ETHIOPIAN UNIVERSITY ENTERANCE EXAM. OF CHEMISTRY COMPILED IN UNITS

PHYSICAL CONSTANT

a. Gas constant , R = 8.314J $mol^{-1}K^{-1}$ = 0.0821 L-atm $mol^{-1}K^{-1}$

b. Avogadro´s number . = 6.o23x 10^{23} mol^{-1}, mass 0f electron=9.11x10^{-31}kg

c. Plank constant , h = 6.626 x 10^{-34} J s^{-1}, Rydberge(RH=2.18x10^{-18}J)

d. Speed of light, c = 3.0 x 10^{8} m s^{-1}

e. Faraday constant (F) = 96,500C mol^{-1}

Aboker preparatory school Chemistry Grade 11 entrance exam

11. Chapter-1

1. Which of the following is correct?
   A. 1L=1dm^3 B. 1L=10dm^3 C. 10L=1dm D. 1L=1m^3
2. Which one of the following is NOT an intensive property?
   A. Mass B. Temperature C. Color D. Density
3. When 0.68 is divided by 14.364, the actual answer is 0.0473405.
   What will be the correct answer?
   A. 0.05 B. 0.047 C. 0.0473 D. 0.04734
4. Which of the following is NOT a basic SI unit?
   A. Candela B. Gram C. Mole D. Second
5. What is the number of significant figures in 0.0030050?
   A. 4 B. 5 C. 7 D. 8
6. Which of the following properties of a substance does NOT represent an intensive physical property?
   A. Boiling point B. Color C. Density D. Volume
7. What is the Kelvin scale (K) corresponding to the temperature reading when the degree Celsius (^{0}C) is identical to the degree Fahrenheit (^{0}F)?
   A. 0K B. 37K C. 233K D. 273K
8. If a piece of aluminum (A) foil measuring 24 cm by 31 has a mass of 10.35g, (density of Al = 2.70g cm^{-3}). What is the thickness of the foil in millimeters?
   A. 5.15 x 10^{-3} B. 5.15 x 10^{-2} C. 3.833 D. 7.44
9. Which of the following is the right order of the steps of a scientific method?
   A. Performing experiments formulating hypothesis Making observations
   B. Formulating hypothesis Making observations performing experiments
   C. Making observations formulating hypothesis performing experiments
   D. Making observations performing experiments –Formulating hypothesis
10. How many spectral lines are emitted from a hydrogen atom excited to the state designated by the principal quantum number, n=3?
    A. 1 B. 2 C. 3 D.4
11. How many moles are there in 159g of alanine, $C_3H_7N0_2$?
    A. 0.560 B. 0.992 C. 1.78 D.3.31
12. How many chloride ions are in 1.0 mole of $CaCl_2$?
    A. 3.01x10^{23} Cl^- ions B. l.81xl0^{24} Cl^- ions
    C. 6.02xl0^{23} Cl^- ions D. 1.20x10^{24} Cl^- ions
13. Which of the following is the right order of the steps of a scientific method?

A. Performing experiments formulating hypothesis Making observations

B. Formulating hypothesis Making observations performing experiments

C. Making observations formulating hypothesis performing experiments

D. Making observations performing experiments –Formulating hypothesis

14. The distance between two carbon atoms in a diamond is 154 pm. What is the distance between the carbon atoms in millimeters?

A. 7.7×10^{-5} B. 7.7×10^{-7} C. 1.54×10^{-7} D. D. 1.54×10^{-9}

15. In which of the following numbers all of the zeros significant?

A. 100.090090 B. 0.143290 C. 0.1000 D. 00. 0030020

16. The first step of the scientific method involves

A. forming a hypothesis C. making observations

B. performing an experiment D. predicting the result of an experimrnt

17. Which of the following is correct when 34495 is rounded to three significant figures?

A. 345 B. 34500 C. 344 D. 3840

18. What is the first step of scientific method?

A. Making observations B. Forming a hypothesis

C. Performing an experiment D. Predicting the result of an experiment

19. Which of the following is correct?

A. 1 Pa = $10Nm^{-2}$ B. 1 N = 10 kg m s^{-2} C. 0.00072 = 7.2×10^{-3} D. 1 L = 1 dm^3

20. Which of the following represents a tentative explanation of certain scientific law?**.**

A. Hypothesis B. Observation C. Experimentation D. Theory

21. In order to advance to the level of theory, a hypothesis should

A. be obviously accepted by most people B. be repeatedly confirmed by experimentation

C. be a fully functional experiment D. report the past experience

22. What is the equivalent of 50^0 C in F ?

A. 10^0 F B. 18^0 F C. 82^0 F D. 122^9 F

23. A student determined the density of an acid to be 3.91, 3.90, and 3.93 g cm^{-3} . If the actual density of the solid is 2.76 g cm^{-3}, how should the student's result be described?

A. Low accuracy and low precision B. Low accuracy and high precision

C. High accuracy and low precision D. High accuracy and high precision

24. A pattern or relationship that has been established based on a large amount of experimental data is a

A. Theory B. Hypothesis C. Law D. Scientific method

25. Which of the following numbers has 4 significant figures?

A. 0.0430 B. 0.04309 D. 0.0431 D. 0.43980

26. Which of the following correctly expresses the number 0.0000850 in scientific notation?

A. 8.50×10^{-5} B. 8.50×10^{-4} C. 8.5×10^{-5} D. 8.50×10^{5}

27. What is the sum of 3.71×10^{8} and 4.62×10^{7} to the correct significant figure?
A. 4.17×10^{8} B. 4.99×10^{7} C. 4.17×10^{8} D. 4.991×10^{7}

28. What is the closeness of the measurement to its true value?
A. Precision B. Reproducibility C. Accuracy D. Usefulnes

29. What skill is a scientist using when he/she listens to the sounds that animals make?
A. Drawing conclusion B. Making a hypothesis C. Making observation D. Interpreting data

30. relationship between picometer(pm) and nanometer(nm)is:
A. 1pm=10nm B. 1nm=1000pm C. 1pm=100nm D. 1nm=10pm

31. To determine the volume of an irregularly shaped glass vessel, the vessel is weighed empty (121.3 g) and when filled with CCl_4(283.2g). What is the volume capacity of the vessel, given that the density of CCl_4 is $1.59 g/cm^3$?
A. $76.29cm^3$ B. $257.42cm^3$ C. $178.11cm^3$ D. $101.82cm^3$

32. What is the bases for the scientific method?

A. To formulate a research problem and disprove the hypothesis.

B. To test hypotheses and if they are disproved, they should be abandoned completely.

C. To test hypotheses in conditions that are favourable to their success.

D. To formulate a research problem, test the hypotheses under carefully controlled conditions that challenge the hypotheses

33. Which of the following has the same number of significant figures as the number 1.00310?

A. 199.791 B. $1X10^{6}$ C. 100 D. 5.119

34. Precision refers to……..

A. How close a measured number is to the true value B. How close a measured number is to the zero

C. How close a measured number is to the calculated value D. How close a measured number is to other measured numbers

35. What is the first step in scientific investigation?

A. Ask questions B. Draw conclusions C. Do research D. Make observation

36. Which of the following is the SI units of electric current?

A. Watt B. Volt C. Amphere D. Columb

11 Chapter-2

1. Which one the following electronic transition in a hydrogen atom releases the largest energy?
   A. n =2 ⟶ n=1 C. n = 6 ⟶ n = 3
   B. n=4 ⟶ n=2 D. n = 7 ⟶ n = 6
2. Which set of quantum numbers (n, L, mℓ, ms) is not possible?
   1,0,0,1/2 B. 1,1,0,1/2 C. 1,0,0,-1/2 D. 2,1,-1,1/2
3. Which of the following particles contains more electrons than neutrons?
   I. $^{1}_{1}H$ II. $^{35}_{17}Cl^{-}$ III. $^{39}_{19}K^{+}$
   A. I only B. II only C. I and II only D. II and III only
4. In which region of the periodic table would the element with the electronic structure below belocated? $1s^2\ 2s^2 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^2\ 4p^6\ 4d^6\ 5s^2$
   A. Group 6 B. Noble gases C. s block D. d block
5. What is the ionization energy of an iron atom if it requires a radiation of 276nm to completely remove its outer most electrons in the gaseous state?
   (planck's constant, h = 6.626×10^{-34}Js, speed of light, C=$3\times10^{8}ms^{-1}$)
   A. 7.21×10^{-19}J B. 7.21×10^{-19}kJ C. 7.21×10^{19}J D. 7.21×10^{19}kJ
6. Which of the electron configurations describes the ground state electron configuration of Ca^{+2}?
   A. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6$ C. $1s^2\ 2s^2\ 2p^6\ 3p^1$
   B. $1s^2\ 2s^2\ 2p^6\ 3s^1$ D. $1s^2\ 2s^2 2p^6 1s^2\ 2s^2\ 2p^6\ 3s^2 3p_x^2 3p_y^1$
7. Which of the following statement is TRUE?
   A. Ultraviolet light has longer wavelength than visible light
   B. The energy of radiation decreases as the wave length decreases
   C. The frequency of radiation increase as the wavelength decrease
   D. Wave number of an electromagnetic radiation increase as wavelength increase
8. An electron has a spin quantum number, s= + ½ and a magnetic quantum number, m_l = +1 1. In which of the following orbital will it NOT be present?
   A. S-orbital B. p-orbital C. d-orbital D. f-orbital
9. Which of the following represents the general configuration of the transition elements?
   A. $ns^2\ np^6$ B. ns(n-1)d C. ns(n-2)f D. $ns^2np^6(n-1)d^{10}$
10. The quantum numbers listed below are meant for four different electrons in an atom:
   I. n = 4, 1 = 0, m1 = 0, ms = + ½ II. n = 3, 1 = 1, m1 = 1, ms = + ½
   II. n = 4, 1 = 2, m1, = 0, ms = + ½ IVn = 4, 1 = 1, m1, = 0, ms = - ½
   When these set as of quantum numbers are arranged in order of increasing energy, one may get:
   A. I < II < III << IV B. I < III < II < IV C. II < I < III < IV D. IV < III < II < I
11. The compound CuCl emits blue light having a wavelength of 450nm when heated at about 1200^0 C what is the increment in energy (quantum) that is emitted at 450nm?
   A. 2.25×10^{-19}J B. 4.41×10^{-19}J C. 8.20×10^{-19}J D. 16.20×10^{-19}J
12. What is the total number of valence-shell electrons in BrO_3^-
   A. 20 B. 26 C. 32 D. 36
13. What is the number of moles of atoms and the number of atoms in a 10.0-g sample of copper?
   A. 0.08 mol cu atoms & 2.16×10^{23} atoms B. 0.16 mol Cu atoms & 9.63×10^{22} atoms
   B. 0.16 mol Cu atoms & 9.63×10^{23} atoms C. 0.31 mol Cu atoms & 4.16×10^{23} atoms
14. Which group of elements is characterized with $ns^2 np^2$ outer-electron configuration?
   A. Group 2A B. Group 4A C. Group 4B D. Group 3B
15. Which of the following quantum number/s determine the energy of an electron in a hydrogen atom?
   A. n B. n and 1 C. n, 1 and m D. n, 1 m and s
16. For elements in the left-most column of the periodic table. Properties that have increasing values as the atomic number increases include which of the following?
   I. Ionization energy II. Atomic radius III. Atomic mass
   A. III Only B I, II, and III C. I and II only D. II and III only
17. What did Rutherford's particle experiment show?
   A. Electrons have a negative charge
   B. A proton is a hydrogen atom without electron
   C. Electrons circle the nucleus of an atom in orbits

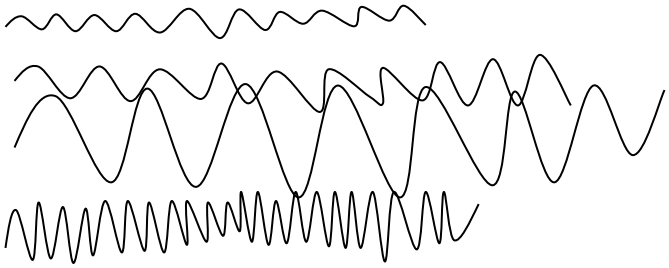
D. Most of the mass and all of the positive charge of an atom is found in a tiny nucleus.

18. Which of the following electron transitions requires the smallest energy to be absorbed by the hydrogen atom?
    A. From n = 1 to n = 2 C. from n = 3 to n = 4
    B. from n = 2 to n = 3 D. from n = 4 to n = 5
19. For an electron that has quantum numbers n = 4 and m ℓ = 0, which of the following is true?
    A. It must have the quantum number n = 0. B. It must have the quantum number ℓ = 0
    C. It must have the quantum number m, = + 1/2. D. It may have the quantum number ℓ = 0,1,2,3
20. For which of the following elements is Hund's rule used in writing the electron configuration?
    A. C B. B C. Be D. Li
21. Which set of quantum numbers (n, L, mℓ .,ms) is NOT permitted by the rules of quantum mechanics?
    A. 1,0,0 1/2 B.2,1,-I,-1/2 C.3,3,1,-1/2 *D.4,3,2,1/2*
22. What can you conclude from the figure below?

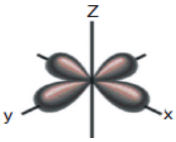
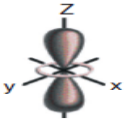
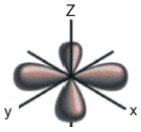
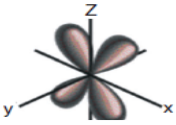
    1S ↑↓ 2s ↑↓ 2P ↑↓

    A. Hund's rule has been violated. B. The Pauli Exclusion Principle has been violated.
    B. The Pauli Exclusion Principle has been violated. D. The Aufbau principle has been violated
23. This is a valid orbital diagram
24. Which of the following is true about chlorofluorocarbons?
    A. React directly with stratospheric ozone to destroy it.
    B. Interact with UV energy and become free radicals which destroy ozone.
    C. Become free radicals that react with oxygen to create ozone.
    D. React with free radicals to remove carbon dioxide.
25. A monoatomic ion that has 20 protons and a +2 charge
    A. Has 16 protons. B. Has the symbol Ar^{2+} C. has 18 neutrons D. is iso electronic with Ar
26. According to valence bond theory, which orbital's on bromine atoms overlap in the formation of the bond in Br_2
    A. 3s B. 3p C. 4s D. 2p
27. Which one of the following represents an acceptable possibl set of quantum numbers (in the order n, l,$m_{1,,}$ m_s) for an electron in an atom
    A. 2, 1 , 0, 0 B. 2, 0 ,2, +1/2 C. 2,1,-1, 1/2 D. 2, 0, 1,- 1/2
28. Of the types of radioactivity characterized by Rutherford, which of the following are particles
    A. ϒ- rays B. β- rays C. α-rays and β-rays D. α - rays, β-rays , and ϒ-rays
29. Consider the three electromagnetic waves shown below.

    1.
    2
    . 3.
    4.

    Which of the electromagnetic waves has the highest frequency ?
    A. 1 B. 2 C. 3 D. 4
30. Which of the following diagrams describes the electron density in the d_{xy} orbital's

    (A)  (B)  (C)  (D) 
31. The wave number of an electromagnetic radiation is 1 x 10^5 cm^{-1} . The frequency of the radiation would be
    A. 3 X 10^8 s^{-1} B. 3 X 10^6 s^{-1} C. 3 X 10^{10} s^{-1} D. 3 X 10^{15} s^{-1}
32. The maximum number of electron in p-orbital with n = 6, m_l = 0 is
    A. 2 B. 6 C. 16 D. 14
33. Which of the following transition will emit maximum energy in the hydrogen atom?

    A. n = 4 → n = 3 B. n = 4 → n = 2 C. n = 2 → n = 1 D. n= 3 → n = 2

34. What is the ratio of the energy of a photo of 300nm wavelength radiation to that of 600nm radiation?
A. 1:2 B. 1:1 C. 2:1 D. 3:1

35. Which of the following quantum number(s) is (are) related to the size and energy of an electron in a hydrogen atom?
A. *n* B. *n,l* C. *n,l,m* D. *n,l,m,s*

36. What is the difference between chlorine- 35 and chlorine -37?
A. Chlorine-37 has two more protons than chlorine-35.
B. Chlorine-37 has two more neutrons than chlorine-35.
C. Chlorine-35 has two more electrons than chlorine-35
D. Chlorine-37 has one more proton and one more neutron than chlorine-35.

37. Which one of the following electromagnetic radiation has the shortest wavelength?
A. X-rays B. UV rays C. gamma rays D. microwaves

38. How many atoms are present in 22 g CO_2?
A. $3.10x10^{23}$ B. $6.02x10^{23}$ C. $2x6.02x10^{23}$ D. $1.5x6.02x10^{23}$

39. The hybridization of the central atom in the XeF_4 molecule is
A. sp^2 B. sp^3 C. sp^3d D. sp^3d^2

40. Which of the following are NOT electromagnetic waves?
A. Infrared waves B. Gamma waves C. Radio waves D. Sound waves

41. What is the distance that a radio wave will travel in 0.250s?
A 1.2×10^7 m B. 12×10^7m C. 7.5×10^7m D. 12×10^7m

42. Which of the following types of rays combine to form atoms of helium?
A. gamma rays (γ) B. beta(β) rays C. alpha(α) rays D. X-rays

43. What is the relationship between frequency (v) , wavelength (λ) and the speed of light (c)?
A. $\frac{\lambda}{v}$ = c B. vc = hλ C. $\frac{hc}{\lambda}$ = v D. c = vλ

44. What is the magnitude of quantum energy and the frequency for an object whose wavelength is 0.6 x 10^{-6} m?
A. 3.31×10^{-19} J , 5×10^{14} s^{-1} B. 3.98 x 10^{-40} J , 2×10^{-15} s^{-1}
C. 1.99×10^{-25} J , 3.98×10^{-40} s^{-1} D. 9.94 x 10^{-12} J , 1.99 x 10^{-25} s^1

45. What new concept did Bohr adapt and use to formulate his model of the atom?
A Electromagnetic theory developed by Maxwell B. The quantum concept developed by Planck
C. Photoelectric theory developed by Thompson D. Neutron theory developed by Chadwick

46. What is the energy required to excite a hydrogen atom by causing an electronic transition from the energy level with n = 1 to the level with n = 4? $E_n\left(\frac{-21.79 \times 10^{-19}}{n^2}\ j\right)$
A. 1.665×10^{26} J B. 1.824×10^{-15} J C. 2.024×10^{-18} J D. 3.649×10^{-15}j

47. Which statement below is true with regard to Bohr′s model of the atom?
A. The model was based on the wave properties of the electron
B. The model accounted for the absorption spectra of atoms but not for the emission spectra
C. The model accounted for the emission spectra of atoms, but not for the absorption spectra
D. The model could account for the emission spectrum of hydrogen and for the Rydberg equation

48. A radar unit is operating on frequency of 9.527 GHz. What is the wave length of the radiation?
A. 314.7nm B. 314.7m C. 3.147cm D. 314.7cm

49. What important conclusion was reached through the study of cathode rays?
A. Cathode rays were shown to be neutral particles with mass
B. Cathode rays were proven to be light rays indicating that atoms were indeed indivisible
C. Cathode rays were shown to be positively charged particles indicating that atoms contained electric charge
D. The ratio of the charge to mass of particles making up cathode rays was constant, indicating they were fundamental particles found in all matter

50. If it takes 8.33min for light to travel from the sun to earth , how far away is the sun?
A. 1.86 x 10^5 miles B. 9.30 x 10^7 miles C. 3.72 x 10^7 miles D. 4.66 x 10^7 miles

51. An element M with an atomic number of 25 has an electronic configuration of $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^5$ .What will be its period and group, respectively, in the periodic table?
A. 4, 7B B. 4, 5B C. 5, 5B D. 6, 5B

52. What is the electron configuration of sulfur?
A. $1s^2 2s^2 3p^2 3s^2 3p^4$ B. $1s^2 2s^2 2p^4$ C. $1s^2 2s^2 3p^6 3s^2 3p^2$ D. $1s^2 2s^2 2p^6 3p^4$

53. What values of m_l are permitted for an electron with $\iota = 3$?
A.0,1,2,3, B. -3, -2 ,-1 ,0 ,1, 2, 3 C. -2, -1, 0, 1, 2 D. 1, 2, 3

54. used the cathode Ray Tube to discover the electron and determine its charge to mass ratio?
A. Robert. A. Millikan B. Ernest Rutherford C. James Chdwick D. J.J Thomson

55. The maximum kinetic energy of a photo electron emitted from a metal is 1.03 x10^{-19}J when light that has a 656nm wavelength shines on the surface s the threshold frequency for this metal?
A. 4.57 X10^{-14} S^{-1} B. 4.57 X10^{14} S^{-1} C. 3.02 X10^{-14} S^{-1} D.3.02 X10^{14} S^{-1}

56. What is the maximum number of electrons in an atom that can have the principal quantum number n=4? A.
A. 32 B. 8 C. 18 D. 34

57. Which quantum number is used to determine sub shell?
A. Principal quantum no B. Magnetic quantum number C. Azimuthal quantum no D. Spin quantum no

58. Which of the following is fundamentally different from others?
A. Radio wave B. Sound wave C. Light wave D. Micro wave

59. Which of the following equations' expresses de Broglie hypothesis?
A. V =c /λ B. ΔE =hc/λ C. ΔE =c/λ D. λ=h/(mv)

60. What wiil be the wavelength of a radio wave having a frequency of 3MHz?
A. 300nm B. 300m C. 100nm D. 100m

61. Which of the following correctly lists electromagnetic waves in order from shortest to longest wavelength?
A. Microwaves, ultraviolet, visible light, gamma rays
B. Radio waves ,infrared gamma rays ,ultraviolet
C. gamma rays ,ultraviolet ,infrared , microwaves
D. gamma rays ,infrared ,ultraviolet, microwaves

62. When an electron in a hydrogen atom makes the transition from the n=4 state, to the n=2state, blue light with a wavelength of 434nm is emitted. Which of the following expressions gives the energy released by the transition?
A. $\frac{(6.63X10^{-34})(4.34X10^{-7})J}{(3.00X10^8)}$ C. $\frac{(6.63X10^{-34})(3.00X10^8)J}{(4.34x10^{-7})}$
A. $\frac{(6.63X10^{-34})}{(3.00X10^8)(4.34X10^{-7})}$ J C. $\frac{(4.34X10^{-7})}{(6.6.3x10^{-34})(3.00x10^8)}$ J

63. Which of the following is Not true about the photoelectric effect?
A. Most metals require ultraviolet light to emit electrons
B. A bright light causes less electron to be emitted the a weak light.
C. Hight frequency light emits electrons with high kinetic energy.
D. A bright light causes more electrons to be emitted than a weak light.

64. The sublevel that can be occupied by maximum of 10 electrons is identified by the letter…….?
A. f B. d C. p D. s

65. The energy of an electron in the first bohr orbit of hydrogen atom is -13.6ev. The possible value of the excited state for an electron in Bohr orbit of hydrogen is……..

A. -4.21ev B. -6.8ev C. -1.51ev D. +6.8ev

66. Consider the following two possibilities for electron transfer in hydrogen, given below:
First: The electron drops from the Bohr orbit n=3 to the orbit n=2, followed by the transition from n=2 to n=1.
Second: The electron drops from the Bohr orbit n=3 directly to the orbit n=1.
Which of the following is correct about the energy change of these transitions?

A. The sum of the energies for the first transitions is less than the energy of transition of the second.
B. The energies of transitions of the first and the energy of transition of the second can't be compared
C. The sum of the energies for the first transitions is greater than the energy of transition of the second.
D. The sum of the energies for the first transitions is equal to the energy of transition of the second

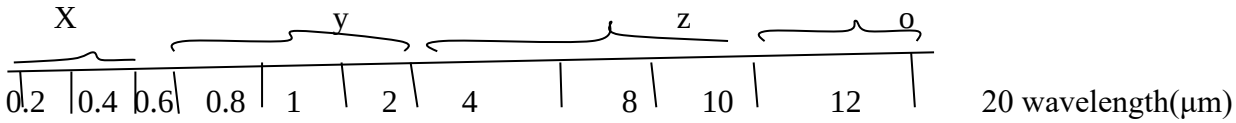
67. Which of the following elements has the highest fifth ionization energy (IE_5)?

A. Si B. Al C. P D. S

68. What aspects of the modern view of atomic structure was proved by Rutherford's gold foil experiment?

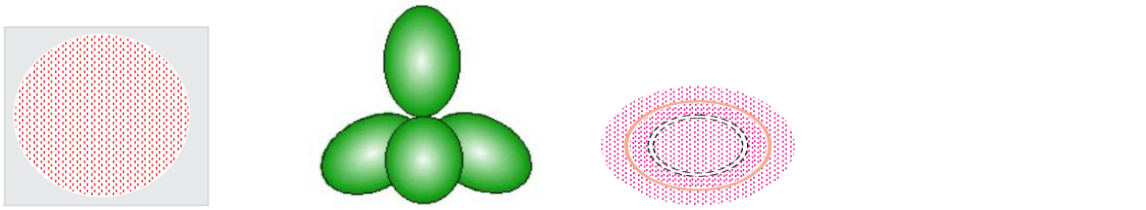
A. The charge on an electron C. The charge on an alpha particle
B. The existence of the nucleus D. The existence of the electron

69. In the electromagnetic spectrum with wavelengths shown(in micrometers,μm), w/c bracketed section of the spectrum represents visible light?



A. O B. Y C. X D. Z

70. Which of the orbitals in the figure below has (have) an angular momentum number of l=2?



I II III IV

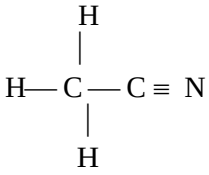
A. II B. I and III C. I D. I and Iv

11. Chapter-3

1. The unit cell in a certain lattice consists of a cube formed by an anion at each corner, an anion in the center, and a cation at the center of each face. How many cations and how many anions does the unit cell have?
   A. 5 anions and 6 cations B. 5anions and 3 cations C. 2 anions and 3 actions D. 3anions and 4 cations
2. Which one of the following atoms in its ground state has the greatest number of unpaired electrons?
   A. $_{13}Al$ B. $_{14}Si$ C. $_{15}P$ D. $_{16}S$
3. Which compound contains both covalent and ionic bonds?
   A. Sodium carbonate, Na_2CO_3 C. Dichloromethane, CH_2Cl_2
   B. Magnesium bromide,MgBr2 D. Ethanoic acid,CH_3COOH
4. Which molecule or ion does NOT have a tetrahedral shape?
   A. XeF_4 B. $SiCl_4$C. BF_4^- D. NH_4^+
5. Why are metals soft and malleable?
   A. Because they are very shiny C. Because of the presence of mobile electrons
   B. B/c they experience electrostatic repulsion D. Because the metal cations can slip over each other fairly easily
6. How many π bonds are present in CO_2?
   A. One B. Two C. Three D. Four
7. What is the correct molecular electronic configuration for the mfolecular ion, B_2^+?
   A. $\sigma_{1s}^2\sigma^*_{1s}^2\sigma_{2s}^2\sigma^*_{2s}^2\sigma_{2p}^2$ C. $\sigma_{1s}^2\sigma^*_{1s}^2\sigma_{2s}^2\sigma^*_{2s}^2\pi_{2px1}^1$
   B. $\sigma_{1s}^2\sigma^*_{1s}^2\sigma_{2s}^2\sigma^*_{2s}^2\pi_{2py}^2$ D. $\sigma_{1s}^2\sigma^*_{1s}^2\sigma_{2s}^2\sigma^*_{2s}^2\pi_{2px}\pi_{2py}$
8. Which of the followazing molecules or ions will exhibit delocalized bonding?
   NO_2^-, NH_4^+, N_3^-
   A. NO_2^- and N_3^- B. NH_4^+ and N_3^- C. NO_2^- D. NO_2^- and NH_4^+
9. Based on molecular orbital theory, the bond orders of H_2, H_2^+ and H_2^- are____ respectively.
   A. 1, 0 and 0 B. 1, ½, and 0 C. 1, 0, and ½ D. 1, ½, and 1/2
10. How many 3d electrons are present in the ground state of chromium atom?
    A. 4 B. 5 C. 6 D. 1
11. Which of the following ionic compounds is formed from the reaction between magnesium and nitrogen?
    A. MgN_2 B. Mg_2N_2 C. Mg_2N_2 D. Mg_2N_3
12. Which of the following molecules represents a non- polar covalent bond?
    A. B-Cl B. C-Cl C. Cl-Cl D. Mg-Cl
13. Which one of the following groups in the periodic table has paramagnetic atoms?
    A. Group zero B. Group IIA C. Group IIB D. Group IVA
14. How many types of cubic unit cells are known?
    A. 2 B. 3 C. 4 D. 5
15. The total number of electrons participating in the bond formation of carbonate anion, CO_3^{2-}, in the molecule of carbonic acid are:
    A. 16 B. 10 C. 8 D. 5
16. Which of the following crystals possess high electrical and thermal conductivities?
    A. Ionic crystals B. Metallic crystals C. Molecular crystals D. Covalent network crystals
17. Which of the following molecules has a trigonalbipyramidal structure?
    A. SF_4 B. IF_5 C. ICl_4 D. BrF_5
18. Which of the following hybrid orbitals is favoring the formation of trigonalbipyramidal?
    A. Sp^3d B. sp^3 C. sp^3d^2D. sp^3d^3
19. Which one of the following molecules/molecular ions is paramagnetic according to the molecular orbital theory?
    A. O_2^{2-} B. O_2 C. F_2 D. O_2^{2+}
20. Which of the following molecules has a dipole moment?
    A. XeF_4 B. H_2S C. SO_3 D. CH_4
21. Which of the following element has the highest melting point?
    A. Iodine B. Tungsten C. mercury D. Bromine
22. Which of the following is a chemical formula that represents and amino acid?
    A. CH_4 B. CH_3NH_2 C. CH_3COOH D. NH_2CH_2COOH
23. Which term describes the units that make up compounds with covalent bonds?

A. Ions B. Acids C. Salts D. Molecules

24. There is a strong covalent bond between the N atoms in nitrogen gas, N_2. Why, then, does nitrogen have such a low boiling point of -196^0C?
    A. The bond between the N-atoms is triple
    B. N is very electronegative, only next to F and O
    C. The strong bond, and intermolecular one, determines the boiling point of the substance
    D. Boiling point is determined by intermolecular force, which in this case is weak as the molecule is non-polar
25. Which of the statement below best explains why atoms react chemically with each other?
    A. When atoms react, they gain protons and are more stable
    B. When atoms react, they lose all their electrons and become more stable
    C. When atoms react, they lose, gain, or share electrons and are then less stable
    D. When atoms react, they lose, gain, or share electrons to attain a full outer energy level and are then more stable.
26. Which of the following species has the smallest H-X-H and angle where X is the central atom?
    A. H_2O B. NH_3 C. CH_4 D. BH_3
27. What is the hybridization of phosphorus atom in PCl_5
    A. Sp^3d B. sp^3d^2 C. sp^3 D. sp^2
28. Which molecule has a Lewis structure that does NOT obey the octet rule
    A. NO B. CS_2 C. PF_3 D. HCN
29. Which of the following explains why, at room temperature, 1_2 is a solid, Br_2 is a liquid and CL_2 is a gas?
    A. Ionic bonding B. Hybridization C. Hydrogen bonding D. London dispersion forces
30. Which molecule listed below has two sigma (π) bonds?
    A. N_2 B. C_2H_4 C. N_2F_2 D. HCN
31. What is the hybridization of the carbon atom attached to nitrogen in acetonitrile shown?
    A. Sp B. sp^2 C. sp^3 D. sp^4



32. Which one of the following is NOT true of metallic bonding?
    A. It gives rise to excellent electrical conductivity
    B. Electrons are free to move throughout the structure
    C. The strength of metallic bonds increases down a group.
    D. The strength of metallic bonding affects the boiling point of metals.
33. All of these are characteristics of most ionic compounds in the solid phases EXCEPT,
    A. High melting point C. high electrical conductivity
    B. Solubility in water D. insolubility in organic solvents
34. Which one of the following does NOT form hydroxide ions when placed in water?
    A. Ionic hydrides C. Ionic metal oxide C. nonmetal oxides D. ionic nitrides
35. Which set contains only covalently bonded molecules?
    A. BCl_3,$SiCl_4$, PCl_5 B. Br_2, N_2, HBr C. 1_2, H_2S, NaI D. AI, O_3, As_4
36. Which of the following compounds would be expected to have the highest melting point?
    A. BaF_2B. $BaCl_2$ C. BaBr2 . BaI_2
37. Which one of the compounds below is most likely to be ionic?
    A. CCl_4 B. NO_2 C. $SCCl_3$ D. ClO_2
38. When the following substances are arranged in order of increasing melting point (lowest melting point first), the correct order is:
    A. CH_3 CH_2 CH_3, CH_3 $COCH_3$, CH_3 CH_2CH_2 OH
    B. CH_3 CH_2 CH_3, CH_3 CH_2CH_2 OH, CH_3 $COCH_3$
    C. CH_3 $COCH_3$, CH_3 CH_2CH_2 OH, CH_3 CH_2 CH_3
    D. CH_3 CH_2 CH_2CH_2OH, CH_3 CH_2 CH_3, CH_3 $COCH_3$
39. The type of compound that is MOST likely to contain a covalent bond is one that is
    A. a solid metal B. composed of only nonmetals
    C. composed of a metal from the far left and a non metal from far right of the periodic table
    D, held together by the electrostatic forces between appositively charged ions

40. How many sigma and pi bonds are present in the following molecule ? $H_3C-CH=CH-CH_3$

A. 8 σ bonds and 1 π bond C. 8 σ bonds and 2 π bond

B. 10 σ bonds and 2 π bond D. 11 σ bonds and 1 π bond

41. How many orbital's are there in an atom with n = 4?

A. 2 B. 8 C. 16 D. 25

42. What hybridization change does the carbon atom undergo in the combustion of methane?

$$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$$

A. $sp \rightarrow sp^2$ B. $sp^2 \rightarrow sp^3$ C. $sp^3 \rightarrow sp$ D. $sp^2 \rightarrow sp$

43. Which of the following ionic compounds has the greatest lattice energy?

A. LiF B. LiCL C. LiBr D. LiI

44. How many unpaired electrons are there in the Lewis structure of a N^3 - ion?

A. 0 B. 1 C. 2 D. 3

45. Which one following compound does NOT follow the octet rule?

A. CS_2 B. PBr_3 C. IBr D. BrF_3

46. The molecular geometry of the H_3O^+ ion is

A. Linear B. tetrahedral C. bent D. trigonal pyramidal

47. What is the hybridization of sulfur atom in SF_6?

A. Sp2 B. Sp3 C. sp^3 d D. sp^3d^2

48. Which of the following electron transition required the smallest energy to be absorbed by the hydrogen atom?

A. From n=4 to n=5 B. From n=3 to n=4 C. From n=2 to n=3 D. From n=1 to n=2

49. Which of the following molecules has a dipole moment?

A. XeF_2 B.IF_3 C. BF_3 D. SF_5^+

50. The dissolution of water in octane (C_8H_{18}) is prevented by

A. dipole- dipole attraction between octane molecules

B. hydrogen bonding between water molecules

C. London dispersion forces between octane molecules

D. repulsion between like charged water and octane molecules

51. Which one of the following is NOT a form of chemical bonding?

A. Covalent bonding B. Metallic bonding C. Ionic bonding D. Hydrogen bonding

52. Which of the following statement is NOT true about covalent bonding?

A. Covalent bonds are least likely to be formed between atoms of the element.

B. Covalent bonds are least likely to be formed between atoms of different elements on the right side of periodic table

C. Covalent bonds are least likely to formed between an element in Group 1 and an element in Group V11

D. Covalent bonds are least likely to be formed by head of the group elements with high ionization energies

53. What values of *l are permitted for an electron with* n= 4 ?

A. 1, 2, 3 B. 1, 2 , 3, 4 C. 0, 1 , 2, 3, 4 D. 0, 1, 2, 3

54. Which of the following electron, identified only by their n and *l* quantum numbers have the highest energy?

n = 3, l = 0

n = 4, l = 1

n = 3, 1 = 2

n= 4, l = 2

A. n = 3 , l =2 B. n = 4, l =1 C. n = 4, 1= 2 D. n = 3, l = 0

55. What is the maximum number of unpaired electrons in a d shell?

A. 2 B. 5 C. 3 D. 4

56. The following energy level diagram represents the outermost shell of what ground state element?

A. B B. He C, Al D. Be

57. Formic acid , which is released by ants , has a molecular formula of HCOOH. What are the possible hybridizations that exist in the molecule?

A. sp^2 and sp^3 B. sp and sp^3 C. sp,sp^2 and sp^3 D. sp and sp^2

58. What would happen to the O_2 molecule upon ionization to O_2^+

A. The bond length will increase and the bond energy will increase

B. The bond length will increase and the bond energy will decrease

C. The bond length will decrease and the bond energy will increase

D. The bond length will decrease and the bond energy will decrease

59. How many bonding pairs and lone pairs , respectively does the ion ICl_4 have?

A. 3, 2 B. 4, 2 C. 5,1 D. 4, 1

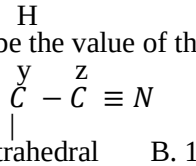
60. Which of the following molecules does NOT have a tetradral central atom?

A. SF_4 B. AlH_4 C. BF_4 D. $SiCl_4$

61. Acrylontrile has the following Lewis structure with designation of x, y and z for each carbon atom:

$$\overset{x}{CH_2} = \overset{y}{\underset{|}{C}} - \overset{z}{C} \equiv N$$

What will be the value of the bond angle and geometry of



A. 109^0 ,tetrahedral B. 120^0 ,trigonal pyramidal C. 180^0 ,linear D. 90^0, T- shaped

62. Antimony (Sb) is a group V element . What will be the molecular geometry and number of lone pair electrons, respectively that exist in the ion $[SbCl_5]^{2-}$?
A. Seesaw,1 B. Square planar, 2 C. Seesaw, 2 D. Linear, 3
63. Which of the following molecule does NOT have a trigonal bipyramidal electron-pair geometry?
A. SF_4 B. ClF_3 C. XeF_2 D. BrF_5
64. How many atomic orbitals are required for an sp^3 hybridization?
A. 2 B. 6 C.4 D. 8
65. A neutral molecule having the general formula AB , has two unshared pair of electrons on A . What is the hybridization of A ?
A, sp B, sp^2 C, sp^3 D. sp^3
66. Which of following contains an sp^2 hybridized atom?
A, CH_2Cl B. H_2O C. N_2 D. H_2CCH_2
67. What is the electron set and molecular geometry of BrO_2 ?
A, Trigonal planner, trigonal planar B. Tetrahedral ,trigonal planner
X. Trigonal pyramidal , linear D. Tetrahedral, bent
68. According to VSEPR theory , what is the geometry of PCl_3 molecule?
A. Linear B. Trigonal planner C. Trigonal pyramidal D. Tetrahedral
69. What is the geometry of the molecular compound formed by the reaction of sulfur with hydrogen?
A. Linear B. Trigonal planner C. Trigonal pyramidal D. Tetrahedral
70. Which combination of atoms is more likely to produce an ionic compound?
A. Al and F B. P and H C. SI and O D. S and Br
71. What are the ions present in $KHCO_3$?
A. KH^+ and CO_3 B. K^+ , H^+ , C^{4+} and O^+ C. K^+ , HCO_3^+ D. KH^{2+} ,CO_3^{2-}
72. Which of the following substances contains an atom that obeys the octet rule?
A. PCl_3 B. AlF_3 C. SF_4 D. NO_2
73. Which of the following has formed coordinate covalent bond?
A. H_2O B. NH_4 C. CO_3^{2-} D. Na_2O
74. Which of the following elements will form an ionic bond with chlorine?
A. Magnesium B. Oxygen C. Phosphorous D. Silicon
75. The perchloric acid molecule contains
A. 8 lone pairs, no π bonds ,and 5σ bonds B. 9 lone pairs ,2π bonds , and 5σ bonds
C. 8 lone pairs , 3π bonds, and 5σ bonds D. 2 lone pairs , 3π bonds , and 4σ bonds
76. When a student draws a plausible Lewis structure for hydrazine molecule (N_2H_4), how many lon pairs of electrons are available? A. 2 B. 1 C.3 D. 4
77. The number of resonance structures for CO_3^{2-} are:
A. 3 B. 2 C. 6 D. 9
78. In the following equation, what type of hybridization change, if any, occurs at the Xe atom?
$XeF_2(s) + F_2(g) \longrightarrow XeF_4(s)$
A. Sp^3d to sp^3 B. dsp^2 to sp^3 C. sp^3d to sp^3d^2 D. sp^3 to sp^3d
79. What is (are)the bond angle(s) in SF_6?
A. 180^o B. 109.5^o C. 90^o and 109.5^o D. 90^o
80. Which of the following statements about oxygen and fluorine is NOT correct?
A. O and F have the same number of core electrons. B. O has a smaller atomic radius than F.
C.O has a smaller electron affinity than F. D. O^{2-} has a larger ionic radius than F^-
81. What will be the charges on the ions formed when silicon reacts with nitrogen?
A. Si^{2+}, N^{2-} B. Si^{4+}, N^{3-} C. Si^{3+}, N^{3+} D. Si^{4+}, N^{2-}

82. Which of the following compounds does NOT contain an ionic bond?
A. K_2S B. NaOH C. HCl D. LiH

83. Which of the following molecular orbital diagram is correct for the carbide ion (C_2^{2-})?
A. $\sigma 1s^2\ \sigma^*1s^2\sigma 2s^2\sigma^*2s^2\pi 2p^4$ C. $\sigma 1s^2\ \sigma^*1s^2\sigma 2s^2\sigma^*2s^2\pi 2p^4\sigma 2p^2\pi^*2p^4$
B. $\sigma 1s^2\ \sigma^*1s^2\sigma 2s^2\sigma^*2s^2\pi 2p^4\sigma 2p^2\pi^*2p^2$ D. $\sigma 1s^2\ \sigma^*1s^2\sigma 2s^2\sigma^*2s^2\pi 2p^4\sigma 2p^2$

84. Which of the following is not the decomposition product of HNO_3?
A. N_2O_4 B. NO_2 C. O_2 D. H_2O

85. From CO_2, H_2O, $BeCl_2$ and N_2O which have the same molecular geometry?
A. CO_2, $BeCl_2$ and N_2O C. CO_2, H_2O and N_2O
B. CO_2 and $BeCl_2$ only D. H_2O and N_2Oonly

86. How many electrons are present in the σ2p molecular orbital of N_2^+?
A. 1 B. 4 C. 3 D. 2

87. Give the following AF_n species, BF_3, BeF_2 ,CF_4,NF_3, OF_2,what is the correct order of F-A-F bond angles?
A. $OF_2<BeF_2<NF_3<BF_3<CF_4$ C. $OF_2<NF_3<CF_4<BF_3<BeF_2$
B. $CF_4<BF_3<NF_3<BeF_2<OF_2$ D. $BeF_2<OF_2<NF_3<BF_3<CF_4$

88. Which of the following molecules has the largest dipole moment?
A. HF B. HCN C. HCl D. CO

89. Arrange the following molecules in the order of increasing stability.
A. $N_2^+<N_2<N_2^-<N_2^{2-}$ C. $N_2^{2-}<N_2^-<N_2<N_2^+$ B. $N_2<N_2^+=N_2^-<N_2^{2-}$ D. $N_2^{2-}<N_2^-=N_2^+<N_2$

90. Which of the following statements is correct about nitrosyl chloride (NOCl)?
A. It has a trigonal planar geometry with O a central atom
B. It has a bent or angular geometry with O a central atom
C. It has a trigonal planar geometry with N a central atom
D. It has a bent or angular geometry with N a central atom

91. What hybridization change, if any occurs at the underlined atom in the following reaction?
$CO_2 + H_2O \longrightarrow H_2CO_3$
A. Sp^2 to sp^3 B. sp to sp^2 C. sp^3 to sp^3d D. No hybridization change observed

92. What is the molecular shape of ICl_4^-?
A. Octahedral B. T-shaped C. Trigonal bipyramidal D. Square planar

93. Which one of the following types of bonding exists between atoms with very different electronegativities?
A. Ionic bonding B. Hydrogen bonding C. Network covalent bonding D. Metallic bonding

94. Considering only resonance structures that are major contributors to the over all bonding in PF_5, which of the following statements is correct?
A. There are no resonance structures that involve ionic contributions.
B. Only three resonance structures can be drawn for PF_5
C. One resonance structures contains five P-F bonds.
D. In each resonance structure, the P atom carries a positive charge.

95. Which groups in the periodic table form ionic bonds?
A. Groups IA and VIIB, Groups IIA & VIB C. Groups IA and 17(VIIA), Group IIA &16(VIA)
B. Group IA &18(VIIA), Groups IVB &14 (IVA) D. Groups IIIB & VB, Group IVB &14 (IVA)

96. There is a progressive decrease in the bond angle in the series of molecules CCl_4, PCl_3 and H_20. According to the VSEPR model, this is best explained by:
A. Increasing electro negativity of the central atom C. increasing number of lone pairs electrons
B. Decreases the size of the central atom D. decreasing bond strength

98. Which of the following compounds does not contain both ionic and covalent bond?
A. NH_4NO_3 B. Na_2CO_3 C. NH_4Cl D. CH_3CO_2H

11 Chapter- 4

1. In a reaction, A+B → product, the rate is doubled when the concentration of B is 'doubled, and the rate increases by a factor of 8 when concentrations of both the reactants (A and B) are doubled, the rate law for the reaction can be written as:
   A. Rate = k[A] [B] B. Rate = k[A][B]^2 C. Rate = k [A]^2 [B] D. Rate = k [A]^2 [B]^2
2. Which factor will influence the rate of the reaction shown below?

   $NO_2(g) + CO(g) \rightleftharpoons NO(g) + CO_2(g)$

   I. The number of collisions per second
   II. The energy of the collisions
   III. The geometry with which the molecules collide
   A. I only B. II only C. I and II only D. I, II and III
3. The mechanism of a reaction is shown is shown below.
   $HOOH + I^- \rightarrow HOI + OH^-$ (slow)
   $HOI + I^- \rightarrow I_2 + OH^-$ (fast)
   $2OH^- + 2H_3O^+ \rightarrow 4H_2O$ (fast)
   What is the rate law based on this mechanism?
   A. Rate = k [HOOH] [I$^-$] C. Rate = k [HOOH] [I$^-$]^2
   B. Rate = k [HOOH]^2 [I$^-$] D. Rate = k [HOOH]
4. The half life for the first order decomposition of nitro methane, CH_3NO_2, at 500k is 650 seconds. If the initial concentration of CH_3NO_2 is 0.500M, what will its concentration be(M) after 1300 seconds have elapsed?
   A. 0.125 B. 0.140 C. 0.250 D. 0.425
5. In a zero- order reaction for every 10^0 rise of temperature, the rate is doubled. If the temperature is increased from 10^0c to 100^0C, the rate of the reaction will become
   A. 64times B. 128 times C. 256 times D. 512 times
6. The kinetic data below are for the reaction:
   A + B → C

[A]	[B]	Initial Rate (mol dm^{+3} sec^{-1})
0.1	0.1	$1x10^{-5}$
0.1	0.2	$4x10^{-5}$
0.2	0.1	$1x10^{-5}$

   A. order of A = 1 order of B = 0 C. order of A = 0 order of B = 4
   B. order of A = 0 order of B = 2 D. order of A = 1 order of B = 2
7. Which of the following molecules represents a non- polar covalent bond?
   A. B-Cl B. C-Cl C. Cl-Cl D. Mg-Cl
8. What is a valid rate expression for the following reaction?
   $2NO + 2H_2 \rightarrow N_2 + 2H_2O$
   A. $\frac{1}{2}\frac{\Delta[NO]}{\Delta t}$ B. $-\frac{1}{2}\frac{\Delta[H_2o]}{\Delta t}$ C. $-\frac{1}{2}\frac{\Delta[NO]}{\Delta t}$ D.- $\frac{\Delta[N_2]}{\Delta t}$
9. For the reaction:
   $2A + B \longrightarrow C$
   The following experimental results were obtained:

Experiment	[A]	[B]	Rate (mol L^{-1}s^{-1})
1	0.50	0.50	0.300
2	0.50	0.25	0.075
3	0.25	0.25	0.075

   What is the value of the rate constant?
   A. 0.6mol L^{-1}s^{-1} B. 0.6Lmol^{-1}s^{-1} C. 1.2Lmol^{-1}s^{-1} D. 2.4molL^{-1}s^{-1}
10. Increase in temperature of a reaction also increase the rate of a given reaction is due to the increase in the:
    A. Extent of molecular dissociation D. Frequency of collision of the reacting species
    B. Activation energy of the reaction Numerical value of the rate constant of the reaction
11. The reaction for the formation of nitrosyl chloride
    $2NO(g) + Cl_2(g) \rightleftharpoons 2NOCl(g)$ Was studied at 25^0C. The value of Kp for this reaction at 25^0C is 1.9 x 10^3 atm^{-1}
    What is the value of K_c at 25^0C?
    A. 1.9 x 10^{-3} L/mol B. 3.8 x 10^{-3} L/mol C. 4.6 x 10^4 L/mol D. 4.6 x 10^5 L/mol

12. What is the half-life, t 1/2 for a zero order reaction A → B, (K is rate constant)?
    A. In2K B. $[A]/2K$ C. Ink$[A]$ D. In2$[A]$K
13. Consider the following reaction:
    $2S_2O_3^{2-}(aq)+I_2(aq \rightarrow S_4O_6^{2-}(aq)+2I^-(aq)$ If, in an experiment, 0.05 mol $S_2O_3^{2-}$ is consumed in 1.0 L of solution each second, at what rates are $S_4O_6^{2-}$ and 1- produced in this solution?
    A. $S_4O_6^{2-}=0.025;1^-=0.025$ C. $S_4O_6^{2-}=0.025;1^- =0.05$
    B. $S_4O_6^{2-}=0.05;1-=0.05$ D. $S_4O_6^{2-}=0.05;1-=0.025$
14. The reaction 2X + Y ⟶ Z was studied and the following data were obtained

Expt	$[X]$	$[Y]$	Rate (mole L^{-1}-s^{-1})
1	3.0	3.0	1.8
2	3.0	1.5	0.45
3	1.5	1.5	0.45

    What is the proper rate expression?
    A. Rate = K$[X]$ B. Rate = K$[X]$ [Y] C. Rate = K$[Y]^2$ D. ^{2}Rate = K$[X]2$ $[Y]$
15. The reaction between NO and I_2 is second order in NO and first- order in I_2. What change occurs in the rate of the reaction if the concentration of NO is doubled and I_2 left unchanged?
    A. Double B. Quadruple C. Eight times D. Three times
16. A reaction is 50% complete in 2 hours and 75%complete in 4 hours. What is the order of this reaction?
    A. 0 B. 1 C. 2 D. 3
17. Which are the number of moles and the mass of a copper sample containing $5.00x10^{20}$ atoms?
    A. 3.8xlO-^{4}mol Cu and 5.2xlO-^{2}g Cu C. 5.2xlO-^{2} mol Cu and 8.3xlO-4_g Cu
    B. 8.3xl0-4 mol Cu and 5.2xlO-^{2}g Cu D. 5.2xlO-^{2} mol Cu and 3.8xI0-4_g Cu
18. Given the following reaction, what mass of gaseous carbon dioxide can be absorbed by lkg of lithium hydroxide?
    $2LiOH(s) + CO_2(g) \rightarrow LiC0_3(s) + H_20(1)$
    A. 920g B. 1840g C. 2760g D. 3680g
19. If a sample containing 36g NH_2 is reacted with 180g of CuO, according to the following reaction, then what is the limiting reactant and how many grams of N_2 will be formed?
    $2NH3(g) + 3CuO(s) \rightarrow N2(g) + 3Cu(s) + 3H_20(g)$
    A. NH_3; 10.6gN_2 B. NH_3;22.3gN_2 C. CuO; 22.3gN_2 D. CuO; 10.6gN_2
20. If the fermentation of sugar in an enzymatic solution, which is initially 0.2M, the concentration of the sugar is reduced to O.IM in 10hours and to 0.05M in 20 hours. What is the order of the reaction and the rate constant?
    A. First order K= 1.92xlO-^{s}s-^{1} C. Second order K=1.38xl0-4M^{-1}s^{-1}
    B. First order K= 3.85xI0-^{s}s-^{1} D. Second order K= 2.72xlO-4M-1s^{-l}
21. The reaction, 20_r-->30_2, proceeds through the mechanism given below:
    $O_3 \rightarrow O_2 + O$, fast
    $O + O_3 \rightarrow 2O_2$ slow.
    What would be the rate law expression for the reaction?
    A. Rate = K[0_3f[02r^1 B. Rate = KfQ:rhE02l C. Rate = KL<hll:0_2] D. rate = K[0_3]2
22. Consider the following:
    $2NO(g)+Cl_2$ --. 2NOCl(g), ΔH= -78.38KJ
    Which of the following does NOT affect the rate of a chemical reaction?
    A. Enthalpy of the reaction C. Surface area
    B. Concentration of reactants D. Temperature
23. Which of the following is NOT a valid expression for the rate of the reaction given below?
    $4NH_3+7O_2$ -$4NO_2+6H_2O$
    A. $\frac{[NO_2]}{7\ t.t}$ B. $\frac{lA[NO_2]}{4\ t.t}$ C. $\frac{1A[H20]}{6\ t.t}$ D. $\frac{1A\ [NH3]}{4\ t.t}$
24. Each of the choices below gives a reaction and the corresponding rate law. Of these choices, which one could be an elementary process or individual step in a chemical reaction?
    A. 2A→ P, rate = K[A] C. A+B → P, rate = K [A][B]
    B. A+2B→ P, rate = K [A] D. A+B+C →P, rate = K [A][C]
25. Consider the reaction in which nitric oxide is oxidized to nitrogen dioxide:
    $2NO(g)+O_2(g)$-$2NO_2(g)$

For which the rate law is rate = k [N0]2[02]' If this reaction takes place in a sealed vessel and the partial pressure of nitric oxide is doubled, what effect would this have on the rate of reaction?

A. The reaction rate would increase by a factor of four.
B. The reaction rate would increase by a factor of three.
C. The reaction rate would increase by a factor eight.
D. The reaction rate would increase by a factor of two.

26. The equilibrium constant for reaction (1) is K what is the equilibrium constant for reaction (2)?

$SO_2(g) + O_2 \rightarrow 2SO_3(g)$ …….. (1)

$2SO_3lg) \rightarrow 2SO_2(g) + O_2(g)$…… (2)

A. K2 B.2K C. IK D.IK2

27. A homogeneous liquid reaction mixture is often heated to increase the rate of reaction. This is best explained by the fact that ν raising the temperature:

A. Increases the heat of reaction. C. Increases the vapor pressure of the liquid.
B. Decrease the energy of activation. D. Increases the average kinetic energy of the reactants.

28. Considering the reaction below , in which of the following will the effect of concentration and temperature simultaneously cause an increase in the rate at which products are formed?

$CaCO_{3(s)} + 2HCl_{(aq)} \rightarrow CO_{2(g)} + CaCl_{2(aq)} + H_2O_{(l)}$ + heat

A. Decrease [HCl] and decrease temperature C. Increase [HCl] and decrease temperature
B. Increase [HCl] and increase temperature D. Grind up the $CaCO_3$ and decrease temperature

29. For the gas phase reaction

$N_2 + O_2 \rightleftharpoons 2NO$ $\Delta H = +180KJ\ mol^{-1}$ the value of K changes with the

A. change in pressure C. introduction of NO
B. change in concentration of N_2 D. change in temperature

30. In the reaction ($2SO_2 + O_2 \rightleftharpoons 2SO_3$,$K_{eq} = 100$) what will be the concentration of O_2 , the concentration of SO_2 is the same as that of SO_3

A. $[O_2] = [SO_2]$ B. $[O_2] = 0.01M$ C. $[O_2] = 100M$ D. $[O_2] = 0.1M$

31. The decomposition of nitrosyl chloride was studied as

$2NOCl_{(g)} \rightleftharpoons 2NO(g) + Cl_{2(g)}$

The following data were obtained where

Rate = $-\Delta[NOCl] / \Delta t$

$[NOCl]_0$ (molecules/cm^3)	Initial Rate (molecules/cm^3 .s)
3.0×10^{16}	5.98×10^4
2.0×10^{16}	2.66×10^4
1.0×10^{16}	6.64×10^3
4.0×10^{16}	1.06×10^5

What is the rate law in the above decomposition?

A. $r = k[NOCl]^2$ B. $r = k[NOCl]$ C. $r = k[NOCl]\ [NO]$ D. $r = k[NOCl]\ [Cl]$

32. Considering the mechanism for a reaction below , which of the following statement is correct?

Step 1: $HBr + O_2 \rightarrow HOOBr$
Step 2 : $HBr + HOOBr \rightarrow 2HOBr$
Step 3 : $2HOBr + 2HBr \rightarrow 2Br_2 + 2H_2O$

A. Br_2 is reactant B. HBr is a product
C. HOBr is a catalyst D. HOOBr is a reaction intermediate

33. The reaction A + 3B = 2C + D is first order with respect to reactant A and second order with respect to reactant B . If the conc of A is doubled and the concentration of B is halved , the rate of the reaction would….by a factor of…

A. increase ,2 B. decrease ,2 C. increase, 4 D. decrease , 4

34. What conditions of temperature and pressure will produce the highest yield of NOCI at equilibrium?

A. High temperature High pressure. C. Low temperature high pressure.
B. High temperature low pressure. D. Low temperature low pressure.

35. At 445^0C,K_e for the following reaction is 0.020.

$2HI_{(g)} \rightleftharpoons H_{2(g)} + I_{2(g)}$

A mixture of H_2, I_2, and HI in a vessel at 445^0C has the following concentrations: [HI]= 2.0 M,[H_2]= 0.50M and [I_2]= 0.10M. which one of the following statements concerning the reaction quotient, Q_c, is true for the above system?

A. Q_c is less than K_c; more HI will be produced
B. Q_c is greater than K_c ; more than HI will be produced.
C. Q_c is less than K_c; more H_2 and I_2 will be produced.
D. Q_c is greater than K_c ; more H_2 and I_2 will be produced.

36. The conventional equilibrium constant expression (K_c) for the system

$$2ICl_{(s)} \rightleftharpoons I_{2(s)} + Cl_{2(g)} \text{ is}$$

A. $[I_2]\,[Cl_2]/\,[ICl]^2$ B. $[I_2]\,[Cl_2]/\,2[ICl]$
C. $[Cl_2]$ D. $[I_2] + [Cl_2]/2\,[ICl]$

37. How many electrons will appear when the following half- reaction is balanced?

$$S_4O_6^{2-} \rightarrow S_2O_3^{2-}$$

A. 3 B. 2 C. 4 D. 1

38. The decomposition of carbon disulfide. CS_2 to carbon monosulfide, CS, and sulfur is first order with $K=2.8\times10^{-7}S^{-1}$ at 1000^0C. What is the half-life of the reaction below at 1000^0C?

$$CS_2 \rightarrow CS+S$$

A. 5.0×10^{-7}S B. 4.7×10^{-6}S C. 3.8×10^{5}S D. 2.5×10^{6}S

39. If we increase the concentration of a reactant , what happens to the collisions beteen particles?
A. There are more collisions B. There are fewer collisions
C. There are the same number of collisions D. There are same number of collisions , but they have more energy

40. A drug decomposes by zero-order kinetics with a rate constant of 2mg mL^{-1} $month^{-1}$. If the initial concentration is 100 mg mL^{-1} , how long will it take for the drug to decompose by 10%?
A. 2 month B. 3 month C. 5month D. 4 month

41. For a first -order reaction , a plot of ---------- versus ---------- is linear.
A. $\frac{1}{[A]t}$,t B. Ln $\frac{1}{[A]t}$,t C. $[A]_t$,t D. Ln$[A]_t$,t

42. The rate law of the overall reaction A + B → C is: rate = K[A]^2 Which of the following will NOT increase the rate of the reaction?
A. Increasing the concentration of reactant A C. Increasing the temperature of the reaction
B. Increasing the concentration of reactant B D. Adding a catalyst for the reaction

43. Which of the following statement(s) is (are) applicable to a balanced chemical equation of an elementary reaction?
i. Order is the same as molecularity ii. Order is less than the molecularity
iii. Order is greater than the molecularity iv. Molecularity can never be zero
A. i B. i , ii C. i , iv D. i , iii

44. At high pressure, the following reaction is zero order

$$2NH_{3(g)} \xrightarrow{11.30\ K,Pt} N_{2(g)} + 3H_{2(g)}$$

i. Rate of reaction = rate constant
ii. Rate of reaction depends on the concentration of ammonia
iii. Rate of decomposition of ammonia remains constant until ammonia decomposes completely
iv. Further increase in pressure will change the rate of reaction
A. i B. i , iii, iv C. i, ii D. i ,ii iv

45. Which of the following expressions is correct for the rate of the reaction given below?

$$5Br^-(aq) + BrO_3^-(aq) + 6H^+(aq) \rightarrow 3Br_2(aq) + 3H_2O(l)$$

A. $\frac{\Delta[Br^-]}{\Delta t} = 5\frac{[\Delta H^+]}{\Delta t}$ B. $\frac{\Delta[Br^-]}{\Delta t} = 5/6\,\frac{[\Delta H^+]}{\Delta t}$ C. $\frac{\Delta[Br^-]}{\Delta t} = 6/5\frac{[\Delta H^+]}{\Delta t}$ D. $\frac{\Delta[Br^-]}{\Delta t} = 6\frac{[\Delta H^+]}{\Delta t}$

46. Rate for the reaction A + 2B ➜ C is found to be

Rate = K [A][B]

If the concentration of reactant ′ B′ is doubled , keeping the concentration ′A′ constant , what will be the value of the rate constant? A. the same B. doubled C. halved D. quadrupled

47. The oxidation of chloride by dichromate ($Cr_2O_7^{2-}$) in acidic solution can be written as follows:

$$6Cl^{-1}(aq) + Cr_2O_7^{2-}(aq) \rightarrow 3Cl_2(g) + 2Cr^{3+}(aq) + H_2O(l)$$

The reaction is first order in Cl^{-1} ,first order in $Cr_2O_7^{2-}$ and second order in H^+ . What is the change in initial rate if the concentration of Cl^{-1} and $Cr_2O_7^{2-}$ are halved ? The new rate will be /have

A. rate = $\frac{1}{8}$ (initial rate) B. rate = $\frac{1}{2}$ (initial rate)
C. rate = $\frac{1}{4}$ (initial rate) D. no change

48. Consider the following gaseous reaction and its rate law given below

$$2A(g) + B(g) \rightarrow C(g)$$

Rate = K$[A]^2$ [B]

In this reaction [A] = 2.0 M and the rate was recorded to be 0.048 mole $1^{-1}s^{-1}$. What will be the numerical value of the rate constant, K ?

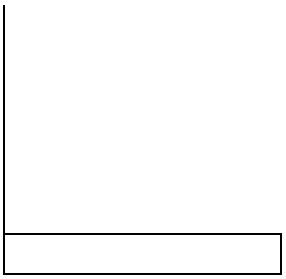
A. 8.O B. 6.0 x 10^{-3} C. 3.0 x 10^{-3} D. 1.5 x 10^{-3}

49. Given : A + 3B $\rightarrow$ 2C +D

This reaction is first order with respect to reaction A and second order with respect to reactant B . If the concentration of A is doubled and the concentration of B is halved , the rate of the reaction would ---------- by a factor of-------

A. increase, 2 B. decrease , 2 C. increase , 4 D. decrease , 4

50. The graph shown below shows the variation of concentration of a reactant with time as a reaction proceed .What is the average reaction rate , in mol$1^{-1}s^{-1}$, during the first 20s



A. 0.0025 B. 0.0036 C. 0.75 D. 0.0090

51. For zero order reactions ,which one of the following is true ?

A. The units of the rate constant (k) are time $^{-1}$

B. The half- life may be represented by the expression $t\frac{1}{2} = 0.693/k$

C. The rate of degradation is independent of the concentration of the reactant(s)

D. A plot of the concentration remaining against time is a straight line with a gradient of 1/k

52. If the reaction is zero order in A, tripling the concentration of A will cause the reaction rate to:

A. Increase by a factor of 27 C. Remain constant

B. Increase by a factor of 3 D. Increase by a factor of 9.

53. Which one of the following factor does NOT affect the rate of a chemical reaction?

A. Humidity B. Concentration C. Temperature D. Nature of reactants

54. Consider the following equilibrium:

$2CO(g) + O_2(g) \rightleftharpoons 2CO_2(g)$ Keq= 4.0 x 10-10

What is the value of Keq for $2CO_2(g) \rightleftharpoons 2CO(g) + O_2(g)$

A. 4.0 x 10^{-10} B. 2.5 x10^{9} C. 5.0 x 10^{4} D. 2.0 x 10^{-5}

55. What species of ions are present in a 0.1M solution of HCl and what will be their equilibrium concentration?

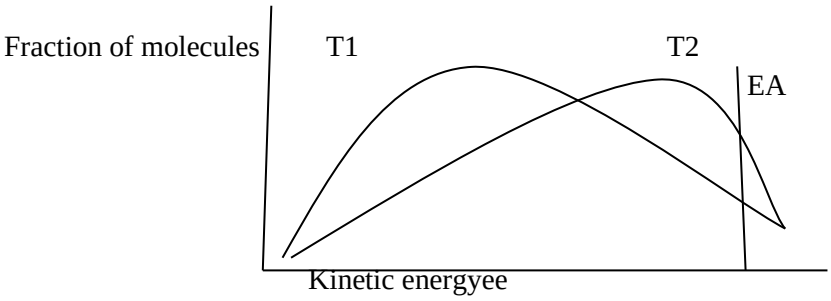
A. $[H_3O]^+$= 01M; $[OH]^-$ = 0.1M, $[Cl]^-$ =0.1M C. $[H_3O]^+$ =0.1M; $[OH]^-$ =10^{-13}M, [Cl] =0.1M

B. $[H_3O]^+$ = 0.1M; $[OH]^-$ =0.01M, $[Cl]^-$ =0.1M D. $[H_3O]^+$ =10^{-13}; $[OH]^-$=0.1M,$[Cl]^-$ =0.1M

56. The decomposition of a compound at 400^{o}c is first order with the half life of 1570seconds. What fraction of an initial amount of the compound remains after 4710seconds?

A. 1/12 B. 1/6 C. 1/8 D. 1/3

57. The diagram below shows the range of energies of collision of a collection of reactants at two temperatures, T_1 and T_2.



58. Which of the following is true regarding T1 and T2?

A. T1=T2, fraction of molecules at both temperatures are equal.

B. T1<T2, fraction of molecules at T1 is smaller.
C. T2<T1, fraction of molecules at T2 is smaller.
D. T1<T2, fraction of molecules at T1 is larger.

59. In three different experiments the following results were obtained for the reaction A products: $[A]_0$=1.00M, $t_{1/2}$ = 50min; $[A]_0$= 2.00M, $t_{1/2}$=25min; $[A]_0$=0.50M, $t_{1/2}$= 100min. what is the value of the rate constant for this reaction?
A. $0.010Lmol^{-1}min^{-1}$ B. $0.030Lmol^{-1}min^{-1}$ C. $0.020Lmol^{-1}min^{-1}$ D. $0.040Lmol^{-1}min^{-1}$

60. The reaction below takes place with all of the reactants and products in the gaseous phase. Which of the following is true of the relative rates of disappearance the reactants and appearance of the products?

$2NOCl \longrightarrow 2NO + Cl_2$

A. NO appears at twice the rate that NOCl disappears. B. NO appears at half the rate that NOCl disappears.
C.NO appears at the same rate that NOCl disappears D. Cl_2 appears at the same rate that NOCl disappears

61. The proposed reaction mechanism between nitrogen monoxide and bromine is given below.

$NO + Br_2 \rightleftharpoons NOBr_2$(fast)

$NOBr_2 + NO \longrightarrow 2NOBr$(slow)

Which of the following rate equetions is consist with the proposed mechanism?
A. $Rate=K[NO]^2$ B. $Rate=k[NO][Br_2]^2$ C. $Rate=k[NO]^2[Br_2]$ D. $Rate=k[NO][Br_2]$

62. The minimum energy required for an effective collision is called……?
A. activation energy B. Potential energy C. Free energy D. Kinetic energy

63. For the reaction, $N_2(g) + 3H_2(g)$ $2NH_3(g)$, the rate of disappearance of H2 is $0.01molL^{-1}min^{-1}$. What is the rate of appearance of NH_3?
A. $0.007molL^{-1}min^{-1}$ B. $0.02molL^{-1}min^{-1}$ C. $0.01molL^{-1}min^{-1}$ D. $0.002molL^{-1}min^{-1}$

64. The appropriate unit for a first order rate constant is?
A. 1/S B. 1/MS C. M/S D. $1/M^2S$

65.

11 Chapter- 5

1. Answer the following question using the phase diagram below.



At which point can only the solid and liquid phases coexist?

A. 1 B. 2 C. 3 D. 4

2. Which statement is true about chemical reactions at equilibrium?
   - A. The forward and back ward reactions proceed at equal rates
   - B. The forward and backward reactions have stopped
   - C. The concentrations of the reactants and products are equal
   - D. The forward reaction is exothermic
3. Which changes will increase the amount of SO3(g) at equilibrium?

   $2SO_2(g) + O_2(g) \leftrightarrows 2SO_3(g) \quad \Delta H^0 = -197kJ$

   I. Increasing the temperature
   II. Decreasing the volume
   III. Adding a catalyst

   A. I only B. II only C. I and II only D. I,II and III
4. What is the equilibrium constant expression for the following reaction?

   $2Hg(g) + O_2(g) \leftrightarrows 2HgO(s)$

   A. $k = 1/([Hg]^2 [O_2])$ C. $k = [HgO]^2 / ([Hg]^2 [O_2])$
   B. $k = [Hg]^2 [O_2]$ D. $k = [2HgO] / ([2Hg] [O_2]$
5. Which of the following mathematical relationships between K, K_1 and K_2 correct?

   $CO_2(g) + H_2 (g) \leftrightarrows CO (g) + H_2O(g)$ K
   $Fe (s) + CO_2 (g) \leftrightarrows FeO (s) + CO (g)$ K_1
   $Fe(s) + H_2O(g) \leftrightarrows FeO (s) + H_2 (g)$ K_2

   A. $K = K_1 + K_2$ C. $K = K_1 / K_2$
   B. $K = K_1 \times K_2$ D. $K = K_2/K_1$
6. The value of Keq for the following equilibrium reaction is 4.0 at a temperature of 373K.

   $CH_3COOH + C_2H_5OH \rightleftharpoons CH_3COOC_2H_5 + H_2O$

   What mass of ethyl ester ($CH_3 COOC_2H_5$) would be present in the equilibrium mixture if 15g of acetic acid and 11.5g of ethanol were mixed and equilibrium was established at this temperature?

   A. 5.2 B. 10.1 C. 12.6 D. 14.1
7. Which of the following statements is TRUE about equilibrium reaction?
   - A. No more reactants are transformed into products
   - B. There are equal amounts of reactants and products
   - C. The rate constant for forward reactions equals that of the reverse reaction
   - D. The rate for the forward reactions equals that of the reverse reactions
8. Three gases are in equilibrium in a closed chamber sealed with a piston. The following equilibrium is established :

   $2NH_3(g) \rightleftharpoons N_2(g) + 3H_2(g)$

   What will happen if the piston is pushed into the chamber?

   A. The mole fraction of N_2 increases C. The mole fraction of N_2 remains the same
   B. The mole of N_2 decreases D. The mole fraction of N_2 increases and then decreases
9. Consider the following phase Diagram for CO_2

   What happens when in a CO_2 sample initially at 1 atm and -700C the temperature increases from -70^0C to -10^0C at a constant pressure of 60 atm?

   A. $CO_2(g) \longrightarrow CO_2(s)$ C. $CO_2(g) \rightarrow CO_2(g)$
   B. $CO_{2\,(s)} \rightarrow CO_2(1)$ D. $CO_2(g) \rightarrow CO_2(I)$
10. What will happen if NaOCl is added to this reaction at equilibrium

    $HOCl + H_2O \rightleftharpoons H_3O^+ + OCl^-$?

    A. The concentrations of both HOCl and H_3O^+ would increase.

B. The concentrations of both HOCl and H_3O^+ would decrease.
C. The concentration of HOCl would increase and the concentration of H_3O^+ would decrease.
D. The concentration of HOCl would decrease and the concentration H_3O^+ would increase.

11. Consider the following equilibrium

$$CaCO_3(S) \rightleftharpoons CaO(S) + CO_2(g)$$

Which of the following mixtures, each placed in a closed container and allowed to stand is not capable of reaching the equilibrium given above?

A. Pure $CaCO_3$ C. Some CaO and a pressure of CO_2 greater than the value of K_p
B. $CaCO_3$ and CaO D. Some $CaCO_3$ and a pressure of CO_2 greater than the value of K_p

12. Which of the following statement correctly describes a chemical reaction at equilibrium?
A. The concentrations of the products and reactants are equal
B. The change in the concentrations of the products and reactants is constant
C. The rate of the forward reaction is less than the rate of the reverse reaction
D. The rate of the forward reaction is greater than the rate of the reverse reaction

13. If the following reaction is at equilibrium, which one of the following changes will shift the equilibrium to the left?

$N_2 + 3H_2 \longleftrightarrow 2NH_3 + heat$

A. Increasing pressure C. Adding more N_2 and H_2
B. Decreasing temperature D. Increasing the volume of the reaction container.

14. Suppose reactions A$\longrightarrow$B and B$\longrightarrow$A are both elementary processes with rate constants of 8 x $10^2 s^{-1}$ and 4 X 10^4s-1, respectively. What is the value of the equilibrium constant for the equilibrium?

$A \rightleftharpoons B$

A. 2 x 10^2 B. 0.5 x 10^2 C. 4 x 10^2 D. 4 x 10^2

15. Which one of the following will change the value of an equilibrium constant?
A. Changing the temperature.
B. Adding other substances that do not react with any of the species involved in the equilibrium.
C. Varying the initial concentration of reactants.
D. Varying the initial concentration of products

16. The conventional. equilibrium constant expression (Kc) for the system as described by the equation:

$2ICI(s) \rightleftharpoons I(s)+Cl_2(g)$ is:

A. [Cl] B. $[Cl_2]$ / [ICI]2 C.$[I_2][Cl_2]$ / [ICl] D. $[I_2][Cl_2]$ / [ICl]

17. The value of K_{eq} for the following reaction is 0.5

$$SO_{2(g)} + NO_{2(g)} \leftrightarrows SO_{3(g)} + NO_{(g)}$$

What is the value of K_{eq} at the same temprature for the reaction below ?

$$2\,SO_{2(g)} + 2NO_{2(g)} \leftrightarrows 2\,SO_{3(g)} + 2NO_{(g)}$$

A. O.25 B. 0.026 C. 0.50 D. 16

18. The following equilibrium constants were determined at 300^0 C

$$2N_2O(g) \leftrightarrows 2N_2(g) + O_2(g) \qquad K_c = 4.0 \times 10^{18}$$

$$N_2(g) + O_2(g) \leftrightarrows 2NO(g) \qquad K_c = 4.0 \times 10^{-31}$$

What will be the equilibrium constant at 300^0 C for the gaseous reaction of

$$N_2O(g) + O_2(g) \leftrightarrows 4NO(g) \ ?$$

A. 3.2 x 10^{-12} B. 2 x 10^{-13} C. 5.O x 10^{50} D. 1.6 x 10^{-49}

19. When 0.50 mol of N_2O_4 is placed in a 4.0 liter reaction vessel and heated to 400K, 80% of the N_2O_4 decomposes to NO_2 gas as follows:

$$N_2O_4(g) \leftrightarrows 2NO_2(g)$$

What will be the value of K_p , in units of pressure , at 400K for this reaction?

A. 2.62 B. 13.12 C. 50.48 D. 16.20

20. Consider the following graph ,which relates to the equilibrium system:

$$CH_3COOH(aq) + H_2O \leftrightarrows CH_3COO^-(aq) + H_3O^+(aq) \qquad \Delta H < 0$$

21. Which of the following actions caused the change in the concentration of [H_3O^+ (aq)] at time t ?
A. Addition of CH_3COO^- (aq) B. Addition of HCl
C. Decreasing of temperature D. Increasing the volume of the container

22. In which of the following systems will the position of equilibrium shift to the left upon an increase in pressure, but to the right upon an increase in temperature ?

A. $CO_2(g) + H_2(g) \rightleftharpoons CO(g) + H_2O(g) \qquad \Delta H > 0$

B. $C_2H_4(g) + H_2O(g) \rightleftharpoons C_2H_5OH(g) \qquad \Delta H < 0$

C. $C_2H_6 \rightleftharpoons C_2H_4(g) + H_2(g)$ $\Delta H > 0$

D. $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$ $\Delta H < 0$

23. The hydrogen used in the Haber process is made by the following reaction:

$CH_4(g) + H_2O(g) \rightleftharpoons CO(g) + 3H_2(g)$ $\Delta H^0 = +206$ kJ

Which of the following sets of conditions will favor the formation of H_2?

A. Low pressure and high temperature B. Low pressure and low temperature

C. High pressure and low temperature D. High pressure and high temperature

24. Why does the rate of the reaction increase when powdered calcium carbonate is used instead of marble chips?

A. The powdered calcium carbonate acts as a catalyst

B. There is an increase of the concentration of the calcium carbonate

C. There is an increase of yhe particles size of the calcium carbonate

D. There is an increase of the suface area of the calcium carbonate

25. In the Haber process for the synthesis of ammonia, the expected reaction is

$N_2(g) + 3H_2(g) \quad 2NH_3(g) + 92.4KJ\ mol^{-1}$

Which of the following is true about this process at equilibrium?

A. Concentration of reactant and product are equal

B. The forward and backward reaction rate are equal

C. The formation of ammonia is more dominant at equilibrium

D. Formation and dissociation of ammonia at equilibrium is static.

26. In the coal -gasification process, carbon monoxide is converted to carbon dioxide via the following reaction:

$CO(g) + H_2O(g) \leftrightarrows CO_2(g) + H_2(g)$

In an experiment , 0.35 mol of CO and 0.40 mol of H_2O were placed in a 1.00-L reaction vessel. At equilibrium , there were 0.19 mol of CO remaining . What is K_{eq} at the temperature of the experiment?

A. 0.25 B. 0.36 C. 0.56 D. 0.78

27. A pure substance is heated as indicated in the diagram below . Which section of the graph indicates the boiling point?

A. A B. B C. C D. D

28. The value of K_{eq} for the equilibrium

$H_2(g) + 1/2\ I_2(g) \leftrightarrows 2HI(g)$

is 794 at 25 ^{0}C . At this temperature. what is the value of K_{eq} for the equilibrium below?

$HI(g) \leftrightarrows 1/2H_2(g) + 1/2I_2(g)$

A. 0.0013 B. 0.035 C. 28 D. 397

29. Which one of the following will change the value of equilibrium constant?

A. Adding other substances that do net react with any of the specis involved in the equilibrium.

B. Varying the initial concentration of reactants

C. Varying the initial concentration of products

D. Changing temperature

30. Which of the following statements is true about equilibrium involving a chemical reaction?

A. The rate constants of the forward and reverse reactions are equal

B. The rate of the forward and reverse reactions are equal

C. The value of the equilibrium constant is 1

D. All chemical reactions have ceased

31. The rate equation for the decomposition of nitramide, $H_2NNO_2 \rightarrow N_2O + H_2O$, is Rate=$k[H_2NNO_2][H^+]^{-1}$. Which of the following mechanisms is consistent with this rate equation?

A. $H_2NNO_2 \rightarrow N_2O + H_2O$ slow

B. $H_2NNO_2 + H^+ \rightleftharpoons H_3NNO_2^+$ fast equilibrium

$H_3NNO_2^+ \rightarrow N_2O + H_3O^+$ slow

$H_3O^+ \rightleftharpoons H^+ + H_2O$ fast equilibrium

C. $H_2NNO_2 \rightarrow OH^- + NH_4^+$ slow

$NH_4^+ \rightleftharpoons NH_3 + H^+$ fast equilibrium
$H_2O \rightleftharpoons H^+ + OH^-$ fast equilibrium

D. $H_2NNO_2 \rightleftharpoons H^+ + HNNO_2^-$ fast eqilibrum
$HNNO_2^- \longrightarrow N_2O + OH^-$ slow
$H^+ + OH^- \longrightarrow H_2O$ fast

31. Given the equilibrium constant values:
$N_2(g) + 1/2O_2(g) \rightleftharpoons N_2O(g)$ Kc= 3.4 x10-18
$N2O4(g) \rightleftharpoons 2NO2(g)$ Kc= 4.6 x10-3
$1/2N_2(g) + O_2 \rightleftharpoons NO_2(g)$ Kc=4.1 x10-9
What is the value of Kc for the following reqaction?
$2NO_2 + 3O_2(g) \rightleftharpoons 2N_2O_4(g)$
A. 2.4×10^{-6} B. 1.2×10^{6} C. $1,2 X10^{-6}$ D. 4.8×10^{6}

32. The equilibrium constant for the ionization of HCN is 4.9×10^{-10}
$HCN \rightleftharpoons H^+ + CN^-$ $K=4.9 \times 10^{-10}$
Which of the following statements is true regarding this equilibrium?
I. The reaction is product favored III. Equilibrium lies far to the right
II. The reaction is reactant favored VI. Equilibrium lies far to the left
A. II and III B. I and III C. II and IV D. I and IV

33. For the certain gas phase reaction
$2A(g) \rightleftharpoons B(g) + C(g)$ $\Delta H=+45KJ/mol$, $K=4.5x\ 10^{-2}$
Which of the following would be true if the temperature was increasesd from 25°C to 200°C ?
I. The value of K would be smaller
II. The concentration of A (g) would be increased.
III. The concentration of B(g) would increase.
A. III B. II C. I D. I and III

34. For the reaction $C_6H_{14}(g) \longrightarrow C_6H_6(g) + 4H_2(g)$, $\Delta P(H_2)/\Delta t$ was found to be 2.5 x10-2 atm/s, where $\Delta P(H_2)$ is change in the pressure of hydrogen. Determine $\Delta P(H_2)/\Delta t$(in units of atm/s) for this reaction at the same time.
A. $-6.2x10^{-3}$ B. $1.6x10^{-3}$ C. $2.5x10^{-2}$ D. $6.2x10^{-3}$

35. Consider the following equilibrium:
$Cl_2(g) + 2NO(g) \longrightarrow 2NOCl(g)$ Keq=5.0
At equilibrium , $[Cl_2]$=1.0M and [NO]=2.0M. What is the [NOCl] at equilibrium?
A. 4.5M B. 0.89M C. 0.80M D. 10M

36. Which of the following statement is NOT true in relation to the triple point on a single component phase diagram?
A. The point at which the solid, liquid and gaseous phases for a substance coexist.
B. The system must be enclosed so that no vapour can escape.
C. The triple point exists for a substance occurs at a specific temperature and pressure.
D. The triple point exists at a single temperature and is independent of pressure.

37. In the figure shown below, what does O denote?

A. Melting point B. vaporization C. Boiling point D. Triple point

38. Which one of the following statements regarding a dynamic equilibrium is false?
A. At equilibrium, the forward and reverse reaction ceases to occur.
B. At equilibrium, there is no net change in the system
C. At equilibrium, the rate of the forwared and backwared reactons is identical.
D. At equilibrium, the concentration of reactants and products saty the same.

39. A sample of solid ammonium carbamate is heated in a closed container at 298K and allowed to reach equilibrium.
$NH_4CO_2NH_2(s) \rightleftharpoons 2NH_3(g) + CO_2(g)$

If the total pressure of the system is 0.114atm, what is the value of equilibrium constant, KP?

A. $1.29X10^{-3}$ B. $3.80X10^{-4}$ C. $2.19X10^{-4}$ D. $7.60X10^{-3}$

40. Which one of the following reaction at equilibrium would be unaffected by an increase in pressure?

I. $N_2(g) + 3H_2(g)$ $2NH3(g)$ II. $2H_2(g) + O_2(g)$ $2H_2O(g)$

III. $N_2(g) + N_2(g) \longleftrightarrow 2NO(g)$ IV. $2CO(g) + O_2(g) \longleftrightarrow 2CO_2(g)$

A. I B. II C. III D. IV

41. A sealed isothermal container initially contained 2mole of CO gas and 3moles of H_2 gas. The following reversible reaction occurred: $CO(g) + 2H_2(g)$ $CH_3OH(g)$ at equilibrium, there was one mole of CH_3OH in the container at equlibreium?

A. 1 B. 3 C. 2 D. 4

$2X(g)$ $3Y(g) + Z(g) \Delta H(\text{forward rxn}) > 0$

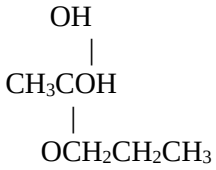
42. The molar equilibrium concentrations for the reaction mixture represented above at 298K are [X]=4.0M,[Y]=5.0M, and [Z]=2.0M.What is the value of the equilibrium constant, Keq, for the reaction at 298K?

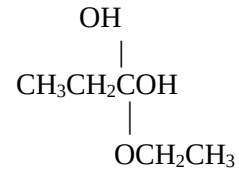
A. 16.0 B. 2.50 C. 0.06 D. 62.5

Chemistry grade-11entrance

Chapter- 6

1. Commercially, liquid vegetable oils are converted to solid fats such as margarine by:
   A. Hydrogenation B. Hydration C. Saponification D. Oxidation
2. What is the chemical name for Aspirin?
   A. Acetyl salicylic acid B. Salicylic acid C. Methyl salicylate D. Sodium salicylate
3. Which compound is a carboxylic acid?
   A. CH_3,COOH B. $(CH_3CO)_2O$ C. $(CH_3)_2CHOOCH_3$ D. $(CH_3)_2O$
4. A triacylglyceol that is solid at room temperature is called :
   A. Lecithin B. Fat C. Wax D. Oil
5. Which compound is an ester?
   A. CH_3 COOH B. $CH_3OC_2H_5$ C. C_2H_5CHO D. $HCOOCH_3$
6. Which of the following gives the correct order of decreasing acidity of carboxylic acids?
   A. Cl_3 CCOOH, Cl_2CHCOOH, FCH_2COOH, CH_3COOH
   B. FCH_2COOH, CH_3 COOH, Cl_2 CHCOOH, Cl_3 CCOOH
   C. CH_3 COOH, FCH_2 COOH, Cl_2 CHCOOH, Cl_3 CCOOH
   D. Cl_2 CHCOOH, CH_3 COOH, FCH_2COOH, Cl_3 CCOOH
7. Which of these compounds is the ester formed from the reaction of acetic acid and 1- propanol?

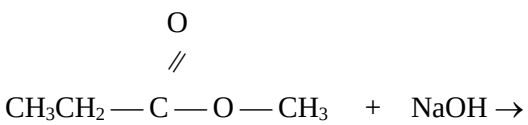
A.


B.


C. $CH_3CH_2CH_2OCH_2COH$

D. $CH_3COCH_2CH_2CH_3$

8. What is the name of a base-promoted ester hydrolysis reaction?
   A. Acylation B. Esterification C. Condensation D. Saponification
9. What is the name of the following compound?
   A. Benzoate ester B. Ethyl benzoate C. Phenyl butyrate D. Ethyl benzyl ketone
10. Which of the following statements is **true** about esters?
    A. Esters can form intermolecular hydrogen bonds
    B. Ester molecules can form intermolecular hydrogen bonds
    C. Ester molecules cannot form intermolecular hydrogen bonds
    D. Esters have higher boiling points than alcohols of comparable molecular weight
11. The organic compound $CH_3C(O)CH_3$ is
    A. Aldehyde B. Ester C. Carbonyl D. Ketone
12. Consider the following reaction



What are the products of this reaction?
A. Sodium acetate and ethanol C. Sodium propionate and methanol

B. Sodium acetate and methanol D. Methyl propionic acid and methanol

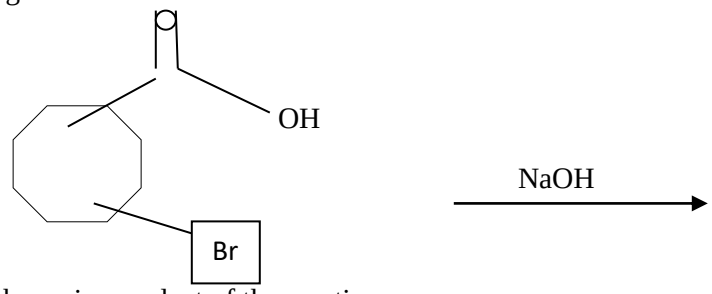
13. Which catalyst is used in the hydrogenation of vegetables?
    A. Iron B. Nickel C. Platinum D. Molybdenum
14. What is the name of a base-promoted ester hydrolysis reaction?
    B. Acylation B. Esterification C. Condensation D. Saponification
15. Which organic functional group does the following molecular representation, i.e., R_1R_2CHCOH belong? (R_1 and R_2 represent different alkyl chains)
    A. Amides B. Aldehyde C. Ethers D. Organic acids
16. What is the IUPAC name for the compound

    $(CH_3)_2 CHCH_2CHCOH$

    A. 2,4-dimethypentanoic acid C. 1-hydroxy-2,4-dimethylpentanone

    B. 1,1,3- trimethylbutanoic acid D. 2-carboxyisohexane

17. Given the following reaction



What is the major product of the reaction

18. What is the process that converts liquid vegetable oils to solid fats?
    A. Hydration B. Hydrogenation C. Hydrolysis D. Saponification
19. What would be the solubility of $HOCH_2 (CH2)_6 CH_2OH$ compared to $CH_3(CH_2)_6CH_2OH$?
    A. Less soluble in water C. The same solubility in water
    B. More soluble in water D. more soluble in a non-polar solvent such as dichloroethane
20. Which of the following reactions will produce an akyl carboxylic acid?
    A. Heating a methyl ketone with acid and iodine
    B. Reacting an alky halide with hydrogen gas and platinum
    C. Reacting an alcohol with ozone
    D. Oxidation of a primary alcohol with hot permanganate or chromate
21. Which of the following statements is NOT TRUE?
    A. Naturally derived soaps consist of a soluble salt of a long chain fatty acid
    B. Triacylglyverols are esters of glycerol and long chain carboxylic acids
    C. Long chain carboxylic acids are also known as fatty acids
    D. The major acidic components of vinegar is formic acid
22. What is the product of the hydrolysis of easters in the presence of a mineral acid catalyst?
    A. alcohol B. carbon dioxide C. ether D. ketones
23. To which organic functional group does the following molecular representation, i.e., R_1R_2CHCOH belong? (R_1 and R_2 represent different alkyl chains)
    A. Amides B. Aldehyde C. Ethers D. Ketones
24. Chemically , fats and oils are
    A. acids B. alcohols C. esters D. alkene
25. Which of the following would react to form pentylethanoate?
    A. 1 -prppanol and pentanoic acid B. Ethanol and pentanoic acid
    C. 1 -pentanol and ethanoic acid D. Ethanol and ethanoic acid

26. The difference between fats and oils is that

A. oils are liquid at room temperature. B. oils have more calories

C. oils are solid at room temperature D. fats are liquid at room temperature

27. Which of the following is NOT true about carbonyl compounds?
A. Carbonyl compounds contain 3α - bond and 1π - bond
B. The carbon oxygen bond is both longer and weaker
C. The bond angle in carbonyl is about 120^0
D. Carbonyl compounds may be hydrolyzed

28. Consider the following reaction;Which of the following types of compounds are expected products from saponification of a fat?
A Glycerol and fatty acid salts B. Glycerol and fatty acids
C. Fatty acid salts and fatty acids D. Glycerol, fatty acid salts and fatty acids

29. Which of the following statements concerning the carbonyl group in aldehydes and ketones is NOT true?
A. The bond is polar , with a slight negative charge on the oxygen atom

B. The bond angles about the central carbon atom are 120^0

C. The bond is polar . Therefore , carbonyl groups readily form hydrogen bonds with each other

D. In condensed form, the carbonyl group can be written as CHO

30. Which of the following statements concerning fats and oils is INCORRECT?
A. They are also called triacylglycerols B. They are also called triglycerides
C. They are fatty acids salts D. They are glycerol triesters

31. Which of the following statements concerning petroleum is **INCORRECT**?
A. It is a renewable energy source
B. It is a fossil fuel
C. It is a mixture consisting mainly of hydrocarbons
D. It was formed from marine organisms, which died millions of years ago

32. Triglycerides (fats and oils) are made up of

A. sugars and water B. glycerol and amino acids

C. fatty acids and glycerol D. water , glycerol and salt

33. The compound shown below is derived from------- and ------- It is called----------

A. propanol, benzoic , propyl benzoate B. ethanol, benzoic acid , ethybenzoate

C. ethanol, benzol, phenyl butyrate D. ethanol, benzol, ethybenzoate

34. What is the correct name of the following compound?

A. 2-aminopropanoic acid B. 3- aminobutanoic acid

C. 2-aminobutanoic acid D. 3-aminopropanoic acid

35. When ----------reacts with NaOH, the product is sodium benzoate.

A. Benzoic acid B. Benzaldehde C. Benzene D. Benzoic hydroxide

36. The reaction between alcohol and acyl chlorides produce……

A. Ether B. Carboxilic acids C. Aromatic salts D. Eester

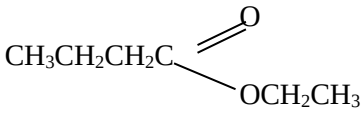
37. Fats and oils are:

A. Esters B. Alcohols C. Acids D. Alkanes

38. Compounds that contain the carboxyl and hydroxyl) group are said to be:

A. Ester B. Ketones C. Organic acids D. Aldehydes

39. An ester has the structural formula



On hydrolysis, the ester would produce:

A. Propanoic acid and propan-1-ol C. Butanoic acid and ethanol

B. Ethanoic acid butan-1-ol D. Propanoic acid and ethanol

40. Which of the following compounds would be the most stable in H_2O?

A. Ethane B. Pentane C. Octhanoic acid D. Ethanoic acid

41. Which acid is produced when toluene is subjected to KMnO4 oxidation?

A. Toluic acid B. Benzoic acid C. Phenyl acetic acid D. Phthalic acid

42. Which of the following is an organic acid?

A. CH_3CO_2H B. CH_3CH_2OH C. $CH_2=CH_2$ D. CH_3CH_3

43. During esterfication of carboxylic acid with alcohol which bond of carboxylic acid undergoes cleavage?

A. C- C B. C= O C. O- H D. C- O

44. Hydrolysis of ester leads to the formation of which of the following products in basic medium?

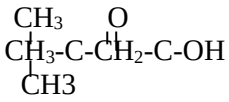
A. Alcohol and sodium carbonate C. Ether and alcohol

B. Aldehyde and alcohol D. Sodium carboxylate

45. Fats and oils can be classified as------.

A. carbohydrates B. Acids C. alcohols D. esters

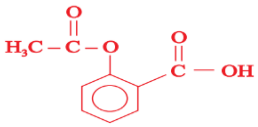
46. What is the IUPAC name for the following carboxylic acid?



A. 2-dimethylbutanoic acid C. 3,3-Dimethylbutanoic acid

B. 2-methylpentanoic acid D. 3-methylpentanoic acid

47. Acetylsalicylic acid (aspirin) has the structural formula:



Which functional group (groups)is (are) present in aspirin?

a. A. Carboxyl and ester B. hydroxyl and carbonyl C. carboxyl and acetyl D. Hydroxyl

48. Which of these compounds is propanoic acid ?

CH_3 CH_2COOCH_3 B. CH_3CH_2COH C. CH_3CH_2COOH D. $CH_3CH_2CH_2OH$

Chemistry grade-12 Entrance exam

Chapter-1

1. Which of the following statement(s) is (are) true of an ideal liquid-liquid solution?
   I. It obeys pV=nRT
   II. It obeys Raoult's law
   III. Solute-solute, solvent-solvent, and solute –solvent interactions are very similar
   IV. Solute-solute, solvent-solvent, and solute-solvent interactions are quite different
   A. I, II and III B. I, II and IV C. II and III D. II and IV
2. Butane burns in oxygen according to the equation below.
   $2C_4H_{10}(g) + 13O_2(g) \longrightarrow 8CO_2(g) + 10H_2O(1)$
   If 11.6g of butane is burned in 11.6g of oxygen, which is the limiting reagent?
   A. Butane B. Oxygen C. Neither D. Both oxygen and butane
3. A beaker filled to the 100mL mark with salt (the salt has a mass of 100g) and another beaker to the 100mL mark with water (the water has a mass of 100g) are mixed together in a bigger beaker unit the salt is completely dissolved. What will be the mass of the solution?
   A. It will be much more than 200g B. It will be much smaller than 200g
   B. It will be exactly 200g C. It will be slightly more than 200g
4. A solution is made by dissolving 250.0g of potassium chromate crystals (k_2CrO_4, molar mass, 194.2g) in 1.00kg of water. What will be the freezing point of the solution? (kf for water is 1.860c/molal).
   A. -8.87 ^{0}C B. -7.18^{0}c C. -5.73^{0}c D. -1.86^{0}c
5. How many moles of sodium hydroxide are present in 2.5L of 0.5 M aqueous solution?
   A. 0.2 B. 0.5 C. 1.25 D. 12.5
6. If the solute-solvent interactions are greater than the solute-solute and solvent-solvent interactions, what will be the total vapor pressure of the solution?
   A. Greater than that calculated from Raoult's law
   B. Less than that calculated from Raoult's law
   C. The same as calculated from Raoult's law
   D. Raoult's law cannot be applied for such interactions
7. What volume of 0.5000M NaOH is required to neutralize 25.0mL of 1.2 M H_2SO_4? (assume complete ionization of the acid).
   A. 60mL B. 90mL C. 100mL D. 120mL
8. An aqueous solution is 70.0% nitric acid (HNO_3) by mass. What is the concentration of HNO_3 expressed in molality?
   A. 0.559m B. 8.62m C. 11.1m D. 37.0m
9. A lab instructor is preparing 5.0 liters of a 0.10 M $Pb(NO_3)_2$ (Molecular mass 331) solution. What is the mass required?
   A. 165.5g of Pb $(NO_3)_2$ and add 5.0kg of H_2O
   B. 165.5g of $Pb(NO_3)_2$ and add H_2O until the solution has a volume of 5.0liters
   C. 33.1g of $Pb(NO_3)_2$ and add H_2O until the solution has a volume of 5.0 liters
   D. 33.1g of $Pb(NO_3)_2$ and add 5.0 liters of H_2O
10. What would be the solubility of $HOCH_2\ (CH_2)_6\ CH_2OH$ compared to $CH_3(CH_2)_6\ CH_2OH$?
   A. Less soluble in water C. The same solubility in water
   B. More soluble in water D. More soluble in a non-polar solvent such as dichloromethane
11. What is the mass of one molecule of water?
   A. 3.0×10^{-23}g B. 0.0003g C. 1.8×10^{-22}g D. 18.0g
12. Which of the following is the most important type of solute-solvent interaction in a solution of n-butanol in water?
   A. Dispersion B. Ion – dipole C. Dipole – dipole D. Hydrogen bonding
13. Which of the following statements is TRUE about colligative properties?
   A. Both vapor pressure &freezing point increase when a non- volatile solute is added to a solvent
   B. Both freezing point and boiling point increase when a non- volatile solute is added to a solvent
   C. Both vapor pressure and boiling point decrease when a non-volatile solute is added to a solvent
   D. Colligative properties depend only upon the number of solute particles in a solution and not upon their identity
14. What is the equivalent weight of HNO_3, as an oxidizing agent, in the following balanced reaction?
   $3Fe^{2+} + 4H^+ + NO_3^- \rightarrow 3Fe^{3+} + NO + 2H_2O$
   A. 10.50 B. 15.75 C. 21.00 D. 31.50

15. What is the number of chloride ions (Cl-) present in 1.0×10^{-5} mol of $AlCl_3$?
    A. 1.80×10^{19} B. 6.02×10^{18} C. 6.02×10^{23} D. 6.02×10^{28}
16. A solution was prepared by adding 48g of methanol (CH_3OH) into 81g of water (H_2O). What is the mole fraction of methanol in this solution?
    A. 0.25 B. 0.75 C. 1.5 D. 4.
17. A solution was prepared by dissolving 3.75g of pure hydrocarbon in 95.0g of cyclohexane. The boiling point of pure cyclohexane was observed to be 80.70^0c and that of the solution was 81.45^0c. What is the approximate molecular weight of the hydrocarbon?
    (Kb for cyclohexane = 2.79^0c/m)
    A. 71.0g/mol B. 105 g/mol C. 147 g/mol D. 312 g/mol
18. How many mL conc. HNO_3 and how many mL of water are required to prepare 500mL of 0.1 M HNO_3 from a conc.13M HNO_3?
    A. 1mL HNO_3 and 496.15mL H_2O C. 3.85mL HNO_3 and 500mL H_2O
    B. 3mL HNO_3 and 500mL H_2O D. 3.85mL HNO_3 and 496.15mL H_2O
19. Which one of the following organic molecules has the highest water solubility?
    A. $HOCH_2CH_2CH_2OH$ C. $HOCH_2CH_2CH_2CH_2OH$
    B. $CH_2CH_2CH_2CH_2OH$ D. $CH_3CH_2CH_2CH_2OH$
20. Which one of the following substances is a non-conductor of electricity?
    A. Graphite B. $MgCl_2(s)$ C. Silver (s) D. H_2SO_4 (aq)
21. Which of the following is Not a solution?
    A. Milk B. Brass C. Whisky D. Coca cola drink
22. How much water has to be evaporated from 250 ml of 1 M $Ca(OH)_2$ to make it 3M
    A. 100 ml B. 150 ml C. 167 ml D. 200 ml
23. How many ml of water is required to dilute 50 ml of 3.5 M H_2SO_4 to 2.00 M H_2SO_4?
    A. 37.5 B. 45 C. 75 D. 87.5
24. The solubility of sodium selenite, Na_2SeO_4, is 84g/100g of water at 35^0C. If a solution is obtained by dissolving 92 g of Na_2SeO_4 in 200g of water at 35^0C, what do you call this solution?
    A. Diluted B. Saturated C. Unsaturated D. Supersaturated
25. Which law relates the concentration of a dissolved gas, Cg, to its partial pressure?
    A. Henry's law B. Raoult's C. Boyle's law D. Ideal gas law
26. Which of the following compounds would give the lowest freezing point depression when 100 g of each are dissolved in 1 kg of water (K, for water = 1.86^0C/m)? Assume complete dissociation.
    A. NaCl B. NH_4NO_3 C. $(NH_4)_2SO_4$ D. glucose, $C_6H_{12}O_6$
27. Which of the following is most likely to deviate from ideal gas behavior?
    A. He B. Ar C. Cl_2 D. CCL_2F_2
28. What is the molarity of a solution containing 10g of sulfuric acid in 500ml of solution?
    A. 0.02 B. 0.03 C. 0.12 D.0.2

29. Which of the following types of solutions are possible?
    I. Solid dissolved in a liquid III. Gas dissolved in a liquid
    II. Gas dissolved in a gas IV. Solid dissolved in a gas
    A. I and II B. I, II,III and IV C. I,ll and IV D.I
30. What is the normality of l.0M solution ofNa_2C0_3?
    A. 1N B. 0.5N C.2N D.3N
31. What type of solute-solvent interaction should be the most important in a solution of iodine in carbon tetrachloride?
    A. London forces B. Ionic bond C. Ion-dipole forces D. Dipole -dipole forces
32. A liquid is any substance of biochemical orgin that is

    A. soluble in both water and non polar solvents

    B. insoluble in both water and non- polar solvents

    C. soluble in water but insoluble in non- polar solvents

    D. soluble in non- polar solvents and insoluble in water

33. What is the molarity of a 5 g hydrogen peroxide (H_2O_2) in 100 ml. solution that is used for their bleaching?

A. 0.015M B. 0. 15M C. 1.5M D. 3M

34. If a student wishes to prepare approximately 100 milliliters of an aqueous solution of 6M HCl using 12 M HCl, which proceure is correct?
A. Adding 50 ml. of 12 HCl to 50 ml. of water while stirring the mixture steadily.
B. Adding 25 ml .of 12M HCl to 50 ml. water while stirring the mixture steadily
C. Adding 50ml. of water to 50ml. of 12 M HCl while stirring the mixture steadily
D. Adding 25 ml. of water to 50ml. of 12 M HCl while stirring the mixture steadily

35. What kind of solution forms when gasoline evaporates in air?
A. Gas in gas so/n B. Gas in liquid so/n C. Liquid in liquid so/n D. Liquid in gas so/n

36. What is the solvent in 70% alcohol solution
A. Water B. Alcohol C. Sugar D. Kerosene

37. How many moles of H_2SO_4 are needed to prepare 5.0 liters of a 2.0 M of H_2SO_4
A. 2.5 B. 5.0 C. 20 D. 10

38. What is the balanced NET IONIC EQUATION for the reaction of $CaCl_{2(eq)}$ and $AgNO_3$?
A. $CaCl_{2(aq)} + 2AgNO_{3(aq)} \rightarrow a(NO_3)_{2(aq)} + 2AgCl_{(s)}$
B. $Ca^{2+}(aq) + 2Cl^{-}(aq) + 2Ag^{+}(aq) + 2NO_3^{-}(aq) \rightarrow Ca^{2+}(aq) + 2NO_3^{-}(aq) + 2AgCl_{(s)}$
C. $Cl(aq) + Ag^{+}(aq) \rightarrow 2AgCl_{(s)}$
D. $2Cl(aq) + 2Ag^{+}(aq) \rightarrow 2AgCl_{(s)}$

39. When a small amount of crystal solute is added to the supernatural solution , the solute crystal will
A. grow bigger B. slightly dissolve C. remain unchanged D. dissolve completely

40. What is the molality of a solution that contains 51.2 g of naphthalene, $C_{10}H_8$, in 500 mL of carbon tetrachloride ? The density of CCl_4 is 1.60 g/mL.
A. 0.750m B. 0.500m C. 0.840m D. 1.69 m

41. Which of the following does **NOT** affect the solubility of a gas dissolved in a liquid?
A. Nature of solute and solvent B. Pressure
C. Temperature D. Rate at which the gas dissolves

42. Equal masses of He and Ne are placed in a sealed container . What is the partial pressure of Ne, if the total pressure is 6 atm?
A. 2 B. 3 C. 1 D. 5

43. What is the morality of a solution made by dissolving 10 g of glucose ($C_6H_{12}O_6$) in sufficient water to form 300 mL solution? A. 0.18 B. 0.251 C. 0.362 D. 0.278

44. What is the molar solubility of $Fe(OH)_3$ in a solution that is buffered at pH = 3.50 at 25 ^{0}C?
(K_{sp} ($Fe(OH)_3$ = 4 x 10^{-38})
A. $1x10^{-5}$ B. 1.1 x 10^{-6} C. 2.0 x 10^{-6} D. 1.26 x 10^{-6}

45. Dissolve each of NaI, $CuSO_4$, $KMnO_4$. KNO_3 in different 200 mL measuring cylinders. Which one of the following forms more concentrated molar solution?
A. KNO_3 B. NaI C. $KMnO_4$ D. $CuSO_4$

46. Consider the following compounds having lattice energy of

Compound	NaOH	$Mg(OH)_2$	MgO	$Al(OH)_3$
Lattice energy (KJ/mol0	900	3006	3791	5627

Which one is insoluble in water?
A. $Al(OH)_3$ B. MgO C. $Mg(OH)_2$ D. NaOH

47. At 70 ^{0}C , the vapour pressure of pure water is 39 kPa. Which one of the following is the most likely vapour pressure for a 1.5 M solution of sucrose (aq) at the temperature?
A. 37kPa B. 39kPa C. 41 kPa D. 45 kPa

48. What is the concentration of nitrate ion $(NO_3)^-$ in a solution that contains 0.5 M $Al(NO_3)_3$?
A. 0.5 M B. 1 M C. 1.5 M D. 2.5 M

49. A 500 mL of 0.1 M nitric acid solution (HNO_3) is to be prepared from a 13 M concentrated nitric acid (HNO_3) . How many mL of concentrated HNO_3 and how many mL of water are needed?
A. 3.85 mL conc. HNO_3 and 496.15 mL HNO_3 B. 15 mL conc. HNO_3 and 485 mL H_2O

C. 30 mL conc. HNO_3 and 470 mL H_2O D. 13 mL conc. HNO_3 and 487mL H_2O

50. The figure below shows the solubilities of several ionic solids as a function of temperature.

51. A sample of potassium nitrate (49.0g) is dissolved in 100 g of water at 100 ^{0}C with precautions taken to avoid evaporation of any water. The solution is cooled to 30.0 ^{0}C and no precipitate is observed . This solution is----------

A. Supersaturated B. Saturated C. Unsaturated D. Hydrated

52. What is the molarity of sodium chloride in solution that is 13.0 % by mass sodium chloride and that has a density of 1.10g/ml?

A. 1.43×10^{-2} B. 2.23 C. 1.22 D. 2.45

53. Which opposing processes occur in a saturated solution?

A. Vaporization and condensation B. Dissociation and crystallization

C. Dissociation and reduction D. Oxidation and reduction

54. Compounds A and B are combined in a mole ratio of 0.30 to 0.70 respectively . At a given temperature, the pure vapor pressure of compound A is given to be 100 torr and the pure vapor pressure of B is 50 torr. What will be the total pressure above the solution?

A. 85 torr B. 70 torr C. 65 torr D. 55 torr

55. Ammonium sulphate $(NH_4)_2SO_4$ is manufactured by reacting sulphuric acid with ammonia as follows

$$H_2SO_4(aq) + 2NH_3(aq) \rightleftharpoons (NH_4)_2SO_4(aq)$$

What volume of 0.80 M H_2SO_4 is needed to react with 200 mL of 1.2 M ammonia solution to prepare the required salt, $(NH_4)_2SO_4$) ?

A. 0.40 L B. 0.30 L C. 0.150 L D. 0.0244 L

56. Which of the following aqueous solutions will have the **Lowest** freezing point?

A. Pur H_2O B. aq.0.50m KF C. aq.0.24m FeI_3 D. aq. 0.60m glucose

57. A……ΔH corresponds to an ……process.

A. Positive, endothermic C. Negative, endothermic

B. Positive exothermic D. Zero, exothermic

58. You are given a bottle of solid X three aqueous solutions of Y , the first saturated,the second unsaturated and the third supersaturated. Which of the following is correct, if you add the small amount of the solid solute to each solution?

A. The solution in which the added solid solute dissolves is the saturated solution.

B. The supersaturated solution is unstable and addition of additional solute causes the excess solute to crystallize.

C. The solution in which the added solid solute remains undissolved is the unsaturated solution.

D. In all the three solutions ; saturated,unsaturated and supersaturated the added solidsolute will dissolve.

59. The phrase like dissolve like refers to the fact that:

A. Polar solvents dissolve polar solutes and non polar solvents dissolve non polar solutes

B. Polar solvents dissolve nonpolar solutes and vice versa

C. Solvents can only dissolve solutes of similar molar mass

D. Gases can only dissolve other gases.

60. 2.3g of ethanol(CH_3CH_2OH) is added to 500 g of water. What is the molality of the resulting solution?

A. 0.01m B. 1.0m C. 0.1m D. 10.0m

61. A 0.5L and 0.1MHNO_3 solution is to be prepared by dilution process from a 13M nitric acid. How many Ml con. HNO3 and how many mL of water are required to prepare the dilute solution?

A. 3.85mL HNO_3 and 496.15mLwater C. 10ml HNO_3 and 490mLwater

B. 2mL HNO_3 and 498mLwater D. 20ml HNO_3 and 490ml water

62. Commercial concentration sulphuric acid (density=1.831g/cm3) is 94.0%H_2SO_4, by mass. What is the normality of H_2SO_4 solution?(Molar mass of H_2SO_4=98g/mol)

A. 16.8M B. 28.2 C. 40.4 M D. 35.0N

63. What is the final temperature when 150.0ml of water at 90.0^{o}c is added to 100.0ml of water at 30.0^{o}c?

A. 33.0^{o}c B. 45.0^{o}c C. 66.0^{o}c D. 60.0^{o}c

64. What is the PH of a mixture of 15.0ml of 0.26M NaOH and 21.0M H_2SO_4?

A. 1.70 B. 13.60 C. 11.81 D. 2.15

65. Which of the following is true regarding the solution formation process?

A. Intermolecular force between the solute particles must weaken in which the enthalpy change is exothermic ($\Delta H<0$).

B. Intermolecular forces between the solvent molecules must weaken in which the enthalpy change is exothermic ($\Delta H<0$).

C. Covalent bonds within the solute and solvent molecules must be broken.

D. New columbic attractions between the solute and the solvents from in which the enthalpy change is exothermic ($\Delta H<0$)

66. What volume of 1.40MH_2SO_4 solution is needed to react exactly with 10.0 g of aluminum according to the following reaction? $2Al(s) + 2H_2SO_4(aq) \rightarrow Al_2(SO_4)_3(aq) + 3H_2(g)$

A. 2.643ml B. 26.43ml C. 2643ml D. 264.3ml

67. A solution of NH_4Cl made by dissolving 3.16g NH_4Cl in 30.14 g H_2O has a density of 1.0272g/cm3. What is the mole fraction of NH_4Cl?

A. 0.0341 B. 0.9659 C. 0.6500 D. 0.2100

68. Is the standard cell potential for the oxidation of ammonia, given below?

$4NH_3 + 3O_2 \longrightarrow 2N_2 + 6H_2O$, $\Delta G=-1356KJ$

A. 3.51V B. 1.17V C. 7.02V D. 14.04V

69. . What is the freezing point of the solution of 250g of CaCl2 in 1.0kg of water?(Kf for H_2O =1.86^{0}c/m) A. -1.3^{0}c

A. -13^{0}c C. -9.0^{0}c D. -6.5^{0}c

70. Which of the following compounds is least soluble in water?

A. $(NH_4)_2CO_3$ B. $(Na_3(PO4)$ C. $(Fe(NO_3)_3$ D. $BaCO_3$

71. Given the following unbalanced equation

KMnO4 + KI + H2SO4 $\rightarrow$K2SO4 + MnSO4 + I2 + H2O

How many grams of KMnO4 are needed to make 250ml of 0.20N solution?

A. 3.95g B. 1.58g C. 2.98g D. 3.16g

72. If a solution of acetic acid (CH_3COOH) has a PH of 3.00, what is its concentration? Ka of acetic acid=1.74x10^{-5}

A. 0.0057M B. 0.57M C. 0.057M D. 5.70M

73. The indicator methyl red in a solution of NaH_2PO_4. Which of the following eqution is consistent with this observation?

A. $H_2PO_4^- + H_2O \rightleftharpoons H_3PO_4 + OH^-$ C. $HPO_4^{2-} + H_2O \rightleftharpoons PO_4^{3-} + H_3O^+$

B. $HPO_4^{2-} + H_2O \rightleftharpoons H_2PO_4^- + OH^-$ D. $H_2PO_4^- + H_2O \rightleftharpoons HPO_4^{2-} + H_3O^+$

74. A chemist creates a buffer solution by mixing equal volume of a 0.2 M HOCl solution and a 0.2M KOCl solution. Which of the following will occur when a small amount of KOH is added to the solution ?

I. The concentration of undissociated HOCl will increase

II. The concentration of OCl^- ions will increases

III. The concentration of H^+ ions will increase.

A. I only B. I and II only C. III only D. II only

75. In which of the following cases will the dissolution of sugar be the most rapid?

A. Powdered sugar in hot water C. Sugar crystals in cold water

B. Sugar crystals in hot water D. Powdered Sugar in cold water

76. How many grams of iodine, I_2, must be dissolved in 225.0ml of carbon disulfide, CS_2 (density= 1.261g/cm^3), to produce a 0.116m solution?

A. 4.84g B. 6.32g C. 11.71g D. 4.17g

77. 4 L of 0.02M of aqueous solution of NaCl is diluted with 1L of water. What is the molarity of the solution?

A. 0.004M B. 0.016M C. 0.012M D.0.008

78. How much water, in liters, must be added to 0.50liter of 6.0MHCl to make the solution 2.0M?

A. 0.50 B. 2.0 C. 3.0 D. 2.0

79. Which of the four colligative properties arises in systems where there is equilibrium between a liquid solution phase and a second liquid phase?

A. Vapour pressure lowering B. Boiling point elevation

73. C. Osmotic pressure D. Freezing point depression

Chemistry grade 12 Entrance

Chapter-2

1. Which of the following is NOT a conjugate acid-base pair?
   A. HNO_3/NO_3^- B. H_2SO_4/HSO_4^- C. NH_3/NH_2^- D. H_3O+/OH^-
2. During the titration of a know volume of a strong acid with a strong base, there is
   A. A steady increases in PH C. steady decrease in pH
   B. A sharp increase in pH around the end point D. A sharp decrease in pH around the end point
3. A solution with pH of 7.5 would be described as:
   A. Very basic B. Slightly basic C. Slightly acidic D. Very acidic
4. Which species CANNOT act as a Lewis acid?
   A. NH_3 B. BF_3 C. Fe^{2+} D. $AlCl_3$
5. Which of the following statements is true?
   A. A universal indicator is a mixture of indicators that will give a different colour for a different pH
   B. Phenolphthalein is a universal indicator
   C. A universal indicator can only be used in either strongly acidic or basic solution
   D. The colour of a universal indicator is red in a weak acid
6. Three acids, HA, HB, HC have the following ka values.
   k_a (HA) = $1x10^{-5}$ k_a(HB) = $2x10^{-5}$ k_a (HC) = $1x10^{-6}$
   What is the correct order of increasing acid strength (weakest first)?
   A. HA, HB, HC B. HC, HB, HA C. HC, HA, HB D. HB, HA, HC
7. Which of the following procedures will produce a buffered solution?
   I. Equal volumes of 0.5M NaOH and 1 M HCl solutions are mixed
   II. Equal volumes of 0.5 M NaOH , 1.0M CH_3 COOH solutions
   III. Equal volumes of 1 M $NaCH_3$ CO_2 and 1 M CH_3 COOH
   IV. Equal volumes of 1.0 M NaOH and 1,0M HCl solutions are mixed
   A. I B. III C. I and II D. II and III
8. Which of the following statements is true about the percent ionization of a weak acid?
   A. Its decrease with increasing concentration C. It increases with increasing concentration
   B. It increases with decreasing concentration D. It decreases with decreasing concentration
9. Which one of the mixture of the following pairs will NOT give a buffer solution?
   A. HCN and NaCN B. NH_3 and NH_4Cl C. H_3PO_4 and KH_2 PO D. HNO_3 and $NaNO_3$
10. Which one of the following is TRUE for salts formed from strong acids and strong bases?
    A. No hydrolysis takes place C. Produces ions which are proton acceptors
    B. Produces ions that are proton donors D. Depends on the pK_a and pK_b of the parent acids and bases
11. What is the quantity of water, in mL, required to prepare 0.5M of HCl from a concentrated solution of 3.5 M in 50mL is?
    A. 50mL B. 100mL C. 300mL D. 350mL
12. What is the pH of 0.005 M solution of $Ca(OH)_2$?
    A. 2.3 B. 10 C. 12 D. 14
13. Given the following equilibria and equilibrium constant:
    I. $HC_2H_3O_2 + H_2O \rightleftarrows H_3O^+ + C_2H_3O_2^-$; $K_a = 1.80x10^{-5}$
    II. $H_2CO_3 + H_2O \rightleftarrows H_3O+ + HCO_3^-$; $K_a = 4.20x10^{-7}$
    III. $NH_4^+ + H_2O \rightleftarrows H_3O^+ + NH_3$; $K_a = 5.6x10^{-10}$
    IV. $HCOOH + H_2O \rightleftarrows H_3O+ H_3O^+ + HCOO^-$ $K_a = 1.80x10^{-4}$
    What is the strength of the acids in DECREASING order?
    A. I, IV, II and III B. II, III, IV and I C. III, II, I, and IV D. IV, I, II and III
14. Given the reaction:
    $H_2PO_4^- + H_2O \longrightarrow H_3O^+ + HPO_4^{2-}$
    Which of the following represents a conjugate acid-base pair?
    A. $H_2PO_4^-$ and H_2O B. $H_2PO_4^-$ and HPO_4^2 C. $H_2PO_4^-$ and H_3O^- D. H_2O and HPO_4^2
15. The indicator Bromthymol Blue (HBb) is a weak acid with $K_a = 1.0 x10^{-7}$ ionizes as follows:- HBb(aq, yellow) ⇌ H^+(aq, colourless) + In^-(aq, blue)
    Which way will the equilibrium shift when NaOH is added and what will the colour of the NaOH solution be containing this indicator?

A. Equilibrium will shift to the right and the color of NaOH solution will turn green
B. Equilibrium will shift to the right and the color of NaOH solution will turn blue
C. Equilibrium will shift to the left and the color of NaOH solution will turn yellow
D. Equilibrium will shift to the left and the color of NaOH solution will turn blue

16. A 50 mL solution of H_2SO_4 of 0.205 M is titrated with NaOH solution of unknown concentration. The endpoint against phenolphthalein indicator was signed when 41.0mL of NaOH was added. What is the concentration of NaOH solution?
A. 0.10M B. 0.25M C. 0.41M D. 0.50M
17. To 0.2M solution of a weak monoprotic acid, HA, enough quantity of its sodium salt, NaA, was dissolved to give a concentration of 0.2M of the salt. What will be the acid concentration, $[H_3O^+]$, in the final solution? (K_a of HA =1.80 x 10^{-5}) A. 3.60 x 10^{-6} M B. 1.00 x 10^{-5}M C. 1.80 x 10^{-5}M D. 1.90 x 10^{-3}M
18. What is the pH of an aqueous solution prepared to contain 1.3 x10^{-3} M sodium nitrite ($NaNO_2$) if the acid dissociation equilibrium constant, K_a, for nitrous acid (HNO_2) is
5.1 x 10^{-4}?Kw = 1.0 x 10^{-14}
A. 3.1 B. 5.1 C. 6.0 D. 7.3
19. A solution is labeled 0.500 M HCl. What is PH?
A. 0.5 B. 1.5 C. 1.6 D. 1.69
20. Which of the following compounds would be the most basic?
A. 0.1 M acetic acid C. 0.1 M hydrochloric acid
B. 0.1 M sodium acetate D. 0.1 M ammonium chloride
21. How is a buffer solution prepared?
A. By mixing a weak acid and a strong acid
B. By mixing a weak acid and its conjugate base
C. By mixing a strong acid and its conjugate base
D. By mixing a strong base and its conjugate acid.
22. The dye bromothymol blue (HBb) is a weak acid whose ionization can be represented as follows, HBb(aq) ⇌ H^+ (aq) +Bb^- (aq) Which way will the equilibrium shift when NaOH is added?
A. To the left C. nitially to the left and after a while to the right
B. To the right D. Initially to the right and after a while to the left
23. Which one of the following statements is NOT true about acids
A. An acid is a proton donor C. An acid is an electron pair acceptor
B. An acid is an electron pair donor D. An acid is a substance that is ionized in water to produce H^+(aq)
24. Consider the following acids:
I. CH_3COOH, K_a=1.8x10^{-5} III. HCO_2H, K_a=1.8x10^{-4}
II. HOBr, K_a=2.4x10^{-9} V. C_6H_5OH, K_a=1.0x101^{-10}
Which of the following aqueous solutions will have the highest pH?
A. 0.10 M N_aOBr B. 0.10 M HCO_2Na C. 0.10 M C_6H_5ONa D. 0.10 M CH_3COONa
25. What is the hydroxide ion concentration for a solution with a pH of 10 at 25^0C?
A. 10^{-14}M B. 10^{-10}M C. 10^{-7} M D. 10^{-4}M
26. Which of the following titrations will have an equivalence point at a pH< 7
A. Strong acid with weak base C. Strong acid with strong base
B. Weak acid with weak base D. Weak acid with strong base
27. All of the following can act as Bronsted-Lowry bases EXCEPT
A. 1^- B. NH_3 C. HCO^-_3 D. H_2CO_3
28. Which of the following is a conjugate acid/base pair?
A. HCl/OCl B. H_3O^+/OH^- C. NH_4^+/NH_3 D. H_2SO_4/SO_4^2
29. The pH at room temperature of a 0.1 M solution of formic acid ($HCHO_2$) was measured to be 4.50. What is the hydrogen ion concentration?
A. 3.16x10^{-5}M B. 3.16x10^{-12}M C. 6.32x10^{-3}M D. 6.32x10^{-4}M
30. In which of the following period of the periodic Table is an element with atomic number 20 placed?
A. 1 B. 2 C. 3 D. 4
31. Which of the following substances undergoes hydrolysis in aqueous solution?
A. HCl B. $HC_2H_30_2$ C. ~OH D. NH_4Cl
32. The pH of 0.1M solution of a weak acid is 3.0. What is the value of the ionization constant for the acid?
A. 10^{-7} B. 10^{-5} C. 10^{-3} D. 0.1
33. An amphiprotic species is a molecule or ion that can?

A. Accept protons C. both accept and donate protons
B. Donate more than one protons D. be formed into a double ion.

34. Which one is true for a triprotic acid, such as phosphoric acid, H_3PO_4?
A. Kal>Ka2>Ka3 B. Ka3>Ka2>Kal C. Kal>Ka2 = Ka3 D. Ka, = Ka2 = Ka3

35. Which of the following is true for a 0.10M solution of a weak base HB?
A. [H+]=0.10M B. [B-] = 0.10M C. [HB]>[H+] D. pH= 1.0

36. What is the molarity of a solution obtained by dissolving 0.01moles of NaCl is 500ml of solution?
A. 0.01M B.0.005M C.0.02M D.0.10M

37. Which of the following is true concerning this acid-base reaction?

$$HS^- + CH_3Cl \rightarrow CH_3SH + Cl^-$$

A. CH_3CI is a Bronsted Lowry acid C. HS-is a Lewis acid
B. HS· is a Bronsted -Lowery acid D. HS- is a Lewis Base.

38. For the stepwise dissociation of aquesous H_3P0_4, which of the following is NOT a conjugate acid base pair?
A. HPO^{2-}_4 and PO^{3-}_4 C. $H_2PO^-_4$and HPO_4^{2-}
B. H_3P0_4 an $H_2PO_4^-$ D. H_2P0_4 and PO^{3-}_4

39. Which solution below has the highest concentration of hydroxide ions?
A. pH =3.21 B. pH =12.59 C. pH =7.93 D. PH= 9.82

40. How many grams of $Ca(OH)_2$ are contained in 1500ml of 0.0250M $Ca(OH)_2$ solution?
A. 1.85g B. 2.78g C.3.17g D.4.25g

41. What is the conjugate base of HSO^-_4?
A. H^+ B. H_2S0_4 C. OH^- D. $S0_4^{2-}$

42. What is the molality of a solution that contains 51.2g of naphthalene,($C_{10}H_8$) in 500ml of carbon tetrachloride? Given the density of $CC1_4$ = 1.60glml.
A. 0.25m B.0.50m C.0.75m D.0.84m

43. Which of the following titrations will have an equivalence point at a pH> 7.00?
A. Weak acid with strong base. C. Weak acid with a weak base
B. Strong acid with a strong base D. Strong acid withweak base

44. A 0.10M solution of a weak acid, HX, is 0.059% ionized. What is the dissociation constant for the acid?
A. $3.8xl0^{-9}$ B. $3.5xl0^{-8}$ C.$6.5xl0^{-7}$ D.$4.2xl0^{-6}$

45. How many moles are there in 159g of alanine, $C_6H_5NH_2$?
A. 0.560 B. 0.992 C.1.78 D.3.31

46. What is the normality of l.0M solution ofNa_2CO_3?
A. 1N B. 0.5N C.2N D.3N .

47. Which of the following substances could **N0T** be amphiprotic?
A. NO_3^- B H_2O C. NH3 D. HCO_3^-

48. For the acid - base equilibrium, $HCO_3^- + H_2O \rightleftharpoons H_2CO_3 + OH^-$, the Bronsted - Lowry acid are A. H_2O and OH^- B. HCO_3^- and OH^-
C. H_2O and H_2CO_3 D. HCO_3^- and H_2CO_3

49. The acide- base indicator bromocresol green is aweak acid . The yellow acid and blue base forms of the indicator are present in equal concentration in a solution when the PH is 4.68. What is the pK_a of bromocresol green
A. 4.48 B. 4.68 C. 5.68 D. 6.68

50. If $NaNO_2$ is added to a solution of HNO_2 , which of the following statement is true?
A. The pH of the solution increases C. The pH of the solution will decrease
B. The pH will remain the same D. The equilibrium will not be affected

51. If a solute dissolves in an endothermic process,
A. H bonds must exist between solvent and solute
B. Strong ion-dipole forces must exist in the solution
C. The entropy of the solution must be greater than that of its pure components
D. The solute must be a gas

52. The following data was collected at the end point of a titration performed to find molarity of an HCl solution.
Volume of acid (HCl) used = 1.4 mL
Volume of base (NaOH) = 22.4mL
Molarity of standard base (NaOH) = 0.20 M
On the basis of the above data ,what is the molarity of the acid solution?
A. 1.6 M B.0.64 M C. 0.31 M D. 0.13 M

53. An aqueous solution contains 0.100 M NaOH at 25.0 ºC. The pH of the solution is?
A. 0.100 B. 1.00 C. 7.00 **D**. 13.0

54. The pK_a of a weak monoprotic acid is 4.8 . What should be the ratio of [Acid]/[Salt] of buffer , if pH = 5.8 is required?
A. 0.1 B. 1.0 C. 2.0 D. 10

55. PKa value of three acids X, Y and Z are 4.5 , 3.5 and 6.5, respectively . Which of the following represents the correct order of acid strength ?
A. X > Y > Z B. Z > X > Y **C**. Y > X > Z D. Z > Y > X

56. What is the concentration of sodium chloride in water needed in order to produce an aqueous solution that has an identical osmotic pressure (isotonic) with blood (7.70) atm at 25 ºC ?
A. 0.003mol L^{-1} B. 0.006mol L^{-1} C. 0.1575 mol L^{-1} D. 0.315 mol L^{-1}

57. For the reaction $N_2 + 3H2 \quad 2NH3$ the rate of disappearance of H_2 is 0.01mol L^{-1} min^{-1}.
The rare of appearance of NH_3 would be
A. 0.01mol $L^{-1}min^{-1}$ B. 0.02mol $L^{-1}min^{-1}$ **C**. 0.007mol$L^{-1}min^{-1}$ D. 0.002 mol L^{-1} min^{-1}

58. The solubility of oxygen gas in water at 25^0C and 1.0 atm pressure of oxygen is 0.041 g/L. The solubility of oxygen in water at 3.0 atm and 25^0C is _____g/L.
A. 0.014 B. 0.31 C. 0.041 **D**. 0.123

59. According to the Arrhenius concept ,an acid is a substance that
A. is capable of donating one or more H^+ to any solvent
B. causes an increase in the concentration of H^+ in aqueous solutions
C. can accept a pair of electrons to form a coordinate covalent bond
D. reacts with the solvent to the cation formed by autoionazation of that solvent

60. The Ka of hypochlorous acid (HClO) is 3.0 × 10^{-8} at 25^0C. What is the % ionization of hypochlorous acid in a 0.015M aqueous solution of HClO at 25^0C ?
A. 2.1 × 10^{-5} **B**. 0.14 C. 1.4 × 10^{-2} D. 3.3 × 10^{-1}

61. Which one of the following combinations CANNOT produce a buffer solution ?
A. HCl O_4 and $NaClO_4$ B. HCN and NaCN
C. HNO_2 and $NaNO_2$ D. NH_3 and $(NH_4)_2SO_4$

62. How many moles of NH_4Cl must be added to 1.5L of 0.2M solution of NH_3 to form abuffer whose pH is 9.00 (K_b = 1.8 × 10^{-5}) ?
A. 0.36 B. 0.65 C. 0.54 D. 0.8

63. What is the ionization constant for a weak acid, HA, that is .60% ionized in 0.0950 M solution?
A. 2.69 × 10^{-3} B. 3.77 × 10^{-2} C. 2.47 × 10^{-5} D. 9.91 × 10^{-6}

64. In which direction will the following equilibrium shift ,if a solution of CH_3CO_2Na is added ?
$CH_3COOH(aq) \rightleftharpoons CHH_3CO_2^-(aq) + H^+(aq)$
A. The equilibrium shift to the right (more products) B. No change
C. The equilibrium shifts to the left (more reactant) D. Cannot be predicted

65. A. 1.0 x 10^{-4} M solution of a weak acid is found to dissociate by only 1.37%. Which of the following acid is likely to be?
A. HF K_a = 7.2 x 10^{-4} C. CH_3COOH K_a = 1.8 x 10^{-5}
B. HNO_2 K_a = 6.9 x 10^{-4} D. HCOOH K_a = 1.9 x 10^{-4}

66. A 1.0 x 10^{-4} M solution has a pH of 10.00 The solute is a
A. weak acid **B**. weak base C. strong base D. strong acid

67. Which of the following salt will be hydrolyzed to give acidic solution?
A.CH_3COONa B. CH_3COONH_4 **C**. NH_4Cl D. Na_2CO_3

68. Which of the following would NOT make a good buffer solution?
A.CH_3COO^- and CH_3COOH B. HCO_3^- and H_2CO_3
C. SO_4^{2-} and HSO_4^- D. NH_3 and NH_4^+

69. Which of the following will give the strongest conjugate base?
A. HNO_3 **B**. H_2O C.HSO_4^- D. CN^-

70. The dye bromthymol blue (HBb) is a weak acid whose ionization can be represented as
HBb(aq) (yellow) ⇆ H^+ (aq) + Bb(aq) (blue)
Which way ill the equilibrium shift when NaOH is added and what is the color of NaOH solution containing the dye
A. There will be no shift
B. The equilibrium will shift to the right and the color of the solution will be blue
C. The equilibrium will shift to the left and the color of the solution will be blue

D. The equilibrium will shift to the right , and thecolor of the solution will be yellow

71. Consider an indicator that ionized as shown below for which its K_a =1.0 x 10^{-4}

HIn(yellow) + H_2O ⇆ H_2O^+ + In^{-1} (red)

Which of the following statements is NOT true about the above equilibrium ?

A. The predominant color in its acid range is yellow

B. The pH at which the indicator changes color is pH =4

C. At pH =7 most of the indicator is in the un-ionized form

D. In the middle of the pH range of its color change , a solution containing the indicator will probably be change

72. In the following acid -base equilibrium, HCO_3^- + H_2O ⇆ H_2CO_3 + OH^-, the Bronsted-Lowry acids are

A. H_2O and OH^- B. HCO_3^- and OH^- C. H_2O and H_2CO_3 D. HCO^{---} and H_2CO_3

73. Which of the following is NOT both a Bronsted-Lowry acid and a Bronsted -Lowry base?

A. HSO4- B. H2PO4- C. HCO^{3-} D. OH-

74. The pH of a 0.10 M solution of a weak base is 9.82 . What is the K_b for this base?

A. 4.4 x 10^{-8} B. 3 x 10^{-7} C. 3 x 10^{-6} D. 3.4 x 10^{-5}

75. Which of the following is **NOT** both a Bronsted-Lowery acid and a Bronsted-Lowery base?

A. HS^- B. $HSO4^-$ C. OH^- D. HCO_3

76. A solution in which propanoic acid is 0.94% ionized has a PH of 2.85.what is the value of the acid ionization constant (Ka) for propionic acid?

A. 4.2x10^{-4} B. 6.8 x10^{-4} C. 1.3x10^{-5} D. 8.7x10^{-5}

77. A 0.2M solution of a weak acid HA is 1% ionized at 25oC. Ka for the acid is equal to:

A. $\frac{0.19}{0.01}$ B. $\frac{0.02 \times 0.02}{0.18}$ C. $\frac{0.01 \times 0.01}{0.19}$ D. $\frac{0.002 \times 0.002}{0.198}$

78. Which one of the following statement is true?

A. Addition of $(CH_3NH_3)Cl$ to a solution of CH_3NH_2 will decrease the PH.

B. Addition of NaNO2 to a solution of HNO_2 will decrease the PH.

C. Addition of HCl to a solution $NaC_2H_3O_2$ will increase the PH.

D. Addition of KBr to a solution of HBr will increase the PH.

79. During titration, what volume of 0.500M KOH is necessary to completely neutralize 10.0ml of 2.00M CH_3 COOH?

A. 10.0ml B. 20.0ml C. 40.0ml D. 25.0mL

80. If 49 grams of H_2SO_4 reacts with 80.0grams of NaOH, how much reactant will be left over after the reaction is complete?

A. 24.5g H2SO4 B. 40.0g NaOH C. 20.0g NaOH D. 60.0g NaOH

81. A solution of 10.0ml of 0.050M nitrous acid (HNO_2; PKa=3.34) is titrated with 0.050M KOH. What is the PH of the solution after 10ml KOH has been added?

A. 10.02 B. 6.68 C. 3.34 D. 13.36

82. Consider the following equilibria;

I. $HCO_3^- + H_2O \rightleftharpoons H_2CO_3 + OH^-$

II. $NH_4^+ + H_2O \rightleftharpoons H_3O^+ + NH_3$

III. $HSO_3^- + H_3O^+ \rightleftharpoons H_2O + H_2SO_3$ In each of the following equilibrium(equilibria) does water act as a bronsted- lowery base? A. II only B. Ionly C. II and III D. I, II,III

83. When a saturated solution of NaCl is heated, it be becomes?

A. A. unsaturated B. Supersaturated C. Remains saturated D. Attains equilibrium conditions

84. What is the PH of a 0.10M solution of NH3,a weak base, whose Kb=1.8x10^{-5}

A. 11.11 B. 4.76 C. 9.24 D. 2.89

85. The PH of a solution prepared by the addition of 100ml 0.002M HCl to 100ml distilled water is closest to:

A. 1.0 B. 1.5 C. 3.0 D. 2.0

86. Which of the following can function as both a bronster-Lowery acids and bases?

A. HSO4- B. H2SO4 C. SO4-2 D. H+

Chemistry grade-12 Entrance

Chapter-3

1. A gas is confined to a cylinder under constant atmospheric pressure. When the gas undergoes a particular chemical reaction, it releases 135kJ of heat to its surroundings and does 63 kJ of p-V work on its surroundings. What are the values of ΔH and ΔE for the process?
   A. ΔH= 135kJ, ΔE= 63kJ C. ΔH= 135kJ, ΔE = 198kJ
   B. H= -135kJ, ΔE= -63Kj D. ΔH= -135kJ, ΔE= -198kJ
2. Which statement about the following reaction is correct?
   $2Fe(s) + 3CO_2(g) \rightarrow Fe_2O_3(s) + 3CO(g)\ \Delta H^0 = +26.6kJ$
   A. 26.6kJ of energy are released for every mole of Fe reacted
   B. 26.6kJ of energy are absorbed for every mole of Fe reacted
   C. 53.2kJ of energy are released for every mole of Fe reacted
   D. 13.3kJ of energy are absorbed for every mole of Fe reacted
3. Which of the following is true about an open system?
   A. A system that can not exchanges both energy and matter with its surroundings
   B. A system that can not exchange both matter and energy with its surroundings
   C. A system that only exchanges matter with its surroundings
   D. A system that only exchanges energy with its surroundings
4. What is the value of ΔH for the reaction S (s) →S(g)?
   $S(s) + O_2(g) \rightarrow SO_2(g)$ ΔH = - 395kJ
   $S(g) + O_2(g) \rightarrow SO_2(g)$ ΔH = -618kJ
   A. -1013kJB. -223kJ C. +223kJ D. +1013kJ
5. Enthalpy is defined as the heat content of the system at constant:
   A. Heat B. Moles C. Pressure D. Volume
6. How many kilojoules of heat are absorbed when 20g of NaCl(s) is decomposed into Na(s) and $Cl_2(g)$ at constant pressure according to the following reaction?
   $2Na(s) + Cl_2(g) \longrightarrow 2NaCl(s)\ \Delta H = -802.8kJ$
   A. -281.0 B. -140.5 C. +140.5 D. +281.0
7. What is the quantity of heat required to raise the temperature of 80g of ethanol from 25^0c to 75 ^{0}c? (specific heat of ethanol = $2.46JgK^{-1}$)
   A. 2.46kJ B. 4.0kJ C. 9.84kJ D. 18.68kJ
8. Consider the following gaseous reaction at 25^0c:
   $CH_4(g) + 2O_2(g) \longrightarrow CO_2(g) + 2H_2O(g)\ \Delta H = -802kJ$
   Which energy change would occur if 3.2 moles of CH_4 is completely combusted?
   A. 2.57×10^2 kJ will be released C. 6.43×10^3 kJ will be released
   B. 2.57×10^2kJ will be absorbed D. 6.43×10^3 kJ will be absorbed
9. Which of the following reactions is expected to have negative value of entropy change (ΔS)?
   A. $C_6H_6(s) + 6O_2(g) \longrightarrow 6CO_2(g) + 6H_2O(g)$
   B. $CaCO_3(s) \longrightarrow CaO(s) + CO_2(g)$
   C. $N_2O_4(g) + Cl_2(g) \longrightarrow 2NOCl(g) + O_2(g)$
   D. $2SO_2(g) + O2(g) \longrightarrow 2SO_3(g)$
10. Gaseous petrol in a combustion system has done 375 kJ of work during its expansion in the piston. Simultaneously, it absorbed 586kJ of heat from the engine. What is the internal energy change during the process?
    A. +222kJ B. +961kJ C. -211kJ D. -961kJ
11. Under what conditions will the enthalpy change of a process equals the amount of heat transferred into or out of the system?
    A. Under constant volume C. Under constant pressure and volume
    B. Under constant pressure D. Under constant pressure and temperature.
12. For the reaction A + B →C + D, ΔH^0=+40kj and ΔS^0 = + 50J/K Therefore, the reaction under standard conditions is
    A. Spontaneous at all temperatures D. Nonspontaneous at all temperatures.
    B. Spontaneous at temperatures greater than 800K. C. Spontaneous only at temperatures between 10K and 800K.

13. What is the change in internal energy, ΔE of a system if it absorbs 300 KJ of heat from the surroundings and does 500 KJ of work on the surroundings?
    A. 100KJ B. -200 KJ C. 400 KJ D. 500 KJ
14. Why does a pressure cooker reduce cooking time?
    A. The heat is more evenly distributed C. The high pressure tenderizes the food
    B. A stronger flame is used for cooking D. The boiling point of water inside the cooker is increased
15. Which of the hydrogen halide has the highest enthalpy of vaporization?
    A. HI B. HBr C. HCI D. HF
16. Which of the following statement is NOT true according to 1st law of thermodynamics?
    A. Energy can neither be created nor destroyed although it can be change from one form to another.
    B. The total energy of the universe is constant.
    C. The change in the internal energy of a closed system is equal to the sum of heat absorbed by the system and work done by the system.
    D. The change in internal energy of a system is zero in all the processes.
17. What is the bond order of O_2+?
    A. 2 . B. 2.5 C. 1.5 D. 3
18. Which of the following is characteristic of an anti-bonding molecular orbital?
    A. It is a molecular orbital with a high probability of finding e^- parallel to the region between bonded atoms.
    B. It has no electrons
    C. It is a molecular orbital with a high probability of finding e- away from the region between bonded atoms.
    D. It is a molecular orbital with a high probability of finding electrons in the region between bonded atoms.
19. The enthalpy change for which reaction represents the standard It. enthalpy of formation for hydrogen cyanide, HCN?
    A. H(g)+C(graphite) +N(g) -+HCN(g) C. HCN(g) $\rightarrow$ 1/2 H_2(g) +C(graphite) + 1/2 N_2(g)
    B. 1/2 H_2(g)+C(graphite) + 1/2N2(g) $\rightarrow$HCN(g) D. H $_2$(g) + 2C (graphite) +N_2(g) $\rightarrow$2HCN(g)
20. What is the standard entropy change for the reaction: $2S0_2(g)+0_2(g) \rightarrow 2S0_3(g)$
    Given the following data: (So of SO_2 (g) =248.IJ/(mol.K); S^0 of 0_2 (g) = 205.0J/(mol.K); S^0 of $S0_2$(g) =256.6J/(mol.K)
    A. -188.0JIK B. +l7:0JIK C. -1965.5JIK D. +60.IJIK
21. A system which can change both matter and energy with its surrounding is said to be a/an
    A. isolated system B. open system C. ideal system D. closed system
22. The enthalpy of combustion of solid carbon to form carbon dioxide is - 393.5KJ/mol carbon and the enthalpy of combustion of carbon monoxide to form carbon dioxide is - 283.3KJ/mol CO. What will be the enthalpy change , Δ H for the reaction?
    $2C(s) + O_2(g) \rightarrow 2CO(g)$
    A. - 110.4KJ B. - 220.8KJ C. + 172.9KJ D. + 1354.0KJ
23. For the conversion of C (diamond) C (Graphic), ΔH =-3KJ. What does this mean?
    A. Both are equally stable C. Diamond is more stable than graphite
    B. Graphite is more stable than diamond D. Graphite has more stable energy than diamond
24. If the enthalpy change for a certain reaction A $\rightarrow$ B is 2kJat 300K, what would be the entropy change in the surrounding?
    A. -40J/K B. 40J/K C. -3.6 X 10^6 J/K D. 3.6 X 10^6J/K
25. The enthalpies of formation of gaseous N_2O and NO at 298 K are 82 and 90KJ/mol. respectively. The enthalpy change for the reaction $N_2O_{(g)}$ + 1/2 $O_{2(g)} \rightarrow 2NO_{(g)}$ is
    A. -8KJ B. 98KJ C. -74KJ D. 8KJ
26. Sodium acetate spontaneously crystallizes out of a supersaturated solution on standing .Which of the following is true for for thermodynamic quantities of this system for such a process?
    A. $\Delta S < 0, \Delta H < 0$ B. $\Delta G < 0, \Delta H > 0$ C. $\Delta S > 0, \Delta G < 0$ D. $\Delta S > 0, \Delta H > 0$
27. Which one of the following statements best describes the standard enthalpy of formation of any element?
    A. The value of ΔH^0_f (element) depends on temperature
    B. The value of ΔH^0_f (element) is zero for any element in the standard state
    C. The value of ΔH^0_f (element) is zero only for element in the solid state
    D. The value of ΔH^0_f (element) is zero only at absolute zero temperature
28. A drug used to treat hypertension undergoes a decomposition reaction to give an insoluble product. What is the temperature at which this reaction becomes spontaneous if the enthalpy of the reaction at 298 K is 51 kJ mol^- and the entropy of the reaction at this temperature is 118.74 JK^{-1} mol^{-1} ?
    A. 375 K B. 430 K C. 525 K G. 530 K

29. What happens to the value of ΔH for a thermochemical reaction if the reaction is reversed ?
    A. ΔH has the same numerical value , and the sign changes
    B. ΔH has the same numerical value , and the sign reactions the same
    C. ΔH is the reciprocal of the original value, and the sign changes.
    D. ΔH is the reciprocal of the original value , and the sign remains the same.
30. The first law of thermodynamics is based on which of the following principles?
    A. Action and reaction B. Conservation of mass
    C. Conservation of energy D. The entropy -temperature relationship
31. A system that does NOT exchange matter or energy with its surrounding is called an -------- system.
    A. adiabatic B. isolated C. isothermal D. isotonic
32. Calculate ΔH for the following reaction using the bond energies given below:
    H-H(g) + I-I(g) ⟶ 2H-I(g)
    Bond energies: H-H=436KJ/mol, I-I=151KJ/mol, H-I=297KJ/mol
    A. +290KJ B. -7KJ C. +7KJ D. -290KJ
33. is the standard cell potential for the oxidation of ammonia, given below?
    $4NH_3 + 3O_2 \longrightarrow 2N_2 + 6H_2O$, ΔG=-1356KJ
    3.51V B. 1.17V C. 7.02V D. 14.04V
34. Which of the following statement is true?
    A. If the entropy of the system increases during a reversible process, the entropy change of the surroundings decrease by the same amount.
    B. If the entropy of the system increases during a reversible process, the entropy change of the surroundings increase by the same amount.
    C. If the entropy of the system increases during a reversible process, the entropy change of the surroundings will remain the same.
    D. If the entropy of the system decreases during a reversible process, the entropy change of the surroundings decrease by the same amount.
35. What is the change in internal energy of a system that releases 12.4J of heat and does 4.2J of work on the surrounding
    A. -16.6J B. 8,2J C. 16.6J D. -8.2J
36. Based on the information given in the table below, what is the enthalpy change for the reaction:
    $2H_2O_2(g) + S(s) \rightarrow SO_2(g) + 2H_2O(g)$

substance	ΔH0f(KJ/mol)
$H_2O_2(g)$	-150
$SO_2(g)$	-300
$H_2O(g)$	-250
S(s)	0

    A.200KJ B. -200KJ C. -500KJ D. 400KJ
37. What does it mean by ΔH=negative for a given process?
    A. The process is exothermic C. The process is exothermic
    B. The process is Adiabatic D. The process is equithermic

Chemistry grade-12 Entrance

Chapter-4

1. The electrolysis of molten NaCl is an industrial process. what does the electrolysis product?
   A. Na and Cl_2 B. H_2 and O_2 C. Na+andCl^-D. NaOH and Cl_2
2. For which conversation is an oxidizing agent required?
   A. $2H^+(aq) \rightarrow H_2(g)$ C. $SO_3(g) \rightarrow SO_4^{2-}(aq)$
   B. $2Br^-(aq) \rightarrow Br_2(aq)$ D. $MnO_2(s) \rightarrow Mn_2^+(aq)$
3. The oxidation numbers of nitrogen in NH_3, HNO_3 and NO_2 are _____ respectively.
   A. -3, -5, +4 B. +3, +5, +4 C. -3, +5, -4 D. -3, +5, +4
4. The two standard electrode potentials involved in the nickel- cadmium rechargeable cell are given below. Calculate the ΔG^0 in kJ of the cell.
   $NiO_2(s) + 2H_2S(1) + 2e^- \rightarrow Ni(OH)_2(s) + 2OH^- E^0 = +0.49v$
   $Cd(OH)_2(s) + 2e^- \rightarrow Cd(s) + 2OH^-(aq) E^0 = -0.76v$
   A. -184 B. -153 C. -241 D. -206
5. Which one of the following reactions is NOT a redox reaction?
   A. $Ag^+(aq) + Cl^-(aq) \rightarrow AgCl(s)$ C. $Mg(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2(g)$
   B. $2Na(s) + Cl_2(g) \rightarrow 2NaCl(s)$ D. $Cu^{2+}(aq) + Zn(s) \rightarrow Cu_{(s)} + Zn^{2+}(aq)$
6. The half – reaction for formation of magnesium metal upon electrolysis of molten $MgCl_2$ is :
   $Mg^{2+} + 2e^- \longrightarrow Mg$
   What is the mass of magnesium formed upon passage of a current of 60.0 A for a period of 2.00×10^3 s?
   A. 5.0g B. 10.0g C. 15.1g D. 30.2g
7. Which of the following is NOT a characteristic of the electrolytic cell containing aqueous solution of NaCl used in the manufacture of sodium hydroxide?
   A. The sodium hydroxide solution is produced in the electrolytic cell
   B. The electrolyte must be a dilute solution of NaCl
   C. Hydrogen is produced at the cathode
   D. The production of chlorine gas occurs at the anode
8. Which of the following metals is NOT obtained by commercial electrolytic process?
   A. Ag B. Al C. Cu D. Na
9. A 1 M solution of Cu $(NO_3)_2$ is placed in a beaker with a strip of Cu metal. A 1M of $SnSO_4$ is placed in a second beaker with a strip of Sn metal. The two beakers are then connected by a salt bridge and the two metal electrodes are connected by wires to a voltammeter. Which of the following electrode serves as the anode and which electrode gain mass?
   Given that $E^0 Cu^{2+}/Cu = 0.34V$ and $E^0 sn^{2+}/Sn = -0.14V$
   A. Anode, Sn,Sn electrode gains mass C. Anode, Cu, Sn electrode gains mass
   B. Anode, Sn Cu electrode gains mass D. Anode, Cu, Cu electrode gains mass
10. In the electroplating of nickel from a solution containing Ni^{2+}ion, what will be the weight of the metal deposited on the cathode by a current of 8A flowing for 500minutes?
    A. 73g B. 103g C. 117.4g D. 145g
11. Consider the following unbalanced redox reaction in acidic solution:
    $Mn_4^- + Fe2+ \longrightarrow Mn^{2+} + Fe^{3+}$
    What is the change in oxidation state for both the substances oxidized and reduced, and the coefficients of Fe2+ and Mn2+ respectively, after balancing?
    A. 2 and 7, and 2 and 5 B. 3 and 2, and 5 and C. 1 and 5, and 5 and 1 D. 2 and 5, and 5 and 2
12. For the following hypothetical equation, in aqueous solution, what is the correct representation of the cell notation?
    $A(s) + B_2+(aq) \longrightarrow A^{2+}(aq) + B(s)$
    A. $A(s)|A^{2+}(aq)||B^{2+}(aq)|B(s)$ C. $A^{2+}(aq) | A(s) || B(s) | B^{2+}(aq)$
    B. $B^{2+}(aq)| B(s)|| A^{2+}(aq) | A(s)$ D. $B(s) | B^{2+}(aq) || A^{2+}(aq) | A(s)$
13. What reactions occur at the anode and cathode when an aqueous solution of Na_2SO_4 is electrolyzed?

		E^0red
I.	$S_2O8^{2-} + 2e^- \longrightarrow 2SO_4^{2-}$	2.01V
II.	$O_2 + 4H^+ + 4e^- \longrightarrow 2H_2O$	1.23V
III.	$2H2O + 2e^- \longrightarrow H_2 + 2H^-$	-0.83V
IV.	$Na^+ + e^- \longrightarrow Na$	-2.71V

A. H_2 at cathode and O_2 at anode C. H_2 at cathode and $S_2O_8^{2-}$ at anode

B. Na at cathode and $S_2O_8^{2-}$ at anode D. Na at cathode and O_2 at

14. If ACr^{2+} (aq) solution is ectrolyzed us· g a current of 15.A, then what mass of chromium, ted out after 3 days?

A.400g B. 700g C. 800g D.2100g

15. Which of the following has the greatest number of atoms?

A. 4g of hydrogen B. 24gof ozone C. 40g of calcium D. 127gof iodine

16. Consider the following half -reactions:

Fe (H0)2 (s) + 2e- ~ Fe (s) + 20H-(aq), E^0_1 = -0.88V

$Ni0_2$ (s)+$2H_20$ (I) +2e- ~Ni(0H)2 (s) + 20H-(aq), E^0 = +0.49V

What is the standard cell potential for a voltaic cell using these electrodes?

A. -1.37V B. -0.39V C. O.4 D. 1.37V

17. What is the standard entropy change for the reaction: $2S0_2(g)+02(g) \rightarrow 2S0_3(g)$

Given the following data: (So of SOlg) =248.IJ/(mol.K); SO of 02(g) = 205.0J/(mol.K); SO of$S0_3(g)$ =256.6J/(mol.K)

A. -188.0JIK B. +l7:0JIK C. -1965.5JIK D. +60.IJIK

18. The standard reduction potential of Zn_2^+ / Zn is (-0.76) V and that of Cu^{2+} /Cu is +0.34V. What would be the electromotive force (emf) of the cell constructed between these two electrodes?

A. 1.1OV B. 0.42V C. -l.lOV D. -0.42V

19. At constant T and P, which one of the following statements about the enthalpy (~H) and internal energy (~U) changes is correct for the reaction? CO (g)+ 1/2 0_2(g) $\rightarrow C0_2g$)

A. H = U B. H < U C.H > U·

D. .H and U are independent of physical states of the reactants

20. Which one of the following conditions regarding a chemical process ensures its spontaneity at all temperatures?

A. H < O,~S < O B. H > O,S <O C. H < O,S > O D. H > O,S > O

21. Which equation represents an oxidation - reduction reaction?

A. $H_2SO_4+2NH_3$~$(NH_4)2SO_4$ C. $2K2CrO_4+ H_2S0_4$~$K2Cr2O7+K2SO_4+H_2O$

B. $H_2SO_4+Na2CO3$~$Na2SO4+H_2O+CO_2$ D. $2\ H_2SO_4+CU$~$CuSO4\ +2H_2O+SO_2$

22. An electrochemical cell constructed for the reaction:

Cu^2+(aq)+M(s) $\rightarrow$Cu(s)+M2+(aq)

Has an E^0_{cell}= 0.75V. The standard reduction E^0 red potential for

A Cu^2+(aq) is 0.34V. What is the standard reduction potential for *(M^{+2} (g)*/ M ?

A. -1.09V B. -0.41OV C.O.4lOV D.1.09V

23. What is the correct order when the substances 02,H_20,OF_2, and H_20_2 are arranged in order of increasing oxidation number for Oxygen?

A. 02,H_2O,OF_2,H_2O_2 B. H_2O,H_2O_2,O_2,OF_2 C. H_2O_2,O_2,H_2O,OF_2 D. OF_2,O_2,H_2O_2,H_2O

24. Consider the standard voltaic (or galvanic) cell: Fe,Fe^2+ versus, Au,Au^3+. Which answer identifies the cathode and gives the E^0 red for the cell?

Given *EO(Au3+/Au)* = 1.50 V, E^0 (Fe^2+/Fe) = -0.44V .

A. Fe,-0.44V B. Au, 1.06V C. Au, 1.94V D. Fe, 1.94V

25. The process of solute particles being surrounded by solvent particles is known as

A. saturation B. agglomeration C. solvent D. dehydration

26. What kind of energy is converte in galvanic cell?

A. Chemical energy is converted into electrical energy

B. Chemical energy is converted to heat

C. Chemical energy is obtained from heat

D. Electrical energy is converted into chemical energy

27. The decreasing order of electrochemical characteristics of some metals is given as : Mg > Al > Zn > Cu > Ag . What will happen if a cooper spoon is used to stir a solution of aluminum nitrate (Al $(NO_3)_3$) ?

A. There is no reaction C. The spoon will get coated with aluminum

B. The solution becomes blue D. An alloy of cooper and aluminum is formed

28. Which of the following statement is ture ?

A. All forms of electromagnetic radiation are visible

B. Radio waves have shorter wavelength than visible light

C. Ultraviolet light has longer wavelengths than visible light

D. The frequency of radiation increases as the wavelength decreases

29. A solution in an electrolytic cell contains Cu^{2+} (E^o = 0.34 V), Ag^+ (E^o = 0.80 V), and Zn^{2+} (E^o = -0.76 V). If the voltage is initially very low and slowly increased , in which order will the metals be plated out onto the cathode?

A. $Zn^{2+} > Cu^{2+} > Ag^+$ B. $Ag^+ > Zn^{2+} > Cu^{2+}$

C. $Cu^{2+} > Zn^{2+} > Ag^+$ C. $Ag^+ > Cu^{2+} > Zn^{2+}$

30. During the electrolysis of an aqueous solution of copper sulphate using platinum electrodes, the reaction takes place at the anode is

A. $CU^{2+} + 2e^- \rightarrow CU$ B. $CU \rightarrow CU^{2+} + 2e^-$

C. $2H_2O \rightarrow 4H^+ + O_2 + 4e^-$ D. $4H^+ + O_2 + 4e^- \rightarrow H_2O$

31. .Standard electrode potential for Sn^{4+}/Sn^{2+} couple is +0.15v and that for the Cr^{3+}/Cr couple is -0.74v. These two couples in their standard state are connected to make a spontaneous electrochemical reaction. The cell potential will be

A. +1.83v B. +1.19v C. +0.89v D. +0.18v

32. What mass of magnesium is plated out upon elecrolysis from molton $MgCl_2$ using acurrent of 60 A for a period of 4000 seconds?

A. 30g B. 24g C, 60g D. 72g

33. For a voltaic (or galvanic) cell using Ag ,Ag^+ (1.0 M) and Zn, Zn^{2+} (11.0 M) half -cells, which of the following statements is INCORRECT?

A. The zinc electrode is the anode

B. Electrons ill flow through the external circuit from the zinc electrode to the silver elecrode.

C. The mass of the zinc electrode will increase as the operates .

D. Reduction occurs at the zinc electrode as the operates.

34. For the galvanic cell shown below , which one of the following statements is correct?

A. At the zinc electrode , zinc ions are formed

B. The electrode potential is measured by the voltmeter

C. The following reaction takes place at the magnesium electrode $Mg^{2+} + 2e^- \rightarrow Mg$

D. Electrons flow from zinc electrode to the magnesium electrode

35. What is the purpose of a salt bridge in an electrochemical cell?

A. To provide a source of ions to react at the anode and cathode.

B, To maintain electrical neutrality in a half -cell through migration of ions

C. To provide means of electrons to travel from the cathode to the anode

D. To provide means of electrons to travel from the anode to the cathode

36. The standard cell potential (E^0) for the reaction below is 1.10V. What is the cell potential for this reaction when $[Cu^{2+}] = 1 \times 10^{-5}$ M and $[Zn^{2+}] = 1$M ?

$Zn(s) + Cu^{2+}(aq) \rightarrow Zn^{2+}(aq) + Cu(s)$

A. 1.10 B. 0.95 C. 1.20 D. 1.35

37. Which of the following statements is true?

A The more positive the value of E_{red}^0 , the greater the driving force for reduction

B. The more exothermic the value of E_{red}^0 , the greater the driving force for reduction

C. The more endothermic the value of E_{red}^0 , the greater the driving force for reduction

D. The more negative the value of E_{red}^0 , the greater the driving force for reduction

38. Which of the following types of elements are good oxidizing agents?

A. Alkali metals B. Halogens C. Lanthanides D. Transition elements.

39. Which of the following is NOT true about the electrolysis of copper sulphate solution using copper electrodes?

A. Copper metal is deposited at the cathode

B. The concentration of copper at the cathode decreases

C. The copper metal dissolves leaving electrons at cathode

D, The impure copper at anode is turned to pure copper at the cathode

40. Of the following , which is the WEAKEST oxidizing agent?

A. $HNO_3(aq)$ B. H_2O_2 (aq) C. I_2 (s) D. Mg(s)

41. Which of the following metals CANNOT be electroplated on to the surface of another metal using an aqueous electrolyte?

A. Ag B. Cu C. Ni D. Mg

42. Which of the following statements is true in the electrolytic decomposition of water?

A. Oxygen is formed at both the anode and the cathode

B. Hydrogen is formed at both the anode and the cathode

C. Hydrogen is formed at the cathode and oxygen is formed at the anode

D, Hydrogen is formed at the anode and oxygen is formed at the cathode

43. When an electric current is passed through a solution of potassium iodide (KI) containing some phenolphthalein indicator , a brown colour is observed at one of the electrodes . Which one of the following reactions is occurring at this electrode?

A. $2H_2O + 4I^- 2I_2^+ \rightarrow 2OH^- + H_2 + 2e^-$ C. $KI + I^- + K$

B. $2H_2O + 2e^- \rightarrow H_2 + 2OH^-$ D. $2I^- \rightarrow I_2 + 2e^-$

44. What is the half- reaction that occurs at the anode during the electrolysis of molten sodium bromide?

A. $2Br^- \rightarrow Br_2 + 2e^-$ B. $Br_2 + 2e^- \rightarrow 2Br$

C. $Na^+ + e^- \rightarrow Na$ D. $Na \rightarrow Na^+ + e^-$

45. Chlorine has an oxidation number of +5 in :

A. NaClO B. $NaClO_3$ C. $NaClO_2$ D. $NaClO_4$

46. When a sodium chromate (Na_2CrO_4) solution is acidified, its is converted to:

A. Cr(s) B. $Cr_2O_7^{2-}$ C. CrO_3 D. Cr_2O_3

47. During the electrolysis of a concentrated aqueous solution of NaCl, what substance is formed at the cathode?

A. Hydrogen B. Oxigen C. Chlorine D. Sodium

48. In a voltaic cell, electrons flow from the……..to the……..

A. Salt bridge, anode B. Salt bridge, cathode C. Anode, salt bridge D. Anode , cathode

49. During the electrolysis of $CuSO_4$(aq)using carbon electrodes, which of the following is the correct half reaction for the anode electrode?

A. $Cu^+(aq) + 2e^- \longrightarrow Cu(s)$

B. $4OH^-(aq) \longrightarrow 2H_2O(l) + 4e^-$

C. $2H_2O(L) \longrightarrow O_2(g) + 4H^+(aq) + 4e^-$

D. $SO_4^{2-}(aq) + O_2(g) + 4H^+(aq) \longrightarrow SO_4^-(aq) + 2H_2O(L)$

50. Two electrolytic cells were placed in series, one of $AgNO_3$ and the other of $CuSO_4$. If 1.273g of Ag is deposited, how much Cu was deposited at the same time?

A. 0.0118 B. 0.954 C. 0.748 D. 0.374

51. How long has a current of 3ampere to be applied through a solution of silver nitrate to coat a metal surface of 80 cm^2 with 0.005cm thick layer? Density of Ag=10.5g/cm_3.

A. 476 sec B. 1028sec C. 1252sec D. 683sec

52. Which one of the following is true?

A. Entropy increases when a liquid freezes at its melting point B. For a spontaneous process $\Delta G>$.

C. Entropy of the pure crystalline solid is zero at $0c^0$ D. For spontaneous process ΔS.

53. A certain current produces 0.50g of hydrogen gas in 2.0hrs. what is the amount of copper librated from a solution of copper sulfate by the same current flowing for the same time?

A. 15.9g B. 63.6g C. 31.8g D. 6.36g

54. For which of the following half-cell is the reduction potential E independent of the PH of the solution?

A. $[Cr_2O_7]^{2-} + 14H^+ + 6e^- \rightleftharpoons 2Cr^{3+} + 7H_2$ C. $[NO_3]^- + H_2O + 2e^- \rightleftharpoons [NO_2]^- + 2[OH]^-$

B. $Co^{2+} + 2e^- \rightleftharpoons Co$ D. $H_2O_2 + 2H^+ + 2e \rightleftharpoons 2H_2O$

55. Which of the following metals cannot be electroplated on to the surface of another metal using an aqueous electrolyte?

$E^0(Ni_2+/Ni)=-0.28V$; $E^0(Cu+/Cu)=0.34v$ and $E^0 (Mg^{2+}/Mg) = -2.37V$; $E^0 (Ag^+/Ag)=0.80V$

A. Mg B. Cu C. Ni D. Ag

56. A nickel electrode can undergo oxidation to Ni^{2+} ion as follows:

$Ni(s) \longrightarrow Ni_2+ (aq) + 2e^- \quad E^0_{red}=-0.28V$

$2H_2O(l) \longrightarrow 4H^+(aq) + O_2(g) + 4e^- \quad E^0_{red}= 1.23V$

57. What will happen during the electrolysis of concentrated aqueous solution of NiSO4 using Ni electrodes?

I Nickel will deposit at the cathode. C. Oxygen will be released at the anode

II. Nickel will dissolve at the anode. D. Nickel will deposit at the anode.

A. I only B. I,II C. II,IV D. I,III

58. Features common to both galvanic and electrolytic cells include which of the following?

I. Oxidation at the anode II. Can perform electrolysis III. Spontaneous

A. III only B. II only C. I only D. I and II only

59. Which of the following is the correct reaction taking place at the electrodes during the electrolysis of dilute sodium

chloride solution?

A. Anode: $2Cl^-(aq) \longrightarrow Cl_2(l) + 2e^-$ & Cathode: $2Na^+(aq) + 2e^- \longrightarrow 2Na(s)$

B. Anode: $2Cl^-(aq) \longrightarrow Cl_2(l) + 2e^-$ & Cathode: $2H_2O(l) + 2e- \longrightarrow H_2(g) + OH^-(aq)$

C. Anode: $2H_2O(l) + 2e^- \longrightarrow O_2(g) + 4H^+(aq) + 4e-$ & Cathode: $2H_2O(l) + 2e- \longrightarrow H_2(g) + OH^-(aq)$

D. Anode: $2H_2O(l) + 2e- \longrightarrow O_2(g) + 4H^+(aq) + 4e^- \longrightarrow$ & Cathode: $2Na^+(aq) + 2e^- \longrightarrow 2Na(s)$

60. The oxidation state of chlorine in $HClO_4$ is:

A. +1 B. +3 C. +7 D. +5

Chemistry grade-12 Entrance
Chapter- 5

1. The simplest formula for a compound containing Mn^{+4} and O_2 is
   MnO B. MnO_2 C. $Mn_2)_4$ D. Mn_4O_2
2. Which one of the following chemicals is used to disinfect water?
   A. Fluorine B. Nitrogen C. Oxygen D. Chlorine
3. Which of the following metals forms a volatile compound during the extraction process?
   A. Fe B. Co C. Ni D. Cu
4. Which of the following metals is extracted by thermal reduction process?
   A. Cu B. Fe C. Al D. Mg
5. Which of the following metals has the highest electrical and termal conductivities of any Metal? A. AgB. Cu C. Ni D. Co
6. Which of the following is the most important source for the extraction of iron?
   A. Hematite B. Bauxite C. Chalcopyrite D. Sphalerite
7. Which of the following gases is manufactured using the Haber process?
   A. Ammonia B. Nitric oxide C. Nitrogen D. Nitrogen dioxide
8. Which of the following elements is the second most abundant element in the earth's crust?
   A. Aluminum B. Iron C. Oxygen D. Silicon
9. Which of the following metals has the highest electrical and thermal conductivities?
   A. Ag B. Co C. Cu D. Ni
10. Which of the following metal alloys does NOT contain tin?
    A. Brass B. Bronze C. Pewter D. Plumber's solder
11. Which of the following is the most important ingredients used for production of DAP fertilizer?
    A. Ammonia and phosphoric acid C. Phosphoric acid urea and ammonia
    B. Nitric acid, urea and phosphoric acid D. Sulphuric acid, ammonia and urea
12. Consider the following reaction:
    $I_2O_5(s) + 5CO\ (g) \longrightarrow I_2(s) + 5CO_2(g)$
    What is the magnitude of the change in the oxidation number of the elements?
    A. I,+5 to 0,C,+2to+4 C. I,+0 to 0,C,+2 to+4
    B. I,+5to 0,C,+4to+4 D. I,+0to 0,C,+2to+4
13. Consider the following oxidation-reduction equation:
    $2H_2O_{(l)}+Al(s)+MnO_4\ (aq)+ \rightarrow AlOH_4(aq)+MnO_2(s)$
    What are the reducing and the oxidizing agents in this reaction?
    A. Al(s) is the reducing agent and H_2O is the oxidizing agent
    B. Al(s) is the oxidizing agent and H_2O is the reducing agent
    C. Al(s)is the oxidizing agent and $MnO_4^-(aq)$ is reducing agent
    D. Al(s) is the reducing agent and $MnO_4(aq)$ is the oxidizing agent
14. A solution at 25^0C contains the metal ions $N1^{-2+}$, Pt^{2+} and Pd^{2+}, all at 1.0 M concentrations. Consider the following standard reduction potentials:
    $N1^{-2+} + 2e^- \longrightarrow Ni \quad E^0 = -0.23V$
    $Pt^{+2} + 2e^- \rightarrow Pt \quad E^0 = -0.20V$
    $Pd^{2+} + 2e^- \longrightarrow Pd \quad E^0 = -0.99V$
    Which metal(s) will plate out first when the solution is electrolyzed?
    A. Ni B. Pd C. Pt D. Ni and Pd
15. Which of the following statements is true?
    A. A battery is rechargeable
    B. A battery is produces electricity
    C. A battery has generally no liquid components.
    D. A battery produces the same amount of electricity, regardless of composition.
16. All of the following when added to water will produce an electrolytic solution EXCPT
    A. $N_2(g)$ B. Nal(s) C. HCl(g) D. KOH(s)
17. What mass of aluminum is produced in one hour by the electrolysis of molten $AlCl_3$ with a current of 10A?
    A. 1.5 g B. 2.5 g C. 3.4 g D. 4.3 g

18. Consider the following balanced equation.
$3Ba(NO_3)_2$ (aq) → $Fe_2(SO_4)_3$ (aq) →$3BaSO_4$(s) + $2Fe(NO_3)_3$(aq
The net ionic equation to describe this balanced equation is
A. $3Ba^+$ (aq) + SO_4^{2-} (aq) → $3BaSO_4$(s)
B. $3Ba^{2+}$ (aq) + $3SO_4^{2-}$ (aq) → $3BaSO_4$(s)
C. $6NO_3^-$ (aq) + $2Fe^{2+}$ (aq) → $2Fe(NO_3)_3$ (aq)
D. $3Ba^{2+}$(aq) + $2NO_3^-$ (aq) + $2Fe^{3+}$ (aq) +$3SO_4^{2-}$ (aq) → $3BaSO_4$ (s) + 2Fe+ (aq) + $6NO_3^-$ ($_{aq}$)
19. How can silver can be plated onto nickel?
A. Electricity to a nickel anode in a solution of silver ions.
B. Electricity to a silver anode in a solution of nickel ions
C. A solution of nickel ions to react with a pice of silver
D. Electricity to a nickel cathode in a solution silver ions
20. Which of the following ions is the most abundant in sea water?
A. Na^- B. Ca^{2+} C. CT D. HCO_3^-
21. Which alkaline earth metal shares diagonal relationship with aluminium?
A. Ba B. Be C. Ca D. Mg
22. Which is the metal ion in the porphyrin of heme?
A. Calcium B. Iron C. Molybdenum D. Magnesium
23. Which group of elements are the most reactive of all the metallic elements?
A. Alkali metals C. transition metals
B. Alkaline earth metals D. group 2B metals
24. In the process known as 'roasting' ,a (n) __ is chemically converted to a (n).
A. Carbonate /oxide C. sulfide /oxide
B. Oxide/ sulfate D. phosphate /phosfide
25. Why are silicate minerals NOT commonly used as sources of metals?
A. They are rare minerals.
B. They usually do not contain important metals.
C. They are difficult to reduce and concentrate.
D. They are only found at excessive depths in the oceans.
26. Which of the following metals is the best conductor of heat and electricity?
A. Copper B. silver C. Gold D. Tungsten
27. $HN0_3$ is used as:
I. a hydrogenating agent. II. An oxidizing agent.
II. An acid IV. An ammoniating agent
A. II and III B. I and II C. I, II, III and IV D. II, III and IV
28. Which metal can be found as the free element?
A. Cr B. Fe C. Mn D. Pt
29. The conversion of nitrogen gas to nitrates by bacteria is called
A. nitrification B. nitrogen fixation C. excretion D. dentrification
30. The most abundant metal on the surface of the earth is
A. Fe B. Al C. Ca D. Na
31. Which one of the following metals is extracted by thermal reduction process?
A. Al B. Cu C. Fe D. Mg
32. Which of the following gases is manufactured using the Haber process?
A. Ammonia B. Nitric oxide C. Nitrogen D. Nitrogen dioxide
33. What is the final concentration of Cl^- ion when 250 ml. of 0.20 M $CaCl_2$ solution is mixed with 250ml. of 0.40 M KCl solutions?(Assume additive volumes)
A. 1.60M B. 0.40 M C. 0.20 M D. 0.60 M
34. The concentration of nitrate ion in a solution that contains 0.900 M aluminum nitrate is
A. 0.90 B. 0.49 C. 0.30 D. 2.70
35. Electrolysis of dilute aqueous NaCl solution was carried out by passing 10 mill ampere current . The time required to liberate 0.01 mol of H_2 gas at the cathode is
A. 9.65 X 10^4 s B. 19. 3 X 10^4 s C. 28.95 X 10^4 s D. 38.6 X 10^4 s
36. Which of the following metals forms a volatile compound that is taken as an advantage for its extraction?
A. Co B. Fe C. Ni D. W

37. Which of the following metals is NOT obtained by commercial electrolytic process?
    A. Ag B. Al C. Cu D. Na
38. Which of the following plant nutrient will be produced as a result of nitrogen fixation?
    A. Carbohydrate B. Cellulose C. Mineral D. Protein
39. Which is the most common ore used for the extraction of copper?
    A. CuO B. $CuSO_4$ C. $CuCO_3$ D. $CuFeS_2$
40. Which of the following material has maximum ductility?
    A. Nickel B. Aluminum C. Mild steel D. Copper
41. The four most abundant metals in the earth′s crust in decreasing order of abundance are:
    A. Oxygen, Silicon, Aluminum, and Iron
    B. Aluminum, Iron, Calcium, and Magnesium
    C. Iron, Aluminum, Silicon. and Oxygen
    D. Silicon, Aluminum, Magnesium ,and Sodium
42. What is galvanized iron?
    A. Iron that is coated with tin B. Iron that is coated with zinc
    C. Iron that is coated with chromium D. Iron that is coated with aluminum
43. Sulphuric acid is prepared industrially by contact process. In this process, sulphur will be oxidized to SO_3 by excess oxygen . Why is SO_3 formed in this process NOT absorbed directly in water to form H_2SO_4 ? Because
    A. V_2O_5 catalyst does not remove all impurities
    B. when SO_3 dissolves in water , it produce high heat and is difficult to liquefy
    C. the reaction that produces SO_3 is exothermic and unable to produce $H_2S_2O_7$
    D. the direct reaction of SO_3 with water prohibits the formation of $H_2S_2O_7$
44. Which oxide of a metal gets reduced only by coke and not by H_2 gas or CO gas?
    A. Fe_2O_3 B. PbO C. ZnO D. CuO
45. Ores are complex mixtures of metal containing minerals and accompanying rocks and soil, called gangue. What will be the correct order of the extraction processes to get a pure metal?
    A. Floatation ,distillation, and reduction C. Electrolysis , refining, and chemical reduction
    B. Concentration ,reduction, and refining D. Pretreatment, distillation ,and electrolytic reduction
46. Which of the following elements is used to galvanize metals for corrosion protection?
    A. Sn B. Zn C. Cu D. Na
47. How do alkaline earth metals exist in nature?
    A. Salts B. Liquids C. Oxides D. Metals
48. During nitrification, bacteria convert……into ……..
    A. N_2, N_2O into nitrous oxide C. N_2, nitrous oxide into nitrogen
    B. NO_3^-,NH_4^+ or nitrates into ammonium D. N_2 into nitrates
49. Which of the following metals exists in a free state?
    A. Pt B. Mg C. Zn D. Na
50. The main ore of lead is called :
    A. Cinnabar B. Zinc blend C. Galena D. Chromite
51. Which of the following reactions is Not involved in the contact process, dring the production of sulfuric acid?
    A. $SO_2 + O_2 \rightarrow 2SO_2$ C. $SO_3 + H_2SO_4 \rightarrow H_2S_2O_7$
    B. $H_2S_2O_7 + H_2O \rightarrow H_2SO_4$ D. $SO_3 + H_2O \rightarrow H_2SO_4$
52. When NaCrO4 solution is acidified, which of the following is formed?
    A. Cr metal B. $Cr_2O_7^{2-}$ C. CrO_4^{2-} D. Cr_2O_3
53. What makes the phosphorous cycle different from carbon and nitrogen cycles?
    A. Phosphourous is found in the atmosphere in the gaseous state
    B. Carbon and nitrogen are found in the atmosphere in the gaseous state
    C. Phosphorus salts are released at the higher rate compared to carbon and nitrogen cycle
    D. Carbon and nitrogen are released at lower rate compared to phosphatebsalts
54. The metal extracted from limestone, chalk and marble is……..
    A. Sodium B. Zinc C. Calcium D. Chromium

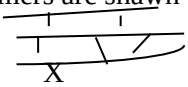
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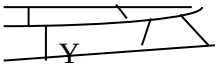
1. Which of the following is natural polymer?
   A. Nylon B. PVC C. Cotton D. Dacron
2. Which pair of monomers forms polyesters?
   A. bifunctional alcohol, bifunctional organic acid C. Ethylene, ethylene
   B. bifunctional alcohol, bifunctional amino acid D. Amino acid, amino acid
3. Which of the following is a synthetic rubber produced from caprolactam (CPL)?
   A. Nylon 6, 10 B. Terlyene C. Teflon D. nylon 6
4. Which of the following is a natural polymer?
   A. Polythene B. polysaccharides C. Nylon D. Terylene
5. Which of the following is a linear polymer?
   A. High density polyethene (HDPE) C. Bakelite
   B. Low density polyethene (LDPE) D. Vulcanized rubber
5. What structural feature is usually needed to present in order for an addition polymer to be produced?
   A. A carbon – carbon sigma bond C. A carbon – oxygen sigma bond
   B. A carbon – oxygen pi bond D. A carbon – carbon pi bond
6. What are the raw materials required to synthesize nylon 66, a specific kind of nylon?
   A. Formaldehyde B. Diamine C. Nitrogen D. Sulfur
7. Which of the following substances are added to natural rubber to toughen it?
   A. Calcium B. Carbon C. Nitrogen D. Sulfur
8. Which of the following form of synthetic rubbers can be vulcanized to greatly enhance its mechanical strength?
   A. Neoprene B. Isoprene C. Styrene- butadiene rubber D. Butyl rubber
9. What is the range in the number of carbon atoms of the monosaccharides that are found in nature?
   A. 3 to 7 B. 4 to 10 C. 4 to 12 d. 5 to 12
10. Which of the following biomolecules forms a zwitterion at higher or lower pH?
   A. Cellulose B. Glucose C. Protein D. Starch
11. What are the two principal polysaccharide forms of starch?
   A. Aldohexose and ketopentose C. maltose and cellobiose
   B. Amylose and amylopectin D. sucrose and lactose
12. Which synthetic polymer is produced from caprolactam?
   A. Nylon -6 B. Nylon 6,10 C. Teflon D. Terylene
13. Which of the following is a chemical formula that represents an amino acid?
   A. CH_4 B. CH_3NH_2 C. CH_3COOH D. NH_2CH_2COOH
14. Which of the following is NOT a carbohydrate?
   A. Starch B. Glucose C. Glycine D. Cellulose
15. Which element is added to natural rubber to make it harder and reduce its susceptibility to oxidation and chemical attacks?
   A. Sulfur B. Silicon C. Carbon D. Nitrogen
16. Which of the following statements is not correct?
   A. Fats are esters of glycerol and the fatty acids
   B. Fats produce more .energy .per gram than either proteins or carbohydrates.
   C. Fats are insoluble in water, with permits their storage in the body.
   D. True vegetarians, who do not eat meat, fish, eggs, or dairy products, have zero cholesterol in their bodies.
17. Synthetic fibers are:
   A. naturally produced.
   B. Manufacture through the use of chemical substances.
   C. Produced from animal hair fibers.
   D. Produced from plant substances.
18. What is the type of monomer unit in a natural protein polymer?
A. Amino acids B. Essential amino acids C. α- amino acids D. nucleic acids
19. Which of the following are carbohydrates?
   1. Nucleic acids II. Polyhydroxyketones III. Disaccharides IV. Aldoses V. triglycerides
   A. II, III andHZ B. I and V C. I, III and V D. III and IV

20. At. which point can only the solid and liquid phases coexist in phase diagram of water given below ?
Diagram
A. 3 B. 4 C.5 D. 8
21. Which of the following plant nutrient will be produced as a result of nitrogen fixation?
Carbohydrate B. Cellulose C. Mineral D. Protein
22. Which of the folloing is used in the reaction called saponification?
A .Strong base B. Strong acid C. Hydrogen D. Nickel
23. Natural rubber is a polymer of
A. butadiene B. isoprene C. neoprene D. styrene
24. Which of the following form of synthetic rubbers can be vulcanized to greatly enhance its mechanical strength?

A. Neoprene B. Isoprene C. Styrene-butadiene rubber D. Butyl rubber
25. Which of the following reactions will convert carboxylic acids to primary amines?
A. Decarboxylation with HBr and peroxide, then reaction of the alkyl brominde with ammonia
B. Reduction of the acid to the alcohol with NaOH/ formaldehyde, then reaction with ammonium chloride and heat
C. A two –step conversion, first to the amide with ammonia and heat, and then by reduction with lithium aluminum hydride or hydrogen plus catalyst
D. Lactase fermentation in the presence of ammonia atmosphere
26. Which of the following statements about polyvinyl chloride is **NOT** correct?
A. PVC can be used in making water pipes B. PVC is stiff
C. PVC is softened on heating D. The monomer of PVC is CHCl = CHCl
27. Bakelite is obtained from phenol by reacting with
A. HCHO B. $(CH_2OH)_2$ C. CH_3CHO D. CH_3COCH_3
28. Which of the following is a natural polymer?
A. Keratin B. Polythene C. Cellulose D. Polymethacrylate
29. A polysaccharide is a polymer made up of which kind of monomers?
A. Amino acids B. Nucleotides
C. Simple sugars D. Alternating sugar and phosphate groups
30. Which pair of the following compounds will be the source of phenyl acetate, $CH_3CO_2C_6H_5$?
A. CH_3CH_2OH and C_6H_5COOH B. CH_3COOH and C_6H_5COOH
C. CH_3COOH and C_6H_5OH D. CH_3CH_2OH and C_6H_5OH
31. Consider the following organic compounds, What will be its IUPAC name?
A. 3,4-dihydroxybenzoic acid B. 4,5 - -dihydroxybenzoic acid
C. m, p-dihydroxybenzoic acid D. 3-hydroxy-para-benzoic acid
32. Suppose you went to the market to buy cooking utensils coated with a synthetic polymer, which types of polymer do you prefer for such purpose?
A. Teflori B. PMMA C. Polystyrene D. Polypropylene chloride
33. Which of the following statements is true?
A. The hydrolysis of esters should be carried out at pH 7.0 for optimum efficiency
B. The hydrolysis of esters can be carried out under acidic or basic conditions
C. The hydrolysis of esters is not pH dependent
D. The hydrolysis of esters must be acid catalyzed
34. Which of the following plastics might Y be?
A. Perspex B. Urea- methanol C. Polystyrene D. Polyester
35. The monomer of neoprene is:
A. Butadiene B. 2-methyl-1,3-buthadiene C. Isoprene D. Chloroprene
36. Nylons are:
A. Polyamides B. Peptides C. Amides D. polyesters
37. Which of the following is a natural polymer?
A. Perspex B. PVC C. Rubber D. Teflon
38. The process of vulcanization of rubber makes it……
A. Less elastic B. Soft C. Hard D. more soluble in solvents

39. Two types of polymers are shawn below. Which of the following statements concerning these polymers is correct?





A. X and Y are thermosetting
B. X is thermosetting and Y is the thermoplastic
C. X &Y are thermoplastic
D. X is thermoplastic whereas Yis thermosetting

40. Nylon is a/an----------?

A. Polyamide B. Peptide C. Amide D. Polyester

41. Which of the following is Not a component of polysaccharides?

A. Sucrose B. Glucose C. Cellulose D. Glycogen

42. Which substance is used to lower the melting point of aluminum oxide ore in the electrolytic extraction of aluminum?

A. Bauxite B. Cryolite C. Hematite D. Magnetite

43. Which one of the following is Not a condensation polymer?

A. Polyamides B. Neoprene C. Poyester D. Nylon