

## ROUND 11

### TOSS-UP

- 1) PHYSICS *Multiple Choice* Which of the following best describes W and Z particles:
- W) a subgroup of leptons (Pron: lep-tawns)
  - X) a subgroup of hadrons (Pron: had-rawns)
  - Y) Gauge bosons
  - Z) particles with a spin of 1/2

ANSWER: Y) GAUGE BOSONS

### BONUS

- 1) PHYSICS *Short Answer* Assuming  $g = 32 \text{ feet/sec}^2$ , what is the velocity of a free falling object, falling from rest, after falling 256 feet?

ANSWER: 128 FEET/SEC

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### TOSS-UP

- 2) BIOLOGY *Multiple Choice* Which of the following will give the best 3-D resolution of a live protozoan:
- W) bright field microscopy
  - X) scanning electron microscopy
  - Y) Normarsky microscopy
  - Z) transmission electron microscopy

ANSWER: Y) NORMARSKY MICROSCOPY

### BONUS

- 2) BIOLOGY *Short Answer* The endocardium is made up of what specific type of cells:

ANSWER: ENDOTHELIAL CELLS

### TOSS-UP

- 3) CHEMISTRY *Multiple Choice* Of the following, which is the most powerful tool available for the structure determination of organic molecules:
- W) gas liquid chromatography
  - X) mass spectrometry
  - Y) NMR spectroscopy
  - Z) high pressure liquid chromatography

ANSWER: Y) NMR SPECTROSCOPY

### BONUS

- 3) CHEMISTRY *Short Answer* Heating an alcohol in the presence of an acid catalyst, whereby alcohol molecules join by splitting out a water molecule, yields what family of organic compounds:

ANSWER: ETHERS

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### TOSS-UP

- 4) ASTRONOMY *Short Answer* In degrees, what is the declination of the sun at the equinox?

ANSWER: 0°

### BONUS

- 4) ASTRONOMY *Multiple Choice* To a stargazer living in Northern Michigan, a star that lies almost exactly on the celestial equator, such as sigma Orionis, will do which of the following:
- W) spend 12 hours above the horizon and 12 hours below
  - X) rise in the north and set in the south
  - Y) cannot be seen
  - Z) its diurnal path is cut by the horizon into unequal parts

ANSWER: W) SPEND 12 HOURS ABOVE THE HORIZON AND 12 HOURS BELOW

**TOSS-UP**

5) MATH *Multiple Choice* A plane cutting a circular cone at an angle parallel to the axis will produce which of the following:

- W) a circle
- X) an ellipse
- Y) a parabola
- Z) a hyperbola

ANSWER: Y) A PARABOLA

**BONUS**

5) MATH *Short Answer* Find the solution set for  $x$  of the following equation:  
 $7x - 2(x+1) = x + 2$

ANSWER: 1

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**TOSS-UP**

6) EARTH SCIENCE *Multiple Choice* Columnar joints are a kind of:

- W) fracture
- X) fossil
- Y) fault
- Z) fold

ANSWER: W) FRACTURE

**BONUS**

6) EARTH SCIENCE *Multiple Choice* The weather of the doldrums is typified by:

- W) daily thunderclouds and heavy rain
- X) hot and dry days
- Y) cool and humid days
- Z) arctic nights

ANSWER: W) DAILY THUNDERCLOUDS AND HEAVY RAIN

**TOSS-UP**

- 7) GENERAL SCIENCE *Short Answer* What scientist and student of Freud devoted a great deal of study to mythology, religion, alchemy, and astronomy, to form his theory of personality?

ANSWER: CARL JUNG (ACCEPT: JUNG)

**BONUS**

- 7) GENERAL SCIENCE *Multiple Choice* Which of the following weighs the least by volume:

- W) aluminum
- X) brass
- Y) copper
- Z) steel

ANSWER: W) ALUMINUM

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**TOSS-UP**

- 8) COMPUTER SCIENCE *Multiple Choice* LISP, a programming language used primarily in Artificial Intelligence, is based around what type of data structures:

- W) array
- X) set
- Y) postscript
- Z) list

ANSWER: Z) LIST

**BONUS**

- 8) COMPUTER SCIENCE *Multiple Choice* The default name given to a compiled program on a UNIX system is:

- W) c.end
- X) a.out
- Y) end.c
- Z) finish.cc

ANSWER: X) A.OUT

**TOSS-UP**

- 9) **PHYSICS** *Short Answer* What term is defined as the ratio of the angle subtended by an image through a lens to the angle subtended with the unaided eye, considering that the object is at the near-point of the eye:

ANSWER: ANGULAR MAGNIFICATION (ACCEPT: MAGNIFYING POWER)

**BONUS**

- 9) **PHYSICS** *Short Answer* Order the following 4 materials from those with the lowest density to the highest density: iron, iridium, copper, tin

ANSWER: TIN, IRON, COPPER, IRIDIUM

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**TOSS-UP**

- 10) **BIOLOGY** *Multiple Choice* Which of the following has the lowest blood pressure:

- W) anterior vena cava
- X) carotid (Pron: ker-ought-id) artery
- Y) femoral artery
- Z) iliac artery

ANSWER: W) ANTERIOR VENA CAVA

**BONUS**

- 10) **BIOLOGY** *Short Answer* What formed elements in human blood release serotonin and thromboplastin?

ANSWER: PLATELETS

### TOSS-UP

11) CHEMISTRY *Multiple Choice* The enzyme which aids our body in digesting starch is:

- W) maltase
- X) cellulase
- Y) amylase
- Z) lactase

ANSWER: Y) AMYLASE

### BONUS

11) CHEMISTRY *Short Answer* What is the name for the tendency for a liquid to be sucked into small spaces, such as between objects and through narrow-pore tubes, where the force to do this comes from surface tension between the liquid and the solid:

ANSWER: CAPILLARY ACTION (ACCEPT: CAPILLARY MOTION)

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### TOSS-UP

12) ASTRONOMY *Multiple Choice* A white dwarf forms when:

- W) a massive star explodes as a supernova
- X) a star's core becomes hot enough to fuse hydrogen into helium
- Y) two red dwarf stars collide
- Z) the outer layers of a red giant star escape into space

ANSWER: Z) THE OUTER LAYERS OF A RED GIANT STAR ESCAPE INTO SPACE

### BONUS

12) ASTRONOMY *Short Answer* What is the common astronomical name for the spot in space about 1.5 million kilometers from the Earth in a straight line away from the sun where the NASA map satellite will perform its observations?

ANSWER: LAGRANGE POINT (ACCEPT: 2nd LAGRANGE POINT)

### TOSS-UP

- 13) MATH *Short Answer* How old is Frank if 6 years from now he will be 2 times as old as he was 3 years ago?

ANSWER: 12

(Solution:  $x + 6 = 2(x - 3)$ )

### BONUS

- 13) MATH *Short Answer* At the state fair, 100 people who ate hot dogs were surveyed and it was found that 70 used mustard, 60 used relish, and 50 used both mustard and relish on their dogs. How many used mustard OR relish on their hot dogs?

ANSWER: 80

(Solution:  $n(A \cup B) = n(A) + n(B) - n(A \cap B)$ ;  $= 70 + 60 - 50 = 80$ )

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### TOSS-UP

- 14) EARTH SCIENCE *Multiple Choice* Which of the following is true about the rate at which days grow longer or shorter:

- W) there is no set time of year
- X) the rate does not change
- Y) the rate is fastest at the equinoxes
- Z) the rate is fastest at the solstices

ANSWER: Y) THE RATE IS FASTEST AT THE EQUINOXES

### BONUS

- 14) EARTH SCIENCE *Multiple Choice* Which of the following is TRUE about the Coriolis Effect:

- W) the temperature of a moving object influences its magnitude
- X) its effect is minimum at the poles and maximum at the equator
- Y) it acts to deflect objects in the Northern Hemisphere to the left
- Z) it is zero at the equator and reaches a maximum at the poles

ANSWER: Z) IT IS ZERO AT THE EQUATOR AND REACHES A MAXIMUM AT THE POLES

**TOSS-UP**

15) GENERAL SCIENCE *Multiple Choice* What alloy is comprised of 80% tin and 20% lead and is used extensively because it can be carved by hand or on a lathe:

- W) solder
- X) bronze
- Y) constantan
- Z) pewter

ANSWER: Z) PEWTER

**BONUS**

15) GENERAL SCIENCE *Multiple Choice* The main food source for the great blue whale and other large whales is:

- W) zooplankton
- X) phytoplankton
- Y) krill
- Z) squid

ANSWER: Y) KRILL

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**TOSS-UP**

16) COMPUTER SCIENCE *Multiple Choice* If the electron gun in a monitor draws every line in a single pass without skipping lines, it is called:

- W) noninterlaced
- X) interlaced
- Y) interfaced
- Z) noninterfaced

ANSWER: W) NONINTERLACED

**BONUS**

16) COMPUTER SCIENCE *Multiple Choice* The ability to execute more than one program simultaneously is known as:

- W) multithreading
- X) multiscanning
- Y) multitasking
- Z) multicasting

ANSWER: Y) MULTITASKING



**TOSS-UP**

17) PHYSICS *Multiple Choice* Which of the following laws most directly applies to elastic solids:

- W) Avogadro's Law
- X) Hooke's Law
- Y) Stefan's Law
- Z) Stoke's Law

ANSWER: X) HOOKE'S LAW

**BONUS**

17) PHYSICS *Multiple Choice* A horizontal stabilizer is to pitch as ailerons are to:

- W) yaw
- X) stall
- Y) roll
- Z) stall

ANSWER: Y) ROLL

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**TOSS-UP**

18) BIOLOGY *Short Answer* In the Central Dogma established by Watson and Crick, the ideas of replication transcription and translation did not consider the creation of DNA from RNA since what enzyme was not yet discovered:

ANSWER: REVERSE TRANSCRIPTASE

**BONUS**

18) BIOLOGY *Short Answer* *Penicillium notatum* is to penicillin as *Streptomyces erythraeus* (pronounced: strep-TOE-my-sees EE-rith-ray-us) is to:

ANSWER: ERYTHROMYCIN

### TOSS-UP

- 19) CHEMISTRY *Multiple Choice* If you were looking to purchase hydrochloric acid in a retail store in the U.S., which of the following would you be correct in buying:
- W) muriatic acid
  - X) nail polish remover
  - Y) photographic hypo solution
  - Z) turpentine

ANSWER: W) MURIATIC ACID

### BONUS

- 19) CHEMISTRY *Multiple Choice* Which of the following molecules is bent in shape, with a bond angle of approximately  $120^\circ$ :
- W)  $\text{SO}_2$
  - X)  $\text{BH}_3$
  - Y)  $\text{BF}_3$
  - Z)  $\text{H}_2\text{O}$

ANSWER: W)  $\text{SO}_2$

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### TOSS-UP

- 20) ASTRONOMY *Multiple Choice* Caucasus, Harbinger, Taurus, and Piton are all:
- W) constellations viewable from the southern hemisphere
  - X) mountains on the moon
  - Y) craters on the moon
  - Z) craters on mars

ANSWER: X) MOUNTAINS ON THE MOON

### BONUS

- 20) ASTRONOMY *Short Answer* What is the most common term for the assumption that the universe is isotropic and homogenous?

ANSWER: COSMOLOGICAL PRINCIPAL

### TOSS-UP

- 21) EARTH SCIENCE *Short Answer* If all seismic waves leave the earthquake focus at the same instant, which seismic wave will typically be recorded by as seismograph second?

ANSWER: S-WAVE (ACCEPT: SECONDARY OR SHEAR WAVES)

### BONUS

- 21) EARTH SCIENCE *Multiple Choice* The ultimate result of headward erosion would most likely be:

- W) dendritic drainage
- X) karst topography
- Y) spheroidal domes
- Z) stream piracy

ANSWER: Z) STREAM PIRACY

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### TOSS-UP

- 22) GENERAL SCIENCE *Multiple Choice* Two identical containers labeled A and B are filled with different liquids. The density of the liquid in A is two times the one in B. The volume of A is half the volume of B. Upon weighing, which of the following is true:

- W) A weighs twice B
- X) B weighs twice A
- Y) A and B weigh the same
- Z) A weighs one-quarter less than B

ANSWER: Y) A AND B WEIGH THE SAME

### BONUS

- 22) GENERAL SCIENCE *Short Answer* Order the following soils from those with the smallest particle size to those with the largest particle size: sand; gravel; silt; clay

ANSWER: CLAY; SILT; SAND; GRAVEL

**TOSS-UP**

23) PHYSICS *Multiple Choice* Circle of least confusion is most directly associated with what lens aberration:

- W) spherical aberration
- X) coma
- Y) astigmatism
- Z) curvature of field

ANSWER: W) SPHERICAL ABERRATION

**BONUS**

23) PHYSICS *Short Answer* Assuming  $g = 32 \text{ ft/sec}^2$  and friction is negligible, if an onion is thrown up vertically with an initial velocity of 32 ft/sec, how far up will it be in feet after 1 second?

ANSWER: 16

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**TOSS-UP**

24) BIOLOGY *Multiple Choice* The structure of DNA proposed by Watson and Crick was primarily based on the experimental works of:

- W) Chargoff and Pauling
- X) Chargoff, and Franklin and Wilkins
- Y) Pauling and Franklin
- Z) Watson and Franklin

ANSWER: X) CHARGOFF, AND FRANKLIN AND WILKINS

**BONUS**

24) BIOLOGY *Short Answer* What is the most common term for a mutant organism which is defective in a biosynthetic pathway but reverts to normal growth when provided with the product of that pathway?

ANSWER: AUXOTROPH (ACCEPT: AUXOTROPHIC MUTANT)

### TOSS-UP

25) CHEMISTRY *Multiple Choice* If a chiral molecule rotates the plane of polarized light clockwise, we say it is:

- W) racemic
- X) levorotatory
- Y) dextrorotatory
- Z) optically inactive

ANSWER: Y) DEXTROROTATORY

### BONUS

25) CHEMISTRY *Short Answer* What is the name of the “COOH” organic functional group:

ANSWER: CARBOXYL (ACCEPT: CARBOXYLIC OR CARBOXYLIC ACID)