

ROUND 7

TOSS-UP

1) PHYSICS *Multiple Choice* The fundamental forces of nature are most correctly given as:

- W) gravitational, electromagnetic, strong interactive, weak interactive
- X) chemical, mechanical, friction and atomic
- Y) gravitational, electromotive, magnetic, atomic
- Z) graviton, photon, lepton, hadron

ANSWER: W) GRAVITATIONAL, ELECTROMAGNETIC, STRONG INTERACTIVE, WEAK INTERACTIVE

BONUS

1) PHYSICS *Short Answer* The throbbing caused by sounds of slightly different frequencies that results because of periodic constructive and destructive interference is called:

ANSWER: BEATS (ACCEPT: BEATING)

TOSS-UP

2) BIOLOGY *Multiple Choice* Which of the following fins is NOT found on fish:

- W) pectoral
- X) lateral
- Y) dorsal
- Z) pelvic

ANSWER: X) LATERAL

BONUS

2) BIOLOGY *Short Answer* What reflex causes the extension of the big toe and fanning of the other toes when the bottom of the foot is stroked?

ANSWER: BABINSKI SIGN (ACCEPT: BABINSKI REFLEX OR BABINSKI RESPONSE)

TOSS-UP

3) CHEMISTRY *Multiple Choice* Which of the following is the best example of a polysaccharide:

- W) glucose
- X) galactose
- Y) sucrose
- Z) cellulose

ANSWER: Z) CELLULOSE

BONUS

3) CHEMISTRY *Short Answer* What is the concentration, in parts per billion, of a solution that contains 1 microgram of solute per liter?

ANSWER: 1 PPB (ACCEPT: 1 PART PER BILLION)

TOSS-UP

4) ASTRONOMY *Multiple Choice* Which of the following is NOT a superior planet:

- W) Jupiter
- X) Venus
- Y) Mars
- Z) Pluto

ANSWER: X) VENUS

BONUS

4) ASTRONOMY *Short Answer* Mars has a thin atmosphere composed mainly of what gas?

ANSWER: CARBON DIOXIDE (ACCEPT: CO₂)

TOSS-UP

5) MATH *Short answer* In the following data set, which of the numbers are irrational:
{-8, $\frac{2}{3}$, $\sqrt{3}$ (pronounced: square root of 3), π (pronounced: PIE)}

ANSWER: $\sqrt{3}$ and π

BONUS

5) MATH *Multiple Choice* A person with lung cancer is given an MRI. Four radiologists examine each MRI independently. If each specialist can detect lung cancer with 80% accuracy, what is the probability that at least one of them will detect cancer in this patient:

- W) 0.998
- X) 0.01
- Y) 0.25
- Z) 0.8

ANSWER: W) 0.998

(Solution: $C_{nx}Pq^{n-x}$)

TOSS-UP

6) EARTH SCIENCE *Multiple Choice* A famous downslope wind that occurs in North America on the East side of the Rocky Mountains is called a:

- W) sirocco
- X) mistral
- Y) foehn
- Z) chinook

ANSWER: Z) CHINOOK

BONUS

6) EARTH SCIENCE *Short Answer* What is the upper surface of the saturated zone of groundwater called:

ANSWER: THE WATER TABLE

TOSS-UP

7) GENERAL SCIENCE *Multiple Choice* An experiment is testing whether a certain water-based plant fertilizer helps plants grow better. The experimental group contains plants that are given 20 milliliters of the fertilizer per day. Which of the following would be the best control in this experiment:

- W) an equal number of plants that received nothing in place of the fertilizer
- X) an equal number of plants that received 20 milliliters of pure water in place of the fertilizer
- Y) an equal number of plants that received twice as much fertilizer
- Z) there is no need for a control

ANSWER: X) AN EQUAL NUMBER OF PLANTS THAT RECEIVED 20 MILLILITERS OF PURE WATER IN PLACE OF THE FERTILIZER

BONUS

7) GENERAL SCIENCE *Short Answer* This term is used by scientists when referring to the belief that the simplest explanation is most likely the correct explanation?

ANSWER: OCKHAM'S RAZOR

TOSS-UP

8) GENERAL SCIENCE *Multiple choice* Why should you periodically defragment the hard drive:

- W) to prevent damage to the read/write heads on the hard drive
- X) to prevent the reoccurrence of error code 653 at startup
- Y) to identify bad sectors on the hard drive
- Z) to improve the quality of the sound card

ANSWER: W) TO PREVENT DAMAGE TO THE READ/WRITE HEADS ON THE HARD DRIVE

BONUS

8) GENERAL SCIENCE *Short Answer* What is the network device used to regenerate or replicate a signal over the same medium and is used to regenerate analog or digital signals distorted by transmission loss:

ANSWER: REPEATER

TOSS-UP

9) PHYSICS *Multiple Choice* Which of the following is the emission source for microwaves in a typical microwave oven:

- W) small cyclotron
- X) cadmium disk bombarded with a soft x-ray source
- Y) magnetron
- Z) laser lamp

ANSWER: Y) MAGNETRON

BONUS

9) PHYSICS *Short Answer* How many neutrons and how many protons are present in a single deuterium nucleus?

ANSWER: ONE PROTON AND ONE NEUTRON

TOSS-UP

10) BIOLOGY *Multiple Choice* In mammals, the embryos have a physiological connection to the mothers body during development. This is an example of:

- W) viviparity
- X) ovoviviparity
- Y) oviparity
- Z) parity

ANSWER: W) VIVIPARITY

BONUS

10) BIOLOGY *Short Answer* In plants, this naturally occurring auxin has the abbreviation IAA:

ANSWER: INDOLE ACETIC ACID

TOSS-UP

11 CHEMISTRY *Multiple Choice* Which of the following dominates the gasses in the Earth's atmosphere, making up some 78% of the air by volume:

- W) nitrogen
- X) oxygen
- Y) helium
- Z) hydrogen

ANSWER: W) NITROGEN

BONUS

11) CHEMISTRY *Short Answer* Never found uncombined on Earth, what element occurs abundantly in limestone, gypsum and fluorite:

ANSWER: CALCIUM (ACCEPT: Ca)

TOSS-UP

12) ASTRONOMY *Multiple Choice* Which of the following planets has the highest escape velocity:

- W) Saturn
- X) Uranus
- Y) Jupiter
- Z) Mars

ANSWER: Y) JUPITER

BONUS

12) ASTRONOMY *Short Answer* Which moon is the only other body in our solar system, besides the Earth, that has an atmosphere of mostly nitrogen?

ANSWER: TITAN

TOSS-UP

13) MATH *Short Answer* What is formula for the volume of a sphere of radius R:

ANSWER: $\frac{4}{3}\pi R^3$

BONUS

13) MATH *Multiple Choice* The Babylonian number system is base 60, which makes it:

- W) vigesimal
- X) quinary
- Y) binary
- Z) sexagesimal

ANSWER: Z) SEXAGESIMAL

TOSS-UP

14) EARTH SCIENCE *Multiple Choice* A tropical storm will be declared a hurricane when:

- W) there is evidence of eye formation
- X) wind speeds reach 64 mph
- Y) wind gusts are in excess of 74 mph
- Z) there is evidence of eye formation and sustained wind speeds of 74 mph

ANSWER: Z) THERE IS EVIDENCE OF EYE FORMATION AND SUSTAINED WIND SPEEDS OF 74 MPH

BONUS

14) EARTH SCIENCE *Short Answer* What kind of rocks are formed by the lithification of sediments:

ANSWER: SEDIMENTARY ROCKS

TOSS-UP

15) GENERAL SCIENCE *Short Answer* What Clark University physics professor was an American pioneer of rocket theory after whom a major NASA space center is named?

ANSWER: ROBERT GODDARD (ACCEPT: GODDARD)

BONUS

15) GENERAL SCIENCE *Short Answer* The most common recommended method for calibrating a 1 milliliter automatic pipette gun would be to do what?

ANSWER: WEIGH A MILLILITER OF WATER FROM THE PIPET

TOSS-UP

16) GENERAL SCIENCE *Multiple Choice* Which of the following is a standard datatype for Java, but not for standard C:

- W) float
- X) char
- Y) byte
- Z) integer

ANSWER: Y) BYTE

BONUS

16) GENERAL SCIENCE *Multiple Choice* Which of the following is true about Java versus C language:

- W) C allows forward references
- X) Java allows forward references
- Y) neither Java nor C allow forward references
- Z) Java and C both allow forward references

ANSWER: Z) JAVA AND C BOTH ALLOW FORWARD REFERENCES

(Solution: C struct, Java class)

TOSS-UP

17) PHYSICS *Multiple Choice* Which of the following exhibits the least resistivity at 0°C:

- W) mercury
- X) tungsten
- Y) gold
- Z) silver

ANSWER: Z) SILVER

BONUS

17) PHYSICS *Short Answer* Which element has the simplest absorption spectrum?

ANSWER: HYDROGEN

TOSS-UP

18) BIOLOGY *Multiple Choice* The following pathway, $\text{CO}_2 + \text{H}_2\text{O} + \text{energy}$ **yields** $(\text{CH}_2\text{O})_n + \text{O}_2$ (pronounced: parenthesis C, H, 2, O, close parenthesis, subscript n, + O, 2), represents which of the following:

- W) cellular respiration
- X) photosynthesis
- Y) an irreversible reaction
- Z) glycolysis

ANSWER: X) PHOTOSYNTHESIS

BONUS

18) BIOLOGY *Short Answer* What is the vector for Rocky Mountain Spotted Fever?

ANSWER: THE TICK (ACCEPT: DERMACENTAR)

TOSS-UP

19) CHEMISTRY *Multiple Choice* Which of the following is an organic molecule:

- W) CaSO_4
- X) CH_4
- Y) NH_3
- Z) H_2O

ANSWER: X) CH_4

BONUS

19) CHEMISTRY *Short Answer* To the nearest whole number, convert 0.300 atmosphere into millimeters of mercury, or torr:

ANSWER: 228 MILLIMETERS OF MERCURY, OR TORR

(Solution: $1 \text{ atm} = 760 \text{ torr}$; $(.300 \text{ atm})(760 \text{ torr}/1 \text{ atm}) = 228$)

TOSS-UP

20) ASTRONOMY *Multiple Choice* What is the term for the amount of energy released from each square meter of an object's surface each second:

- W) energy flux
- X) Pascal's Law
- Y) Boltzman's Equation
- Z) Kelvin's Law

ANSWER: W) ENERGY FLUX

BONUS

20) ASTRONOMY *Short Answer* When a superior planet is at quadrature in reference to the Earth, what is its elongation in degrees?

ANSWER: 90°

TOSS-UP

21) EARTH SCIENCE *Short Answer* What is the fossilized resin of ancient trees which forms through the natural polymerization of sap:

ANSWER: AMBER

BONUS

21) EARTH SCIENCE *Short Answer* What is the common name for the test that gives the hardness of the material by the size of an indent left in it by a standard steel ball?

ANSWER: THE BRINELL TEST

TOSS-UP

22) GENERAL SCIENCE *Multiple Choice* Which of the following is the name for a rotating machine that converts mechanical energy into electrical energy by an armature rotating in a field produced by permanent magnets:

- W) electric motor
- X) turbine
- Y) magneto
- Z) kinetocycle

ANSWER: Y) MAGNETO

BONUS

22) GENERAL SCIENCE *Short Answer* Air on Earth consists mainly of three gases. Give their percent composition rounded off to the nearest whole number:

ANSWER: 78% NITROGEN; 21% OXYGEN; AND 1% ARGON

TOSS-UP

23) PHYSICS *Multiple Choice* In beta minus emission, the number of nucleons in the atom:

- W) increases by one
- X) decreases by one
- Y) increases by four
- Z) remains the same

ANSWER: Z) REMAINS THE SAME

BONUS

23) PHYSICS *Short Answer* Order the following categories of electromagnetic radiation from the LOWEST frequency to the HIGHEST: FM radio, UHF TV, AM radio, microwaves

ANSWER: AM RADIO; FM RADIO; UHF TV; MICROWAVES

TOSS-UP

24) BIOLOGY *Multiple Choice* George Gamow made a contribution to biology by correctly interpreting the:

- W) X-ray crystallographic structure of DNA
- X) existence of reverse transcriptase
- Y) minimum number of letters in the code for amino acids
- Z) existence of oncogenes

ANSWER: Y) MINIMUM NUMBER OF LETTERS IN THE CODE FOR AMINO ACIDS

BONUS

24) BIOLOGY *Short Answer* What three main parts make up the carpel of a plant?

ANSWER: STIGMA, STYLE, AND OVARY

TOSS-UP

25) CHEMISTRY *Multiple Choice* Which one of the following has the greatest tendency to lose an electron?

- W) Zn
- X) Cl
- Y) Br₂
- Z) A mixture of PbSO₄ and H₂O

ANSWER: W) ZN

BONUS

25) CHEMISTRY *Short Answer* Round the following number to four significant figures and express the result in standard exponential notation: 0.006543210

ANSWER: 6.543×10^{-3} (pronounced: 6.543 times 10 to the minus 3)