# ISC 2019 Suggestions

**(Disclaimer :** Don't rely only on these. Follow at your own risk**)**

## Physical Chemistry

## (25 Marks)

**Solid state :**

- BCC, FCC, ccp crystal - unit cell calculation
- Radius(r) and nearest neighbour distance (d) relation only.
- Packing efficiency - bcc, fcc, ccp (no calculation)
- Octahedral and tetrahedral voids related numericals.
- Density related numericals ($\rho = \frac{Z\ x\ M}{a^3\ x\ N_o}$)
- Schottky, Frenkel defect-in detail.
- F-center, NaCl yellow colour, ZnO
- n and p type semiconductor, temperature with semiconductor.
- Co-ordination number. NaCl, ZnS type crystal.

**Solution :**

- Rasult's Law, Positive and Negative deviation
- Colligative Property
- Elevation of bp. depression in freezing point, osmotic pr. Isotonic Solution
- Abnormal colligative property. Van't Hoff factor. i = 1, i>1, i<1
- $Na_2SO_4$ , Glucose, $MgCl_2$ – comparative study of colligative property.

**Electrochemistry :**

- Nernst equation for different cell, numericals,
- standard reduction potential(definition),
- salt bridge,
- utility of electrochemical series,
- utility of standard reduction potential,
- cell representation,
- spontaneity of cell,
- cell constant (mainly numericals) ,
- specific equivalent and molar conductance-relation change with dilution,
- Kohlrausch's law, and numerical,
- cell constant,
- Faraday's law - mainly numericals

**Chemical Kinetics :**

- Zero, first order reaction in detail
- rate law, half life, units - numericals,
- numerical related to rate equation, order of reaction

**Surface Chemistry :**

- Physical and Chemical adsorption – differences,
- What is adsorption isotherm,
- lyuphilic and Lyophobic solutions differences,
- Dialysis,
- Ultra-centrifugation,
- Electrophoresis,
- Coagulation,
- Why adsorption is exothermic,
- peptization,
- factors which influence the adsorption of a gas on a solid,
- emulsion,
- aerosol, jel, foam, example (phase).

## Inorganic Chemistry

## (20 Marks)

**General Principles and Processes of Isolation of Elements :**

- Froth floatation,
- Leaching,
- Flux (Example),
- Calcination,
- Roasting,
- Zone refining,
- electrolyte refining,
- wrought iron,
- cast iron,
- role of NaCN in extraction of silver ore,
- role of Iodine in refining of Titanium,
- Role of depressant in froth floatation method,
- vapour phase refining,
- extraction of $Cu_2S$ – reactions involved.
- Why Aluminium can't be extracted by chemical reduction process.
- Thermite mixture.

**p-Block Elements :**

- Inert pair effect - its application,
- boiling point,
- thermal stability of $H_2O$, $H_2S$, $H_2Se$, $H_2Te$. Acid strength, Reducing character of $H_2O$, $H_2S$, $H_2Se$, $H_2Te$.
- Electron gain enthalpy of F, Cl, Br, I.
- $F_2$ is highly oxidising.
- Thermal stability, acid strength, reducing character of — HF, HCl, HBr, Hi.
- Acid strength of oxoacids of halogen.
- Why interhalogens are more reactive,
- pseudo halogen—example only.
- Reactions — $Cl_2$ with $NH_3$, $Cl_2$ with $H_2S$ and $Na_2S_2O_3$, $Cl_2$ with hot and cold NaOH.
- Liquification and melting and boiling points of noble gases
- structure of $XeF_4$, $XeOF_4$, $XeO_3$. $F_2$, $Cl_2$, $Br_2$, $I_2$ (bond energy).
- Tailing of Mercury,
- $O_3$ reacts with $I_2$, HCl, PbS; $H_2O_2$ with PbS, $Cl_2$, KI.

**d and f Block Elements :**

- Atomic radii - variation,
- explanation - catalytic properties,
- complex formation of d-block elements
- why Zn, Cd are not Transition elements
- $K_2PtCl_6$ is known but corresponding Ni compound is not known,
- Cu(II) is paramagnetic but Cu(F) is diamagnetic.
- Lanthanide contraction,
- Basicity of $La(OH)_3$ and $Lu(OH)_3$,
- Atomic radii — Zr, Hf, Misch metal-composition,
- stainless steel, invar, Alnico-composition,
- preparation $KMnO_4$ from Pyrolustic Ore,
- $K_2Cr_2O_7$ reacts with acidified KI, $AgNO_3$ + KI → ?

**Coordination Compounds :**

- Type of ligands - one example each.
- Chelate complex,
- IUPAC nomenclature,
- Ionisation,
- hydrate,
- linkage isomer — example only.
- Stereoisomerism of — $Ma_2b_2$, $Ma_2bC$, $M(AA)_2b_2$ type complexes,
- why NO GI for Tetrahedral complex,
- Total isomer for $[CoCl_2(en)_2]^+$ complex.
- Bonding,
- magnetic character of $[NiCl_4]^{-2}$, $[Fe(H_2O)_6]^{+3}$ , $[Fe(CN)_6]^{-3}$ complexes.

# Organic Chemistry

## (25 Marks)

**Haloalkanes and Haloarenes :**

- Reaction of halogen acids with alcohol,
- Hunsdiecker reaction,
- dehydrohalogenation,
- Grignard reagent,
- Wurtz-Fittig,
- Fittig reaction,
- chloropicrin,
- $ChCl_3 \xrightarrow{KOH}$ ?,
- $ChCl_3 \xrightarrow{Ag}$ ?,
- Iodoform reaction.

**Alcohols, Phenols and Ethers :**

- Preparation of primary, secondary, tertiary alcohols by Grignard reagent,
- acid catalyzed hydration of alkene,
- acid strength of 1° , 2° , 3° alcohol,
- dehydration, R-OH + $SOCl_2$ -->?,
- dehydrogenation,
- Lucas test
- lower to higher alcohol conversion and vice versa ,
- acid character of phenol,
- effect of substituent on the acidity of phenol,
- Phenol + $Br_2$ / $H_2O$ --> ?
- Phenol + $Br_2$ / $CS_2$ --> ?
- picric acid,
- Kolbe's A Schimdt reaction, salol, aspirin comma oil of wintergreen , reimer tiemann reaction, coupling, gattermann reaction reaction

**Aldehydes, Ketones and Carboxylic Acids :**

- Williamson synthesis,
- R OH + $CH_2N_2$ + $HBF_4$ --> ?
- ether + HI in cold --> ?
- ether + HI in excess --> ?
- $(CH_3COO)_2Ca$ + heat --> ?
- $(HCOO)_2Ca$ + heat --> ?
- Rosenmund reduction,
- Reactivity of aliphatic aldehyde and ketone,
- cyanohydrin formation,
- Acetals and ketals,
- 2,4—DNP,
- $RCH_2OH$ (reduction),

- $CH_3$—CH=CH—CHO + $NaBH_4$ --> ?
- $CH_3$—CH=CH—CHO + $LiAlH_4$ --> ?
- Cannizaro reaction
- aldol
- cross aldol
- mesitylene
- phorone
- Tischenko reaction
- Carboxylic acid more acidic than phenol
- HVZ reaction
- Distinction between phenol and carboxylic acid
- How would you prepare Lactic acid from acetaldehyde,
- How would you prepare ethane from acetaldehyde?
- Wolf-Kishner
- Clemenson reduction,
- Why formic acid reduces Tollen's reagent?
- Acid strength of compounds – $CH_3CH_2OH$, $CH_3COOH$, $ClCH_2COOH$, $C_6H_5CH_2COOH$, $FCH_2COOH$

**Organic Compounds containing Nitrogen :**

- Stephen's reduction,
- R-$NO_2$ + Sn/HCl or $LiAlH_4$ --> ?
- R-$NO_2$ + Zn / $NH_4Cl$ --> ?
- Nitrobenzene Reduction --> ? 1. Acidic, 2. Neutral, 3. Alkaline medium
- Amide to Amine
- Basic character of aliphatic and aromatic amine (Polar and Non-Polar solvent)
- Diazotisation
- $RNH_2$ + $HNO_2$ --> ?
- Carbylamine reaction
- Sandmeyer, Balz-Schiemann reaction
- Aniline does not undergo Friedel-craft reaction, Why?
- Aniline to Benzene
- Sulphonilic acid cannot be acylated but its sodium salt can be readily acylated, why?

**Biomolecules :**

- Reducing, non-reducing sugar (example) ,
- osazone,
- glucose reacts with conc $HNO_3$, $Br_2/H_2O$, [Aldohexose, Aldoketose-example]
- acidic, basic, neutral amino acid-example [zwitter ion - for Alanine, Glycine],
- Isoelectric Point,
- What is Peptide bonds,
- Fibrous and globulour protein,
- denaturation of protein,
- vitamin B12 - metal,
- glycosidic linkage,
- nucleoside and nucleotide,
- co-enzyme,
- avidaminose,

- glucose heated with Tollen's reagent,
- mutarotation

**Polymers :**

- Addition, condensation polymer,
- Elastomer,
- Vulcanisation,
- Thermoplastic and Thermosetting polymers,
- write name of monomer - natural rubber,
- neoprene,
- PVC,
- Teflon,
- Terylene or Dacron,
- Nylon-6 or Perlon,
- Nylon - 66,
- Buna-S,
- Buns-N,
- Homopolymer,
- Copolymer,
- what are polyesters, Bakelite,
- what are Polyamides-example,
- Low density - High density polythene.