

ROUND 5

TOSS-UP

10) EARTH AND SPACE Multiple Choice Which of the following is the term for the hygroscopic [hy-gruh-SKOP-ik] atmospheric particles that are precursors to clouds?

W) Stratospheric aerosols

X) Cloud condensation nuclei

Y) Aqueous particles [AY-kwee-uhs]

Z) Stratospheric condensation nuclei

ANSWER: X) CLOUD CONDENSATION NUCLEI

BONUS

10) EARTH AND SPACE Multiple Choice Which of the following does the far side of the Moon possess in greater quantity when compared to the near side of the Moon?

W) Maria

X) Regolith [REG-uh-lith]

Y) Impact craters

Z) Aurora

ANSWER: Y) IMPACT CRATERS

TOSS-UP

21) CHEMISTRY Short Answer Give the name of the periodic table group that contains elements that are silver in color, soft, and react explosively with water.

ANSWER: ALKALI METALS (ACCEPT: GROUP 1 OR GROUP 1A)

BONUS

21) CHEMISTRY Short Answer A particle has a de Broglie [duh broh-GLEE] wavelength of 3×10^{-10} meters when it is traveling at 1.1×10^7 meters per second. Expressing your answer in kilograms and in scientific notation to one significant figure, what is its approximate mass?

ANSWER: 2×10^{-31}

TOSS-UP

15) PHYSICS Multiple Choice Which of the following particles has an electric charge of zero?

W) Electron

X) Quark

Y) Gluon

Z) Muon

ANSWER: Y) GLUON

BONUS

15) PHYSICS Short Answer A swimming pool water pump draws about 4.2 amperes when connected to 240 volts. If energy costs 10 cents per kilowatt hour, what is the bill to the nearest cent for running the pump continuously for 1 day?

ANSWER: \$2.42 (ACCEPT: 242 CENTS)

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TOSS-UP

3) PHYSICS Short Answer Two charges, Q and $-Q$, are placed at $x = -3$ and $x = +1$ on the x -axis. Where on the x -axis between $+Q$ and $-Q$ can another charge be placed so that it experiences no net force?

ANSWER: NOWHERE, DOES NOT EXIST

BONUS

3) PHYSICS Short Answer Suppose that you support a meter stick horizontally by positioning one finger under one of the ends and the other finger about one-quarter of the way from the opposite end. Now suppose you move your fingers slowly together until they touch. By number, identify what will most likely happen to the meter stick: 1) it will fall off the side with the finger under the end; 2) it will fall off the side with the finger about one quarter of the way from the end; or 3) it will stay balanced on your fingers.

ANSWER: 3

TOSS-UP

7) BIOLOGY Short Answer The fossil record of European black bears provides evidence of adaptive selection. In a population of black bears, identify the specific type of adaptive selection which would allow the average size of European black bears to increase after periods of glaciation but later decrease in size as interglacial periods warmed.

ANSWER: DIRECTIONAL (DO NOT ACCEPT: DIVERSIFYING)

BONUS

7) BIOLOGY Short Answer What is the common name of the large species of lizard found in Indonesia whose unusual size is attributed to island gigantism?

ANSWER: KOMODO DRAGON

TOSS-UP

6) ENERGY Multiple Choice When traveling at the same speed, which of the following fission products has the greatest kinetic energy?

W) A neutron

X) An alpha particle

Y) A beta particle

Z) A positron

ANSWER: X) AN ALPHA PARTICLE

BONUS

6) ENERGY Short Answer Name all of the following four choices that are types of coal: 1) lignite, 2) bituminous [by-TOO-muh-nuhs], 3) dolomite, 4) anthracite [AN-thruh-syt].

ANSWER: 1, 2, 4 (ACCEPT: LIGNITE, BITUMINOUS, ANTHRACITE)

TOSS-UP

4) MATH Short Answer What is the sum of the infinite geometric series with a first term of $\frac{1}{3}$ and a second term of $\frac{1}{9}$?

ANSWER: $\frac{1}{2}$ (ACCEPT: 0.5)

BONUS

4) MATH Short Answer How many real solutions does the following equation have: $(x^2 + 1)^2 + 2(x^2 + 1) - 3 = 0$ [x squared plus 1 quantity squared plus 2 times open parenthesis x squared plus 1 close parenthesis minus 3 equals zero]?

ANSWER: ONE

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TOSS-UP

6) ENERGY Short Answer When processing mined uranium ore, it is first crushed to a fine powder and then processed with concentrated acid, alkaline, or peroxide solutions to leach out the uranium. What is the common term for the remaining coarse powder?

ANSWER: YELLOWCAKE (ALSO ACCEPT: URANIA)

BONUS

6) ENERGY Multiple Choice Which of the following metabolites has the most negative standard Gibbs free energy of hydrolysis [hy-DROL-uh-sis]?

W) Phosphocreatine [fohs-foh-KREE-uh-teen]

X) Pyrophosphate [py-roh-FOS-fayt]

Y) Glucose 1-phosphate

Z) Phosphoenolpyruvate [fohs-foh-uh-nol-py-ROO-vayt]

ANSWER: Z) PHOSPHOENOLPYRUVATE

TOSS-UP

12) EARTH AND SPACE Multiple Choice Which of the following is produced by gas-to-particle conversion in the atmosphere?

W) Primary particulate matter

X) Secondary particulate matter

Y) Tertiary aerosols

Z) Primary aerosols

ANSWER: X) SECONDARY PARTICULATE MATTER

BONUS

12) EARTH AND SPACE Short Answer What are the two most abundant minerals in the continental crust?

ANSWER: QUARTZ AND FELDSPAR (ACCEPT: FELDSPAR FAMILY)

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ANSWER: Z) PHOSPHOENOLPYRUVATE

TOSS-UP

15) BIOLOGY Short Answer What disease occurs when blood vessel walls harden and blood passage is decreased or fully blocked?

ANSWER: ARTERIOSCLEROSIS (ACCEPT MYOCONDITIS)

BONUS

15) BIOLOGY Short Answer Name the fat soluble vitamin that is a component of visual pigments in vertebrates.

ANSWER: VITAMIN A (ACCEPT: RETINOL)

TOSS-UP

4) MATH Multiple Choice The equation $-mx + 1 = 13 - 4(x + 3)$ [negative m x plus 1 equals 13 minus 4 times the quantity x plus 3] is an identity if m equals which of the following?

W) -4

X) -1

Y) 1

Z) 4

ANSWER: Z) 4

BONUS

4) MATH Multiple Choice If $f(x) = -2x^2 + 8x - 4$, which of the following is true?

W) f is not a one to one function

X) The graph of f opens upward

Y) The graph of f has no x-intercept

Z) The maximum value of f(x) is -4

ANSWER: W) f IS NOT A ONE TO ONE FUNCTION

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or 3) it will stay balanced on your fingers.

ANSWER: 3

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11) BIOLOGY Multiple Choice The proboscis [proh-BOS-kis] is used primarily by invertebrates to perform which of the following functions?

W) Egg fertilization

X) Excavation

Y) Feeding

Z) Defense

ANSWER: Y) FEEDING

BONUS

11) BIOLOGY Multiple Choice Which of the following pollinators is a member of the order Lepidoptera [lep-i-DOP-ter-uh]?

W) Lesser long-nosed bats

X) Fritillary butterflies [FRIT-l-er-ee]

Y) Green bottle flies

Z) Blue orchard bees

ANSWER: X) FRITILLARY BUTTERFLIES

TOSS-UP

15) CHEMISTRY Multiple Choice Ethylene [ETH-uh-leen] has which of the following?

W) 2 pi bonds

X) 2 sigma bonds and 1 pi bond

Y) 3 sigma bonds

Z) 5 sigma bonds and 1 pi bond

ANSWER: Z) 5 SIGMA BONDS AND 1 PI BOND

BONUS

15) CHEMISTRY Short Answer What is the electron-pair geometry for ICl_4^- - [eye C L 4 minus]?

ANSWER: OCTAHEDRAL

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