Chemistry Standards Practice Test

Read each question, and choose the best answer.

(The topic of the question is listed to the right of the question.)
Did not cover this topic yet, but you can probably figure out the answer.
Didn't cover this topic yet or won't cover it at all.
Did cover this topic, but it will *not likely* be on the CST.
Didn't cover this topic, but it will *not likely* be on the CST.

1. What kind of bond exists between the copper and the sulfate ions in $CuSO_4$? **BONDING**
   A. covalent B. ionic C. metallic D. nuclear
2. Aloe juice contains $1.0x10^{-6}$ M of hydroxide ions. What is its pH? **ACIDS AND BASES**
   A. 1.0 B. 6.0 C. 8.0 D. 16.0
3. How do you determine the enthalpy change for the reaction shown below? **THERMODYNAMICS**
   $H_2(g) + (1/2)O_2(g) \rightarrow H_2O(l)$
   A. (enthalpy of water) + [(enthalpy of hydrogen) – (1/2)(enthalpy of oxygen)]
   B. (enthalpy of water) – [-(enthalpy of hydrogen) + -(1/2)(enthalpy of oxygen)]
   C. (enthalpy of water) – [(enthalpy of hydrogen) + (1/2)(enthalpy of oxygen)]
   D. (enthalpy of water) + [(enthalpy of hydrogen) + (1/2)(enthalpy of oxygen)]
4. In this equation, the question mark should be replaced by **BALANCING EQUATIONS**
   $2Al + ?HCl \rightarrow 2\ AlCl_3 + 3H_2$
   A. 1 B. 2 C. 3 D. 6
5. Max Planck's work with atoms correlated energy to **HISTORY OF ATOM**
   A. atomic size B. frequency C. ionic charge D. mass
6. Gamma particles **NUCLEAR CHEMISTRY**
   A. penetrate less than alpha particles
   B. penetrate less than beta particles
   C. are the least penetrating of all radioactive decay.
   D. are the most penetrating of all radioactive decay.
7. The rate of a reaction can be described by **EQUILIBRIUM**
   A. evidence of reactant depletion
   B. evidence of product formation
   C. the decrease in the concentration of the reactants with time
   D. the decrease in the concentration of the products with time
8. The Lewis dot structure for chlorine is shown below. What is the electron configuration for chlorine? **ATOMIC STRUCTURE**

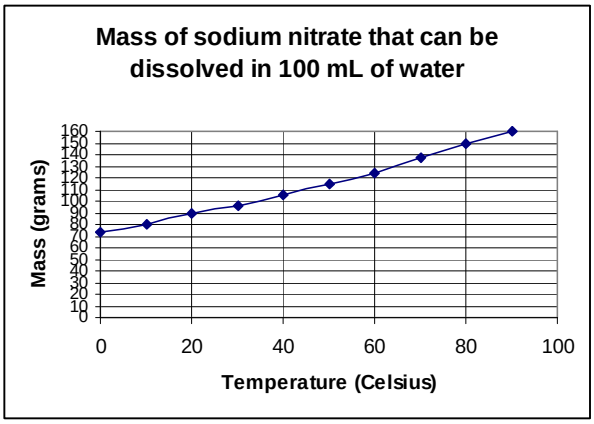
   A. $1s^2 2s^2 2p^1$ B. $1s 2s^2 2p^6 3s^1$ C. $1s^2 2s^2 2p^6 3s^2 3p^1$ D. $1s^2 2s^2 3s^2 3p^5$
9. In order to decrease the pressure of a container full of gas particles, **GASES**
   A. its volume must increase
   B. its temperature must increase
   C. its volume must decrease and its temperature must increase
   D. a lighter gas must be added
10. A strong nuclear force holds protons and neutrons together in the atomic nucleus, yet atomic nuclei with too many protons and neutrons are unstable. Which statement correctly explains this? **NUCLEAR CHEMISTRY**
    A. The electromagnetic force is stronger than the nuclear force.
    B. The weak nuclear force becomes more important for large nuclei.
    C. The range of the strong nuclear force is too small for large nuclei.
    D. The range of the electromagnetic force is too great for large nuclei.
11. A tank containing 1.7 atm of oxygen gas is combined with a tank containing 0.6 atm of oxygen gas and a tank containing 2.3 atm of oxygen gas. What is the final pressure in the tank? **GASES**
    A. 0.0 atm B. 2.3 atm C. 4.0 atm D. 4.6 atm
12. Sodium hydroxide is a strong base. How will it dissociate in water? **ACIDS AND BASES**
    A. It will not dissociate in water
    B. It will partially dissociate in water
    C. It will fully dissociate in water
    D. It will not mix with water

13. The nucleus of an atom **ATOMIC STRUCTURE**
    A. is the largest part of an atom
    B. is the lightest part of an atom
    C. contains all of the atom's mass
    D. has a negative charge

14. A basic solution usually feels **ACIDS AND BASES**
    A. cold B. gritty C. soapy D. tingly

15. Standard temperature and pressure (STP) occurs at **GASES**
    A. 1 atm B. 1 mm Hg C. 1 pound per square inch D. 1 torr

16. According to these data, what is the approximate number of grams of sodium nitrate that can be dissolved at a temperature of 90°C? **SOLUTIONS (SOLUBILITY)**



    A. 150 g B. 155 g C. 160 g D. 165 g

17. Higher temperatures will **REACTION RATE**
    A. decrease the amount of products in a chemical reaction.
    B. decrease the concentration of products in a chemical reaction.
    C. increase the reaction rate of a chemical reaction.
    D. increase the activation energy of a chemical reaction.

18. What is 50°C in kelvins? **GASES**
    A. 223 K B. 273 K C. 323 K D. 373 K

19. A ketone has a functional group of **ORGANIC CHEMISTRY**
    A. —CHO B. —CO— C. —COOH D. —OH

20. Use the ideal gas law below. What is the pressure produced by 2.0 mol of H_2 in a 22.4-L container at 273 K? Use R = 0.0821 (L·atm/(mol·K).
    PV = nRT **GASES**
    A. 0.5 atm B. 2.0 atm C. 4.0 atm D. 8.0 atm

21. Hydrogen ions are donated by **ACIDS AND BASES**
    A. acids B. bases C. radioactive isotopes D. salts

22. After four half-lives have passed, how much of the original radioactive material will remain? **NUCLEAR CHEMISTRY**
    A. 1/2 B. 1/4 C. 1/16 D. 1/32

23. A solution is a uniform mixture. How are molecules distributed in a solution? **SOLUTIONS**
    A. molecules are distributed by their random motion
    B. molecules are distributed based on their atomic mass
    C. molecules are distributed by ionic attraction
    D. molecules are distributed by electromagnetic attraction

24. An Arrhenius base is a(n) **ACIDS AND BASES**
    A. hydroxide-ion producer
    B. hydroxide-ion donor
    C. ionic compound that dissociates into a metal and hydroxide ion.
    D. substance that, in water, dissociates into hydrogen ions.

25. Henri LeChatelier believed a new equilibrium after a change in a reaction would **EQUILIBRIUM**
    A. minimize the impact of the change
    B. maximize the impact of the change
    C. not occur in cases of a change in pressure
    D. not occur in cases of a change in temperature

26. A solution
A. acts as a buffer B. contains a dissolved substance C. must contain a salt D. reacts with a solvent

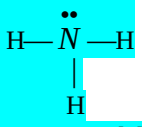
27. Which form of radioactive decay consists of electrons? **NUCLEAR CHEMISTRY**
A. alpha B. beta C. delta D. gamma

28. How many atoms does 230 g of sodium (atomic weight = 23) have? **THE MOLE**
A. 3.01×10^{23} B. 6.02×10^{23} C. 1.20×10^{24} D. 6.02×10^{24}

29. Which is true of liquids? **KINETIC MOLECULAR THEORY**
A. Their molecules move less freely than those in solids
B. Their molecules move more freely than those in gases
C. The intermolecular forces between the atoms or molecules are weaker than those in solids
D. The intermolecular forces between the atoms or molecules are weaker than those in gases

30. J.J. Thomson's experiments with cathode rays in magnetic and electric fields led to the discovery of **HISTORY OF ATOM**
A. electrons B. neutrons C. protons D. quarks

31. The Lewis dot structure for NH_3 is shown below. What is the probable shape of NH_3? **VSEPR**



A. linear B. pyramidal C. tetrahedral D. trigonal planar

32. Amino acids make up **BIOCHEMISTRY**
A. DNA B. lipids C. proteins D. sugars

33. Which of these is the correct way to express the equilibrium constant for the reaction below? **EQUILIBRIUM**
$2HI\ (g) \leftrightarrow H_2\ (g) + I_2\ (g)$
A. $K = [HI] + [H_2] + [I_2]$
B. $K = [HI]^2 \times [H_2][I_2]$
C. $K = [HI] \div 2[H_2][I_2]$
D. $K = [H_2][I_2] \div [HI]^2$

34. What is the approximate molarity of 109.5 g of HCl (36.5 g/mole) in 750 L of solution? **SOLUTIONS (CONCENTRATION)**
A. 3M B. 4M C. 6M D. 12M

35. Which temperature is unrealistic?
A. -100°C B. -100°F C. -100 K D. 100 K

36. Which statement most accurately describes the state of a reaction after it has reached chemical equilibrium? **EQUILIBRIUM**
A. At chemical equilibrium, equal amounts of products and reactants are present
B. The forward and reverse reaction rates are producing equal concentrations
C. The forward and reverse reaction rates are occurring at equal rates.
D. At equilibrium, the reaction is continuing in either the forward or reverse direction.

37. In the reduction reaction shown below, how many electrons are needed to balance the equation? **REDOX**
A. 0 B. 1 C. 2 D. 4

38. Which element sets the standard for the quantity of a mole? **THE MOLE**
A. carbon B. hydrogen C. sodium D. uranium

39. The diagram below shows a chemical equation representing a chemical reaction. The name and mass of each substance involved in the chemical reaction are also shown. What mass of sedum chloride was produced in this reaction?

36.5 g		40.0 g		? g		18.0 g
HCl	+	**NaOH**	→	**NaCl**	+	**H_2O**
hydrochloric acid		sodium hydroxide		sodium chloride		water

STOICHIOMETRY

A. 24.0 g B. 35.5 g C. 48.0 g D. 58.5 g

40. According to the kinetic theory of gases, which has the least influence on gas molecules? **KINETIC MOLECULAR THEORY**
A. molecular attraction B. volume of the container C. temperature D. velocity

41. What holds the atoms of a salt in a fixed pattern? **BONDING**
A. covalent bonds B. electrostatic attraction C. magnetic force D. viscosity

42. Which of these increases as the amount of solute particles in a solution increases? **COLLIGATIVE PROPERTIES**
A. atomic number B. boiling point C. is absorbed by the ice D. is released by the water

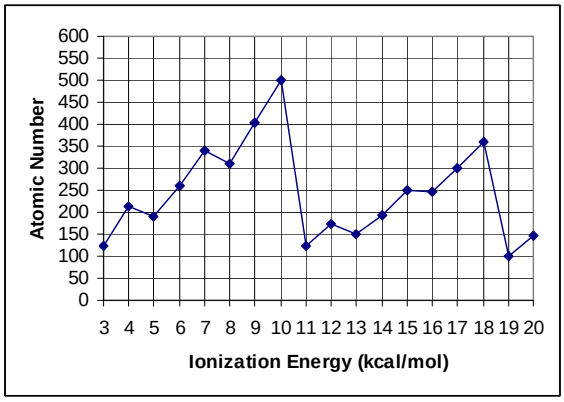
43. When an ice cube melts, energy **THERMOCHEMISTRY (ENDOTHERMIC/EXOTHERMIC)**
A. remains unchanged B. is transferred to a catalyst C. is absorbed by the ice D. is released by the water

44. Perfume diffuses through the air because the molecules of a gas **GASES**
A. produce pressure B. have random motion C. vibrate quickly D. are very small

45. Uranium, located in the last row (elements 90 through 103) of the two rows normally shown as an insert of the periodic table, is a(n) **ARRANGEMENT OF PERIODIC TABLE**

A. actinide element B. alkali metal C. alkaline metal D. lanthanide element

Use the graph below to answer question 46.



PERIODIC TRENDS

46. Elements with atomic numbers 4, 12, and 20 are in the same group in the periodic table. As you move down a group,

A. the principal energy level increases and the first ionization energy increases
B. the principal energy level increases and the first ionization energy decreases
C. the principal energy level decreases and the first ionization energy increases
D. the principal energy level decreases and the first ionization energy decreases

47. An isotope of uranium is most likely to be **NUCLEAR CHEMISTRY**

A. inert B. radioactive C. of a lower atomic number than uranium D. of a higher atomic number than uranium

48. Refer to the periodic table to answer this question. In the periodic table, the halogens are located in column (group) **ARRANGEMENT OF PERIODIC TABLE**

A. 1A B. 2A C. 7A D. 8A

49. The periodic table is organized into blocks representing the energy sublevel being filled with valence electrons. In the periodic table, which block represents the p sublevel? **ARRANGEMENT OF PERIODIC TABLE**

A. first two columns B. last six columns C. middle ten columns D. bottom 14 columns

50. Why is carbon found in so many molecules? **ORGANIC CHEMISTRY**

A. it has versatile bonding characteristics
B. it has the highest electronegativity of all elements
C. it has a unique atomic number
D. its atomic mass makes it ideal to bond with

51. Which statement best describes what happens to sodium and chlorine atoms when they combine to form sodium chloride? **BONDING**

A. The sodium atom becomes a positive ion, and the chlorine atom becomes a negative ion
B. The sodium atom becomes a negative ion, and the chlorine atom becomes a positive ion
C. The sodium atom becomes a positive ion, and the chlorine atom becomes a positive ion
D. The sodium atom becomes a negative ion, and the chlorine atom becomes a negative ion

52. How many molecules does 2 mol of NaOH have? **THE MOLE**

A. 3.01×10^{23} molecules B. 6.02×10^{23} molecules C. 1.20×10^{24} molecules D. 6.02×10^{24} molecules

53. Nucleic acids are composed of many **BIOCHEMISTRY**

A. amino acids B. nucleotides C. monosaccharides D. triglycerides

54. Which identifies an amino acid? **BIOCHEMISTRY**

A. N group B. R group C. C terminal D. N terminal

55. How many electrons do the elements in the first column of the periodic table have available for bonding?

A. 0 B. 1 C. 7 D. 8 **BONDING**

56. In chromatography, a solute is separated from a solvent by **SEPARATING TECHNIQUES**

A. boiling off the solvent B. siphoning off the solvent C. electrostatic attraction D. viscosity

57. How does a catalyst affect reaction rates? **REACTION RATE**

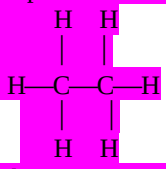
A. It decreases the reaction rate of a chemical reaction
B. It increases the reaction rate of a chemical reaction
C. It shifts the equilibrium constant of a chemical reaction to the left
D. It shifts the equilibrium constant of a chemical reaction to the right

58. When two atoms of the same kind (and, thus, with the same electronegativity) bond, **BONDING**

A. a hydrogen bond is formed
B. an ionic bond is formed
C. a nonpolar covalent bond is formed
D. a polar covalent bond is formed

59. Which is true of nuclear fusion? **NUCLEAR CHEMISTRY**
A. It releases hydrogen ions
B. It requires a low initial temperature
C. It releases a great amount of energy
D. It occurs regularly on Earth.

60. The compound shown below is known as **ORGANIC CHEMISTRY (NAMING)**



A. ethane B. methane C. ethene D. methene

61. How do hydrogen bonds contribute to the high boiling-point temperature of water? **INTERMOLECULAR FORCES**
A. The bonds give up electrons
B. The bonds cause protons to lose part of their positive charge
C. The bonds cause a shorter distance
D. The bonds are identical to ionic bonds

62. Buttermilk has a pH of about 4.6. This makes buttermilk a **ACIDS AND BASES**
A. strong acid B. strong base C. weak acid D. weak base

63. A reaction has a positive change in free energy. This reaction will **THERMODYNAMICS**
A. be spontaneous
B. It requires a low initial temperature
C. It releases a great amount of energy
D. It occurs regularly on Earth.

64. Which element has the strongest attraction for electrons? **PERIODIC TRENDS (ELECTRONEGATIVITY)**
A. beryllium (atomic number = 4)
B. calcium (atomic number = 20)
C. magnesium (atomic number = 12)
D. sodium (atomic number = 11)

65. Which is a substructure of a neutron? **ATOMIC STRUCTURE**
A. electron B. isotope C. proton D. quark

66. How much heat in joules does it take to raise 100 g of water from 25°C to 30°C? **THERMOCHEMISTRY**
(The specific heat of water is 4.180 J J/g·°C)
A. 20.9 J B. 209 J C. 2090 J D. 20,900 J

67. When temperature rises,
A. collisions occur less often B. energy decreases C. entropy decreases D. molecules move faster

68. How does blood maintain a pH of about 7.4? **ACIDS AND BASES**
A. It is a weak acid B. It contains buffers C. It contains sugar D. It contains red blood cells

69. Which is an exothermic reaction? **THERMOCHEMISTRY**
A. building a chemical bond B. making a protein C. oxidation D. reduction

70. Which is an example of activation energy? **REACTION RATE**
A. energy required to split a nucleus
B. energy required to start a chemical reaction
C. energy required to buffer a solution
D. energy required to initiate radioactive decay

71. Niels Bohr's work with the atom led him to speculate about **HISTORY OF ATOM**
A. isotopes B. protons C. spectral lines D. types of bonds

72. In a chemical reaction, a yield of 1000 g of a substance is predicted based on the amount of reactants. Only 979 g of the substance is produced. What is the percent yield? **CONSERVATION OF MATTER**
A. 2 percent B. 21 percent C. 98 percent D. 979 percent

73. Which demonstrates the collisions of gas molecules? **GASES**
A. mass of a tank of gas on a balance
B. movement of dye in a glass of water
C. pressure on the inside walls of a balloon
D. smell of a skunk in the air