

CHEMISTRY

1. CHEMISTRY

Toss Up: Multiple Choice

Which of these compounds is not a saturated compound?

- W) ethane
- X) propanol
- Y) butanal
- Z) acetylene

Toss Up Answer: Z

Bonus: Short Answer

What are the two compounds formed when ethanoic acid and ethanol react?

Bonus Answer: Ethyl ethanoate and water

2. CHEMISTRY

Toss Up: Multiple Choice

What is the fourth most abundant element on Earth?

- W) Oxygen
- X) Carbon
- Y) Sulfur
- Z) Argon

Toss Up Answer: X

Bonus: Short Answer

What metal forms compounds that give a grayish-white color?

Bonus Answer: Lead

3. CHEMISTRY

Toss Up: Short Answer

How many mL of 0.5 M Barium Hydroxide are needed to neutralize 500 mL of 1 M Hydrochloric Acid completely?

Bonus Answer: 500 mL

Bonus: Short Answer

Calculate the pOH of a solution given the H^+ concentration is 1.0×10^{-5}

Bonus Answer: 9

4. CHEMISTRY

Toss Up: Multiple Choice

How many carbon atoms and hydrogen atoms are present in one molecule of hexane?

- W) 6 hydrogen, 14 carbon
- X) 6 carbon, 14 hydrogen
- Y) 6 carbon, 12 hydrogen
- Z) 6 carbon, 10 hydrogen

Toss Up Answer: X

Bonus: Short Answer

Identify which of the following statements about carbon dioxide are true: 1) It has a molar mass of approximately 44 g/mol 2) It is a polar molecule 3) It has two double bonds

Bonus Answer: 1 and 3

5. CHEMISTRY

Toss Up: Multiple Choice

What type of bond is formed between two atoms with an electronegativity difference of 1.0?

- W) Polar Covalent
- X) Nonpolar Covalent
- Y) Ionic
- Z) Hydrogen

Toss Up Answer: W

Bonus: Short Answer

Of the following, which increase with atomic number in group 5 of the periodic table? 1) Atomic Radius 2) Atomic mass 3) First Ionization Energy

Bonus Answer: 1 and 2

6. CHEMISTRY

Toss Up: Multiple Choice

How many electrons occupy the bonding molecular orbitals of a CN triple bond?

- W) 2
- X) 4
- Y) 6
- Z) 8

Toss Up Answer: Y

Bonus: Multiple Choice

Which of the following compounds would have the highest boiling point?

- W) CH₃CH₂CH₂CH₃
- X) CH₃NH₂
- Y) CH₂F₂
- Z) CH₃OH

Bonus Answer: Z

7. CHEMISTRY

Toss Up: Multiple Choice

The H-C-O bond angle in H₂C=O (formaldehyde) is approximately:

- W) 90
- X) 109
- Y) 120
- Z) 180

Toss Up Answer: Y

Bonus: Short Answer

In which compound does carbon have the highest oxidation state?

- 1. CH₄
- 2. HCN
- 3. H₂CO
- 4. CH₂Cl₂

Bonus Answer: 2. HCN

8. CHEMISTRY

Toss Up: Multiple Choice

Which of the following has the highest electronegativity?

- W) Francium
- X) Carbon
- Y) Fluorine
- Z) Oxygen

Toss Up Answer: Y

Bonus: Short Answer

How many times faster does hydrogen diffuse through a hole than oxygen?

Bonus Answer: 4

9. CHEMISTRY

Toss Up: Multiple Choice

What does Pauli's Exclusion Principle state?

- W) Electrons of an atom must have the same spin
- X) No two electrons of an atom travel in the same orbital
- Y) no two electrons in an atom can be at the same time in the same state or configuration
- Z) Electrons can switch spin automatically

Toss Up Answer: Y

Bonus: Short Answer

What law states that electrons in the same orbitals reorganize themselves to maximize spin?

Bonus Answer: Hund's law

10. CHEMISTRY

Toss Up: Short Answer

What is the largest ion with an equal amount of protons and neutrons?

Bonus Answer: Ca²⁰⁺

Bonus: Short Answer

Who is regarded as the father of the modern periodic table? (1st and last name)

Bonus Answer: Dmitri Mendeleev

11. CHEMISTRY

Toss Up: Multiple Choice

Which of the following radioactive isotopes is used in the treatment of thyroid cancer?

- W) Carbon-12
- X) Iodine-131
- Y) Uranium-238
- Z) Technetium-99

Toss Up Answer: X

Bonus: Short Answer

If a radioactive isotope has a half life of 2 years, how long would it take for 1/8 of the original material to remain?

Bonus Answer: 6 years

12. CHEMISTRY

Toss Up: Short Answer

What element has the largest atomic radius?

Bonus Answer: Francium

Bonus: Multiple Choice

What is the most electronegative element?

- W) Francium
- X) Beryllium
- Y) Fluorine
- Z) Lithium

Bonus Answer: Y

13. CHEMISTRY

Toss Up: Multiple Choice

Which of the following isoelectronic ions has the largest ionic radius?

- W) Sulfur: 2-
- X) Chlorine: 1-
- Y) Potassium: 1+
- Z) Calcium: 2+

Toss Up Answer: W

Bonus: Short Answer

Complete the sentence with one word: As the nuclear charge of an ion increases, the ionic radius _____.

Bonus Answer: decreases (Do not accept decrease)

14. CHEMISTRY

Toss Up: Multiple Choice

Which of the following is false about metals?

- W) Metals are malleable and ductile
- X) Metals tend to lose electrons to become cations
- Y) Metallic reactivity increases as you go down a group.
- Z) All metals are solid at room temperature

Toss Up Answer: Z

Bonus: Multiple Choice

Which of the following metals isn't solid at room temperature?

- W) Mercury
- X) Tantalum
- Y) Barium
- Z) Chromium

Bonus Answer: W

15. CHEMISTRY

Toss Up: Short Answer

How many orientation of f orbitals are there?

Bonus Answer: 7

Bonus: Short Answer

The Pauli Exclusion Principle states that at most how many electrons can occupy a single atomic orbital?

Bonus Answer: 2

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16. CHEMISTRY

Toss Up: Short Answer

Which group of the periodic table has a fully filled d orbital?

Bonus Answer: Group 12

Bonus: Short Answer

Name 2 elements that behave both as a metal and non-metal

Bonus Answer: Any 2: Boron, silicon, germanium, arsenic, antimony, tellurium, (polonium)

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17. CHEMISTRY

Toss Up: Short Answer

Which group of elements has the lowest ionization energy?

Bonus Answer: Alkali metals

Bonus: Short Answer

What are the elements in group 5 called?

Bonus Answer: Pnictogens

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18. CHEMISTRY

Toss Up: Multiple Choice

Which of the following elements are Lanthanides?

W) Lawrencium

X) Meltnerium

Y) Seaborgium

Z) Terbium

Toss Up Answer: Z

Bonus: Short Answer

What unit does electronegativity use?

Bonus Answer: No unit

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19. CHEMISTRY

Toss Up: Short Answer

Order the following in terms of the rate of diffusion along them, from fastest to slowest. 1: Open Surface. 2: Through an amorphous material. 3: Through a crystal.

Bonus Answer: 1, 3, 2

Bonus: Multiple Choice

Which of the following is a thermal conductor, but not an electrical one?

W) Graphite

X) Graphene

Y) Diamond

Z) Polystyrene

Bonus Answer: Y

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20. CHEMISTRY

Toss Up: Short Answer

If you have a 1 L of a 10 M solution of HCl and you want 2 L of a 5 M solution of HCl, how much water must you add?

Bonus Answer: 1 L

Bonus: Short Answer

If the pOH of a solution is 6, what is the concentration of H⁺ ions?

Bonus Answer: 1.0×10^{-8} (also 0.00000001)

21. CHEMISTRY

Toss Up: Short Answer

Roger Y. Tsien, Osamu Shimomura, and Martin Chalfie were awarded the 2008 Nobel Prize in Chemistry for the discovery and development of which protein?

Bonus Answer: Green Fluorescent Protein, GFP

Bonus: Multiple Choice

Which organism was the Green Fluorescent Protein first isolated from?

W) Anglerfish

X) Jellyfish

Y) Squids

Z) Gulper Eels

Bonus Answer: X

22. CHEMISTRY

Toss Up: Multiple Choice

Which element is most electronegative?

W) Chlorine

X) Fluorine

Y) Astatine

Z) Cesium

Toss Up Answer: X

Bonus: Multiple Choice

What is the range of electronegativity values?

W) 0.0 to 1.0

X) 0.0 to 2.0

Y) 0.0 to 3.0

Z) 0.0 to 4.0

Bonus Answer: Z

23. CHEMISTRY

Toss Up: Multiple Choice

How many orbitals does the p sublevel have?

W) 1

X) 2

Y) 3

Z) 4

Toss Up Answer: Y

Bonus: Short Answer

which element has the electron configuration $1s^2 2s^2 2p^6 3s^1$ in its ground state?

Bonus Answer: Sodium, Na

24. CHEMISTRY

Toss Up: Short Answer

Where does oxidation occur in an electrochemical cell?

Bonus Answer: Anode

Bonus: Short Answer

In the redox reaction $2H_2 + O_2 \rightarrow 2H_2O$ how many electrons are transferred?

Bonus Answer: 4

25. CHEMISTRY

Toss Up: Multiple Choice

When 50 mL of stock solution of 6M NaCl (aq) is diluted into a 150 mL solution what will be the molarity of the diluted solution?

W) 3M

X) 2M

Y) 1M

Z) 6M

Toss Up Answer: X

Bonus: Short Answer

What is the given equation for calculating molarity?

Bonus Answer: Moles of solute divided by liters of solution

26. CHEMISTRY

Toss Up: Multiple Choice

Given the following ions, Na^+ , Br^- , Ag^+ , and Cu^{2+} which ion has the greatest atomic radius?

W) Na^+

X) Br^-

Y) Ag^+

Z) Cu^{2+}

Toss Up Answer: Y

Bonus: Short Answer

Name the group of elements with the least electronegativity.

Bonus Answer: Noble gases (Group 18)

27. CHEMISTRY

Toss Up: Multiple Choice

Choose the strongest acid from the choices below.

W) Hydrochloric acid

X) Hydrobromic acid

Y) Hydroiodic acid

Z) Hydrofluoric acid

Toss Up Answer: Y

Bonus: Short Answer

What are the conjugate bases of HCl, HBr, and HI?

Bonus Answer: Cl-, Br-, I-

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28. CHEMISTRY

Toss Up: Multiple Choice

From what two molecules is an ester synthesized?

- W) alcohol and ester
- X) alcohol and aldehyde
- Y) carboxylic acid and ester
- Z) carboxylic acid and alcohol

Toss Up Answer: Z

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Bonus: Short Answer

If one mole of an acid is dissolved in a liter of water, and the acid has a pKa of 10, what is the pH of the solution?

Bonus Answer: 7

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29. CHEMISTRY

Toss Up: Multiple Choice

Which of the following exhibits diamagnetism?

- W) bronze
- X) water
- Y) liquid oxygen
- Z) diamond

Toss Up Answer: X

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Bonus: Short Answer

Order the following by second ionization energy, from lowest to highest: Sodium, Magnesium, Aluminum

Bonus Answer: Magnesium, Aluminum, Sodium

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30. CHEMISTRY

Toss Up: Multiple Choice

Why is diamond a thermal conductor, even though it isn't an electrical conductor?

- W) heat vibrations can move along the rigid structure
- X) carbon has a low heat capacity
- Y) there are no impurities which increase resistance
- Z) carbon has a high heat capacity

Toss Up Answer: W

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Bonus: Multiple Choice

Which of the following has the highest carbon content?

- W) wrought iron
- X) cast iron
- Y) pig iron
- Z) slag

Bonus Answer: Y

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31. CHEMISTRY

Toss Up: Multiple Choice

Which of the following describes the carbon dioxide molecule?

- W) Polar and Linear
- X) Polar and Bent
- Y) Nonpolar and Linear
- Z) Nonpolar and Bent

Toss Up Answer: Y

Bonus: Short Answer

What hybridization is typically found in linear molecules?

Bonus Answer: sp

32. CHEMISTRY

Toss Up: Multiple Choice

In the reaction $A + B \rightarrow C + D$, which of the following occurs when reactant B is added?

- W) The concentration of A decreases
- X) The concentration of C decreases
- Y) The concentration of D decreases
- Z) The reaction shifts to the left

Toss Up Answer: W

Bonus: Short Answer

Given the specific heat capacity of water is 4.18 Joule/gram*°C, if you have 20 grams of water and want to heat it from 10 degrees C to 15 degrees C, how many joules must be added?

Bonus Answer: 418 Joules

33. CHEMISTRY

Toss Up: Multiple Choice

The conjugate base of HCl is which of the following?

- W) A weak acid
- X) A strong acid
- Y) A weak base
- Z) A strong base

Toss Up Answer: Y

Bonus: Short Answer

How many sigma and pi bonds does carbon dioxide have?

Bonus Answer: 2 sigma, 2 pi

34. CHEMISTRY

Toss Up: Multiple Choice

Which of the following substances cannot be decomposed further chemically?

- W) Carbon Dioxide
- X) Water
- Y) Silicon
- Z) Ammonia

Toss Up Answer: Y

Bonus: Short Answer

If 0.5 moles of NaCl are dissolved in 2 kg of water, what is the molality of the resulting solution?

Bonus Answer: 0.25 or 1/4

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35. CHEMISTRY

Toss Up: Short Answer

What is the oxidation number of chromium in the dichromate ion?

Bonus Answer: +6

Bonus: Short Answer

Name the following: CuCr_2O_7 .

Bonus Answer: Copper (II) dichromate; or Cupric dichromate

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36. CHEMISTRY

Toss Up: Multiple Choice

What is the most reasonable pH of the solution when the salt formed by reacting hydrochloric acid and aluminum hydroxide is dissolved in water?

W) 7

X) 4

Y) 10

Z) 0

Toss Up Answer: X

Bonus: Short Answer

125 mL from a 4M perchloric acid stock solution is reacted with excess sodium hydroxide. How many moles of the salt are formed if the system is 50% efficient?

Bonus Answer: 0.25 mol; 1/4 mol

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37. CHEMISTRY

Toss Up: Short Answer

How many hydrogen atoms does a molecule of acetone have?

Bonus Answer: 6

Bonus: Short Answer

What is the electron configuration of Cr^{3+} using noble gas notation?

Bonus Answer: $[\text{Ar}]3d^3$

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38. CHEMISTRY

Toss Up: Multiple Choice

The relation between pressure and temperature of two ideal gases is stated in

W) Gay-Lussac's Law

X) Boyle's Law

Y) Charles's Law

Z) Avogadro's Law

Toss Up Answer: W

Bonus: Short Answer

What are the dimensions of the gas constant R in SI base units?

Bonus Answer: $\text{kg m}^2 \text{mol}^{-1} \text{K}^{-1} \text{s}^{-2}$ (accept as a fraction)

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39. CHEMISTRY

Toss Up: Multiple Choice

Which of the following describes the reaction that involves a hydrocarbon chain and H₂ gas yielding two shorter hydrocarbon chains?

W) Synthesis

X) Cracking

Y) Hydrocracking

Z) Substitution

Toss Up Answer: Y

Bonus: Short Answer

What electron geometry does ammonia(NH₃) have?

Bonus Answer: tetrahedral, tetrahedron also accepted

40. CHEMISTRY

Toss Up: Multiple Choice

Which of the following has the largest ionic radius?

W) Li

X) Be

Y) Na

Z) Mg

Toss Up Answer: X

Bonus: Short Answer

Why does Oxygen have a smaller atomic radius than boron?

Bonus Answer: Effective nuclear charge

41. CHEMISTRY

Toss Up: Short Answer

What are the numbers of sigma bonds and pi bonds, in ethyne, respectively?

Bonus Answer: 3 sigma bonds, 2 pi bonds

Bonus: Short Answer

Pi bonds are created by the overlap of what type of orbital?

Bonus Answer: p, p orbitals

42. CHEMISTRY

Toss Up: Multiple Choice

The shape of a PCl₃ molecule is described as

W) bent

X) trigonal pyramidal

Y) linear

Z) trigonal planar

Toss Up Answer: X

Bonus: Short Answer

Twenty-five percent of element X exists as ²¹⁰X and 75 percent of it exists as ²¹⁴X. What is the atomic weight of element X?

Bonus Answer: 211

43. CHEMISTRY

Toss Up: Short Answer

Is HCL a strong acid?

Bonus Answer: Yes

Bonus: Short Answer

Is NAOH a strong base?

Bonus Answer: Yes

44. CHEMISTRY

Toss Up: Multiple Choice

Which of the following species is amphoteric?

W) Na_3PO_4

X) HSO_4^-

Y) KOH

Z) HNO_3

Toss Up Answer: X

Bonus: Short Answer

A 600-milliliter container holds 2 moles of $\text{O}_2(\text{g})$, 3 moles of $\text{H}_2(\text{g})$, and 1 mole of $\text{He}(\text{g})$. Total pressure within the container is 760 torr. What is the partial pressure of O_2 ?

Bonus Answer: 253 torr

45. CHEMISTRY

Toss Up: Multiple Choice

What is the correct term(s) used to determine if a system has come to equilibrium?

W) K_a and Q

X) K_{sp}

Y) Q

Z) K_c

Toss Up Answer: Y

Bonus: Multiple Choice

Chemical equilibrium may be used to describe

W) gas phase chemical reactions

X) acid and based ionization

Y) Solubility

Z) All of the Above

Bonus Answer: Z

46. CHEMISTRY

Toss Up: Multiple Choice

The term(s) most useful in determining the solubility of a substance is (are)

W) K_a and Q

X) K_{sp}

Y) Q and Le Chatelier's Principle

Z) K_c

Toss Up Answer: X

Bonus: Multiple Choice

The effect of temperature on a chemical system is best described using

- W) K_a and Q
- X) K_{sp}
- Y) Le Chatelier's Principle
- Z) K_c

Bonus Answer: Y

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47. CHEMISTRY

Toss Up: Multiple Choice

Which of the following is closest in mass to a proton?

- W) Alpha Particle
- X) Positron
- Y) Neutron
- Z) Hydrogen Molecule

Toss Up Answer: Y

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Bonus: Short Answer

What is the amount of calories of heat transferred to the water is when the temperature of a 20-gram sample of water is increased from 10°C to 30°C?

Bonus Answer: 400

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48. CHEMISTRY

Toss Up: Multiple Choice

Which of the following elements has the largest number of possible oxidation states?

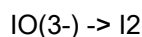
- W) Fe
- X) Cl
- Y) Ca
- Z) Mn

Toss Up Answer: X

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Bonus: Multiple Choice

What is the minimum number of electrons needed to balance the following half-reaction with whole number coefficients?



- W) 1 e⁻
- X) 2 e⁻
- Y) 5 e⁻
- Z) 10 e⁻

Bonus Answer: Z

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49. CHEMISTRY

Toss Up: Short Answer

In 12.4 hours, a 100 gram sample of an element decays so that its mass is 25 grams. What is the approximate half-life of this radioactive substance?

Bonus Answer: 6.2 hours

Bonus: Multiple Choice

Which of the following will raise the boiling point of a sample of water?

- W) Heat the water
- X) Mix gasoline into the water
- Y) Bring the water to a higher altitude
- Z) Dissolve table sugar in the water

Bonus Answer: Z

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50. CHEMISTRY

Toss Up: Multiple Choice

What kind of process is the loss of electrons?

- W) electrolysis
- X) thermodynamically favored
- Y) reduction
- Z) oxidation

Toss Up Answer: Z

Bonus: Multiple Choice

Which of the following metals does not react with water to produce hydrogen?

- W) Zn
- X) Li
- Y) Ca
- Z) Na

Bonus Answer: W

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51. CHEMISTRY

Toss Up: Multiple Choice

Which of the following is not commonly produced by eletrolysis?

- W) NaOCl
- X) Al
- Y) Fe
- Z) NaOH

Toss Up Answer: Y

Bonus: Multiple Choice

Which of the following pairs of constants are not mathematically related to eachother?

- W) Equilibrium constant and Gibbs Free Energy
- X) Rate Constant and Activation Energy
- Y) Standard Cell Voltage and Equilibrium Constant
- Z) Standard Cell Voltage and Rate Constant

Bonus Answer: Z

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52. CHEMISTRY

Toss Up: Short Answer

An ideal gas in a closed inflexible container has a pressure of 6 atmospheres and a temperature of 27°C. What will be the new pressure of the gas if the temperature is decreased to -73°C?

Bonus Answer: 4 atmospheres

Bonus: Multiple Choice

When CO₂ is bubbled through distilled water at 25°C, which of the following is most likely to occur?

- W) Solid carbon will form
- X) The pH of the solution will be reduced
- Y) The water will boil
- Z) Methane gas will be formed

Bonus Answer: X

53. CHEMISTRY

Toss Up: Multiple Choice

Which would be the easiest way to burn an iron nail?

- W) Hold an iron nail with crucible tongs, and heat strongly in the flame of a bunsen burner.
- X) Use the above method with an oxyacetylene torch to reach highest temperatures.
- Y) Grind the nail into very small, dust-sized particles and spray them into a flame.
- Z) Dissolve the nail in acid to make the oxide.

Toss Up Answer: Y

Bonus: Multiple Choice

What is a reasonable and safe substitute for zinc in reduction reactions in aqueous solutions?

- W) S
- X) F₂
- Y) K
- Z) Cd

Bonus Answer: Z

54. CHEMISTRY

Toss Up: Multiple Choice

Which of the following is a nonpolar molecule?

- W) Carbon dioxide
- X) Water
- Y) Ammonia
- Z) Hydrochloric acid

Toss Up Answer: W

Bonus: Short Answer

Which of the following forms of radioactive decay has (or have) no electrical charges? 1) Alpha Decay 2) Beta Decay 3) Gamma Decay

Bonus Answer: 3 only

55. CHEMISTRY

Toss Up: Multiple Choice

Which of these gases is expected to condense at the lowest pressure, assuming that the temperature is constant?

- W) Bromomethane

- X) Dibromomethane
- Y) Tetrabromomethane
- Z) They all condense at the same temperature

Toss Up Answer: Y

Bonus: Short Answer

Which attractive force is the major cause of condensation?

Bonus Answer: London Dispersion Forces (accept: London Forces)

56. CHEMISTRY

Toss Up: Multiple Choice

The evaporation of any liquid is expected to have

- W) a positive ΔH and a negative ΔS
- X) a negative ΔH and a negative ΔS
- Y) a positive ΔH and a positive ΔS
- Z) a positive ΔH and a negative ΔS

Toss Up Answer: Y

Bonus: Multiple Choice

The rate of reaction will be large if

- W) ΔG is a large negative number
- X) ΔS is a large negative number
- Y) ΔH is a large negative number
- Z) None of the above

Bonus Answer: Z

57. CHEMISTRY

Toss Up: Multiple Choice

Which of the following can be precisely determined for a chemical substance?

- W) Entropy
- X) Enthalpy
- Y) Free Energy
- Z) All of the Above

Toss Up Answer: W

Bonus: Short Answer

In a rate law, what are the units of k when the order is 3?

Bonus Answer: $L^2 \text{ mol}^{-2} \text{ s}^{-1}$

58. CHEMISTRY

Toss Up: Multiple Choice

Which of the following statements is NOT true for the element of sodium?

- W) It has an oxidation state of +1
- X) It forms a basic solution with water
- Y) It gives off a bright red color when burned
- Z) It reacts with a halogen to form a salt

Toss Up Answer: Y

Bonus: Short Answer

Which of the following are products made from the reaction $\text{H}_2\text{SO}_4(\text{aq}) + \text{Ba}(\text{OH})_2(\text{aq}) \rightarrow ?$ I) $\text{O}_2(\text{g})$ II) $\text{H}_2\text{O}(\text{l})$ III) $\text{BaSO}_4(\text{s})$

Bonus Answer: II and III

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59. CHEMISTRY

Toss Up: Short Answer

In a rate law, what are the units of k when the order is 1?

Bonus Answer: s^{-1}

Bonus: Short Answer

In a rate law, what are the units of k when the order is 5?

Bonus Answer: $\text{L}^4 \text{mol}^{-4} \text{s}^{-1}$

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60. CHEMISTRY

Toss Up: Short Answer

What is the chemical formula of tetraphosphorus decaoxide?

Bonus Answer: P_4O_{10}

Bonus: Short Answer

What is the bond order of the central atom in CO_3^{2-} ?

Bonus Answer: 4/3 (accept: 1 1/3)

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61. CHEMISTRY

Toss Up: Multiple Choice

What happens in a hydrogen atom when an electron jumps from an excited energy state to a more stable energy state?

- W) electromagnetic radiation is emitted by the atom
- X) electromagnetic radiation is absorbed by the atom
- Y) the atom becomes a positively charged ion
- Z) the atom becomes a negatively charged ion

Toss Up Answer: W

Bonus: Short Answer

A closed 5-liter vessel contains a sample of neon gas. The temperature inside the container is 25°C , and the pressure is 1.5 atmospheres. (The gas constant, R, is equal to $0.08 \text{ L}\cdot\text{atm}/\text{mol}\cdot\text{K}$.) If the neon gas in the vessel is replaced with an equal molar quantity of helium gas, which of the following properties of the gas in the container will be changed?

- I. Pressure
- II. Temperature
- III. Density

Bonus Answer: III only

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62. CHEMISTRY

Toss Up: Multiple Choice

A solution of H_2SO_3 is found to have a hydrogen ion concentration of 1×10^{-3} molar at 25°C . What is the hydroxide ion concentration in the solution?

- W) 1×10^{-1}
- X) 1×10^{-3}
- Y) 1×10^{-11}
- Z) 1×10^{-13}

Toss Up Answer: Y

Bonus: Short Answer

If the pH of a solution is changed from 1 to 3 with the addition of an antacid, what percentage of [H+] was neutralized?

Bonus Answer: 99%

63. CHEMISTRY

Toss Up: Short Answer

What is the molecular geometry of ammonia (NH₃)?

Bonus Answer: Trigonal Pyramidal

Bonus: Multiple Choice

How many lone pairs are in Xenon tetrafluoride (XeF₄)?

W) 0

X) 1

Y) 2

Z) 3

Bonus Answer: Y

64. CHEMISTRY

Toss Up: Multiple Choice

Which of the following does not exhibit resonance stabilization?

W) Ozone

X) SO₂

Y) NO₃

Z) H₂O

Toss Up Answer: Z

Bonus: Short Answer

What is the bond order of H₂O?

Bonus Answer: 2

65. CHEMISTRY

Toss Up: Short Answer

At room temperature, what is the only metal that is in liquid form?

Bonus Answer: Mercury (Hg)

Bonus: Multiple Choice

What is the third most common gas found in the air in the atmosphere?

W) Argon

X) Hydrogen

Y) Oxygen

Z) Helium

Bonus Answer: W

66. CHEMISTRY

Toss Up: Multiple Choice

A molecule is considered a Lewis acid if

- W) accepts a pair of electrons to form a bond
- X) accepts a proton from water
- Y) donates a pair of electrons to form a bond
- Z) donates a proton to water

Toss Up Answer: W

Bonus: Multiple Choice

Which of the following is a binary compound?

- W) Hydrogen Sulfate
- X) Hydrogen Sulfide
- Y) Ammonium Sulfide
- Z) Ammonium Sulfate

Bonus Answer: X

67. CHEMISTRY

Toss Up: Short Answer

What is the name for a molecule with tetrahedral electron geometry but only three substituent groups?

Bonus Answer: trigonal pyramidal

Bonus: Multiple Choice

Which of the following is not an ionic compound?

- W) NaCl
- X) HF
- Y) FeCl₃
- Z) H₂SO₄

Bonus Answer: X

68. CHEMISTRY

Toss Up: Multiple Choice

cis 1,2 chloro-ethene and trans 1,2 chloro-ethene differ in which of the following?

- W) electron geometry
- X) enthalpy
- Y) entropy
- Z) boiling point

Toss Up Answer: Z

Bonus: Short Answer

In an acid/base reaction, which (acid or base) is the electrophile?

Bonus Answer: acid

69. CHEMISTRY

Toss Up: Short Answer

During glycolysis, electrons removed from glucose are passed to

Bonus Answer: NAD⁺

Bonus: Multiple Choice

A biological redox reaction always involves

- W) an oxidizing agent
- X) a gain of electrons
- Y) a reducing agent
- Z) All of the Above

Bonus Answer: Z

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70. CHEMISTRY

Toss Up: Multiple Choice

For the unfolding reaction of Protein G, $\Delta H^\circ = 210.6 \text{ kJ/mol}$, this means that

- W) unfolding is favored enthalpically
- X) unfolding is favored enthalpically
- Y) the entropy is positive at all temperatures
- Z) the entropy is negative at all temperatures

Toss Up Answer: X

=====

Bonus: Multiple Choice

At the midpoint of a temperature transition curve,

- W) half of the protein is denatured
- X) $K_{eq} = 1.0$ and $\Delta G = 0$
- Y) $[Native] = [Unfolded]$ (Read as concentration of Native = concentration of Unfolded)
- Z) All of these

Bonus Answer: Z

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71. CHEMISTRY

Toss Up: Multiple Choice

The Standard Gibbs free energy, ΔG° , is

- W) the residual energy present in the reactants at equilibrium
- X) the residual energy present in the products at equilibrium
- Y) the energy required to convert one mole of reactants to one mole of products
- Z) the difference in the residual energy of reactants and products at equilibrium

Toss Up Answer: X

=====

Bonus: Multiple Choice

If the enthalpy change for a reaction is zero, ΔG° is equal to

- W) $T\Delta S^\circ$
- X) $T\Delta S^\circ$
- Y) $-\Delta H^\circ$
- Z) $\ln K_{eq}$

Bonus Answer: X

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72. CHEMISTRY

Toss Up: Multiple Choice

What is the oxidation state of Manganese in the permanganate ion?

W) +5

X) +7

Y) +2

Z) -2

Toss Up Answer: X

Bonus: Short Answer

What is the oxidation state of molecular oxygen?

Bonus Answer: 0
