Guru Nanak Dev Engineering College , Ludhiana
APPLIED SCIENCES DEPARTMENT

Subject Code:-BTCH-101 **Subject Name:-Engg.Chemistry**
Section:-All Branches **Session:- 2014-2017**
(CS,IT,EE,EC,ME,PE,CE)

Note:- This is Question Bank for U.V.Spectroscopy for preparation of students in context of Final Exam. Try to give crystal clarified answer with proper conclusion. Underlined words are keywords for extracting appropriate answer. "OR" means question can be of different form but you have to write same answer for relevant questions. Positively you all will be benefited by these questions and give your best in exams.

Q.1 Define Chromophore and Auxochrome with suitable examples?

Q.2 Explain different types of Electronic transition with representation?

Q.3 Draw labelled diagram of Double Beam UV-Visible Spectrophotometer?

Q.4 Describe different factors affecting width and intensity of spectral lines?

OR

Why UV Spectra is broad in nature instead of sharp peak?

Q.5 Define Bathochromic,Hypsochromic,Hyperchromic and Hypochromic shift and Isobestic point with examples?

OR

Explain different factors affecting λ_{max} of spectral lines?

Q.6 Discuss the influence of increase in polarity of solvent on $\pi - \pi^{\#}$ and n-$\pi^{\#}$ transition?

Q.7 Give a statement of Frank-Condon principle with Potential energy level diagram?

Q.8 How UV Spectroscopy helps in identification of Geometrical Isomers and different carbonyl containing functional group?

Q.9 Explain Principle and Selection Rules of UV Spectroscopy?

Q.10. "1,3-butadiene absorb at high wavelength as compared to ethene'. Justify your answer with relevant reasons?

Q.11. Why β-carotene an orange pigment in carrots absorb at 452 and 478 nm?

Question Bank for I.R.Spectroscopy

Q.1 Explain different types of stretching and bending fundamental vibrations?

Q.2 If the force constant of CO molecule is 1560 Nm^{-1}.Calculate the fundamental frequency of vibration in cm^{-1}?

(HINT:- Hooke's Law formula)

Q.3 Define Finger-print and Functional group region and mention their range?

Q.4 How alkane,alkene and alkyne can be distinguished with the help of I.R. Spectroscopy?

Q.5 What are the main factors which affect the Vibrational frequency?

Q.6 Discuss the Principle and Selection rule of I.R.Spectroscopy?

Q.7 Calculate the number of modes of vibration in CO_2,SO_2,methane and benzene molecule?

Q.8 How different types of H-bonding can be distinguished with the help of I.R.Spectroscopy?

Q.9 Distinguish following pairs using IR Spectra

(a) Ethyl alcohol and Dimethyl ether

(b) Propane and propanol

(c) Acetone and Acetaldehyde

(HINT:- Use of concept of Inductive effect, Resonance and Hooke's Law)

Q.10 HCl is IR active but H_2 and Cl_2 is IR inactive.Explain?

Q.11 How can carbonyl group be differentiated in Formaldehyde, Acetaldehyde and Acetone with the help of IR Spectroscopy?

Q.12 Mention the range of Infrared radiation in terms of Kcal/mole?

Question bank for N.M.R.Spectroscopy

Q.1 What do you mean by shielding and deshielding of protons in N.M.R. Spectroscopy?

OR

What is meant by term Chemical Shift?

Q.2. Why TMS is used as standard reference compound/Super compound in NMR Spectroscopy?

Q.3 Explain the NMR spectra of the following compounds using spin-spin coupling concept and do mention the intensity of splitted signals?

(A) 2-Chloropropane

(B) Ethyl amine

(C) Ethanol

(D) 1,1,2-trichloro propane

Q.4 Which type of nuclei show NMR spectra?

Q.5 Describe the components of NMR Spectrophotometer along with block diagram?

Q.6 What do you mean by relaxation process and coupling constant in NMR Spectroscopy?

Q.7 A compound with molecular formula C_3H_6O and $C_2H_4Br_2$ show one signal in NMR. Predict its structure?

Q.8 How NMR Spectroscopy can distinguish cis and trans isomers of molecule?

Q.9 Explain different factors influencing Chemical shift?

Q.10 What type of solvents are used in NMR Spectroscopy?

Q.11 How proton exchange processes can be studied with the help of NMR Spectroscopy?

Question Bank for Photochemistry

Q.1 Explain Fluorescence and Phosphorescence process with the help of Jablonski Diagram?

OR

Describe radiative and non-radiative electronic transitions with the help of Jablonski Diagram?

Q.2 Define the following terms:-

(a) Photosensitization

(b) Primary and Secondary processes

(c) High and Low Quantum Yield

(d) Quenching

Q.3 Differentiate between Thermochemical and Photochemical Reactions?

Q.4 A sample of HI was irradiated by light of wavelength 473.7nm when 207 J of energy was found to decompose 2.45×10^{-3} moles of HI. Calculate Quantum efficiency for dissociation of HI?

Q.5 Explain different Laws of Photochemistry and mention their mathematical formulation?

Q.6 Derive Beer-Lambert Law and what are its application and limitations?

Q.7 Give mechanism of photochemical reaction for formation of HCl molecule?

Q.8 Explain Emitter and Detector component of Optical Sensors?

Q.9 A substance when dissolved in water at 10^{-3} M concentration absorbs 15% of incident radiation in a path of 1 cm length. What should be concentration of solution in order to absorb 75% of same radiation?

Q.10 Explain different types of Semiconductors and Photovoltaic Cell?

Q.11 Discuss the role of Benzophenone as photosensitizer in valence isomerisation and dimerization reaction of 1,3-butadiene as only reactant?

Question Bank for Water and its Treatment

Q.1 Explain Lime soda process and Zeolite method for softening of hard water?

Q.2 Define the following terms:-

(a) Electrodialysis and Reverse osmosis
(b) Temporary and Permanent Hardness
(c) Priming and Foaming
(d) Sludge and Scale formation
(e) Break-point Chlorination

Q.3 Calculate the amount of lime(91%) and soda(97.2%) required for softening of one million litres of water containing calcium bicarbonate(30.5 ppm), magnesium bicarbonate(35.5 ppm), magnesium sulphate(20.0 ppm), calcium sulphate(24.0 ppm), calcium chloride(25.0 ppm) and sodium chloride(10.0 ppm).

Q.4 Discuss the principle of EDTA titration and Soap method for estimation of Hardness of water?

Q.5 Which factors are responsible for Boiler Corrosion/Caustic Embrittlement?

Q.6 Explain ion-exchange process for softening of hard water?

Q.7 Explain the function of following in treatment of water:-

(a) Colloidal,Carbonate and Calgon

(b) Sodium phosphate,Hydrazine and Alum

Q.8 Define the term Sterlization/Disinfection and mention different methods used for purification of water?

Q.9 What are parameters determined in analysis of water to ascertain quality and utility of water?

Q.10 A water sample contains 19 mg of $MgCl_2$ per litre of water. Calculate the hardness of water in ppm in terms of $CaCO_3$ equivalent?

Q.11 How demineralised water is different from soft water?

Question Bank for Green Chemistry

Q.1 Explain definition,Concept and Principles of Green Chemistry?

Q.2 Discuss the use of Alternative Renewable feedstock/Biofuel in synthesis of Adipic Acid from D-glucose?

Q.3 Define the following terms:-

- **(A) Atom Economy**
- **(B) Sonochemistry**
- **(C) Biodiesel oil**
- **(D) Innocuous Reagents**
- **(E) Aqueous liquids**

Q.4 Explain Supercritical fluid, Derivatized solvent and Ionic liquid as Alternative solvent?

Q.5 Mention five safer chemicals used in Green Chemistry along with its use?

Q.6 Write chemical reaction of Acetylation of Aniline,Diel-Alder reaction and Electrophilic aromatic Substitution reaction using Alternative Reaction Methodology?

Q.7 Give three microwave assisted chemical reaction and mention advantages of using microwave heating in chemical reaction?

Q.8 Write down chemical reactions initiated by ultrasound?

Q.9 How oxidation of cyclohexene can be carried out using traditional and Green approach?

Q.10 Write down Knoevenagel,Saponification,Esterification,Hydrolysis and Friedel-Craft Reaction?

Q.11 Compare traditional and microwave method for esterification of aromatic Carboxylic acid with polar solvent such as methanol in terms of temp., Reaction time and Yield?

Q.12 Write down chemical reactions for synthesis of Indigo dye from aniline and L-tryptophan and which method should be preferred and why?

Question Bank for Corrosion and its Prevention

Q.1 Write the mechanism of Electrochemical Corrosion?

Q.2 Explain how the following secondary factor affect the rate of corrosion:-

(a) Temp. (b) pH (c) Polarization
(d) Anodic and cathodic area

Q.3 Define the following terms:-

(a) Galvanic corrosion (b) Water line corrosion (c) Crevice corrosion

(d) Metal Cladding (e) Sheradizing (f) Passivation

Q.4 What are different factors which affect the rate of corrosion?

Q.5 Discuss different methods for prevention of corrosion?

Q.6 Differentiate the following with suitable examples:-

(a) Galvanic and Electrochemical Series

(b) Pitting and Stress Corrosion

(c) Soil and Microbiological Corrosion

(d) Dry and Wet Corrosion

Q.7 Explain Electroplating and Electrochemical protection methods for prevention of Corrosion?

Q.8 Why Rusting of Iron is quicker in saline water than in ordinary water?

Q.9 How corrosion is affected by volatile nature of products of corrosion?

Q.10 What do you mean by Galvanic Series and how it is useful?

Q.11 Extraction of metal and corrosion are opposite to each other. Justify the statement?

Question Bank for Polymer and Reinforced Composites

Q.1 Differentiate between Addition and Condensation Polymerization?

Q.2 What do you mean by Isotactic, Syndiotactic and Atactic Polymer?

Q.3 Define the following pairs of terms

(a) Monomer and repeating unit

(b) Thermoplastic and Thermosetting polymer

(c) Matrix and dispersed phase

(d) Linear chain and Cross linked polymer

(e) Block and Graft polymer

Q.4 In a polymer, there are 150 molecules of molecular weight 3500, 250 molecules of molecular weight 2500 and 350 molecules of 1500. Calculate number average and weight average molecular weight along with P.D.I.?

Q.5 Write free radical polymerization reaction for formation of polystyrene involving peroxide as initiator?

Q.6 What do you mean by Polymer Reinforced Composite? Mention its characteristics and Advantages?

Q.7 Discuss the effect of molecular weight on different properties of polymers?

Q.8 Explain chain initiation, chain propagation and chain termination step for polymerization mechanism?

Q.9 Classify polymers on basis of ultimate form, chemical composition and type of monomer used in synthesis?

Q.10 Explain different features of polymers?

Q.11 What is the specific role of properties of polymer in widespread use of PVC, PVA, PAN and Teflon?

Q.12 How do double bonds in rubber molecule influence their structure and reactivity?

Question Bank for Nanochemistry

Q.1 What do you mean by Self-assembly? Give its characteristics and examples?

Q.2 Define the following terms along with two applications:-

(a) Nanochemistry

(b) Carbon Nanotubes

(c) Nanowires

(d) Fullerenes (C_{60})

Q.3 Mention the various applications of Nano materials in health care and other fields?

OR

What do you mean by Future perspectives of Nanochemistry?

Q.4 Describe two dimensional Self assembly and Nanocrystals?

Q.5 Discuss different types of Supramolecular structures along with diagrammatic representations?

Q.6 Differentiate between following pairs:-

(a) Molecular and Material Self assembly

(b) 2-D and 3-D Mesoscale Self assembly

Q.7 What are Coercing Colloids and give its example?

Q.8 Define the term Micelles?

Q.9 Why nanomaterials exhibit different properties?

Q.10 Describe quantum confinement effect and how it is responsible for various properties shown by nanoparticles?

Question Bank for Petrochemicals

Q.1 What are first, second and third generation of petrochemicals?

Q.2 What are major treatment processes of Natural Gas?

Q.3 Explain the composition and physical separation processes of Crude Oil?

Q.4 Mention the chemical composition of Natural Gas? Classify it on basis of composition?

Q.5 Define the following terms along with their objectives:-

(a) Catalytic Cracking

(b) Reformation of Petrol

(c) Hydrocracking

Q.6 Discuss the properties and applications of Natural Gas?

Q.7 Write down chemical reaction for production of Ethylene and Propylene? Give its uses?

Q.8 Classify crude oil on basis of relative ratios of hydrocarbon content?

Q.9 Explain Natural gas liquids along with its uses?

Q.10 Give important reactions involved in reformation of petrol and what are its objectives?

Q.11 Discuss the composition of hydrocarbon and non-hydrocarbon compounds?

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