ARULMIGU PALANIANDAVAR ARTS COLLEGE FOR WOMEN , PALANI.

PG DEPARTMENT OF CHEMISTRY

LEARNING RESOURCES

MULTIPLE CHOICE QUESTIONS

PHYSICAL CHEMISTRY

AND

ORGANIC, INORGANIC AND ANALYTICAL CHEMISTRY

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PHYSICAL CHEMISTRY

Phase Rule

1. Gibbs phase rule for general system---------- --.
   (a) P + F = C - 1 (b) P+F=C+1 (c) P +F =C - 2 (d) P+F=C+2
2. In a Single – component condensed system, if degree of freedom is zero, maximum number of phases that can co-exist ----------.
   (a) 0 (b) 1 (c) 2 (d) 3
3. The degree of freedom at triple point in phase diagram of water.
   (a) 0 (b) 1 (c) 2 (d) 3
4. Above the following line, liquid phase exist for all compositions in a phase diagram.
   (a) Time – Line (b) Solvus (c) Solidus (d)Liquids
5. Following is wrong about a phase diagram
   (a) It gives information on transformation rates
   (b) Relative amount of different phase can be found under given equilibrium Conditions
   (c) It Indicates the temperature at which different phases start to melt
   (d) Solid Solubility limits are depicted by it
6. A liquid phase produces two solid phases during---------- reaction up on cooling
   (a) Eutectic (b) Eutectoid (c) Peritectic (d) None of these
7. The phase rule was discovered by
   (a) Nernst (b)gibbs (c)Arrhenius (d)le –chatelier

8. A mixture of three gases of O_2, N_2 and CO_2 is

(a) 1 – Phase System (b) 2 - Phase System

(c) 3 - Phase System (d) 4 - Phase System

9. A mixture of two miscible liquids has the number of phase equal to

(a) 0 (b)1 (c) 2 (d) 3

10. A mixture of two immiscible liquids constitutes a system having the number of phase equal to

(a) 0 (b) 1 (c) 2 (d) 3

11. A Saturated solution of sodium chloride is a

(a) 1 – Phase System (b) 2 – Phase System

(c) 3 - Phase System (d) None of these

12. Water system has three phase– ice, water, vapours. The number of components in the system is

(a) 1 (b) 2 (c) 3 (d) 4

13. A Saturated solution of NaCl in water has degrees of freedom equal to -----.

(a) 1 (b) 2 (c) 3 (d) 4

14. For one component system the phase rule is

(a) F = 3-P (b) F = 2 – P (c) F= 1- P

15. A System with zero degrees is known as

(a) Monovarient (b) Bivarient (c) Non- Varient (d) None

16. At a triple point

(a) Both the temperature and pressure are fixed

(b) Only the temperature is fixed

(c) Only the pressure is fixed

(d) All the above

17. The phase rule is applicable to

(a) 3 Phases coexist in equilibrium

(b) The vapour pressure is equal to the pressure

(c) There are three components in equilibrium

ANSWER KEY:

1) (d) P + F= C+2

2) (c) 2

3) (a) 0

4) (c) Solidus

5) (a) It gives information on transformation rates

6) (a) eutectic

7) b) gibbs

8) (a) 1 – Phase system

9 (b) 1

10) (b) 1

11) (b) 2-phase System

12) (a) 1

13) (a) 1

14) (a) F = 3 - P

15) (c) Non – Varient

16) (a) Both the temperature and pressure are fixed

17) (a) 3 phase coexists in equilibrium

Thermodynamics – I

1. The word thermodynamic implies flow of ---------- --.
2. is the specified portion of matter under study which is separated from the rest of the universe with a bounding surface.
3. There are ---------- types of system.
4. An ----------of a system is that which depends upon the amount of the substance present in the system.
5. An ---------- of a system is that which is independent of the amount of the substance present in the system.
6. The operation by which a system changes from one state to another is called a process. **(True/False)**
7. A Process is said to the ---------- if the ----------of the system remains constant during each storage of the process.
8. A Process is said to be adiabatic if no---------- enters or leaves the system during any step of the process.
9. A Process is said to be isobaric, if the---------- of the system remains constant during each step of the process.
10. The first law of thermodynamics is also known as the---------- --.
11. The difference between the molar heat capacity of a gas at constant volume is equal to_____.
12. If a body A is in equilibrium with body C and body B is also in equilibrium with body C. then bodies A & B are in---------- with each other.
13. The work done by the gas in expansion at constant pressure is numerically given by_____.
14. The Unit of energy is----------.

15. The relationship between mechanical work done W & Heat produced H is expressed as_____.
16. The first law of thermodynamics expresses the conservation of ---------- principle.
17. Changes in energy can be expressed by using the terms ---------- and ---- --.
18. The total mass and energy of an ---------- system remains unchanged.
19. Every substance is associated with a definite amount of energy known as ---------- which depends upon its chemical nature as well as upon T.V and P.
20. Change in internal energy of a system in its initial states A and final state B is given as_____.
21 ---------- is the mathematical statement of first law of thermodynamic.
22. The change in enthalpy when a liquid changes into vapour state is known as _____.
23. The change in enthalpy is denoted as $\triangle H$ =---------- --.
24. The true molar heat capacity is defined by the differential equation. -------- --.
25. The relationship between C_P and C_v in gaseous system is ---------- --.
26. The temperature below which a gas becomes cooler on expansion is known as_____.
27. The----------is the inversion temperature of hydrogen.
28. The phenomenon of change of temperature produced when a gas is made to expand adiabatically from a region of high pressure to a region of extremely low pressure is known as ---------- --.
29. Joules thomon coefficient is denoted by ---------- --.
30. The joule –thomson coefficient for an ideal gas is ----------.

Answer Key:

1.Heat
2.System
3) 3
4) Extensive property
5) Intensive property
6) True
7) Isothermal, Temperature
8) Heat
9) Pressure
10) Law of conservation of energy
11) Gas constant R,
12. Equilibrium
13) $W=P\triangle V$
14.Joule
15.W α H or W = JH
16. Energy
17. Heat & Work,
18. Isolated system
19. Internal energy,
20. $\triangle U=U_B - U_A$
21. $\triangle U =q+w$
22. Enthalpy of vaporization
23. $\triangle U+P\triangle V$
24. $C=dq/dt$
25. $(C_p- C_v= R)$
26. Inversion temperature
27. - 48°C,
28. Joule –Thomson effect
29. $\mu_{JT} = \left(\frac{\partial T}{\partial P}\right)_H$
30. Zero

THERMO CHEMISTRY AND CHEMICAL EQUILIBRIUM

1. The study of heat changes accompanying a chemical reaction is termed -----.
2. Bond energy is also called ----------.
3. The heat change in chemical reaction at constant pressure is ---------- --.
4. Bond enthalpies of diatomic molecules is equal to bond enthalpies of dissociation **(True/False)**
5. The variation of enthalpy of reaction with temperature is given by ----------
   a) Arrhenius equation b)Kirchhoff's equation
   c) Hess's law d)Claussius Clapeyron equation
6. A Catalyst shifts the equilibrium to the right. **(True /False)**
7. At equilibrium,$\triangle G$ is
   a) Positive b)Negative c)Zero d)None of the above
8. If the number of moles of reactants is equal to the number of moles of products
   a)$K_P = K_C$ b)$K_P > K_C$ c)$K_P < K_C$ d)None of the above
9. If the concentrations of the reactants are increased the equilibrium shifts in favour of the ----------.
10. If the concentrations of the products are increased , the equilibrium shifts in favour of the_____.

Answer Key:

1. Thermochemistry
2. Enthalpy of formation of the bond
3. $\triangle H$
4. True
5. b)Kirchhoff's equation
6. False
7. c) Zero

8. a) $K_P=K_C$
9. Products
10. Reactants

SOLUTIONS:

1. The molality of a solution containing 18g of glucose (molar mass 180) in 500g of water is ----------.
   (a) 1 m (b) 0.5m (c)0.2m (d)1.2m
2. The temperature at which two conjugate solutions change into one homogenous solution is called the ---------- --.
   (a) azeotrope (b)Conjugate temperature
   (c) Consolute temperature (d)transition temperature
3. Solution with components which obey Raoult's law over the entire composition range are said to be ---------- --.
   (a) Real solutions (b)Dilute solutions
   (c)Binary solutions (d)Ideal solutions
4. In a binary ideal solution having mole fractions x1 and x2 the free energy of mixing per mole of solution is given by ----------.
   (a) RT[In x1+In x2] (b)RTx1 Inx1+1In x2
   (c)R[In x1+x2 Inx2] (d)n1 RTx1 +n 2RT Inx2.
5. The vapour pressure of a pure liquid at 250°C is 100 torr. Its mole fraction in the solution is 0.20. It its activity coefficient 1.5 then its vapour pressure is -- _____.
   (a) 30 torr (b)7.5 torr (c) 13.3 torr (d) 60 torr
6. The law which relates the solubility of a gas to its pressure is called -------- --.
   (a) Raoult's law (b)The distribution law
   (c) Henry's law (d)Ostwald's law
7. One litre of water under 1.8 atm pressure of N_2 dissolves 0.028g of the gas at 293K. The Henry's law constant for gas in water is ---------- --.
   (a) $1x10^5$ atm (b)0.5×10^{-5} atm (c) $1x10^{-5}$ atm (d) $2.5 x10^5$ atm

8. The Henry's law constant for Argon in water is 2.5 $x10^4$ atm at 250C.the mole fraction of argon, at an argon pressure of 10 atm, at this temperature is _____.

   (a) $4x10^{-2}$ (b)$2.5x10^2$ (c)$4x10^{-4}$ (d)$2.5X10^5$

9. The solubility of a solute ----------with a temperature when the dissolution is attended by adsorption of heat.
10. A substance tends to dissolve in solvents which are chemically ---------- to it.
11. Inorganic compounds are mostly soluble in ---------- solvent.
12. For an ideal solution, the Gibb's free energy of mixing is ---------- and the volume of mixing is ----------.
13. The solubility of a gas in liquid ----------with increase in pressure over the solution, at a given temperature.
14. According to Henry's law , at constant temperature and pressure, the solubility of all gases in a given liquid is ----------.
15. Solution having ---------- deviations from Raoult's law cannot be distilled into pure components.
16. The ratio of the concentration of a solute in a pair of immiscible liquids is called Henry's law constant (**True/False**)
17. Ideal solutions obey Raoult's law (**True/False**)
18. All solutions must obey either Henry's law or Raoult's law over the entire composition range. **(True/False)**

Answer Key:

1.(c) 0.2 m,

2.(a) Azeotrope

3.(d)Ideal solutions

4.(b)RTx1 In x1+1In x2,

5(a)30 torr,

6.(c)Henry's law

7.(a)$1x10^5$atm

8.(c)$4x10^{-4}$

9. Increases

10.Similar

11.Polar

12.Not zero

13.Increases

14.The same

15.Positive

16.False

17.True

18.False

Photo Chemistry

1. A Photochemical reaction takes place by the absorption of

   a) Visible and untraviolet radiations b) Infrared radiations
   c) Heat Energy d) None of these

2. The wavelength of ultraviolet and visible regions of electromagnetic spectrum is

   a)Less than 2000 A^o b)More than 8000^{o}A
   c)2000^0 to 8000 A^0 d)None of these

3. Photochemistry activation is highly selective. This statement is

   a) True b)False c)Sometimes True d)None of these

4. "It is only the absorbed light radiations that are effective in producing a chemical reaction". This is the statement of

   a)Lambert law b)Lambert - Beer Law
   c)Grothus –Draper law d)Stark – Einstein law

5. One Einstein is the energy associated with

   a) One molecule b)One Photon
   c) Avogadro number of photons d)Faraday number of photons

6. The light emitted in a Chemiluminescent reaction is also called

   a)Cold light b)Hot light c)Bright light d)None of these

7. A Solution of quinine sulphate on exposure to visible light exhibits---------.

   a) Fluorescence b)Phosphorescence
   c) Chemiluminescence d)None of these

8. Sulphates of calcium barium and strontium exhibits

   a)Chemiluminescence b)Fluorescence
   c)Phosphorescence d) None of these

9. Photochemical decomposition of a substance is called

   a) Thermal dissociation b) Thermolysis
   c) Photolysis d) None of above

10. Organic dyes like eosin, chlorophyll, ultrarine etc show ---------- in the visible (or) UV region

    a) Fluorescence b) Phosphorescence
    c) Chemiluminescence d) None of these

11. The glow of fireflies is due to the aerial oxidation of luciferin. It is an example of

    a) Fluorescence b)Phosphorescence
    c) Chemiluminescence d) none of these

Answer Key:

1. a) Visible and untraviolet radiations
2. c) 2000A^0 to 8000 A^0
3. a) True
4. c) Grothus- Draper law
5. c) Avogadro number of photons
6. a) Cold light
7. a) Fluorescence
8. c) Phosphorescence
9. c) Photolysis
10. a) Fluorescence
11. c) Chemiluminescence

Organic, Inorganic and Analytical Chemistry

Alcohols, Ethers, Thiols and Thio Ethers

1. Rectified alcohol is ----------.

   (a) 100 % Ethanol b)90% Ethanol c) 100% Methanold d)95% Ethanol

2. Hydroboration – oxidation of propene gives ---------- --.

   a)Isopropyl alcohol b)n-Propyl alcohol

   c)Isobutyl alcohol d) Test – butyl alcohol

3. Ethers are_____.

   a) Lewis Acids b) Neutral c) Lewis Bases d) Cannot be predicted

4. Ethanol is isomeric with---------- --.

   a) Dimethyl ether b)Ethanol c) Diethyl ether d)Propanone

5. Grignard reagents add to the carbonyl group of the ketones to form----------.

   a) 1- alcohol b)2-alcohol 3)3-alcohol 4)None of these

6. Complete the following reactions

   C_6H_5OH + C_2H_5I ------→---------- +HI

7. Zeisels method is used to estimate ---------- --.

   a) Alcoholic group b) Amino Group c) Alkoxy group d) halo group

8. Alkoxy – mercuration – Dioxy mercuration consists of treating an alkene with mercuric triofluoro acetate in the presence of alcohols followed by ----- _____.

   a) $LiAIH_4$ b) $NaBH_4$ c) Pd-$BaSO_4$ d)N:

9. Which one of the following is simple ether

   a)$CH_3OC_2H_5$ b)$C_2H_5OCH_3$ c)$C_2H_5OC_2H_5$ d)$C_3H_7OC_2H_5$

10. Williamsons synthesis is an example of---------- --.

    a)Nucleophilic addition b) Electrophilic Addition

    c) Electrophilic Substitution d) Nucleophilic Substitution

11. Ether is formed when alkyl halide is treated in sodium alkoxide method is known as_____.

    a)Hoffmanns reaction b)Williamsons synthesis

    c)Wurtz synthesis d) Kolbes reaction

12. Tick the correct decreasing order of acid strength of alcohols.

    a) 3^0 alcohol > 2^0 alcohol > 1^0 alcohol

    b) $1^0 > 2^0 > 3^0$

    c) $2^0 > 1^0 > 3^0$

    d) $1^0 > 3^0 > 2^0$

ANSWER KEY:

1. 95 % Ethanol
2. n- propyl alcohol
3. Lewis base

4. Dimethyl ether
5. 3^0 alcohol
6. $C_6H_5\ OC_2H_5$
7. Alkoxy
8. NaBH4
9. $C_2H_5OC_2H_5$
10. Nucleophilic Substitution
11. Williamson's Synthesis
12. $1^0 > 2^0 > 3^0$

Polyhalogen Derivatives

1. Dichloro Difluoro methane is known as ----------.
2. $Ca(OH)_2 + 2CCl_3CHO$ ---------- + $(HOOC)_2$ Ca
3. Chloroform is used as an---------- --.
4. Reactivity of allyl chloride is high

   (True/False)

5. is also known as PVC.
6. Grignard reagent is ---------- --.

   a) RMgX b) RCuX c) C_6H_5X d) C_2H_5X
7. Tetra ethyl lead is used as an antiknocking agent

   (True/False)
8. Cause for depletion of Ozone layer is ---------- --.

   a)Argon b)Freon c) Neon d) Krypton
9. $RNH_2 + CHI_3 + 3KOH \longrightarrow$ ---------- + 3 KI + $3H_2O$
10. $CCl_4 + 2HF$ ---------- + 2HCl

a) CH_2F_2 b)CCl_2F_2 c) CH_2Cl_2 d)C_2H_6

11. $RX + 2Li \longrightarrow + LiX$

12. $RLi + C_6H_5CH_2Br \longrightarrow + LiBr$

13. $\longrightarrow C_6H_4NCH_2CH_2CH_2CH_3 + LiH$

14. $2C_2H5\ ZnI \longrightarrow +ZnI_2$

15. $Zn(C_2H_5)_2 + HgCl_2 \longrightarrow + ZnCl_2$

ANSWER KEY:

1. Freon -12
2. 2CHCl3
3. Anaesthetic
4. True
5. Polyvinyl Chloride
6. RMgx
7. True
8. Freon
9. RNC
10. CCl_2F_2
11. RLi
12. $C_6H_5CH_2R$
13. C_6H_5N
14. $(C_2H_5)_2\ Zn$
15. $(C_2H_5)_2\ Hg$

Chemistry of S – Block Elements

1. The most electropositive elements are found in the group

   a) Zero b) IA C) I B d) VIII group

2. Which of the following would have the lowest ionization energy?

   a) K b) F c) Cs d) CI

3. Beryllium shows diagonal relationship with ----------.

   a) Li b) Al c) B d) Mg

4. Which has the least ionization energy?

   a) Li b) Cs c) CI d) I

5. Which of the following pairs of elements show the diagonal relationship?

   a)Li – Mg b)Na – be c) Cs- F d) C-Si

6. What are coinage metals?

   a) Cu, Ag, Au b) Zn, Cu, Sn c) Ag, Au, Zn d)Be, Mg, Cu

7. What are the alkaline metals?

   a) H A group b) I A group c) I A and II a group d) VIII A group

8. Beryllium reacts with alkalies to give the product---------- --.

   a)$NaBeO_2 + H_2$ b)$Na_2BeO_2 + N_2$ c)$Na_2BeO_2 + H_2O$ d)$NaHCO_3$

9. Li has a_____.

   a) Low ionization energy, Low electro negativity

   b) Highest ionization energy, Highest electro negativity

   c) Low ionization energy, High electro negativity

   d) High ionization energy, Low electro negativity

10. Extraction of Lithium from ---------- --.

    a) Spodumene ore b)Triphyllite ore c)Both a and b d)None of these

11. LiF is Sparingly soluble in water because it has ---------- --.

    (a) Particial covalent character (b) Small Electronegativity

    (c)High lattice enthalpy (d)Low hydration enthalpy

12. Alkali metals, though white, impart characteristic colour to the flame because of

    (a) Excitation and coming back of valence electrons to the original level.

    (b) Oxidation of metal in the presence of flame.

    (c) Excitation of valence electrons

    (d) gain of electrons

13. Which of the alkali metal chloride (Mcl) forms its dehydrate easily?
    (a)Licl (b)cscl (c)Rbcl (d)Kcl
14. Ionic mobility of which of the following alkali metal ions is lowest when an aqueous solution of their salts are put under are electric filed?
    (a) Na (b) K (c) Rb (d) Li
15. A Compound that release Co_2 most easily upon heating is ---------- --.
    (a) K_2 Co_3 (b) Na_2 Co_3 (c) mg Co_3 (d) Ca co_3

ANSWER KEY:

1) b) IA
2) (c) Cs
3) b) Al
4) b)Cs
5) a)Li - Mg
6) a)Cu, Ag, Au
7) b) IA
8) a) Na_2 Beo_2 + H_2O
9) b) Highest ionization energy, highest electro negativity
10) c) Both a and b
11) High lattice enthalpy
12. Excitation and coming back of valence electrons to the original level.
13. Licl
14. Li
15. mg Co_3

Chemistry of P –Block Elements

1. Red lead is_____.
   a) PbP b)Pb_3O_4 c) PbO_2 d)PbO, PbO_2
2. Which of the following is sublimed white lead?
   a) PbO. $2PbSO_4$ b) $Pb(OH)_2$ .2 $PbSO_4$ c) Pb_3O_4 d)PbO
3. Which of the following is not a compound of lead?
   a) Black Lead b)White Lead c)Red Lead d)None of these
4. In air white lead gets blackened due to the formation of
   a) Pb b) PbS c) H_2S d) C
5. Action of heat on white lead gives---------- --.
   a) $Pb(OH)_2$ b) Pb CO_3 c)PbO d) Pb_3O_4
6. Which of the following is used as a red pigment?
   a)Pb_3O_4 b) PbO c) $PbCrO_4$ d)$Pb(OH)_2$
7. When Pb_3O_4 is heated with HNO_3 we get a mixture of---------- --.
   a) Pb $(NO_3)_2$ and PbO_2 b) PbO and NO_2 c) PbO.PbO_2, NO_2, O2 d) None
8. In the atoms of P-Block elements the differentiation electron enters
   a) nP - Orbitals b) (n-1) P – Orbitals
   c) nS - Orbitals d) S and P Orbitals
9. In Dutch process, used for the manufacture of white lead vapours of vinegar are passed on lead in presence of O_2 and ----------.
   a) CO_2 b)Pb $(OH)_2$ c)PbO d) PbO_2
10. Complete the following reaction: CO + Cl2 ---⟶---------- --.
11. An Amphoteric hydroxide among the following is-------- --.
    (a) $Be(OH)_2$ (b) Sr $(OH)_2$ (c) $Ca(OH)_2$ (d) $mg(OH)_2$
12. What is the molecular weight of hydrazine?
    (a) 28 (b) 30 (c) 32 (d)17

13. Hydrazine is miscible with water, is the statement True/False

(True

) 14. Marsh test is used for

detecting

(a) As (b) Zn (c) Al (d) CH_4

15. White lead in paint is used as---------- --.

(a) Base (b) Thinner (c)Pigment (d) None

ANSWER KEY:

1. b.Pb_3O_4 2) a. $PbO \cdot 2PbSO_4$ 3) a. Black Lead 4)b. PbS

5) d. Pb_3O_4 6) a.PbO_4 7) a) $Pb(NO_3)_2$ and PbO_2

8) a. nP-Orbital 9) a. CO_2 10) $COCl_2$ 11. $Be(OH)_2$

12. 32 13.True `14.As 15. Base

Theory of Volumetric Analysis

1. The principle of Volumetric Analysis is ----------.
2. The Equation weight of Mohr salt ----------.

(a)278 (b) 392 (c)63 (d)40

3. The Expansion of EDTA---------- --.
4. EDTA + Hardwater +Eriochrome T ⟶ ---------- --.
5. $AgNO_3 + NaCl$ ⟶ ----------$+ NaNo_3$
6. $NaOH + HCl$ ⟶ ---------- $+ H_2O$
7. $Ca(OH)_2 + H_2SO_4$ ⟶ ----------$+ 2H_2O$
8. $4KMnO_4 + 6H_2SO_4$ ⟶ ----------$+ MnSO_4 + 6H_2O + 5O_2$
9. Phenaphthalein indicator gives pink colour in ----------
10. Water that easily gives lather with soap is called ---------- --.

a) Hard Water b) Soft Water c) Dirty water d) Clean water

Answer Key:

1. $V_1N_1 = V_2N_2$
2. B) 392
3. Ethylene Diamine Tetraacetic acid
4. Wine Red
5. Agcl
6. Nacl
7. $CaSO_4$
8. $2K_2SO_4$
9. Bases
10. b) Softwater