 1100100  
  
Toss-up  
  
3) CHEMISTRY Short Answer: Give the balanced equation for when aluminum is belted and heated with sodium baride to form elemental molten barium and solid aluminum oxide.

ANSWER: 2Al A+ 3BaO 🡪 Al2O3 + 3Ba

BONUS  
  
CHEMISTRY Short Answer: What is the molarity of 10 grams of glucose in 0.5 L of water? Give your answer to the nearest hundredths place.

ANSWER: 0.11  
  
Toss-up   
  
4)   PHYSICS Short Answer: Which law states that simple harmonic motion ocurrs when the net force on an object along the direction of motion is proportional to the object’s displacement and in the opposite direction?

ANSWER: Hooke’s law  
  
BONUS

PHYSICS Short Answer: What is the speed of a wave in m/s whose maximum wave displacement is 0.15 m, distance is 0.4 m, and frequency is 8 Hz?  
  
ANSWER: 3.2

Toss-up  
  
5) EARTH/ ASTRO Short Answer: What is the term referring to two torus-shaped layers of energetically charged particles surrounding Earth, held in place by its magnetic field?  
  
ANSWER: van allen radiation belt

BONUS

EARTH/ ASTRO Short Answer: Name one of two types of reflecting telescopes that use secondary mirrors to avoid placing detectors at the primary focus.  
ANSWER: Newtonian or Cassegrain

Toss-up   
  
6) ENERGY Multiple Choice: Biodiesel is NOT made with which of the following?  
  
W) Oils  
X) Alcohol  
Y) Greases  
Z) Sulfur  
  
ANSWER: Z  
  
BONUS   
  
ENERGY Short Answer: By name or number indicate all of of the following three statements that is or are true.

1) A slab of pure silicon issued to make a PV cell.   
2) The top of the slab is very thinly diffused with an “p” dopant such as phosphorous.  
3) A large amount of “n” dopant, such as boron, is diffused on the base of the slab.  
  
ANSWER: 1  
  
Toss-up   
  
7) BIOLOGY Short Answer: Place the two-host life cycle of Plasmodium in order, from occurring first to occurring last from the time a mosquito bites a human.   
1) Sporozoites enter liver cells.  
2) Merozoites divide inside red blood cells.  
3) Gametocytes form.

ANSWER: 1, 2, 3  
  
BONUS  
  
BIOLOGY Short Answer: What is the name of the cells in the angiosperm gametophyte that guides the pollen tube ?  
  
ANSWER: Syngergid

TOSS-UP  
  
8) MATH Short Answer: What is the probability of tossing a coin 7 times in a row?

ANSWER: 1/128

BONUS  
  
Math Short Answer: What is the area under the sine curve from pi/3 to pi/4?   
  
ANSWER: ( root of 2 - 1 )/ 2  
  
TOSS-UP  
  
9) CHEMISTRY Short Answer: By name or number indicate all of the following three which is or are strong acids.

1) Nitric acid  
2) perchloric acid  
3) Chloric acid

ANSWER: all  
  
BONUS   
  
CHEMISTRY Mult Choice: By name or number indicate all of the following four compounds which is or are soluble.

1) Ammonium  
2) Sulfate  
3) Nitrate  
4) Carbonate  
  
ANSWER: 2, 3  
  
TOSS-UP  
  
10) PHYSICS  Short Answer: By name or number indicate which of the following three statements is or are true.

1) No net work is required to move a charge between two points at the same electric potential.  
2) All points on the surface of a charged conductor in an electrostatic equilibrium are at the same potential.  
3) The electric potential is a constant everywhere on the surface of a charged conductor in equilibrium.

ANSWER: all  
  
BONUS  
  
PHYSICS Short Answer: If a 3.0 uF capacitor is connected to a 12.V battery, then what is the magnitude of the charge on each plate of the capacitor? Give your answer in Coulombs.   
  
ANSWER: 3.6 x 10^-6 C  
  
TOSS-UP   
  
11) EARTH/ ASTRO Multiple Choice: Which of the following statements is true?  
W) Mercury’s magnetic field a hundredth of that on earth.   
X) Scientists have detected a magnetic field on Venus, Mars, and the moon.  
Y) 80% of Mercury’s mass lies in its iron core.  
Z) Mercury has a permanent atmosphere and low average temperature at its polar regions.  
  
ANSWER: w  
  
BONUS   
  
EARTH/ ASTRO Short Answer: Name the regions of the sun from closes to the core to farthest.

1) photosphere  
2) chromosphere   
3) corona  
  
ANSWER: 1, 2, 3

TOSS-UP

12) ENERGY Short Answer: Order the following 3 steps from occurring first to occurring last in a photovoltaic cell.   
1) The p-n junction is formed.   
2) A full circuit is made.  
3) Photons of light strike electrons in the p-n junction and energize them.  
  
ANSWER: 1, 3, 2  
  
BONUS   
  
ENERGY Short Answer: By name or number denote all of the following four statements that is or are true.

1) Rocks that contiain a lot of uranium are called pitch-blende.  
2) Compared to U-235, U-238 splits easily when bombarded by a neutron.  
3) Yellowcake consists mostly of uranium.  
4) Acid is used to dissolve uranium in its extraction, but not the rest of the uranium ore which is made of crushed rock.  
  
ANSWER: all but 2

13) BIOLOGY Short Answer: Name all of the three following groups which have vertebral columns.   
1) Actinopterygii  
2) Amphibia  
3) Petromyzontida  
  
ANSWER: 1, 2  
  
BONUS   
  
BIOLOGY Short Answer: Which of the following are marsupials?  
1) Plantigale  
2) Sugar glider  
3) Flying squirrel  
4) Woodchuck  
  
ANSWER: 1and 2  
  
14) Math Short Answer: What is the sum of the geometric series with the first two terms 1/2 and 1/4 from n=1 to n=4?  
ANSWER: 15/16  
  
BONUS   
  
Math Short Answer: Find the indefinite integral of arcsin(x).   
  
ANSWER: xarcsin(x)-arcsin(x)  
  
Toss-up  
  
15) CHEMISTRY Multiple Choice: Who discovered the neurtron existed?

W) Mendeleev  
X) Chadwick  
Y) Tyndall  
Z) Thomson  
  
ANSWER: X  
  
BONUS  
  
CHEMISTRY Short Answer: What is the oxidation number of sulfure in sulfide?  
ANSWER: +4  
  
Toss-up   
  
16)   PHYSICS Short Answer: The electric flux through any closed surface is equal ot the net charge inside the surface, Qinside, dividing by what constant?

ANSWER: Permittivity of free space  
  
BONUS  
  
  
PHYSICS Multiple Choice: Which of the following statements is false about an isolated conductor?  
W) The electric field is zero inside the conducting material.   
X) Any excess charge on an isolated conductor resides entirely on its surface.  
Y) The electric field just outside a charged conductor is perpendicular to the conductor’s surface.  
Z) On an irregularly shaped conductor, the charge does not accumulate at sharp points, where the radius of curvature is largest.  
  
ANSWER: Z  
  
17) EARTH/ ASTRO Short Answer: Where specifically in the earth is the convection current found?  
  
ANSWER: asthenosphere  
  
BONUS  
  
EARTH/ ASTRO Multiple Choice: Approximately how many minutes does an earthquake P-wave take to travel the first 6500 kilometers after the earthquake occurs?  
  
W) 6  
X) 8  
Y) 10  
Z) 12  
  
ANSWER: y

Toss-up   
  
18) ENERGY Short Answer: What is the name of the process in which wood chips and agricultural wastes are superheated until they turn into hydrogen and other gases?  
  
ANSWER: biomass gassification  
  
BONUS   
  
ENERGY Short Answer: By name/ # indicate which of the following 3 are true.  
1) Transformers steps up voltage of electricity from 2,300 to 22,000 volts from a generator to as much as 765,000 volts.  
2) Step-down transformers located at substatiosn alogn the lines reduce the voltage to 12,000 volts.  
3) Fossil fuel plants are sometimes called thermal power plants because they use heat to generate electricity.  
  
ANSWER: all  
  
Toss-up   
  
19) BIOLOGY Short Answer: What plant hormone promotes xylem differentiation and inhibits phloem differentiation?

ANSWER: Brassinosteriod   
  
BONUS  
  
BIOLOGY Short Answer: Name the four following events from the excretory system in order from first to last.

1) Enters kidney.  
2) Enters urethra.   
3) Enters ureter.   
4) Enters urinary bladder  
  
ANSWER: 1, 3, 4, 2

TOSS-UP  
  
20) MATH Short Answer: What is the surface area of a circle with diameter 8?

ANSWER: 64pi

BONUS  
  
Math Short Answer: What is the vertex of a parabola with equation y=3x^2 +2x - 1?  
  
ANSWER: (-1/3, /4/3)  
  
  
22) PHYSICS  Short Answer: Two resistors with resistances of 3 and 6 ohms respectively and voltage 12 V has what total current?

ANSWER: 24 amperes  
  
BONUS  
  
PHYSICS Short Answer: Light travelling through air is incident on a smooth piece of glass at a thirty degree angle to the normal. Find the angle of refraction if the indices of refraction of air and glass are 1 and 1.5 respectively.  
  
ANSWER: 1/3  
  
TOSS-UP   
  
23) EARTH/ ASTRO Multiple Choice: Approximately how many days does the moon take to complete the lunar cycle?  
  
W) 28.4  
X) 29.5  
Y) 30.1  
Z) 31.7  
  
ANSWER: x  
  
BONUS   
  
EARTH/ ASTRO Short Answer: By name or number indicate which of the following 4 planets are in “superior orbit” around the sun.  
1) Mercury  
2) Jupiter  
3) Saturn  
4) Neptune  
  
ANSWER: all but 1

TOSS-UP

24) ENERGY Short Answer: Where is the enriched uranium taken to in order to prepare it for the nuclear reactor?  
  
ANSWER: Fabrication plant

BONUS   
  
ENERGY Multiple Choice: Which statement is false about nuclear power?   
  
W) Enrichment increases the percentage of uranium from one to ten percent.  
X) Ceramic fuel pellets are made in fabrication plants.  
Y) The pellets can make as much energy as 150 gallons of oil.  
Z) Pellets are sealed in fuel rods, which are bundled into fuel assemblies for the reactor.  
  
ANSWER: W