Br.B.K.College,Vengurla
Department of Chemistry
T.Y.B.Sc. Subject: Physical Chemistry
Molecular Spectroscopy
UNIT I (MCQ)
Choose the correct answer

1. The molecular energies can be arranged as …….
 a) $E_{ele} > E_{vib} > E_{rot}$ b) $E_{ele} > E_{rot} > E_{vib}$ c) $E_{vib} > E_{ele} > E_{rot}$ d) $E_{vib} > E_{rot} > E_{ele}$
2. A linear molecule like XeF_2 will show …….. vibration
 a) 4 b) 5 c) 9 d) 10
3. Uv-Vis are associated with …… transition
 a) Vibrational b) Rotational c) Electronic spectra d) Translation
4. Rayleigh scattering takes place when …….
 a) $\lambda_i > \lambda_s$ b) $\lambda_i = \lambda_s$ c) $\lambda_i < \lambda_s$ d) $\lambda_i \neq \lambda_s$
5. Microwave spectra is observed in ……
 a) Microwave region b) Radiowave Region c) UV-Visible region d) IR- Infrared region
6. A linear molecule containing 'n' atom has …… modes of vibration
 a) 3n-4 b) 3n-5 c) 3n-6 d) 3n-7
7. The number of vibrational mode for CH_4 molecule is ……
 a) 7 b) 8 c) 9 d) 10
8. The molecule of CO_2 and SO_2 possess …….. modes of vibration
 a) 3,3 b) 4,4 c) 4,3 d) 3,4
9. The molecules of CO_2 and $CHCl_3$ ……. modes of vibration
 a) 4,9 b) 9,4 c) 4,4 d) 9,9
10. Total degree of freedom in CO_2 molecules ….
 a) 3 b) 6 c) 4 d) 9
11. The …… value of rotational energy is zero.
 a) Maximum b) Minimum c) Average d) Optimum
12. In Rayleigh scattering the wavelength of the incident radiation
 a) Remain same b) Increases c) decreases d) Varied
13. NH_3 has …… dipole moment.
 a) 1.85 D b) 1.92 D c) 1.63 D d) μ=1.47 D
14. For stokes lines in Raman show ……..
 a) $\nu_i = \nu_s$ b) $\nu_i > \nu_s$ c) $\nu_i < \nu_s$ d) $\nu_i \neq \nu_s$
15. Pure rotational spectra is shown by ……..
 a) H_2 b) HCl c) O_2 d) Cl_2
16. The minimum vibrational energy possessed by a molecule is known as ……. Energy
 a) Rotational b) Zero-point c) Electronic d) Vibrational
17. The wave number of fundamental, First and Second overtone band are roughly in the ratio…….
 a) 1:2:3 b) 2:1:3 c) 3:2:1 d) 0:1:29.
18. The number of vibrational degrees of freedom for benzene is …….
 a) 12 b) 13 c) 30 d) 31
19. The value of rotational constant B is 192 m^{-1} in $^{12}C\ ^{16}O$ its value for $^{13}C\ ^{16}O$ is …..
 a) 194 m^{-1} b) 190 m^{-1} c) 192 m^{-1} d) 188 m^{-1}
20. The unit for moment of inertia is …….. .
 a) Kgm^2 b) Kgm c) Kg/m^2 d) Kg/m

21.The spacing between the any two successive lines in the rotational spectrum of a rigid diatomic rotor (diatomic molecule) is

a) 1B m-1 b) 2B m-1 c) 3B m-1 d) 4B m-1

22.Roman shift is…… for anti-stokes line.

a) Negative b) Positive c) Zero d) -1

23.Rule of mutual exclusion is applicable to ……

a) CO b) O2 c) H2 d) CO2

24.Zero-point energy is given by the expression ----------.

a) $hv0$ b) $\frac{1}{2}hv0$ c) $\frac{1}{3}hv0$ d) $2hv0$

25.Rule of mutual exclusion is applicable to ……

a) CO b) CO2 c) H2 d) O2

26.In which of the molecule C=C stretching is IR active

a) CH2=CH2 b) CH3=CH3 c) CH3-CCl3 d) Both CH2=CH2 & CH3=CH3

27.Raman shaft is…… for Stokes line.

a) Negative b) Positive c) Zero d) -1

Chemical Thermodynamics
UNIT II(MCQ)
Choose the correct answer

1. A semipermeable membrane is permeable to ……. Molecules .

a) Solute b) Solid c) Solution d) Solvent

2. liquids with ……. are less volatile.

a) Weak intermolecular forces b) Strong intermolecular forces

c) Vander'Vaals forces d) Weak ionic forces

3. The rate of most of the reactions increases by factor …… for 10 degree rise in temperature

a) Two b) One c) Four d) Five

4. According to the collision theory, the colliding molecules possess …….. motion only .

a) Vibrational b) Rotational c) Electronic d) Translational

5. Osmotic pressure is …….

a) Directly proportional to the volume of the solution .

b) Inversely proportional to the temperature.

c) Directly proportional to the concentration of the solution.

d) Directly proportional to molar mass of solute .

6. Cryoscopic constant denoted by latter …..

a) Kc b) Kb c) Kf d) Lf

7. Osmotic pressure is measure by…….

a) Static method b) Dynamic method c) Beckmann method d) Berkely and Hartley's method

8. Moderate reaction are reaction with rate constant ……..

a) 10^{-7} b) 10^{-4} to 10^{-1} c) 10^{2} to 10^{5} d) about 10^{11}

9. ……. Method is used to determine rate of the reaction of ultra fast reactions

a) Continuous flow b) Stop flow c) non-flow d) HPCL

10. Which of the following type of compound will have vant'hoff factor =1 ?

a) Strong electrolyte b) Weak electrolyte c) Non-electrolyte d) None of these

11. The flow of solvent molecules can take place from ……..

a) Dilute to concentrated solution b) Concentrated to dilute solution

c) Any one solution to the other d) None of these

12. …….. is the depression of freezing point of 1kg of solvent, when 1 mole of solute is added to it

a) Cryoscopic constant b) Molal boiling point elevation constant
c) Molal elevation constant d) Ebullioscopic contant

13. The flow of solvent through a semipermeable membrane from pure solvent to solution is called

a) Diffusion b) Osmosis c) effusion d) None of these

14. the unit of cryoscopic constant is ……..

a) Kg mol^{-1} k b) Kg mol K c) Kg^{-1} K^{-1} mol^{-1} d) Kg^{-1}mol K^{-1}

15.According to Raoults law, relative lowering of vapour pressure for a solution is equal to

a) Mole of solute b) Moles of solvent
c) Mole fraction of solute d) Mole fraction of solution

16.When a chemical reaction obey collision theory probability factor…….

a) P=1 b) P<1 c) P>1 d) P≠1

17.Linderman's theory is for……..

a) Unimolecular reaction b) Bimolecular reaction
c) Termolecular reaction d) Ter-order reaction

18.The molal depression constant of camphor is ……..

a) 40Kg mol^{-1} K b)45 Kg mol K c)35 Kg^{-} K^{-} mol^{-1} d)50 Kg^{-1} mol K^{-1}

19. ……. method is used to determine rate of the reaction of fast reaction.

a) Continuous flow b) Stop-flow c) Non-flow d) HPLC

20.Which of the following inorganic precipitate acts as a semipermeable member?

a) $Al(OH)_3$ b) $BaCO_3$ c) $CuSO_4$ d) $Cu_2[Fe(CN)_6]$

21.Relative lowering vapour pressure measured by

a) Static and dynamic method b) Berkeley and Hartley method
c) Beckmann's method d) Osmometry

22.Osmotic pressure is pressure required to

a) Prevent osmosis b) Initiate osmosis
c) Pass solute in solution d) Remove solute from solution

23.Which of the following have maximum depression in freezing point?

a) 0.5M Li_2SO_4 b) 1 M KCl c) 0.5 M $Al_2(SO_4)_3$ d) 0.5 M $BaCl_2$

24.When NaCl solution is separated from water by semipermeable membrane then

a) There is no flow of water b) Water flows to NaCl solution
c) NaCl flows to water d) There is no flow of solvent

25.The unit of molal depression constant is

a) K, Kg mol^{-1} b) Kb c) Kf d) Kg mol^{-1}

26.Whch of the following is correct for per mole?

a) $\pi \propto \frac{1}{T}$ b) $\pi \propto v$ c) $\pi = \frac{1}{R}$ d) $\pi v = RT$

Nuclear Chemistry
UNIT III(MCQ)
Choose the correct answer

1. The penetration power of γ-Rays is …… Alpha rays

a) Lower than b) Higher than c) Equal to d) unequal

2. Geiger- Nuttal rule is given by ……

a) λ =A Log R+B b) Log λ= A Log R-B c) Log λ= A Log R+B d) λ =A Log R-B

3. Threshold energy is calculated only if nuclear reaction is……

a) Exoergic b) Endoergic c) Endothermic d) Exothermic

4. Fission reaction is sustainable in nuclear reactor if multiplication factor ……..

a) K>1 b) K<1 c) K=0 d) K≠1

5. ……. not affected by magnetic field.

a) α-Rays b) β-Rays c) ϒ-Rays d) δ-Rays

6. Reaction proceeds at steady state when ……

a) Multiplication factor >1 b) Multiplication factor <1

c) Multiplication factor =0 d) Multiplication factor=1

7. Multiplication factor K is = 1 then chain reaction ……

a) Supercritical b) Divergent c) Subcritical d) Self sustained

8. $_{13}{}^{27}Al + {}^{1}_{0}n$ --------□ $_{12}{}^{27}Mg + {}^{1}_{1}H$ …….. type of transmutation

a) (n,p) b) (p,n) c) (p,α) d) (n,d)

9. ^{235} U is a …….. material

a) Fertile b) Fissile c) Non-fertile d) Both a and c

10. ……. Is the amount of fissionable material which is required for a self sustaining nuclear fission process.

a) Sub critical mass b) Critical mass c) Super critical d) Divergent mass

11. One Rutherford is defined as the quantity of radioactive material which produces …….. disintegration per second

a) 10^7 b) 10^6 c) 10^8 d) 10^9

12. The fission reaction proceeds at a steady rate if K is equality

a) Equal to unity b) Greater than unity c) Less than unity d) Both b and c

13. ……. not acts as reflector.

a) Graphite b) Beryllium c) Lead-silver alloy d) Boron

14. Control rods in nuclear reactor are ……..

a) Cadmium and Boron b) Carbon and Lead

c) Metal sodium and steel alloy d) Lead and Silver

15. The phosphor is used in the study of ϒ- Rays

a) NaI (Thallium activated) b) CaI_2 (Thallium activated)

c) KI (Thallium activated) d) MgI_2 (Thallium activated)

16. The parent element which is bombarded with fast moving particles is called ……..

a) Projectile b) Ejected particle c) Target d) recoil nucleus

26.One Rutherford is---------

a) 106 dps b) 1 Becquerel c) 1 Curie d) Microcurie

17.For radioactive dating …….. is used

a) C 12 b) c14 c) c13 d) c15

18. ……. is fissile material

a) 238U b) 235U c) 232Th d) both 238U and 235U

19.The process of converting one element into another element by bombarding with fast moving particles is called -------.

a) Natural radioactivity b) Artificial radioactivity

c) Induced radioactivity d) Nuclear transmutation

20.In nuclear reaction the thermal neutrons are absorbed by----

a) Control rod b) Moderated c) Neutron reflector d) Moderator & reflector.

21.The reaction 12D + 13T → 24He + 01n is an example of

a) Nuclear fission b) Artificial radioactivity c) Induced radioactivity d) Nuclear fusion

22.The oxygen liberated during photosynthesis $6CO2+6H2O \rightarrow C6H12O6+6O2\uparrow$ comes from.
a) CO2 b) H2O c) Both CO2 & H2O d) CO
23.Anthracene act as ------
a) Phosphor b) Moderator c) Coolant d) Controller
24.When $1327AI$ undergo (α,n) reaction, the recoil nucleus formed is
a) $1530P$ b) $1430Si$ c) $1123Na$ d) $1223Mg$
25.In artificial radioactivity the daughter radioactive nucleus formed having $\frac{N}{Z} < 1$ attains stability by emitting ……
a) Positron b) Neutron c) Electron d) Proton
26.The energy produce by the sun involves which of the following nuclei?
a) Pu b) Li c) U d) H

Surface Chemistry
UNIT IV(MCQ)
Choose the correct answer

1. Lyophilic sols are …… than lyophobic sols .
a) Less stable b) More stable c) Less viscous d) More unstable
2. The colloidal system of liquid in gas ……
a) Smoke b) Soda water c) ink d) fog
3. The movement of dispersion medium under the influence of an electric field is called …….
a) Electrophoresis b) Electro osmosis c) Flow potential d) Sedimentation potential
4. Chemisorption is an ……..
a) Irreversible process b) Reversible process c) Fast process d) Not specific
5. At CMC the surfactant molecules …….
a) Decompose b) Dissociate c) Associate d) Become completely soluble
6. In adsorption of SO_2 gas on activated charcoal, the charcoal serves as …….
a) Adsorbate b) Adsorbent c) Catalyst d) Absorbent
7. Lyophobic sols are ……..
a) Solvent hating b) Solvent loving c) More stable d) Viscous
8. Isoelectric point means pH at which electrophoretic mobility is …
a) +7 b) +1 c) 14 d) Zero
9. …… is system in which dispersed phase is solid and dispersed medium is liquid
a) Gel b) Emulsion c) Foam d) Sol
10. The adsorption of gas by solid is …… in nature
a) Exothermic b) Endothermic c) Endoergic d) Exoergic
11. In chemical adsorption only …… of adsorbate molecule is possible.
a) Multilayer b) Monolayer c) Bilayer d) Trilayer
12. For the colloidal solution, the particle size is ……..
a) $\bar{>}$100nm b) 1nm- 100nm c) < 1nm d) 100nm- 1000nm
13. The curve which gives the relationship between amount of gas absorbed and equilibrium pressure is called …….
a) Isotherm b) Adsorption isotherm c) Isobar d) Isochor
14. The colloidal solution of arsenic sulphide prefers to adsorb
a) NO_3^- b) K^+ c) S^{2-} d) H^+

15. Potential developed at the surface of the fixed layer is called ……..
a) Zeta potential b) Nernst potential c) Liquid junction potential d) Theta potential
16. The formation of micelles takes place above particular temperature called ……..
a) Kraft temperature b) CMC c) Critical temperature d) CST
17. The formation of micelles takes place above particular concentration is called ……..
a) Kraft temperature b) CMC c) Critical temperature d) CST
18.The colloidal solution of arsenic sulphate prefers to adsorb--------
a) NO_3^- b) K^+ c) S^{2-} d) H^+
19.Which of the following is not a colloidal electrolyte?
a) Soap b) Congo red c) Sodium stearate d) Sodium chloride
20.The potential difference between the fixed double layer and diffuse double layer is called
a) Zeta potential b) Sedimentation potential c) Streaming potential d) Flow potential
21.The equation a=K1P/1+K2P represent …….
a) Freundlich isotherm b) Isotherm c) Langmuirs isotherm d) BET isotherm
22.If excess of silver nitrate is added to a dilute solution of potassium iodide, the colloidal silver iodide system will have …….. charge.
a) +ve b) -ve c) Zero d) Neutral
23.Surface area of adsorbent can be determined by using --------
a) Clausius equation b) Clapeyron equation c) Clapeyron- Clausius equation d) BETequation
24.The ferric oxide sol is ……
a) [Fe2O3.*x* H2O] OH-Na+ b) [AgI] I-| K+ c) [AgI] Ag+|NO3 d) AS2 S3 sol
25. …….. proposed by Stern model.
a) Diffused layer b) Not mobile layer c) Not movable layer d) Fixed layer
26. The first layer formed governs ……..
a) Enthalpy of chemical adsorption b) Enthalpy of physical adsorption
c) Enthalpy of Vander Waals forces d) Enthalpy of lattice