1. Four moles of carbon monoxide and ten moles of hydrogen were mixed in a closed container. At equilibrium there was two moles of methanol was formed. What is the total number of moles at equilibrium?

$$CO_{(g)} + 2H_{2(g)} \rightleftharpoons H_3OH_{(g)}$$

A. 4 B. 8 C. 16 D. 10

2. The molar equilibrium concentrations for the reaction mixture represented below at 298k are [A]=2.0M, [B]=3M and [C]= 2M. What is the value of the equilibrium constant for the reaction?

$$2A+B \rightleftharpoons 3C$$

A. 0.66M B. 1.5M C. 0.8M D. 8M

3. 4L of 0.02M of aquous solution of NaCl is diluted with 1L of water. What is the molarity it the solution?

A. $0.008 mol L^{-1}$ C. $0.016 mol L^{-1}$

B. $0.004 mol L^{-1}$ D. $0.012 mol L^{-1}$

4. How much water, in liters, must be added to 500ML of $6.0 mol L^{-1}$ HCl to make the solution $2.0 mol L^{-1}$?

A. 1.5L B. 0.5L C. 1.0L D. 2.0L

5. Which of the following reactions at equilibrium would be affected by the decrease in pressure?

I. $N_{2(g)} + O_{2(g)} \rightleftharpoons 2NO_{(g)}$

II. $2CO_{(g)} + O_{2(g)} \rightleftharpoons 2CO_{2(g)}$

III. $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$

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

6. In which of the following cases will the dissolution of salt be the slowerst?

A. Powdered salt in cold water C. Salt crystals in hot water

B. Powdered salt in hot water D. Salt crystals in cold water

7. How many grams of I2, must be dissolved in 225.0mL of carbondisulfide, CS_2, (density= 1.261g/mL) to produce a 0.116mol/kg solution? I= 127g/mol

A. 8.37g B. 4.84g C. 6.32g D. 11.71g

8. A solution of NH_4Cl made by dissolving 3.16g NH_4Cl in 30.14g H_2O has a density of $1.0272 g/cm^3$. What is the mole fraction of water?

A. 0.0341 B. 0.965g C. 0.6500 D. 0.2100

9. What volume of 4.5M H_2SO_4 solution is needed to react exactly with 10.0g aluminum according to the following recitation? Al=27g, S=32g, O=16g, H=1g

$$2Al_{(s)} + 3H_2SO_{4(aq)} \rightarrow Al_2(SO_4)_{3(aq)} + 3H_{2(g)}$$

A. 123.4mL B. 1234mL C. 12.34mL D. 397mL

10. Commercially concentrated HNO_3(density= $1.83 gcm^{-3}$) is 90% HNO_3, by mass. What is the normality of HNO_3 solution (molar mass of HNO_3= $63 g,mol^{-1}$)

A. 26.14N B. 52.28N C. 13.07N D. 35.1N

11. A 0.5L and 0.1MHNO_3 solution is to be prepared by dilution process from a 13M nitric acid. How many mL conc. HNO_3 and how many mL of water are required to prepare the dilute solution?

A. 20mL HNO_3 and 490mL of water

B. 3.85mL HNO_3 and 496.15mL of water

C. 10mL HNO_3 and 490mL of water

D. 2mL HNO_3 and 498mL of water

12. Consider the following equilibrium :

$$2CO_{(g)} + O_{2(g)} \rightleftharpoons 2CO_{2(g)}, \text{ keq}= 2x10^{-8}$$

What is the value of req for $2CO_{2(g)} \rightleftharpoons 2CO_{(g)} + O_{2(g)}$

A. $2x10^{-7}$ B. $5x10^{7}$ C. $2.5x10^{9}$ D. $4x10^{-10}$

13. The reaction between alcohol and acylicholoride produces _____

A. Ether B. Ester C. carboxylic acid D. Aromatic salt

14. The solubility of NaCl in water at 20^0C is 36g in 100g of water. A solution that contains 18g NaCl in 50g of water at 20^0C is.

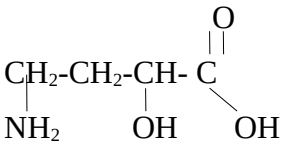
A. Unsaturated B. Saturated C. Supersaturated D. Dilute

15. Which of the following pairs of substances are miscible?

A. Water and Ethanol C. Water and gasoline

B. Water and oxygen D. Water and salt

16. What is the IUPAC name for the following molecules?



A. α- amino - γ - hydroxyl butyric acid

B. γ - amino - α - hydroxyl butyric acid

C. 1- amino -3- hydroxyl butanoic acid

D. 4- amino -2- hydroxyl butanoic acid

17. Which of the following statements concerning fats and oils is incorrect?

A. They are fatty acid salts

B. They are triacylglycerols

C. They are also called triglycerides

D. They are glycerol trimesters.

18. What is the solvent in 70% alcohol solution?

A. Alcohol B. Water C. Kerosene D. Sugar

19. The difference between fats and oils is that:

A. Fats are liquids at room temperature.

B. Oils are liquids at room temperature.

C. Oils are solids at room temperature.

D. Oils have more calories.

20. At 298k the following two gaseous equilibrium involving SO_2,SO_3 and O_2 are established.

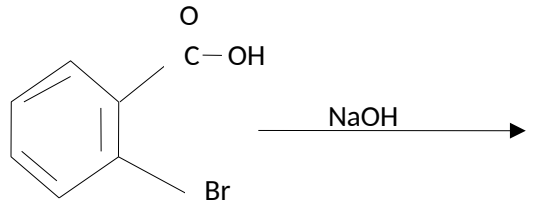
$SO_{2(g)} + ½ O_{2(g)} \rightleftharpoons SO_{3(g)}$, … K_1

$2SO_{3(g)} \rightleftharpoons 2SO_{2(g)} + O_{2(g)}$; … K_2

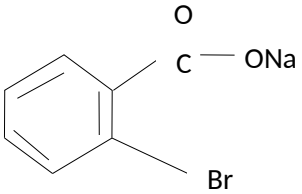
Which of the following equilibrium expression is correct?

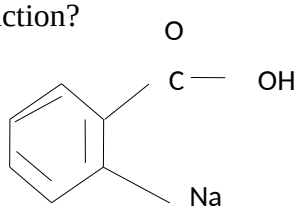
A. $K_2=K_1$ B. $K_1=K_2$ C. $K_2= \frac{1}{K_1^2}$ D. $K_2= \frac{1}{K_1}$

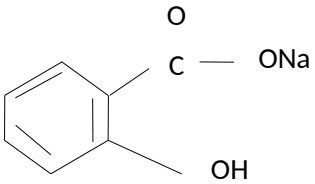
21. Given the following reaction:

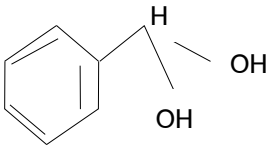


What is the major product of the reaction?

A. 

C. 

B. 

D. 

22. The dissolution of octane in water 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.

23. The solubility of oxygen gas in water at 25^0C and 1.0 atm pressure of oxygen is 0.04g/L. The solubility of oxygen in water at 3.0atm and 25^0C is _____g/L. KHO_2= 0.41g.Latm.
    A. 0.014 B. 0.31 C. 0.041 D. 0.123

24. Which of the following is used in the reaction called saponification?
    A. Strong acid B. Strong base C. Nickel D. Hydrogen

25. What is the final concentration of Cl^- ion when 250mL of 0.20M $CaCl_2$ solution is mixed with 250mL of 0.40M KCl solution?
    A. 0.40M B. 1.60M C. 0.20M D. 0.60M

26. What is the IUPAC name for the compound

$$(CH_3)_2CHCH_2\underset{\underset{CH_3}{|}}{C}H\text{-}CH_2\text{-}CO_2H$$

    A. 3,5,5- trimethyl pentanoic acid
    B. 3,6-dimethy hexanoic acid
    C. 2,4,4- trimethy pentanoic acid
    D. 3,5 – dimethyl hexanoic acid.

27. In the reaction ($2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2SO_{3(g)}$, keq=100). What will be the concentration of O_2, if the concentration of SO_2 is the same as that of SO_3?
    A. $[O_2]=[SO_2]$ C. $[O_2]$=100M
    B. $[O_2]$= 0.01M D. $[O_2]$=0.1M

28. The process of solute particles being surrounded by solvent particles is known as:-

A. Saturation B. Dehydration C. Salvation D. Agglomeration

29. What type of solute solvent interaction should be most important in the dissolution of NaCl in water?

A. London forces
B. Ionic forces
C. Ion- dipole forces
D. Dipole- dipole forces

30. The value of the equilibrium constant does not depend up on the:-

A. Initial concentration of the reactants
B. Initial concentration of the products
C. Presence of a catalyst
D. Nature of the reactants

31. If 16 grams of O_2 react with excess C_2H_6, how many grams of CO_2 will be formed? The unbalanced equation is:

$$C_2H_{6(g)} + O_{2(g)} \rightarrow CO_{2(g)} + H_2O_{(g)}$$

A. 22g B. 9g C. 13g D. 12.6g

32. At 268k, a 3.0L flask contains 4 mol H_2, 0.6 mol I_2 and 10mol HI, in equilibrium. What is the value of k at 295k?

A. 10.2 $molL^{-1}$ B. 20.34$molL^{-1}$ C. 30.34$molL^{-1}$ D. 2.3$molL^{-1}$

33. What will happen if NaOCl is added to the reaction given below 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 $[H_3O^+]$ decrease
D. The concentration of HOCl would decrease and the $[H_3O^+]$ increase

34. Which of the following statements is true about esters?

A. Esters can form intermolecular hydrogen bonds.
B. Ester molecules cannot form hydrogen bonds .
C. Esters have higher boiling points than alcohols of comparable molecular weight.
D. All

35. Consider the following reaction:

$$CH_3CH_2\text{-}CH_2\text{-}\overset{\overset{\displaystyle O}{\|}}{C}\text{-}O\text{-}CH_3 + KOH \rightarrow$$

What are the products of the reaction?

A. Methyl propanoic acid and methanol
B. Potassium propanoate and methanol
C. Potassium acetate and methanol
D. Potassium acetate and ethanol

36. Which catalyst is used in the reduction of ester?

A. $Kmno_4$ B. $LiAlH_4$ C. $K_2Cr_2O_7$ D. Ni

37. How much water has to be evaporated from 250Ml of 1M $Ca(OH)_2$ to make it 3M

A. 100ml B. 200ml C. 166.7ml D. 150ml

38. Consider the following balanced equation

$$3Ba(NO_3)_{aq} + Fe_2(SO_4)_{3aq} \rightarrow 3BaSO_{4(S)} + 2Fe(NO_3)_{3(aq)}$$

What are the spectator ion(s) in the above reactions?

A. Ba^{+2} and $NO_3^{-¿¿}$
B. Fe^{+3} and $NO_3^{-¿¿}$
C. Fe^{+2} and $NO_3^{-¿¿}$
D. Ba^{+2} and $SO_4^{2-¿¿}$

39. Which one of the following organic molecules has the least water solubility?

A. $CH_3CH_2CH_2CH_2OH$
B. $HOCH_2CH_2CH_2CH_2OH$
C. $HOCH_2CH_2CH_2OH$
D. $CH_3CH_2CH_2CH_2\ CH_2OH$

40. Suppose reaction x→y and y→x are both elementary of $8x10^{-2}S^{-1}$ and $4x10^{4}S^{-1}$, respectively, what is the value of the equilibrium constant for the equilibrium x ⇌ y?

A. $0.5x10^{2}$ B. $4x10^{-2}$ C. $4x10^{2}$ D. $2x10^{-2}$

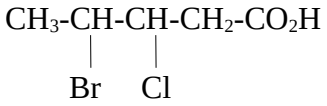
41. What is the normality of a solution containing log of H_2SO_4 in 0.5L of solution? H=1, S=32, O=16

A. 0.02N B. 0.04N C. 0.4N D. 0.2N

42. Which of the following reaction will produce an alkyl carboxylic acid?

A. Oxidation of a primary alcohol with hot permanganate.
B. Reacting an alcohol with ozon
C. Reacting an alkyl halide with hydrogen gas and platinum.
D. Heating methyl ketone with an acid and iodine.

43. What is the IUPAC name for the given molecule?

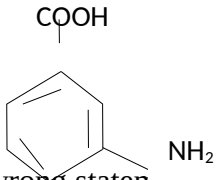


A. 3- Bromo-2- chloro- pentanoic acid
B. 4- Bromo-3- chloro pentanoic acid
C. 2- Bromo-3- chrlopentanoic acid
D. γ- Bromo-β- chloro caproic acid

44. The simplest aromatic dicarboxylic acid is:

A. Phthalic acid B. Oxalic acid C. Benzoic acid D. Methanoic acid

45. The common and IUPAC name for the given molecule is



A. 0- amide benzoic acid and 3- amide benzoic acid
B. P-amide benzoic acid and 3-amide benzoic acid
C. M- amide benzoic acid and 3- amide benzoic acid
D. None

46. Identify the wrong statement about carboxylic acids.

A. Higher acids are waxy solids
B. Lower aliphatic acids have sharp irritating odour
C. Carboxylic acids dissolve in water due to hydrogen bond.
D. Benzoic acid sparingly soluble in cold water than hot water.

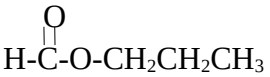
47. Which of the following molecule has high boiling point?

A. C_5H_{12} B. $C_4H_{11}OH$ C. C_2H_5COOH D. $CH_3(CH_2)_4COOH$

48. Which bond cleavage occurs, when carboxylic acid reacts with base?

A. C=0 B. C-O C. O-H D. C-H

49. What is the IUPAC name of the given molecule?



A. Propyl methanoate
B. Methyl propanoate
C. Butanoic acid
D. Propyl formate

50. Which of the following is wrong about fats and oils?

A. Fats and oils are quite reactive substances.
B. The rancidity of a given fat is only the result of long storage.
C. The fat must be stored under favorable conditions.
D. Fats and oils develop an unpleasant odour due to rancidity.

51. Conversion of ethanol into ethanoic acid is an example of:

A. Reduction B. Oxidation C. Hydration D. Addition

52. Hydrolysis reaction of fats by sodium hydroxide is known as:

A. Saponification C. Acetylation

B. Ester fication D. Carboxylation

53. What is the physical state of solute in salt solution?

A. Solid B. Liquid C. Gas D. Solid and liquid

54. In solution process the exothermic step is

A. Separation of solute C. Hydration/ salvation

B. Separation of solvent D. A and B

55. Identify the wrong statement about solution process

A. The rate of dissolution mainly depends on surface area of solute

B. If the solute- solvent interaction is stronger, the solution process is exothermic

C. Hydration of ions favours the dissolution of an ionic solids in water

D. Lattice energy works against the solution process.

56. The partial pressure of CO_2 inside a bottle of carbonated beverage is 6atm and 25^0C. What is the solubility of CO_2? KH for CO_2=3.3 x10^{-2} mol/L atm.

A. 0.198 mol L^{-1} B. 0.1molL^{-1} C. 1.98 x10^{-2} D. 1.98x10^{-3}molL^{-1}

57. What is the molarity of 5.85gNaCl in 250mL of solution? NaCl=58.5g/mol

A. 25molL^{-1} B. 2.5molL^{-1} C. 40molL^{-1} D. 4 mol L^{-1}

58. The equivalent mass of CH_3COOH is:-

A. The same as with its molar mass C. One- fourth of its molar mass

B. Half of its molar mass D. None

59. Which of the following molecule contains the same concentrations interms of molarity and molarity?

A. H_2SO_4 B. $Ca(OH)_2$ C. HCl D. $Al_2 (SO_4)_3$

60. Which one of the following statement is wrong about change?

A. Change is the only permanent thing in the world.

B. Change can be explained only qualitatively.

C. All changes are accompanied by changes in the physical state.

D. B and C

E. All

61. Which one is an intensive physical properties?

A. Conductivity B. Area C. Mass D. Diameter

62. All the base units given below are relevant to chemistry except?

A. Candela (cd) B. Amphere (A) C. Kelvin (K) D. Kilogram (kg)

63. Which of the following numbers has four significant figures?

A. 4,320 B. 43.40 C. 0.0432 D. 432.40

64. An experimental evidences shows that if a blood sample contains 0.00361g of covid-19 virus, a person is considered as covid -19 positive, express it in micrograms?

A. 0.361μg B. 3.6 x10^4μg C. 3.16 x 10^3μg D. 3.61 x 10^6μg

65. How many atoms are present in 49g of H_2SO_4?

A. 3.01 x 10^{23} B. 7 x 3.01 x 10^{23} C. 6.02 x 10^{23} D. 15 x 6.02 x10^{23}

66. Identify the wrong statement about scientific method?
   A. Scientific method is a logical, careful and systematic approach to give response for scientific questions.
   B. Hypothesis that are not disproved by several experiments, developed into a theory.
   C. Scientific law is a general statement that summarizes facts that come from many experiments.
   D. Qualitative observations are more useful than quantitative observations.

67. Under what condition are KP >KC?
   A. Δn=1 B. Δ=0 C. Δn= -1 D. None

68. For the reaction at equilibrium, which of the following shifts the equilibrium to the right?

$$2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2\ SO_{3(g)};\ \Delta H = -196KJ\ mol^{-1}$$

   A. Removal of SO_2 C. Decreasing volume
   B. Increasing temperature D. Decreasing temperature

69. For the reaction at 2000C, $2A(g) + B(g) \rightleftharpoons 3C(g)$, KC= 3.0 predict the direction in which the reaction should proceed to reach equilibrium, if [A]= 2.0m, [B]= 3.0m, [C]= 2.0m.
   A. Forward direction C. To the left
   B. Backward direction D. None

70. The brown gas NO_2 and the colorless gas N_2O_4 exist in equilibrium

$$N_2O_{4(g)} \rightleftharpoons 2NO_{2(g)}$$

0.625 mole of N_2O_4 was introduced into 5.0L vessel and was allowed to decompose until it reached equilibrium with NO_2. The concentration of N_2O_4 at equilibrium was 0.0750m. Calculate KC for the reaction.
   A. 0.3mol L-1 B. 3.0mol L-1 C. 2.25x 10^{-2} mol L-1 D. None

71. A saturated solution of NaCl with an excess of solid is present in equilibrium with its vapour in a closed vessel. The degree of freedom for the system is”
   A. 1 B. 2 C. 0 D. 3

72. For the reaction

$H^{+¿¿}_{(aq)} + OH^{-¿¿}_{(aq)} \rightleftharpoons H_2O_{(1)}$, Kf= 1.4 x 10^{11} and Kr = 2.5 x 10^{-5} at 25^0C, then which of the following is the value of KC for this process

   A. 5.6 x 10^{15} B. 1.8 x 10^{-16} C. 1.4 x 10^{11} D. 3.5 x 10^{6}