

ROUND 10

TOSS-UP

- 1) CHEMISTRY *Multiple Choice* A molecule which consists of tens of monosaccharide units linked covalently is a:
- W) disaccharide
 - X) polysaccharide
 - Y) saturated polysaccharide
 - Z) tetrasaccharide

ANSWER: X) POLYSACCHARIDE

BONUS

- 1) CHEMISTRY *Short Answer* In a 2-step chemical reaction, if the enthalpy change of step 2 is -180 kilojoules and the overall enthalpy change for the overall reaction is -20 kilojoules, what is the enthalpy change for the first step of the reaction?

ANSWER: 160

(Solution: $\Delta H_1^\circ = \Delta H_3^\circ - \Delta H_2^\circ$; $= (-20) - (-180)$; $= 160\text{kJ}$)

TOSS-UP

- 2) PHYSICS *Short Answer* What scientist was the first to irradiate nearly all of the elements of the periodic chart with neutrons, transmutating numerous elements?

ANSWER: ENRICO FERMI (ACCEPT: FERMI)

BONUS

- 2) PHYSICS *Short Answer* How much centripetal force, in Newtons, is required to cause a 5 kilogram body to move at 10 meters per second in uniform circular motion with a radius of 10 meters?

ANSWER: 50

(Solution: $CF = m v^2 / r = 5 \times 10^2 / 10 = 50$)

TOSS-UP

- 3) BIOLOGY *Multiple Choice* Physicians that give patients immuno-suppressing drugs after an organ transplant prevent rejection, but the patient might then die within months most likely from which of the following:
- W) Addison's disease
 - X) a graft versus host response
 - Y) brain cancer
 - Z) Burkett's lymphoma

ANSWER: X) A GRAFT VERSES HOST RESPONSE

BONUS

- 3) BIOLOGY *Short Answer* What is the common botanical term for the cold treatment that is necessary for some biennials and perennials to grow and/or initiate flowering?

ANSWER: VERNALIZATION

TOSS-UP

- 4) ASTRONOMY *Short Answer* What term do astronomers use that infers that the view is the same or equal in all directions?

ANSWER: ISOTROPIC (ACCEPT: ISOTROPY)

BONUS

- 4) ASTRONOMY *Multiple Choice* What does the Pogson scale most directly measure:
- W) mass of a celestial body
 - X) distance of galaxies from Earth
 - Y) brightness of a star
 - Z) recessional speed of a galaxy

ANSWER: Y) BRIGHTNESS OF A STAR

TOSS-UP

5) MATH *Multiple Choice* A doughnut has the same shape as what three-dimensional figure:

- W) an ellipse
- X) a cone
- Y) a frustum
- Z) a torus

ANSWER: Z) A TORUS

BONUS

5) MATH *Short Answer* Solve the following equation for x : $x^2 - 5x + 6 = 0$

ANSWER: $x = 2$ AND $x = 3$

TOSS-UP

6) EARTH SCIENCE *Multiple Choice* Which of the following is a crescent-shaped sand dune with horns pointing downwind:

- W) barchan (Pron: bar-can)
- X) seif (Pron: seef)
- Y) parabolic
- Z) transverse

ANSWER: W) BARCHAN

BONUS

6) EARTH SCIENCE *Short Answer* In the geological time scale, the Jurassic Period belongs to which Era?

ANSWER: MESOZOIC

TOSS-UP

- 7) GENERAL SCIENCE *Multiple Choice* Which of the following pipettes typically has no gradations or volume indicators:

W) Pasteur
X) volumetric
Y) titration
Z) serological

ANSWER: W) PASTEUR

BONUS

- 7) GENERAL SCIENCE *Short Answer* What does an apiarist (Pron: ape-ee-ar-ist) study?

ANSWER: BEES

TOSS-UP

- 8) COMPUTER SCIENCE *Multiple Choice* Which of the following is the networking protocol of the internet:

W) TCP/IP
X) MIME
Y) DNS
Z) POP3

ANSWER: W) TCP/IP

BONUS

- 8) COMPUTER SCIENCE *Multiple Choice* A sniffer is a program which:

W) detects possible problems and aborts risky processes
X) monitors data travelling over a network
Y) verifies authentication information
Z) finds and neutralizes viruses

ANSWER: X) MONITORS DATA TRAVELLING OVER A NETWORK

TOSS-UP

- 9) CHEMISTRY *Short Answer* The heating of a fat with sodium hydroxide yields glycerol and what other product?

ANSWER: SOAP (ACCEPT: SODIUM STEARATE) (DO NOT ACCEPT: DETERGENT)

BONUS

- 9) CHEMISTRY *Short Answer* What law states that the vapor pressure of a solution containing a nonvolatile solute is equal to the vapor pressure of the pure solvent times the mole fraction of the solvent:

ANSWER: RAOULT'S LAW

TOSS-UP

- 10) PHYSICS *Short Answer* What is the common name for the naturally occurring stable isotope of hydrogen which does not have an atomic weight of 1?

ANSWER: DEUTERIUM

BONUS

- 10) PHYSICS *Multiple Choice* Robert Millikan used his "oil drop experiments" to show that:

- W) the proton weighed about 1 amu (Pron: A-M-U)
- X) the electron's charge could be positive
- Y) the neutron weighed the same as the proton
- Z) the electron's charge comes in discrete amounts

ANSWER: Z) THE ELECTRON'S CHARGE COMES IN DISCRETE AMOUNTS

TOSS-UP

11) BIOLOGY *Multiple Choice* The specialization of the different somatic cells of the human body is best explained by which of the following:

- W) they have evolved different genomes
- X) they each contain different genes
- Y) they use different genetic codes
- Z) genetic expression differs among different cells

ANSWER: Z) GENETIC EXPRESSION DIFFERS AMONG DIFFERENT CELLS

BONUS

11) BIOLOGY *Short Answer* What is the least predominant immunoglobulin class found in human serum?

ANSWER: IgE

TOSS-UP

12) ASTRONOMY *Multiple Choice* Stars in the constellation Crux would have a negative declination because their celestial coordinate is in which hemisphere:

- W) northern
- X) southern
- Y) eastern
- Z) western

ANSWER: X) SOUTHERN

BONUS

12) ASTRONOMY *Short Answer* Rounded off to the nearest thousand, how many astronomical units are in a light year?

ANSWER: 63,000

TOSS-UP

13) MATH *Short Answer* Find the derivative of the following equation: $f(x) = 5x^2 + 3x + 2$
(read as: f of x equals $5x^2 + 3x + 2$)

ANSWER: $10x + 3$

BONUS

13) MATH *Short Answer* Find the following number: When the number, one-half of the number, and three-quarters of the number are added, and then 8 is subtracted, the result is 2 less than twice the number:

ANSWER: 24

(Solution: $n + 1/2n + 3/4n - 8 = 2n - 2$)

TOSS-UP

14) EARTH SCIENCE *Multiple Choice* A circular cavity ground out of bedrock by running water is called a:

- W) cave
- X) pothole
- Y) sinkhole
- Z) kettle hole

ANSWER: X) POTHOLE

BONUS

14) EARTH SCIENCE *Multiple Choice* A clastic particle with a size limit of $1/256^{\text{th}}$ of a millimeter to $1/16^{\text{th}}$ of a millimeter is called:

- W) clay
- X) silt
- Y) sand
- Z) pebble

ANSWER: X) SILT

TOSS-UP

- 15) GENERAL SCIENCE *Multiple Choice* Which of the following countries has the highest amount of its nation's share of electricity produced by nuclear power:

W) USA
X) France
Y) Germany
Z) Japan

ANSWER: X) FRANCE

BONUS

- 15) GENERAL SCIENCE *Short Answer* What is the most common reference book used by American medical physicians for information regarding drugs?

ANSWER: PDR (ACCEPT: PHYSICIAN'S DESK REFERENCE)

TOSS-UP

- 16) COMPUTER SCIENCE *Multiple Choice* Which of the following is NOT used in ray tracing a 3D scene in computer graphics:

W) objects
X) camera
Y) film
Z) light source parameters

ANSWER: Y) FILM

BONUS

- 16) COMPUTER SCIENCE *Multiple Choice* Software that is free and can be used with no restrictions is called:

W) freeware
X) shareware
Y) open source
Z) public-domain

ANSWER: Z) PUBLIC-DOMAIN

TOSS-UP

17) CHEMISTRY *Short Answer* How many fundamental amino acids are there?

ANSWER: 20

BONUS

17) CHEMISTRY *Short Answer* What is the most common name for a molecule of glycerol with all three hydroxyl groups esterified to fatty acids?

ANSWER: TRIGLYCERIDE

TOSS-UP

18) PHYSICS *Multiple Choice* In 1905, Einstein explained why, at a given temperature, radiation in thermodynamic equilibrium with its container behaves precisely like:

- W) a perfect gas
- X) a dynamic hysteresis (Pron: his-tah-ree-sis)
- Y) an example of the de Broglie wavelength
- Z) an electromagnetic wave

ANSWER: W) A PERFECT GAS

BONUS

18) PHYSICS *Multiple Choice* If an astronaut traveling at 25% of the speed of light passes a 10 meter long satellite, what length will the astronaut get for the length of the satellite:

- W) 1.75 meters
- X) 0.87 meters
- Y) 8.66 meters
- Z) 9.68 meters

ANSWER: Z) 9.68 METERS

(Solution: $L^1 = L \sqrt{1-V^2} = 10 \text{ meters} \times \sqrt{1-.25} = 9.68 \text{ meters}$)

TOSS-UP

19) BIOLOGY *Multiple Choice* Phosphoglyceride will dissolve best in which of the following:

- W) anhydrous acetone
- X) a chloroform/methanol mixture
- Y) distilled water
- Z) a distilled water/methanol mixture

ANSWER: X) A CHLOROFORM/METHANOL MIXTURE

BONUS

19) BIOLOGY *Multiple Choice* Which of the following is MOST accurate for eukaryotic cells:

- W) introns are spliced out of pre-mRNA as a translational modification
- X) introns are spliced out of pre-DNA as a post-translational modification
- Y) introns are spliced out of pre-mRNA as a post-transcriptional modification
- Z) introns are spliced out of pre-DNA as a pre-transcriptional modification

ANSWER: Y) INTRONS ARE SPLICED OUT OF PRE-MRNA AS A POST-TRANSCRIPTIONAL MODIFICATION

TOSS-UP

20) ASTRONOMY *Short Answer* What atomic particle was named by Enrico Fermi meaning “little neutral one”?

ANSWER: NEUTRINO

BONUS

20) ASTRONOMY *Multiple Choice* What color would a star appear with a surface temperature of about 30,000 Kelvin?

- W) blue
- X) green
- Y) orange
- Z) red

ANSWER: W) BLUE

TOSS-UP

21) MATH *Multiple Choice* Which of the following angles would be located in Quadrant III of a rectangular coordinate system:

- W) $\frac{2}{3}$ rev
- X) -60°
- Y) 60°
- Z) 0.8 rev

ANSWER: W) $\frac{2}{3}$ REV

BONUS

21) MATH *Short Answer* In the following number sequence, what are the values for a, b and c:
a, b, 14, 26, 50, c

ANSWER: a = 5; b = 8; c = 98

TOSS-UP

22) GENERAL SCIENCE *Multiple Choice* What color light does water absorb the least:

- W) red
- X) yellow
- Y) green
- Z) blue

ANSWER: Z) BLUE

BONUS

22) GENERAL SCIENCE *Short Answer* German biologists recently bioengineered a form of *Anopheles stephensi* (Pron: a-nof-e-les stevens-eye) in their effort to control what disease?

ANSWER: MALARIA

TOSS-UP

23) PHYSICS *Multiple Choice* Which of the following has a refractive index closest to 1:

- W) pure silica glass
- X) a near perfect vacuum
- Y) a quartz crystal
- Z) pure water

ANSWER: X) A NEAR PERFECT VACUUM

BONUS

23) PHYSICS *Multiple Choice* What proposition of Niels Bohr states that to understand any one experiment dealing with light one must use either the wave or photon theory but not both:

- W) exclusion theory
- X) principle of complementarity
- Y) quantum exclusion postulate
- Z) photocell theory

ANSWER: X) PRINCIPLE OF COMPLIMENTARITY

TOSS-UP

24) CHEMISTRY *Short Answer* The formula $PV = k$, at constant n and T , is a representation of what gas law?

ANSWER: BOYLE'S LAW

BONUS

24) CHEMISTRY *Short Answer* Under constant temperature conditions, calculate the volume, in liters, of a 1 liter sample of gas if its pressure changes from 10 atmospheres to 2 atmospheres:

ANSWER: 5

(Solution: $P_1V_1 = P_2V_2$; $(10\text{atm})(1\text{L}) = (2\text{atm})(V_2)$; $= 5\text{L}$)

TOSS-UP

25) BIOLOGY *Short Answer* In what eukaryotic organelle does all of the citric acid cycle occur?

ANSWER: MITOCHONDRION

BONUS

25) BIOLOGY *Short Answer* What common disaccharide is composed of two glucose residues?

ANSWER: MALTOSE